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**THE TRANSFORMATION OF THE VOWEL SYSTEM IN  
AFRICAN LATIN WITH A FOCUS ON VOWEL MERGERS AS  
EVIDENCED IN INSCRIPTIONS AND THE PROBLEM OF THE  
DIALECTAL POSITIONING OF ROMAN AFRICA\***

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*Abstract:* Present paper intends to explore the process of the transformation of the vowel system as evidenced in the pre-Christian and Christian inscriptions of the Roman provinces Africa Proconsularis including Numidia and Mauretania Caesariensis. With the help of the LLDB-Database, the phonological profiles of the selected African provinces will be drawn and compared to those of six more territorial units, i.e. Sardinia, Hispania, Gallia, Dalmatia, the city of Rome and Bruttium et Lucania. Then the dialectal position of the selected African provinces will be described by various methods of phonological analysis regarding vocalism in both periods. It will be demonstrated how the selected African provinces did *not* form a homogeneous dialectological area. The vocalism of Latin in later Africa Proconsularis including Numidia turns out to be of the same type as of the later Latin in Sardinia, while the vocalism of the Latin in later Mauretania Caesariensis might have started to develop toward the eastern or Balkan type of vocalism. Regarding consonantism, especially the *b-w* merger, later Mauretania Caesariensis shows explicitly different trends from what we see in later Africa Proconsularis.

*Keywords:* African Latin, phonology, vocalism, inscriptions, dialectology, Vulgar Latin

## 1. Introduction

Over the years, several studies discussed the transformation of the vowel system in African Latin, especially vowel mergers in relation to the problem of the collapse of distinctive vowel quantity and the reorganization of vowel quality.<sup>2</sup> The first exploration of the vowel system of later African Latin based on a selection

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<sup>2</sup> For these processes in general, see Herman 2000, 27ff.

of Christian inscriptions published in ILCV<sup>3</sup> was carried out by Omeltchenko, who concluded that the Latin of Africa was characterized by the extreme conservatism of its vocalism.<sup>4</sup> His main arguments included the scarcity of *e-i* and *o-u* mergers, indicated by the extreme rarity of E/I and O/U confusions. This showed a strong resemblance to the Latin of Sardinia and Sardinian Romance (where the vowel system lost the phonological length distinctions but kept the original vocalic qualities, reflected in both the extreme rarity of relevant spelling confusions in Latin inscriptions and by the vocalism of Sardinian Romance), and a sharp contrast to the Latin of Gaul and Gallo-Romance (where the vowel mergers were in an advanced state, reflected in both the great number of relevant spelling confusions in Latin inscriptions and by the vocalism of Gallo-Romance).

These results of Omeltchenko were supported by Adams, who analysed the spelling errors of the Bu Njem ostraca and the Albertini tablets from the middle of the 3<sup>rd</sup> century and from the end of the 5<sup>th</sup> century respectively, not only regarding vowels but also consonants, with special attention to the *b-w* merger reflected in B/V confusions. Adams pointed out that in these documents from Africa E/I and O/U confusions were very rare or even absent, while B/V confusions were very frequent, all this in sharp contrast to Gaul, where the situation was the opposite. Adams also concluded that African Latin had the same type of vowel system as Sardinian.<sup>5</sup>

Nevertheless, these substantial investigations could not present a full picture since they did not use extensive epigraphic corpora but narrow selections or small corpora of inscriptions and other non-epigraphic documentary corpora, while almost entirely overlooked the huge Pre-Christian epigraphic material.<sup>6</sup>

Accordingly, in our paper, beside the comparative analysis of the later epigraphic material of the Christian period, we will include in the analysis the huge inscriptional corpus of the Pre-Christian period of the Empire. With the help of the LLDB-Database we will try to draw the phonological profiles of Latin Africa, i.e. of the provinces of Africa Proconsularis including Numidia and Mauretania Caesariensis in both an early Pre-Christian and a later Christian period.<sup>7</sup> Then by comparing these profiles to those of six more territorial units, i.e. Sardinia, Hispania, Gallia, Dalmatia, the city of Rome and Bruttium et Lucania chosen for the

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<sup>3</sup> ILCV = Diehl, E.: *Inscriptiones Latinae Christianae ueteres* 1–3. Berlin 1925–1931.

<sup>4</sup> Cf. Omeltchenko 1977, 471ff.

<sup>5</sup> Cf. Adams 2007, 642–649.

<sup>6</sup> Adams only involved the tiny corpus of Bu Njem ostraca from the 3<sup>rd</sup> century as for the pre-Christian period.

<sup>7</sup> Meaning in the 1<sup>st</sup> through 3<sup>rd</sup>, and the 4<sup>th</sup> through 7<sup>th</sup> centuries, respectively, which correspond to the non-Christian and Christian periods.

survey we will try to describe the dialectal position of Latin Africa regarding vocalism in both periods.<sup>8</sup>

First, it has to be emphasized that the results of my investigation on the vowel system of African Latin to be presented here are in a way provisional and cannot be considered entirely conclusive yet. This is because the African Roman epigraphic material has not been yet processed completely in the framework of our project. To date, roughly half of all relevant inscriptions have been entered in the LLDB-Database from the provinces of Africa Proconsularis including Numidia and from Mauretania Caesariensis. The work with material from Mauretania Tingitana, the most western province of Latin Africa has just started and therefore this province was excluded from the present survey. Still, I decided to start my analysis of the African data set as the number of digital data forms recording the changes of the African Latin phonological system has already reached a volume where a distributional analysis is appropriate.<sup>9</sup> The results can this way be compared to the linguistic profiles of other regions of the Roman Empire.

## 2. Methodology

Before we go into the detailed analysis, the following features of methodology have to be highlighted. Throughout our analysis, the method of József Herman will be followed:<sup>10</sup> we will analyse the distributional structures of purely phonological ‘errors’ recorded from Latin inscriptions by excluding data that have morpho-syntactic or other non-phonological interpretations<sup>11</sup> as well as the purely

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<sup>8</sup> Hispania corresponds to Hispania Citerior, Baetica and Lusitania, Gallia with Aquitania, Lugudunensis, Belgica and Narbonensis.

<sup>9</sup> Thanks to the intensive data recording work of our data collectors, particularly Tünde Vágási, Dóra Bohacsek and Natalia Gachallová.

<sup>10</sup> For Herman’s methodology in general, see Adamik 2012, 134–138.

