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The Oxford Guide to the Romance Languages

EDITED BY

ADAM LEDGEWAY & MARTIN MAIDEN

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Short Contents

CHAPTER 7

Romance linguistic geography and dialectometry

HANS GOEBL

7.1 Linguistic geography

7.1.1 Definition and origin

Linguistic geography as a discipline is concerned with the empirical, analytic, and theoretical study of the areal distribution of individual linguistic features. Its chief instrument is the linguistic atlas which, within Romance linguistics, usually takes the form of a folio-style work consisting of several hundred linguistic maps on which, in the case of 'national' linguistic atlases, are to be found—again for several hundred localities, each identified by a different number—the phonetic transcriptions for a given item. Linguistic geography was first conceived of both as a method and as a heuristic procedure by Jules Gilliéron, the founder of the *Atlas linguistique de la France* (*ALF*), the first fully operational Romance linguistic atlas, which was destined to become a model for many other similar endeavours.

Linguistic geography must be not be confused with language geography which, by contrast, is concerned with charting the geographical extension of whole linguistic areas. It must also be kept separate from dialectology which has more general aims and a much longer pedigree.

The theoretical and methodological position of linguistic geography within Romance linguistics is well established, enjoying intradisciplinary links with research in diachronic linguistics, lexicology and lexicography, phonetics, and all branches of variationist research. Its interdisciplinary connections include ethnology, anthropology, human geography, genetics, and other disciplines with a geographical interest.[1]

[1] The available literature is now vast, including: Gamillscheg (1928), Jaberg and Jud (1928), Jaberg (1936), Pop (1950), Coseriu (1955), Iordan (1962:171-308), Vàrvaro (1968:199-231), Vidos (1968:63-108), *Gli atlanti linguistici* (1969), Kratz (1969), Massobrio (1986), *Atlanti regionali* (1989), Goebl (1992), Euskaltzaindia (1992), Ruffino (1992), Winkelmann (1993), García Mouton (1994), Bal et al. (1997:161-5), Winkelmann and Lausberg (2001), Chauveau (2003), Matranga and Sottile (2007), Cugno and Massobrio (2010), Colón and Gimeno Betí (2011).

7.1.2 Jules Gilliéron and the *ALF*

After early geolinguistic experience in the canton of Valais, and encouraged by Gaston Paris (1839-1903), Jules Gilliéron (1854-1926) conceived the idea of producing a single linguistic atlas, the *Atlas linguistique de la France* (*ALF*), for the whole of the Gallo-Romance area (including Swiss Romandy, Wallonia, the valleys of western Piedmont, and the Channel Islands).[2] In practical terms, this involved a single fieldworker (Edmond Edmont, 1849-1926) collecting data *in loco*, directly transcribing informants' answers according to a special phonetic annotation, preparing and administering a wide-ranging standardized questionnaire, eliciting spontaneous translations always from one informant per locality, and establishing a grid of enquiry points based on the organization of the French départements. The project was expertly completed by Edmont between 1897 and 1901 in 638 localities variously distributed across France, Switzerland, Belgium, Germany, Italy, and the Channel Islands. Printing of the atlas began in 1902 and was completed in 1910 with the publication of ten folio volumes.

The atlas proper is made up of three series: series A (638 enquiry points and 1,421 maps alphabetically arranged according to their titles: *abeille* 'bee'–*vrille* 'gimlet'), series B (328 enquiry points across the south of France and 326 maps: *s'abriter* 'to take shelter'–*vous autres* 'you (exclusive plural)', and series C (204 enquiry points across the south-east of France and 173 maps: *abricot* 'apricot'–*voler* 'to steal'). Alongside the folio volumes, the publication also includes an introductory volume (*ALF Notice*), a table of contents (*ALF Table*), and a supplement (*ALF Suppléments*). The *ALF* proved extremely useful in launching Romance geolinguistics, in terms both of fieldwork and of future publications.

Reception of the *ALF* was lukewarm in France, whereas among German, Swiss, Austrian, and Scandinavian Romanists, many of whom had followed Gilliéron's courses at the

[2] On Gilliéron, see also Dauzat (1922), Pop (1950), Pop and Pop (1959), Wolf (1975), Lauwers et al. (2002), Swiggers (2010).