<sup>11</sup> In this investigation we consider only those data forms with phonetic main codes (chosen from the list labelled as ‘Vocalismus’ in the Database) that do not have a nominal or verbal morphosyntactic alternative code (chosen from the lists labelled as ‘Nominalia’ or ‘Verbalia’ in the Database), such as (é: > I) FECIRVNT for *fecerunt* (LLDB-7226), (i > E) MENVS for *minus* (LLDB-2594), (ó: > V) AMVRE for *amore* (LLDB-8255), (ú > O) NOMERO for *numero* (LLDB-554), (ó > V) MEMVRIA for *memoriam* (LLDB-585), (é > I) MIRITO for *merito* (LLDB-25583), (í: > E) PERECVLO for *periculo* (LLDB-18874), (ú: > O) INMONES for *immunis* (LLDB-12585), (e: > I) FILICITER for *feliciter* (LLDB-10024), (i > E) INVEDA for *invida* (LLDB-3074), (o: > V) RVMANVS for *Romanus* (LLDB-28125), (u > O) TVMOLVM for *tumulum* (LLDB-24), (o > V) CORPVRA for *corpora* (LLDB-9446), (e > I) SEMPIR for *semper* (LLDB-13644), (i: > E) VETALIS for *Vitalis* (LLDB-5244), (u: > O) MOSIVO for *musivo* (LLDB-25818) etc. This procedure is necessary because forms like ANNVS for *annos* (e.g. LLDB-11843), MENSIS for *menses* (e.g. LLDB-7012) and IACIT for *iacet* (LLDB-14646), QVIESCET for *quiescit* (LLDB-8079) etc. can be interpreted not only as incidences of phonological changes but also as incidences

orthographic errors as non-linguistic ones.<sup>12</sup> We will consider all types of phonological changes recorded in our database, with particular emphasis on the substantial vowel mergers in the vowel system, and, additionally, on the *b-w* merger in the consonant system (apparent in the confusion of the letters B and V) that was included in the discussion by Adams as a contrast group, as an index of productivity.<sup>13</sup>

As it is well known, the orthographic confusions<sup>14</sup> between E and I and between O and U represent the Vulgar Latin vowel mergers of long  $\bar{e}$  and short  $i$  into a closed  $e$ , long  $\bar{o}$  and short  $u$  into a closed  $o$  in stressed syllables, and into short  $e$  and short  $o$  respectively in unstressed syllables.<sup>15</sup> These changes (i.e.  $\acute{e} \acute{i} > e$ ,  $\acute{e} > e$ ,  $\bar{e} e i > e$ ;  $\acute{o} \acute{u} > o$ ,  $\acute{o} > o$ ,  $\bar{o} o u > o$ ) occurred in the great majority of the Romance languages and a system emerged that can be called ‘Proto-Western-Romance’. However, the evidence from Romance languages suggests that this reorganization of vowel quality did not occur in Sardinia, and occurred only partly in the Latin spoken in the Balkans. Vowel quality in Sardinia remained as it had been all along, even though the length distinctions were lost here just like everywhere else ( $\bar{i} i > i$ ,  $\bar{e} e > e$ ,  $\bar{o} o > o$ ,  $\bar{u} u > u$ ). At the same time, in Rumanian, which is the single persistent representative of Balkan Latin, we find a develop-

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of confusions between either cases, declensions or conjugations – and these are not separable. Accordingly, we have also excluded data forms with an alternative code chosen from the list labelled as ‘Syntacica etc.’ in the Database, e.g. archaisms such as VIVOS for *vivus* (e.g. LLDB-231) or possible recompositions such as PERDEDIT for *perdidit* (LLDB-4335) etc.

<sup>12</sup> The following codes were excluded as purely orthographic phenomena:  $g > C$ ,  $qu > CV$ ,  $H > \sigma$ , aspiratio vitiosa,  $ch > C$ ,  $ph > P$ ,  $th > T$ ,  $PH \sim F$ ,  $c > K$ ,  $k > C$ ,  $x > SX / CS / XS / XSS / XX$ ,  $i (= /j/) > II$ ,  $\acute{a}e > E$ ,  $\acute{e} > AE$ ,  $\acute{e} : > AE$ ,  $ae > E$ ,  $e > AE$ ,  $e : > AE$ ,  $ae / \acute{a}e > AI$ ,  $i : > II$ ,  $e : > EE$ ,  $a : > AA$ ,  $o : > OO$ ,  $u : > VV$ . Similarly, I have also excluded data forms that either contextually (e.g. syncopated forms of *saeculum* in verse) or technically (e.g. readings uncertain for whatever reason) may optionally be regarded as correct, and are therefore labelled as “*fortasse recte*” in the Database.

<sup>13</sup> The method of contrasting the vowel mergers with the *b-w* merger was previously applied in the analysis of Sardinian Latin e.g. by Lupinu 1999.

<sup>14</sup> In this survey for denoting the various types of misspellings in inscriptions, I use the code-system of the Computerized Historical Linguistic Database of Latin Inscriptions of the Imperial Age (see <http://lldb.elte.hu/>, referred to as the Database or LLDB hereafter); as for the format of the codes, the sign “>” is to be interpreted as “represented in the inscriptional text as”, e.g. “ $\acute{e} : > I$ ” means “a Classical Latin stressed long  $e$  is represented in the text by the letter I”.

<sup>15</sup> For the respective mergers, see some illustrative examples from the African material: ( $\acute{e} \acute{i} > e$ )  $\acute{e} : > I$ , FICI for *fecit* (LLDB-46796),  $\acute{i} > E$ , DOMETIVS for *Domitius* (LLDB-70975); ( $\acute{o} \acute{u} > o$ )  $\acute{o} : > V$ , MENSVR for *Mensori* (LLDB-46207),  $\acute{u} > O$ , OXOR for *uxor* (LLDB-73663); ( $\bar{e} e i > e$ )  $e : > I$ , FILICITATI for *felicitati* (LLDB-65168),  $e > I$ , SINATO[R] for *senator* (LLDB-37408),  $i > E$ , FEDELIS for *fidelis* (LLDB-47819), ( $\bar{o} o u > o$ )  $o : > V$ , NEPVS for *nepos* (LLDB-58250),  $o > V$ , SYMBVLORVM for *symbolorum* (LLDB-52695),  $u > O$ , ISTERCOLVS for *Sterculus* (LLDB-51365).

ment halfway between the two; the front vowels merge, just like in most Romance languages, but the difference in quality is preserved in the back vowels ( $\acute{e} > \text{e}$ ,  $\acute{e} > \text{e}$ ,  $\bar{e} e i > \text{e}$ ,  $\bar{o} o > o$ ,  $\bar{u} u > u$ ), just like in Sardinia.<sup>16</sup> This kind of Balkan or Rumanian system is to be found also in the Romance language of a small area in Lucania in Southern Italy.<sup>17</sup> These Romance relations motivated our choice of working areas and selecting territories of the Roman Empire representing all areas of possible Romance outcomes as for the reorganization of the vowel system. Accordingly, we selected Hispania, Gallia, the city of Rome and Dalmatia<sup>18</sup> for the Proto-Western-Romance system, the province of Sardinia for the Sardinian Romance system and Bruttium et Lucania for the so called Balkan or Rumanian system.

### 3. Analysis of the data from the selected provinces

Now let us turn to the analysis of the data from the selected provinces. In order to see the changes over time, we divided the relevant material in two periods: an early one from the 1<sup>st</sup> through the 3<sup>rd</sup> century (see Table I), and a later one from the 4<sup>th</sup> through the 7<sup>th</sup> century (see Table II).<sup>19</sup> In both Tables I and II, the data are displayed in the following manner. Under the name of each province there is a row of information with data such as the total number of all phonological data forms in its first part, then the ratio of vocalic versus consonantal changes (abbreviated as V and C resp. in the tables) in its second part (with the exact data for E/I and O/V confusions within the vocalic changes and for B/V confusions within the consonantal changes respectively between brackets), then the totalized percentage of E/I and O/U faults counted from all phonological errors in its third part, and finally the E/I to O/U ratio in its fourth part. This way the data in Table I and II represent the basic data sets for our interpretation.<sup>20</sup>

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<sup>16</sup> Cf. Herman 2000, 32–33.

<sup>17</sup> Harris – Vincent 1988, 33.

<sup>18</sup> The extinct Dalmatian Romance belonged in the Proto-Western-Romance system group merging both front and back vowels, cf. Windisch 1998, 918.

<sup>19</sup> Accordingly, we have excluded data forms without any date or with a date unclassifiable in the current periodization with a break at 300 A.D., e.g. those dated with a time span of 201–400, i.e. to the 3<sup>rd</sup>–4<sup>th</sup> centuries.

<sup>20</sup> All the data displayed in Table I and II represent the status of the LLDB Database on 01.03.2019. To learn more about the search and charting modules of the LLDB Database, see Adamik 2016.

| <b>Table I: Phonological changes in the early provinces (excluding purely orthographic phenomena)</b> |                                                |                   |                 |
|-------------------------------------------------------------------------------------------------------|------------------------------------------------|-------------------|-----------------|
| <i>1. Mauretania Caesariensis</i>                                                                     |                                                |                   |                 |
| 100% = 396                                                                                            | V 26.2% = 104 (E/I 4.5% = 18, O/V 1.8% = 7)    | E/I + O/U = 6.3%  | E/I : O/U = 2.5 |
|                                                                                                       | C 73.7% = 292 (B/V 1.3% = 5)                   |                   |                 |
| <i>2. Bruttium et Lucania</i>                                                                         |                                                |                   |                 |
| 100% = 103                                                                                            | V 28.2% = 29 (E/I 3.9% = 4, O/V 1% = 1)        | E/I + O/U = 4.9%  | E/I : O/U = 3.9 |
|                                                                                                       | C 71.8% = 74 (B/V 24.3% = 25)                  |                   |                 |
| <i>3. Africa proconsularis</i>                                                                        |                                                |                   |                 |
| 100% = 2237                                                                                           | V 29.8% = 667 (E/I 2.5% = 56, O/V 1.5% = 33)   | E/I + O/U = 4%    | E/I : O/U = 1,7 |
|                                                                                                       | C 70.2% = 1570 (B/V 1.9% = 43)                 |                   |                 |
| <i>4. Sardinia</i>                                                                                    |                                                |                   |                 |
| 100% = 105                                                                                            | V 35.2% = 37 (E/I 2.9% = 3, O/V 3.8% = 4)      | E/I + O/U = 6.7%  | E/I : O/U = 0.8 |
|                                                                                                       | C 64.8% = 68 (B/V 20% = 21)                    |                   |                 |
| <i>5. Hispania</i>                                                                                    |                                                |                   |                 |
| 100% = 1503                                                                                           | V 35.3% = 531 (E/I 5.5% = 82, O/V 1.9% = 29)   | E/I + O/U = 7.4%  | E/I : O/U = 2.9 |
|                                                                                                       | C 64.7% = 972 (B/V 1% = 15)                    |                   |                 |
| <i>6. Gallia</i>                                                                                      |                                                |                   |                 |
| 100% = 839                                                                                            | V 39.7% = 333 (E/I 7.5% = 63, O/V 2.3% = 19)   | E/I + O/U = 9.8%  | E/I : O/U = 3.3 |
|                                                                                                       | C 60.3% = 506 (B/V 1.2% = 10)                  |                   |                 |
| <i>7. Dalmatia</i>                                                                                    |                                                |                   |                 |
| 100% = 912                                                                                            | V 41.9% = 382 (E/I 10% = 91, O/V 1.6% = 15)    | E/I + O/U = 11.6% | E/I : O/U = 6.3 |
|                                                                                                       | C 58.1% = 530 (B/V 3.9% = 36)                  |                   |                 |
| <i>8. Roma</i>                                                                                        |                                                |                   |                 |
| 100% = 2670                                                                                           | V 44.3% = 1184 (E/I 5.5% = 148, O/V 1.7% = 46) | E/I + O/U = 7.2%  | E/I : O/U = 3.2 |
|                                                                                                       | C 55.7% = 1486 (B/V 12.7% = 338)               |                   |                 |