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École Pratique des Hautes Études, it was decidedly more enthusiastic (cf. Jaberg 1908; 1936; Rosenqvist 1919; von Ettmayer 1924; Gamillscheg 1928).

Gilliéron became the first interpreter of his own geolinguistic study. His fundamental idea was based on the interpretation of the changing areal distributions of different linguistic types in the original *ALF* maps. Thus was born the study of areal linguistics proper, which aimed on the one hand to reconstruct the spatial distribution of the different areas (diachronic stratification) and on the other to interpret (in terms of semantics, etymology, etc.) individual forms. Gilliéron attached considerable importance to the metalinguistic behaviours and 'philosophies' of dialect speakers, increasingly shifting his interests to the study of phonetics and lexis.

Unlike some foreign linguists (cf. Jaberg 1908; Rosenqvist 1919; von Ettmayer 1924), Gilliéron was always interested in the close study of the fine linguistic detail of the *ALF* data, rejecting any type of quantitative examination and remaining faithful to the 'tipofobo' doctrine of his master Gaston Paris (1888) regarding the 'non-existence of dialects'.

The logistical coordinates of Gilliéron's study relative to the size of the surveyed grid and length of the questionnaire no doubt draw on the previous experiences of many French geographers, demographers, economists, and statisticians involved in extensive fieldwork (Palsky 1996).

In terms of its content, the *ALF* questionnaire, which surveys not only individual words but also short, semantically simple phrases, includes phonetics, morphology, and, above all, lexis. By contrast, there are very few questions relating to syntax. With very few exceptions, the questionnaire was applied across the entire area under investigation, allowing inter-comparability of the results of many different enquiry points, a key prerequisite for their global quantitative analysis within the dialectometric approach.

Given the onomasiological approach adopted by the *ALF*, its data clearly provided a powerful boost to research within the 'Wörter und Sachen' paradigm, reprised with some enthusiasm in northern Europe (Jaberg 1936; Quadri 1952; Iordan 1962:84-95, 276-85; Vidos 1968:80-93; Goebl 1992). This happy methodological marriage also lies behind Wartburg's conception of the *Französisches etymologisches Wörterbuch*, witness his dedication of the first volume to the 'Neogrammarian' Wilhelm Meyer-Lübke and the 'revolutionary' Jules Gilliéron.

7.1.3 The second generation of national atlases

The striking example provided by the *ALF* immediately inspired others to imitate it, leading naturally to corrections and improvements of all types.

7.1.3.1 AIS

One of the first initiatives in this respect was the *Atlante italo-svizzero* (*AIS*) edited by Jaberg and Jud (1928–40).[3] Originally they had planned a linguistic atlas limited to the Raeto-Romance and Italo-Romance-speaking areas of Switzerland, with an appendix dedicated to northern Italy and a parallel survey of central and southern Italy by Italian linguists. Owing to disagreements with Italian linguists and doubts about the effectiveness of their *Atlante linguistico italiano* (*ALI*), Jaberg and Jud decided to extend the coverage of the *AIS* to the whole of the Italian Peninsula (including Sicily and Sardinia) with the launch of their surveys in 1919.

In contrast to *ALF*, the questionnaire used by *AIS* was concerned above all with the field of agriculture and all its numerous terminological and work-related aspects in accordance with the 'Wörter und Sachen' approach. The questionnaire was now arranged, not in alphabetical order, but along semantic lines, and came in three versions, with the most frequently employed containing around 1,700 questions. It was administered by three fieldworkers, all experts in Romance linguistics, who were assigned to the following areas: Paul Scheuermeier, from northern Italy to Rome; Gerhard Rohlfs, the rest of the Peninsula and Sicily; and Max-Leopold Wagner, Sardinia. The grid of localities surveyed also included several large cities in order to allow the identification of two socially differentiated linguistic levels. Eventually, the principle of employing a single informant for each of the localities was abandoned, with Scheuermeier in particular apparently showing considerable empathy towards the speakers of the localities he was responsible for surveying.