| <b>Table II: Phonological changes in the later provinces (excluding purely orthographic phenomena)</b> |                                                   |                   |                 |
|--------------------------------------------------------------------------------------------------------|---------------------------------------------------|-------------------|-----------------|
| <i>1. Sardinia</i>                                                                                     |                                                   |                   |                 |
| 100% = 242                                                                                             | V 23.6% = 57 (E/I 3.3% = 8, O/V 3.7% = 9)         | E/I + O/U = 7%    | E/I : O/U = 0.9 |
|                                                                                                        | C 76.4% = 185 (B/V 48% = 116)                     |                   |                 |
| <i>2. Africa proconsularis</i>                                                                         |                                                   |                   |                 |
| 100% = 1788                                                                                            | V 23.7% = 424 (E/I 3.2% = 58, O/V 2.1% = 37)      | E/I + O/U = 5.3%  | E/I : O/U = 1,5 |
|                                                                                                        | C 76.3% = 1364 (B/V 29.7% = 531)                  |                   |                 |
| <i>3. Mauretania Caesariensis</i>                                                                      |                                                   |                   |                 |
| 100% = 390                                                                                             | V 29.7% = 116 (E/I 4.6% = 18, O/V 1.3% = 5)       | E/I + O/U = 5.9%  | E/I : O/U = 3.5 |
|                                                                                                        | C 70.3% = 274 (B/V 4.6% = 18)                     |                   |                 |
| <i>4. Bruttium et Lucania</i>                                                                          |                                                   |                   |                 |
| 100% = 109                                                                                             | V 34.9% = 38 (E/I 11.9% = 13, O/V 2.8% = 3)       | E/I + O/U = 14.7% | E/I : O/U = 4.3 |
|                                                                                                        | C 65.1% = 71 (B/V 36.7% = 40)                     |                   |                 |
| <i>5. Roma</i>                                                                                         |                                                   |                   |                 |
| 100% = 3726                                                                                            | V 38.8% = 1445 (E/I 19.3% = 348, O/V 4.3% = 160)  | E/I + O/U = 13.6% | E/I : O/U = 2.2 |
|                                                                                                        | C 61.2% = 2281 (B/V 26.1% = 973)                  |                   |                 |
| <i>6. Hispania</i>                                                                                     |                                                   |                   |                 |
| 100% = 1094                                                                                            | V 44.1% = 483 (E/I 15.9% = 174, O/V 5.4% = 59)    | E/I + O/U = 21.3% | E/I : O/U = 2.9 |
|                                                                                                        | C 55.9% = 611 (B/V 6.9% = 76)                     |                   |                 |
| <i>7. Dalmatia</i>                                                                                     |                                                   |                   |                 |
| 100% = 472                                                                                             | V 57.2% = 270 (E/I 21.8% = 103, O/V 9.7% = 46)    | E/I + O/U = 31.5% | E/I : O/U = 2.2 |
|                                                                                                        | C 42.8% = 202 (B/V 12.3% = 58)                    |                   |                 |
| <i>8. Gallia</i>                                                                                       |                                                   |                   |                 |
| 100% = 1623                                                                                            | V 75.5% = 1225 (E/I 42.1% = 684, O/V 21.4% = 347) | E/I + O/U = 63.5% | E/I : O/U = 2   |
|                                                                                                        | C 24.5% = 398 (B/V 3% = 49)                       |                   |                 |

| Table III: Charts interpreting and summarizing the data displayed in Tables I and II.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-------------------------|-------------------------|------|---------------------|------|----------|------|----------|--------|----------------------|------|--------------------|------|----------------------|----------|----------------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------------|---------------------|------|---------------------|--------------------|----------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|---------------------|-------------------------|----------|------|----------------------|----------|----------------------|------|----------|------|------|------|------|------|---------------------|------|------|--------------------|------|------|----------------------|------|------|----------|------|------|
| <p><b>1a</b></p> <p>Ratio of vocalic vs. consonantal changes in the early period</p> <table border="1"> <thead> <tr> <th>Region</th> <th>Vocalic changes (%)</th> <th>Consonantal changes (%)</th> </tr> </thead> <tbody> <tr><td>Roma</td><td>44.3</td><td>55.7</td></tr> <tr><td>Dalmatia</td><td>41.9</td><td>58.1</td></tr> <tr><td>Gallia</td><td>39.7</td><td>60.3</td></tr> <tr><td>Hispania</td><td>35.3</td><td>64.7</td></tr> <tr><td>Sardinia</td><td>35.2</td><td>64.8</td></tr> <tr><td>Africa Proconsularis</td><td>29.8</td><td>70.2</td></tr> <tr><td>Bruttium et Lucania</td><td>28.2</td><td>71.8</td></tr> <tr><td>Mauretania Caesar.</td><td>26.2</td><td>73.7</td></tr> </tbody> </table> | Region              | Vocalic changes (%)     | Consonantal changes (%) | Roma | 44.3                | 55.7 | Dalmatia | 41.9 | 58.1     | Gallia | 39.7                 | 60.3 | Hispania           | 35.3 | 64.7                 | Sardinia | 35.2                 | 64.8 | Africa Proconsularis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 29.8   | 70.2           | Bruttium et Lucania | 28.2 | 71.8                | Mauretania Caesar. | 26.2                 | 73.7 | <p><b>1b</b></p> <p>Ratio of vocalic vs. consonantal changes in the later period</p> <table border="1"> <thead> <tr> <th>Region</th> <th>Vocalic changes (%)</th> <th>Consonantal changes (%)</th> </tr> </thead> <tbody> <tr><td>Gallia</td><td>75.5</td><td>24.5</td></tr> <tr><td>Dalmatia</td><td>57.2</td><td>42.8</td></tr> <tr><td>Hispania</td><td>44.1</td><td>55.9</td></tr> <tr><td>Roma</td><td>38.8</td><td>61.2</td></tr> <tr><td>Bruttium et Lucania</td><td>34.9</td><td>65.1</td></tr> <tr><td>Mauretania Caesar.</td><td>29.7</td><td>70.3</td></tr> <tr><td>Africa Proconsularis</td><td>23.7</td><td>76.3</td></tr> <tr><td>Sardinia</td><td>23.6</td><td>76.4</td></tr> </tbody> </table> | Region | Vocalic changes (%) | Consonantal changes (%) | Gallia   | 75.5 | 24.5                 | Dalmatia | 57.2                 | 42.8 | Hispania | 44.1 | 55.9 | Roma | 38.8 | 61.2 | Bruttium et Lucania | 34.9 | 65.1 | Mauretania Caesar. | 29.7 | 70.3 | Africa Proconsularis | 23.7 | 76.3 | Sardinia | 23.6 | 76.4 |
| Region                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Vocalic changes (%) | Consonantal changes (%) |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Roma                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 44.3                | 55.7                    |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Dalmatia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 41.9                | 58.1                    |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Gallia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 39.7                | 60.3                    |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Hispania                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 35.3                | 64.7                    |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Sardinia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 35.2                | 64.8                    |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Africa Proconsularis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 29.8                | 70.2                    |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Bruttium et Lucania                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 28.2                | 71.8                    |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Mauretania Caesar.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 26.2                | 73.7                    |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Region                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Vocalic changes (%) | Consonantal changes (%) |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Gallia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 75.5                | 24.5                    |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Dalmatia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 57.2                | 42.8                    |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Hispania                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 44.1                | 55.9                    |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Roma                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 38.8                | 61.2                    |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Bruttium et Lucania                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 34.9                | 65.1                    |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Mauretania Caesar.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 29.7                | 70.3                    |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Africa Proconsularis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 23.7                | 76.3                    |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Sardinia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 23.6                | 76.4                    |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| <p><b>2a</b></p> <p>Percentage of E ~ I + O ~ U faults from all phonological errors in the early period</p> <table border="1"> <thead> <tr> <th>Region</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr><td>Dalmatia</td><td>11.6</td></tr> <tr><td>Gallia</td><td>9.8</td></tr> <tr><td>Hispania</td><td>7.4</td></tr> <tr><td>Roma</td><td>7.2</td></tr> <tr><td>Sardinia</td><td>6.7</td></tr> <tr><td>Mauretania Caesar.</td><td>6.3</td></tr> <tr><td>Bruttium et Lucania</td><td>4.9</td></tr> <tr><td>Africa Proconsularis</td><td>4</td></tr> </tbody> </table>                                                                                                                                 | Region              | Percentage (%)          | Dalmatia                | 11.6 | Gallia              | 9.8  | Hispania | 7.4  | Roma     | 7.2    | Sardinia             | 6.7  | Mauretania Caesar. | 6.3  | Bruttium et Lucania  | 4.9      | Africa Proconsularis | 4    | <p><b>2b</b></p> <p>Percentage of E ~ I + O ~ U faults from all phonological errors in the later period</p> <table border="1"> <thead> <tr> <th>Region</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr><td>Gallia</td><td>63.5</td></tr> <tr><td>Dalmatia</td><td>31.5</td></tr> <tr><td>Hispania</td><td>21.3</td></tr> <tr><td>Bruttium et Lucania</td><td>14.7</td></tr> <tr><td>Roma</td><td>13.6</td></tr> <tr><td>Sardinia</td><td>7</td></tr> <tr><td>Mauretania Caesar.</td><td>5.9</td></tr> <tr><td>Africa Proconsularis</td><td>5.3</td></tr> </tbody> </table> | Region | Percentage (%) | Gallia              | 63.5 | Dalmatia            | 31.5               | Hispania             | 21.3 | Bruttium et Lucania                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 14.7   | Roma                | 13.6                    | Sardinia | 7    | Mauretania Caesar.   | 5.9      | Africa Proconsularis | 5.3  |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Region                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Percentage (%)      |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Dalmatia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 11.6                |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Gallia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 9.8                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Hispania                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 7.4                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Roma                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 7.2                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Sardinia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6.7                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Mauretania Caesar.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6.3                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Bruttium et Lucania                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 4.9                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Africa Proconsularis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 4                   |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Region                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Percentage (%)      |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Gallia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 63.5                |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Dalmatia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 31.5                |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Hispania                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 21.3                |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Bruttium et Lucania                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 14.7                |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Roma                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 13.6                |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Sardinia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 7                   |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Mauretania Caesar.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 5.9                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Africa Proconsularis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 5.3                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| <p><b>3a</b></p> <p>E ~ I to O ~ U ratio in the early period</p> <table border="1"> <thead> <tr> <th>Region</th> <th>Ratio (%)</th> </tr> </thead> <tbody> <tr><td>Dalmatia</td><td>6.3</td></tr> <tr><td>Bruttium et Lucania</td><td>3.9</td></tr> <tr><td>Gallia</td><td>3.3</td></tr> <tr><td>Roma</td><td>3.2</td></tr> <tr><td>Hispania</td><td>2.9</td></tr> <tr><td>Mauretania Caesar.</td><td>2.5</td></tr> <tr><td>Africa Proconsularis</td><td>1.7</td></tr> <tr><td>Sardinia</td><td>0.8</td></tr> </tbody> </table>                                                                                                                                                                                | Region              | Ratio (%)               | Dalmatia                | 6.3  | Bruttium et Lucania | 3.9  | Gallia   | 3.3  | Roma     | 3.2    | Hispania             | 2.9  | Mauretania Caesar. | 2.5  | Africa Proconsularis | 1.7      | Sardinia             | 0.8  | <p><b>3b</b></p> <p>E ~ I to O ~ U ratio in the later period</p> <table border="1"> <thead> <tr> <th>Region</th> <th>Ratio (%)</th> </tr> </thead> <tbody> <tr><td>Bruttium et Lucania</td><td>4.3</td></tr> <tr><td>Mauretania Caesar.</td><td>3.5</td></tr> <tr><td>Hispania</td><td>2.9</td></tr> <tr><td>Roma</td><td>2.2</td></tr> <tr><td>Dalmatia</td><td>2.2</td></tr> <tr><td>Gallia</td><td>2</td></tr> <tr><td>Africa Proconsularis</td><td>1.5</td></tr> <tr><td>Sardinia</td><td>0.9</td></tr> </tbody> </table>                                                      | Region | Ratio (%)      | Bruttium et Lucania | 4.3  | Mauretania Caesar.  | 3.5                | Hispania             | 2.9  | Roma                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2.2    | Dalmatia            | 2.2                     | Gallia   | 2    | Africa Proconsularis | 1.5      | Sardinia             | 0.9  |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Region                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Ratio (%)           |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Dalmatia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6.3                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Bruttium et Lucania                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 3.9                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Gallia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 3.3                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Roma                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 3.2                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Hispania                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 2.9                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Mauretania Caesar.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2.5                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Africa Proconsularis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1.7                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Sardinia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0.8                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Region                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Ratio (%)           |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Bruttium et Lucania                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 4.3                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Mauretania Caesar.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 3.5                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Hispania                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 2.9                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Roma                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2.2                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Dalmatia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 2.2                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Gallia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 2                   |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Africa Proconsularis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1.5                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Sardinia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0.9                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| <p><b>4a</b></p> <p>Percentage of B ~ V faults from all phonological errors in the early period</p> <table border="1"> <thead> <tr> <th>Region</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr><td>Bruttium et Lucania</td><td>24.3</td></tr> <tr><td>Sardinia</td><td>20</td></tr> <tr><td>Roma</td><td>12.7</td></tr> <tr><td>Dalmatia</td><td>3.9</td></tr> <tr><td>Africa Proconsularis</td><td>1.9</td></tr> <tr><td>Mauretania Caesar.</td><td>1.3</td></tr> <tr><td>Gallia</td><td>1.2</td></tr> <tr><td>Hispania</td><td>1</td></tr> </tbody> </table>                                                                                                                                         | Region              | Percentage (%)          | Bruttium et Lucania     | 24.3 | Sardinia            | 20   | Roma     | 12.7 | Dalmatia | 3.9    | Africa Proconsularis | 1.9  | Mauretania Caesar. | 1.3  | Gallia               | 1.2      | Hispania             | 1    | <p><b>4b</b></p> <p>Percentage of B ~ V faults from all phonological errors in the later period</p> <table border="1"> <thead> <tr> <th>Region</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr><td>Sardinia</td><td>48</td></tr> <tr><td>Bruttium et Lucania</td><td>36.7</td></tr> <tr><td>Africa Proconsularis</td><td>29.7</td></tr> <tr><td>Roma</td><td>26.1</td></tr> <tr><td>Dalmatia</td><td>12.3</td></tr> <tr><td>Hispania</td><td>6.9</td></tr> <tr><td>Mauretania Caesar.</td><td>4.6</td></tr> <tr><td>Gallia</td><td>3</td></tr> </tbody> </table>           | Region | Percentage (%) | Sardinia            | 48   | Bruttium et Lucania | 36.7               | Africa Proconsularis | 29.7 | Roma                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 26.1   | Dalmatia            | 12.3                    | Hispania | 6.9  | Mauretania Caesar.   | 4.6      | Gallia               | 3    |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Region                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Percentage (%)      |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Bruttium et Lucania                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 24.3                |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Sardinia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 20                  |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Roma                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 12.7                |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Dalmatia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 3.9                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Africa Proconsularis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1.9                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Mauretania Caesar.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1.3                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Gallia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1.2                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Hispania                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1                   |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Region                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Percentage (%)      |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Sardinia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 48                  |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Bruttium et Lucania                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 36.7                |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Africa Proconsularis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 29.7                |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Roma                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 26.1                |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Dalmatia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 12.3                |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Hispania                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6.9                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Mauretania Caesar.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 4.6                 |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |
| Gallia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 3                   |                         |                         |      |                     |      |          |      |          |        |                      |      |                    |      |                      |          |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                |                     |      |                     |                    |                      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |        |                     |                         |          |      |                      |          |                      |      |          |      |      |      |      |      |                     |      |      |                    |      |      |                      |      |      |          |      |      |