Another innovation of the *AIS* surveys was their frequent use of photographs (of objects, instruments, landscapes, and informants) and of drawings (cf. Scheuermeier 1936). The photographs were archived in Berne, while the drawings were used in a large ethnographic and onomasiological publication printed during and after the Second World War (Scheuermeier 1943/56).

The fieldwork carried out for *AIS* was completed in 1928, and was published between 1928 and 1940 including an introductory and theoretical volume (Jaberg and Jud 1928) and eight volumes containing the atlas folios with 1,705 linguistic maps. Thanks to the integration of the 'Wörter und Sachen' component in the questionnaire, the precision and accuracy with which the field surveys were conducted, and the overall quality of all parts of the publication, *AIS* represents a true masterpiece and worthy successor to *ALF*.

[3] For further details, see also Jaberg and Jud (1927), Jud (1928).

7.1.3.2 ALI

The *Atlante linguistico italiano* (*ALI*) was conceived immediately after the First World War by the Italian linguists Bartoli, Parodi, and Goidanich. From the outset, the size of the planned grid of enquiry points and questionnaire were much larger than those of the *AIS*. Surveys began in 1925 but were interrupted during the Second World War and were completed in the 1950s. After many difficulties, and thanks to the technical and logistical intervention of the Roman Istituto Poligrafico, the first fascicle was published in 1995. To date eight fascicles have been published (with a total of 831 maps). In the publications the grid of enquiry points is divided into two: 589 points for the north, and 359 points for the south. On the *ALI* webpage can be found the indices for the published fascicles.

7.1.3.3 WLAD *and* ALR

We owe our first geolinguistic survey of the Romanian area to Gustav Weigand, who had put together and published his *Linguistischer Atlas des dacorumänischen Sprachgebiets* (*WLAD*) independently of *ALF*. *WLAD* was published in nine fascicles between 1898 and 1909 and covers a network of 752 enquiry points. The printed work only contains 48 linguistic maps in which the geolinguistic information is presented in a rather complex form, making their consultation difficult.

Romanian initiatives for the creation of a 'home-grown' linguistic atlas, *Atlasul lingvistic român* (*ALR*), go back to the 1920s and the efforts of Puşcariu, Pop, and Petrovici, who actively began work on the project just before the outbreak of the Second World War. Two innovations are worthy of note:

(1) The organization of two parallel surveys:
   - *ALR I* (large grid [= 301 enquiry points] with limited questionnaire [*c.*2,000 questions]. Responsibility of Pop).
   - *ALR II* (small grid [= 87 enquiry points] with extended questionnaire [*c.*4,000 questions]).

(2) The parallel publication, in addition to the volumes containing the atlas proper with transcriptions collected *in loco*, of small box-set volumes (*Micul atlas lingvistic român*) with maps in which some of the main patterns of the original data are presented through the use of coloured symbols. These volumes are principally intended for the general public. Two volumes (1938, 1948) were published from *ALR I* and a single volume with a supplement (1940) from *ALR II*. The *Micul atlas lingvistic român* gave rise to two volumes for part I (Pop 1938-42), completed by Pop in 1962 with a third volume, and a single volume for part II (Pop 1940). Following the Second World War, the unpublished data of *ALR I* were destroyed in a fire, whereas the unpublished data of *ALR II* began to be published from 1956, together with the supplement *serie nouă* ('new series'). Similarly, the new series of *ALR II* has seen the publication of four volumes.

The grid of enquiry points for the two Romanian atlases also includes Aromanian and Megleno- and Istro-Romanian localities, as well as Slavonic and Hungarian-speaking localities in Romania.

7.1.3.4 Atlas lingüístic de Catalunya

The publication of the results of a Catalan atlas, the *Atlas lingüístic de Catalunya*, initiated by A. Griera during the First World War, began in 1923 and continued until 1964. The atlas has eight volumes, an index (Haesler 1964), and an introductory volume published in 1964. It surveys 101 points and contains 1,276 maps.

The same Griera also published a micro-atlas for Andorra, *Atlas lingüístic d'Andorra* (Griera 1960), and another for the Gascon varieties of the Val d'Aran, the *Atlas lingüístic de la Vall d'Aran* (Griera 1973).

7.1.3.5 Atles lingüístic del domini català

Badia i Margarit's idea for a new linguistic atlas of the Catalan-speaking area, the *Atles lingüístic del domini català*, goes back to the 1950s, but progress was hampered for a long time by Franco's linguistic policies, although these difficulties were eventually overcome by Veny and Pons i Griera. Publication of the atlas began in 2001, and there are now seven volumes in total covering a network of 190 enquiry points, including 1,689 maps as well as ethnographic photographs and partial indices, all produced using the latest in digitalized technology. Besides the *editio maior*, there is also a smaller version, the *Petit atles lingüístic del domini català* (Veny 2007-11), with colour-coded maps with commentary.[4]

7.1.3.6 Atlas lingüístico de la Península Ibérica

The idea for a pan-Iberian linguistic atlas, the *Atlas lingüístico de la Península Ibérica* (1962), goes back to the 1920s and to Ramón Menéndez Pidal, who was succeeded by Navarro Tomás. A large part of the 527 surveys, conducted by seven fieldworkers, was carried out—under less than ideal conditions—during the Civil War. At the end of the War the collected materials were saved by Navarro Tomás, who took them to the United States, where they remained until they

[4] Also of significance are Alcover and Moll (1929/1930/1932) and Perea (2001).

were returned to the Spanish Consejo Superior de Investigaciones Científicas at the end of the 1950s. Following completion of the surveys (1947–54), one volume was published in 1962.

Fortunately, David Heap successfully salvaged the original questionnaires for all 527 enquiry points, many of which had become dispersed during and after the Civil War. Today all 527 notebooks for each of the enquiry points are available online at http://www.alpi.ca.

7.1.4 Gallo-Romance regional atlases

Alongside *ALF*, Gallo-Romance also boasts a series of small 'individual' atlases dedicated to smaller areas, as well as the prestigious series *Nouvel atlas linguistique de la France* (*NALF*), subsequently also renamed the *Atlas linguistiques et ethnographiques de la France par régions* (*ALFR*). The starting point for all of these atlases was the detailed and authentic study of 'infra-national' areas through a much narrower grid of enquiry points and the administration of regionally adapted questionnaires. In many cases the use of French–patois translation was forbidden, and replaced by 'directed conversation' in the local dialect. There were no changes, however, to the principles of transcribing in loco and publishing the linguistic maps as full text maps.

7.1.4.1 *'Minor' atlases*

Among the minor atlases we can cite here: Guerlin de Guer (1903) for Normandy; Millardet (1910a) for Landes in central Gascony; Bruneau (1914-26) for the Ardennes; Terracher (1912-14) for Angoumois; Bloch (1917) for Vosges; Meunier (1926) for Nivernais; Devaux (1935) for Terres-Froides (between Lyon and Grenoble); and Svenson (1959) for the Vendée Marshes. Of these, Millardet's atlas stands out for its limited areal coverage (85 enquiry points over 2,500km^2), as does Terracher's for its particular focus on tracing through morphology how geolinguistic patterns interconnect with geographical patterns of intermarriage.

Also relevant here are the geolinguistic studies carried out under the auspices of the Swiss dictionary project *Glossaire des patois de la Suisse romande* (Gauchat et al. 1924-33), which were published partly in tabular form in the *Tableaux phonétiques des patois suisses romands* (62 enquiry points, 480 tables). For the Francoprovençal dialects of the Val d'Aosta there is the *Atlas des patois valdôtains*, which has still yet to be published. For the Swiss Valais dialects we now have Kristol's multimedial online *Atlas linguistique audiovisuel du francoprovençal valaisan* (Kristol in progress) which offers visual and acoustic data from the last speakers of the local Francoprovençal variety (see also Ch. 20).

7.1.4.2 NALF *and* ALFR

A second geolinguistic survey of France was undertaken by Dauzat in 1939. His project sought to produce a series of regional atlases characterized by a narrow grid of enquiry points and a two-part questionnaire which, in addition to a general section, also contained a specialized regional section dedicated to 'ethnographic' questions.