In Table III, you can see further charts interpreting and summarizing the data displayed in Tables I and II. They will help us compare and rank the selected provinces as for the chosen categories, and discover the tendencies of phonological changes between the early and the later period. Accordingly, we will analyse those charts in Table III and with their help we will try to describe the dialectal position of the selected Latin African provinces regarding vocalism in both periods.

Since the vocalism of later African Latin has most often been compared to the Latin or Romance language of Sardinia,<sup>21</sup> in our analysis of the charts in Table III we will keep an eye on whether there is an actual similarity in the language of these provinces, meaning Africa Proconsularis (including Numidia), Mauretania Caesariensis and Sardinia. Let us start with the analysis of the ratio of vocalic and consonantal changes, since this is a very basic, but still significant aspect for creating a dialectological profile of the selected areas in both periods. The data are displayed in section 1a and 1b in Table III.

### 3.1. Analysis by the ratio of vocalic versus consonantal changes

Take a look at the provinces ranked by the ratio of vocalic versus consonantal changes in the early period (1a). You will immediately realise that, as opposed to the later period (1b), the consonantal changes dominate over the vocalic ones in all areas. This means that in the early period the transformation of the consonant system was usually more intensive than that of the vowel system. At the same time, there are significant differences between the selected areas in the distribution of the phenomena even if they are not as significant as those in the later Christian period. As for the vocalic changes the most conservative areas are (cf. chart 1a): Mauretania Caesariensis (26.2%), Bruttium et Lucania (28.2%) and Africa Proconsularis including Numidia (29.8%), are all below 30% as for vocalic changes. Though Sardinia follows them (with 35.2%), it still stands closer to Hispania (which has 35.3%) than to the leading trio. Then we have Gallia (with 39.7%), Dalmatia (with 41.9%) and Rome (with 44.3%). This other end of the axis is characterized by a more and more intensive transformation of the vowel system in the early, pre-Christian period.

In the later, Christian period, however, the situation changed dramatically (see chart 1b). On the one hand, in some areas the transformation of the vowel system became more intensive than that of the consonant system, drastically in Gallia (by 35.8%;  $75.5\% < 39.7\%$ ), considerably in Dalmatia (by 15.3%;  $57.2\% < 41.9\%$ ). In other areas vocalism moved in the same direction, significantly in

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<sup>21</sup> Cf. e.g. Petersmann 130 and Loporcaro 2011, 56 with further references.

Hispania (by 8.8%; 44.1% < 35.3%), perceptively in Bruttium et Lucania (by 6.7%; 34.9% < 28.2%), and slightly even in Mauretania Caesariensis (by 3.5%; 29.7% < 26.2%). On the other hand, in other areas it was the transformation of the consonant system that became more intensive than that of the vowel system, such as clearly in Sardinia (by 11.6%; 76.4% < 64.8%), in Africa Proconsularis (by 6.1%; 76.3% < 70.2%) and in the city of Rome (by 5.5%; 61.2 < 55.7%).

In both periods the selected African provinces are in the leading trio, with an intensive transformation of the consonant system (even if their order is reversed). Sardinia precedes the two African provinces in the leading trio in the later period (cf. chart 1b), while in the early period it was in the fourth position, closest to Hispania in the fifth position (cf. chart 1a). This confirms the views of Omeltchenko and Adams on a possible or probable dialectological connection of Africa and Sardinia in the later, Christian period without reservations, but only with reservations regarding the early, pre-Christian period, since Sardinia then showed a profile more similar to Hispania than to the African provinces (see chart 1a).

### **3.2. Analysis by the percentage of E/I and O/U confusions**

Now, if you take a look at the provinces ranked by the percentage of E/I and O/U confusions counted against all phonological errors in the early period (Chart 2a), at first you will see that the joint rate of E/I and O/U faults is quite low, below 10%, nearly everywhere, meaning in seven areas – with the exception of Dalmatia with 11.6%, which means that the underlying vowel mergers were just starting to spread then. In the later period, however (see Chart 2b), the joint rate of E/I and O/U confusions clearly increased in most areas, first of all and quite drastically in Gallia (by 53.7%; 63.5% < 9.8%), still considerably in Dalmatia (by 19.9%; 31.5% < 11.6%), but also significantly in Hispania (by 13.9%; 21.3% < 7.4%), still perceptively in Bruttium et Lucania (by 9.8%; 14.7% < 4.9%), in Rome (by 6.4%; 13.6% < 7.2%), and even in Africa Proconsularis, even if just slightly (by 1.3%; 5.3% < 4%). A stagnation is visible in Sardinia (0.3%; 7% < 6.7%), and a slight decrease may be detected in Mauretania Caesariensis (by 0.4%; 5.9% < 6.3%), which still must be considered stagnation.

The two periods have in common that, again, the African provinces are in the leading trio, characterized by a conservative vocalism in both periods. Sardinia comes after two African provinces in the leading trio in the later period, although in the early period it succeeded the top trio in the fourth position, in a tie with Rome and Hispania. Again, this analysis confirms the views of Omeltchenko and

Adams on the dialectological connection of Africa and Sardinia in the later, Christian period, but only with reservations in the early, pre-Christian period.

To sum up, since the first two chart pairs (1a – 1b and 2a – 2b) of Table III display nearly identical distributional patterns between the selected areas (cf. esp. Charts 1b and 2b), they reveal the vital role vowel mergers played in the transformation of the entire vowel system, and thus in the transformation of the whole phonological system of Vulgar Latin.