In all his preparatory studies Dauzat emphasized the necessity of ensuring the intercomparability of the data to be collected. Unfortunately, subsequent developments, which were marked by the whimsical behaviour of some important names such as Gardette, did much to harm Dauzat's calls for unity. A general index published by Billy (1993) revealed that there are not even ten identically titled maps in the whole *NALF/ALFR* series.

The founding atlases of *NALF* were those for the Lyonnais province by Gardette (*Atlas linguistique et ethnographique du Lyonnais*, Gardette 1950-76), for Gascony by Séguy (1954-74), and for the Massif Central by Nauton (1957-63). The French national research body, CNRS, which had been interested in this line of research since 1939, provided for the finances and publication of *NALF/ALFR* between 1961 and 1991. To date, 19 Romance regional atlases have been founded and published in France.

The typographic appearance of the maps in these atlases is very similar, all making use of a red or orange background on which *ALF*-style phonetic transcriptions have been reproduced by calligraphers. Not all atlases, however, include an index, an introductory volume, or photographs. Unfortunately, some individual attempts to later digitize some of the published atlases were halted in 1991 when funding from the CNRS was withdrawn (cf. Simoni-Aurembou 1998).

Other Gallo-Romance atlases are:

(i) for the Oïl area: *Atlas linguistique et ethnographique picard* (Carton and Lebègue 1989-2010), *Atlas linguistique et ethnographique normand* (Brasseur 1980-2011), *Atlas linguistique et ethnographique de la Bretagne romane, de l'Anjou et du Maine* (Guillaume and Chauveau 1975-83), *Atlas linguistique et ethnographique de l'Ile-de-France et de l'Orléanais* (Simoni-Aurembou, 1973-8), *Atlas linguistique et ethnographique de la Champagne et de la Brie* (Bourcelot 1966-89), *Atlas linguistique et ethnographique de la Lorraine romane* (Lanher et al. 1979-88), *Atlas linguistique et ethnographique de la Franche-Comté* (Dondaine 1972-84), *Atlas linguistique et ethnographique de Bourgogne* (Taverdet 1975-84), *Atlas linguistique et ethnographique du Centre* (Dubuisson 1971-93), *Atlas linguistique et ethnographique de l'Ouest (Poitou, Aunis, Saintonge, Angoumois)* (Massignon and Horiot 1971-83);

(ii) for Francoprovençal: *Atlas linguistique et ethnographique du Lyonnais* (Gardette 1950-76), *Atlas linguistique et*

ethnographique du Jura et des Alpes du nord (Martin and Tuaillon 1971-8);

(iii) for the Oc and Catalan area: *Atlas linguistique et ethnographique de l'Auvergne et du Limousin* (Potte 1975-92), *Atlas linguistique et ethnographique de la Gascogne* (Séguy 1954-73), *Atlas linguistique et ethnographique du Languedoc occidental* (Ravier 1978-93), *Atlas linguistique et ethnographique du Massif Central* (Nauton 1957-63), *Atlas linguistique et ethnographique de la Provence* (Bouvier and Martel 1975-86), *Atlas linguistique et ethnographique du Languedoc oriental* (Boisgontier 1981-6), *Atlas linguistique et ethnographique des Pyrénées orientales* (Guiter 1966).

7.1.4.3 *Wallonia*

The idea for a geolinguistic survey of Wallonia is due to Jean Haust, who compiled a very wide-ranging questionnaire including, in addition to the spheres of agriculture and the petite bourgeoisie, also the grammar of the Romance dialects of Belgium. For various (economic and administrative) reasons, publication only began in 1953. Today the opus magnum, the *Atlas linguistique de la Wallonie* (Haust et al. 1953-2011), boasts 17 volumes, whereas its *editio minor*, the *Petit atlas linguistique de la Wallonie* (*PALW*), is made up of three volumes, including colour-coded maps. A feature of *PALW* is the codified presentation of the data in the maps and the inclusion, in each of the maps, of extensive comments.[5]

7.1.5 Italo-Romance, Sardinian, and Raeto-Romance regional atlases

Italian initiatives in the area of regional atlases have suffered from an absence of central planning, perhaps because they lack an autochthonous methodological model such as *ALF* for France.

7.1.5.1 *Regional Italo-Romance atlases*

The first regional initiative was for an atlas of Corsica, the *Atlas linguistique de la Corse* (Gilliéron and Edmont 1914-15), which Gilliéron and Edmont had developed before the First World War and from which just 799 maps were published. Further publications were stopped by Gilliéron, most probably because of the devastating criticisms levelled at him by some Italian linguists. The proponent of the new Corsican atlas, together with its patriotic title, *Atlante linguistico etnografico italiano della Corsica* (Bottiglioni 1933-42), was Bottiglioni. The work, sumptuously published during the years of Italian fascism, consists of ten volumes, an introduction, and an index-dictionary. Empirically, its distinguishing feature is the systematic use of sentences to elicit answers. Between 1995 and 2009 a local Corsican initiative also published three volumes of a new atlas, the *Nouvel atlas linguistique et ethnographique de la Corse* (Dalbera-Stefanaggi 1995-2009), which also benefits from some digitalized techniques.

For mainland Italo-Romance, the first initiatives were rather modest, namely surveys with results published in tabular form (Melillo 1955a; 1955b). Things took a leap forward with the advent of 'sociological' geolinguistics, which was concerned with recording not only basilectal but also mesolectal registers. Important in this respect are the *Nuovo atlante dei dialetti e dell'italiano regionale* (Sobrero et al. 1991) and in particular the *Atlante linguistico siciliano* (Ruffino 1985-), which, although still far off publishing a real linguistic atlas, acts as a permanent research laboratory.

Operating within a multidimensional (or variationist) framework are the *Atlante linguistico della Basilicata* (Del Puente and Giordano 2010), *Atlante linguistico campano* (Radtke 2002-), and *Atlante linguistico-etnografico della Calabria* (Trumper 2010-), although the latter two have yet to publish real atlas volumes in paper format.

For northern Italy, we can cite the regional atlas of western Piedmont, *Atlante linguistico ed etnografico del Piemonte occidentale* (Telmon and Canobbio 1985-2013), which has all the hallmarks of a classical regional linguistic atlas, including *in loco* surveys of the basilect, an onomasiological bias, and traditional paper format publication. The same is true of the non-Raeto-Romance sections of the two parts of the *Atlante linguistico del ladino dolomitico* (*ALD*; Goebl et al. 1998; 2012) where, for the sake of the accessibility of the published data, both paper and digital formats have been made available.

Also worthy of note is the Swiss initiative behind the *Vocabolario dei dialetti della Svizzera italiana*, which, in addition to publishing fascicles since 1952, also offers a wealth of geo- and ethnolinguistic documentation in its headquarters in Bellinzona.

For central Italy we must mention Giacomelli's *Atlante linguistico toscano* (Giacomelli et al. 2000). It is a diagenerational geolinguistic study focusing exclusively on lexis available on CD-ROM.

Finally, mention must be made of two recent micro-regional atlases for Istria, both compiled by Filipi and Buršić Giudici: *Atlante linguistico istrioto/Istriotski lingvistički atlas* (1998) for Istrian and *Atlante linguistico istroveneto/Istromletački lingvistički atlas/Istrobeneški lingvistični atlas* (2012) for Istro-Venetan.

[5] For further bibliography, see Pop (1950), Tuaillon (1976), Goebl (1978), Holtus (1990), Ravier (1991), Simoni-Aurembou (1998).

7.1.5.2 *Raeto-Romance regional atlases*

The first regional atlas for the area is the Friulian *Atlante storico linguistico etnografico friulano* (Pellegrini and Pellis 1972-86), devised and edited by Pellegrini. The principal focus of the atlas is lexis. The published work consists of six volumes and one introductory volume. The survey covers 199 enquiry points, including Slovene and German linguistic localities. Only one part of the published work (*c.*700 units) includes maps, with a large part of the published material consisting of short tables each containing about a dozen pieces of information.