### 3.3. Analysis of the E/I to O/U ratios

The picture painted so far should be refined by an analysis of the E/I to O/U ratios in our selected areas in both periods (see charts 3a and 3b of Table III). While evaluating the rates of *o/u* and *e/i* mergers as displayed in Charts 3a and 3b of Table III, we should set a reference number for easier orientation. This reference number will be 2, indicating that the number of *e/i* confusions in the data pool is the double of *o/u* confusions. This number two indicates that the two changes took place more or less at the same time and with the same intensity, since the number of the *e/i* sounds is approximately the double of *o/u* sounds in Latin.<sup>22</sup> Consequently, a numerical value considerably higher than 2 indicates that the merger of front vowels was more advanced than that of back vowels in a given area, or that the merger of back vowels had just started or was underdeveloped compared to the merger of front vowels.

Accordingly, let us take a look at the data from the early period (Chart 3a). We can see the highest ratios in Dalmatia, a ratio of 6.3 (with 10% of *e/i* faults divided by the 1.6% of *o/u* faults) and in Bruttium and Lucania, a ratio of 3.9 (with 3.9% of *e/i* faults divided by the 1% of *o/u* faults). We can see slightly lower ratios in Gallia, a ratio of 3.3 (with 7.5% of *e/i* faults divided by the 2.3% of *o/u* faults) in Rome, a ratio of 3.2 (with 5.5% of *e/i* faults divided by the 1.7% of *o/u* faults) and in Hispania, a ratio of 2.9 (with 5.5% of *e/i* faults divided by the 1.9% of *o/u* faults). We can see values roughly the same as our reference value of 2, in Mauretania Caesariensis, a ratio of 2.5 (with 4.5% of *e/i* faults divided by the 1.8% of *o/u* faults) and Africa Proconsularis a ratio of 1.7 (with 2.5% of *e/i* faults divided by the 1.5% of *o/u* faults). However, it should be noted that here the percentages themselves are very low (see the data in Table I). This suggests that in these provinces neither mergers were particularly advanced, especially not in Africa Proconsularis (where we find a ratio of 1.7, with 2.5% of *e/i* faults divided by the 1.5% of *o/u* faults, see section 3 in Table I). Regarding

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<sup>22</sup> As for the methodology of comparing these mergers, see Herman 1971=1990, 139.

early Sardinia (where we see a ratio of 0.8, with 2.9% of *e/i* faults divided by the 3.8% of *o/u* faults), the underlying very low absolute figures (i.e. 2.9% *e/i* faults equals 3 occurrences and 3.8% *o/u* faults 4 ones only, cf. section 4 in Table I) suggest roughly the same conclusion.

In the later, Christian period (Chart 3b), the picture changed considerably. The tendencies leading to the establishment of the Proto-Western-Romance system merging both front and back vowels are now clearly visible first of all in Gallia with a ratio of 2 (so with 42.1% of *e/i* faults divided by the 21.4% of *o/u* faults), characterized by a prominently intensive merger process regarding both front and back vowels. The same development can be seen also in Dalmatia (with a ratio of 2.2, so with 21.8% of *e/i* faults divided by the 9.7% of *o/u* faults), in the city of Rome (with a ratio of 2.2, so with 9.3% of *e/i* faults divided by the 4.3% of *o/u* faults), and possibly also in Hispania (with a ratio of 2.9, so with 15.9% of *e/i* faults divided by the 5.4% of *o/u* faults). In these provinces, the same Proto-Western-Romance tendencies were clearly emerging, since the two changes took place more or less at the same time and with the same intensity, although to varying degrees.

In some areas, the tendencies leading to the Balkan or Rumanian system merging front vowels alone can be noticed, such as first of all in Bruttium et Lucania with a ratio of 4.3 (so with 11.9% of *e/i* faults divided by the 2.8% of *o/u* faults) and possibly also in Mauretania Caesariensis with a ratio of 3.5 (so with 4.6% of *e/i* faults divided by the 1.3% of *o/u* faults). However, the underlying relatively low absolute figures (13 and 3, 18 and 5 resp.) caution against a definitive conclusion.

In later Africa Proconsularis with a ratio of 1.5 (so with 3.2% of *e/i* faults divided by the 2.1% of *o/u* faults) at first glance the rudiments of a potential Proto-Western-Romance development can be seen. However, if we compare the very low percentages of later Africa Proconsularis (3.2% and 2.1%) to those very high ones of later Gallia (42.1% and 21.4%) or of later Dalmatia (21.8% and 9.7%) etc., we will immediately realise that in later Africa Proconsularis neither mergers were active, just like in later Sardinia (with a ratio of 0.9, so with 3.3% of *e/i* faults divided by the 3.7% of *o/u* faults). Consequently, in both of these areas we can see the Sardinian Romance system emerge in the later, Christian period, that merged neither the front nor the back vowels.

It must be emphasised that the later Latin of Africa Proconsularis undoubtedly belonged to the Sardinian Romance type of vocalism. Consequently, from now on the label 'possibly' can be removed from the statement of Loporcaro, who

labelled Africa as ‘possibly’ belonging to the Sardinian type of vocalism.<sup>23</sup> However, Loporcaro’s scepticism explicitly formulated in a note of his relevant study was based on a misunderstanding inherited from the literature that was already clarified by Adams.<sup>24</sup> The dialectological connection of later Africa Proconsularis and later Sardinia in this regard is not just an assumption any more but a scientific fact.

### 3.4. Analysis of the *b-w* merger and Roman Africa as a heterogeneous dialectological area

The relevant literature makes generalizing statements about ‘African Latin’ or ‘Latin in/of Africa’, implicitly suggesting a homogeneous dialectological area. In doing so, it disregards the territorial and administrative, thus possibly dialectological division of this vast area. Based on the analysis presented above, this denomination must be revised. The structural analysis clearly revealed that Mauretania Caesariensis, which lays west of Africa Proconsularis that includes Numidia, while it is also closer to Hispania, shows quite different characteristics in some vital aspects of dialectology in the later, Christian period. As for the ratio of vocalic versus consonantal changes and the percentage of E/I and O/U faults counted from all phonological errors, Mauretania Caesariensis can be grouped together with Africa Proconsularis (and Sardinia, see Charts 1b and 2b). At the same time, as for the E/I to O/U ratio, Mauretania Caesariensis seems to be detached from Africa Proconsularis and thus the Sardinian system of vocalism, possibly developing toward the Rumanian Balkan type of vocalism (Chart 3b).