The other regional Raeto-Romance regional atlas is the *Atlante linguistico del ladino dolomitico* (*ALD*), divided into two parts (*ALD-I* and *ALD-II*; Goebl et al. 1998 and 2012) published in nine volumes.[6] Each part covers 217 enquiry points, and contains 884 and 1,066 maps, respectively. Methodologically, it is a basilectal atlas, very similar to *ALF*. Its defining characteristic is its appearance in both traditional paper and electronic formats. As well as the nine volumes of atlases (containing 1,950 maps), online sites for each part offer the following features: (a) pdfs of all the published maps (with supplementary lists); (b) a search engine for the data contained in both parts; (c) two acoustic databases where all interviews with informants can be accessed. Of the 217 *ALD* enquiry points, only a quarter relate to Raeto-Romance, with the rest distributed across Lombard, Trentino, and Venetan localities. For the 21 dialects of Dolomitic Ladin there is also available online an 'acoustic atlas' based on a separate data collection which makes use of the digital technology made available by the *VIVALDI* project (see below).[7]

7.1.5.3 *Sardinian atlases*

In this category there are two works: one a synthesis of Sardinian data collected for *ALI* (Terracini and Franceschi 1964) and the other a contribution by Wagner (1928), which offers a wealth of geolinguistic documentation by way of an appendix.

Of particular interest for the entire Italo-Romance area is the Berlin initiative *Vivaio acustico delle lingue e dei dialetti d'Italia* (*VIVALDI*) led by Kattenbusch and Tosques. It brings together an online acoustic database which was collected through a basilectal-oriented questionnaire based on that used for *AIS*. At present the acoustic material available online includes northern and central Italy, the islands (Sicily and Sardinia), and many provinces of southern Italy.

[6] Also of interest here is the *Dicziunari rumantsch grischun* (1939).
[7] <http://ald.sbg.ac.at/ald/ald-i>

7.1.6 Iberian atlases

Following the Second World War, Spanish geolinguistics was championed by Manuel Alvar (e.g. Alvar 1969). We owe to him most of the regional initiatives in this area, starting from the *Atlas lingüístico y etnográfico de Andalucía* (Alvar 1961-73; 230 enquiry points). There then followed, in chronological order, the *Atlas lingüístico y etnográfico de las Islas Canarias* (Alvar 1975-8; 51 enquiry points), the *Atlas lingüístico y etnográfico de Aragón, Navarra y Rioja* (Alvar 1979-83; 176 enquiry points), the *Atlas lingüístico y etnográfico de Cantabria* (Alvar 1995-; 55 enquiry points), and the *Atlas lingüístico y etnográfico de Castilla y León* (Alvar and Duero 1999; 213 enquiry points). The general approach of these atlases, whose respective questionnaires contain many questions of an ethnographic nature, and their publication follow traditional lines, with the exception of the additional consideration they give to female language (already adopted in the *Atlas lingüístico y etnográfico de Andalucía*). Two atlases were conceived along different lines: the *Atlas lingüístico y etnográfico de Castilla-La Mancha* (García Mouton and Moreno Fernández 1989; 161 enquiry points), which is available online and offers separate documentation for male and female informants, and the *Atlas lingüístico galego* (Santamarina et al. 1990-2005; 176 enquiry points). The *Cartografía lingüística de Extremadura* (González Salgado 2000) is only available online (www.geolectos.com). Finally, we must also mention here the geolinguistic initiatives carried out by non-Spanish Romanists such as Krüger (1935-9).[8]

The weak point of Iberian geolinguistics is the mainland Portuguese territory, where for some time there has been a project, the *Atlas lingüístico-etnográfico de Portugal e da Galiza* (Saramago 1974-), which has produced a questionnaire and a list of enquiry points. However, it still has not published any atlas data. For the Azores, by contrast, there exists a substantial atlas (Saramago 2001-; 17 survey points).