What is more, if we consider the percentage of B ~ V faults counted from all phonological errors in the later period (Chart 4b in Table III), we can see that regarding consonantism and the *b-w* merger, Mauretania Caesariensis shows explicitly different trends from what we see in later Africa Proconsularis (and Sardinia). While Sardinia and Africa Proconsularis compare in this respect, since both are characterized by an intensive development of the *b-w* merger (48% and

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<sup>23</sup> Cf. Loporcaro 2011, 114.

<sup>24</sup> Loporcaro 2011, 690 (n. 9): “Some doubts about ascribing a Sardinian vowel system to Africa have been expressed by, e.g., Fanciullo (1992: 178–80) and Mancini (2001). Epigraphic evidence does not provide, for Africa, as strong support as for Sardinia, as epigraphic Latin offers here many examples of <i/e> <u/o> confusion (see Acquati 1971:159–65).” Cf. Adams 2007, 642: “Acquati (1971: 161–2, 165) lists several examples of *e* for short *i* in both stressed and unstressed syllables, and of *o* for short *u*, from the inscriptions of *CIL* VIII, but gives no idea of how frequent the phenomena are. The examples seem very few, given the size of the corpus.”

29.7%, see chart 4b), Mauretania Caesariensis is characterized by an underdeveloped and retarded *b-w* merger (4.6%). As such, it may be grouped with Hispania (6.9%) or Gallia (3%).<sup>25</sup>

#### 4. Conclusions

To sum up, the preliminary results of this investigation suggest that while in the early, pre-Christian period the antecedents of the later developments do not appear or are not particularly conspicuous regarding a possible dialectological connection between Sardinia and Africa, in the later, Christian period the vocalism of Latin in Africa Proconsularis including Numidia indeed turns out to be of the same type as the vocalism of the Latin in Sardinia, that is, corresponding to the type of later Sardinian Romance system merging neither front nor back vowels.<sup>26</sup>

Our results confirm Augustine's remark<sup>27</sup> that African ears show no judgment in the matter of the shortening or lengthening of vowels, especially of distinguishing between long *o* and short *o* in stressed syllables.<sup>28</sup> Thus Augustine's

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<sup>25</sup> Nevertheless, this latter argument based on results in consonantism is only a secondary one compared to the former one arising from vocalism, that is, from the E/I to O/U ratio. It is characteristic of the territorial dialectological patterns of the Latin language that different dialectological patterns can be peculiar to different linguistic subsystems of the same corpus in the same region of a certain period. As a result, patterns of one single special subsystem (e.g. of consonantism) cannot automatically predict the changes to another linguistic subsystem (e.g. to the vocalism) of the same corpus, cf. Herman 1985=1990, 86. Still, based on the changes of the case system as evidenced in inscriptions, we were able to state that dialectologically Africa Proconsularis and Hispania could have been closely related, see Adamik 2019.

<sup>26</sup> For more on the conservatism of vocalism of Sardinian Latin inscriptions, see Lupinu 1999 and Tamponi Forthcoming.

<sup>27</sup> Augustinus, Doctr. christ. 4.10.24: *cur pietatis doctorem pigeat imperitis loquentem ossum potius quam os dicere, ne ista syllaba non ab eo, quod sunt ossa, sed ab eo, quod sunt ora, intellegatur, ubi Aerae aures de correptione uocalium uel productione non iudicant?* 'Why should a teacher of piety when speaking to the uneducated have regrets about saying *ossum* ('bone') rather than *os* in order to prevent that monosyllable (i.e. *ōs* 'bone') from being interpreted as the word whose plural is *ora* (i.e. *ōs* 'mouth') rather than the word whose plural is *ossa* (i.e. *ōs*), given that African ears show no judgment in the matter of the shortening of vowels or their lengthening?', translated by Adams 2007, 261.

<sup>28</sup> Augustine cites confusion between the vowel of *os(sum)* 'bone', which should be short, and that of *os* 'mouth', which should be long. As Adams precisely formulates: "Augustine says that Africans could not distinguish between *ōs* and *ōs*, which suggests that under the accent they pronounced the original long *o* and short *o* in the same way. The two words would not have been confused in most parts of the Empire, where, though phonemic oppositions of vowel length were lost, differences of quality between the long and short central vowels persisted. In most of the Romance world CL long *o* merged with short *u* as a close *o*, whereas CL short *o* produced an open

assertion on the vocalic peculiarities of Latin in Africa Proconsularis including Numidia where he was born (in Thagaste) and died (in Hippo Regius) is consistent with a vowel system of the Sardinian type.<sup>29</sup>

At the same time, these observations seem less valid for the other important African province, Mauretania Caesariensis, the western neighbour of Africa Proconsularis including Numidia. According to our preliminary results, the local dialect might have started to develop toward the eastern or Balkan (more exactly Rumanian) type of vocalism, merging only the front vowels. In this regard, Mauretania Caesariensis is rather to be grouped with South-Western Italy, namely Bruttium et Lucania. At the same time, we should not forget that regarding the *b-w* merger, thanks to its retarded status, Mauretania Caesariensis should be grouped with Hispania, which shows the same tendency, while it stands in sharp contrast to Africa Proconsularis including Numidia and its advanced *b-w* merger.

I hope that in my paper I was able to demonstrate that abundant and precise data, together with the effective analytic tools provided by the Computerized Historical Linguistic Database of the Latin Inscriptions of the Imperial Age can adequately contribute to answering such old and vexing questions as determining the characteristics and the dialectal position of Latin Africa regarding vocalism.<sup>30</sup>

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*o*. Augustine seems to be describing a different type of vowel system, one in which long and short *o* merged.” Adams 2007: 647f.

<sup>29</sup> For this famous passage of Augustine, see also Adams (2007): 262f: “The Sardinian system attracts attention in the present context. Could it be that African Latin had the same or a similar vowel system, and that Augustine’s remark about *ōs* / *ōs* should be read in that light as an indication that in Africa long and short *o* had fallen together? (...) Certainly Augustine’s assertion is consistent with a vowel system of the Sardinian type...” 648: “There seems to be confirmation in the African inscriptions and non-literary corpora of Augustine’s observation”; cf. also Loporcaro 2011: 55 and Herman 2000: 28f and Mancini 2001.

<sup>30</sup> And this way we have hopefully diminished the “scepticism about our ability to detect localised phonetic developments from misspelt inscriptions” (Adams, 2007, 730) also as for the Latin in Africa as formulated by Schmitt 2003, 672: “die Analyse der Inschriften außer Namen kaum verwertbare Kriterien (...) geliefert hat” and 673: “von Seiten der lateinischen Philologie wohl kaum noch substantielle Beiträge zu erwarten sind, da das vorhandene Material ausgewertet wurde.”

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