7.1.7 Daco-Romance regional atlases

Regional initiatives began in 1958 under the aegis of the Romanian Academy, subsequently finding their way into one of two series of atlases: *Noul atlas lingvistic român pe regiuni* and *Atlasul lingvistic român pe regiuni*. Internal coordination between both projects was much better than in France, both employing very similar questionnaires. Between 1967 and 2007 *Atlasul lingvistic român pe regiuni* covered three regions, Maramureş, Dobrogea, and Transylvania, while *Noul atlas*

[8] For further references on Ibero-Romance, see González González (1992), Veny (1991).

lingvistic român pe regiuni covered, between 1967 and 2009, the four regions of Banat (Neiescu et al. 1980-2005), Crişana (Stan and Uriţescu 1996-2003), Moldova and Bucovina, and Oltenia (Cazacu et al. 1967-84). At present the data from both atlases are being unified to produce a single national Romanian synthesis covering more than 1,000 survey points, with the first volume (Saramandu 2005-) having been published.[9]

Bessarabia, previously part of the Soviet Union, was surveyed between 1968 and 1973 as part of the *Atlasul lingvistic al Moldovei* (Udler and Melnic 1968-73), which was transcribed using Cyrillic phonetic characters.

The Aromanian and Megleno-Romanian areas were surveyed by German Romanists through the *Atlasul lingvistic aromân* (Kramer and Dahmen 1985-94) and Wild's (1983) *Meglenorumänischer Sprachatlas*, respectively. Both atlases employed a reduced version of the questionnaire used for the *Atlas linguarum Europae* (*ALE*; Weijnen and Alinei 1976). Also now available is Atanasov's (2009) *Atlasul lingvistic al dialectului meglenoromân*.

Istro-Romanian is covered by the *Atlasul lingvistic istroromân/Atlante linguistico istrorumeno/Istrorumunjski lingvistički atlas* (Filipi 2002-7).

7.1.8 Pan-Romance linguistic atlases

Here mention must be made of the *Atlas linguistique roman* (Tuaillon and Contini 1996-2009), which is an offshoot of the pan-European geolinguistic *ALE* project. In 1987 some of the Romance collaborators on *ALE* decided, under the guidance of Tuaillon and Contini, to put together a separate group of researchers with the aim of publishing (with the Roman Istituto Poligrafico) annotated cartographations of a certain number of items from the *ALE* questionnaire.

7.1.9 Some guidelines for reading the maps in a linguistic atlas

It is inherent in the way the data contained in the maps in a linguistic atlas are gathered (standardization of the questionnaire, intercomparability, appropriateness of the questions asked, etc.) that they may be interpreted *diachronically*, despite their *synchronic* nature (as witness the subtitle of Brun-Trigaud et al. 2005: *Du temps dans l'espace* 'Of time in space'). This intimate interrelation between space and time (or history) is true of all 'geographically based' sciences.

[9] See further Caragiu-Marioteanu (1989), Olariu (2010).

Maps focusing on sounds may reveal every link in the relevant chain of phonetic development: see Map 7.1 (development of Lat. -ELLU(M)) and Map 7.10 (development of Lat. /k/ before stressed /a/). For the Gallo-Romance domain the most ancient stages (*-el* and *k*, respectively) occur in the south (in the Occitan domain), while the more recent stages (*-o* or *ʃ*, respectively) are concentrated in the north (often then radiating outwards from the Île-de-France). In some cases, by overlaying some of the outcomes from maps for etymologically related forms we may obtain a clearer impression of how some outcomes have radiated outwards (see Map 7.2).

Map 7.3 explores a morphosyntactic feature (obligatory presence or absence of subject personal pronouns; with a clear geographical distribution: once again the south stands out for its conservativeness (see also Map 7.12).

From a broad geographical perspective, phenomena distributed around the periphery but not in the centre, reveal older stages of Romanization, while the centre may reveal an innovation (see Map 7.5).

The interpretation of lexical maps, where the main challenge is to reconstruct the structural evolution, must go hand in hand with the use of historical sources (etymological dictionaries such as *Französisches etymologisches Wörterbuch* (von Wartburg 1928-2002) or *Lessico etimologico italiano* (Pfister and Schweickard 1979-) (see Maps 7.4, 7.6, 7.9, and 7.11). In Map 7.4, beside the innovatory type *coq*, the Latin type GALLU(M) is still in the majority; however the Gascon types *biguey*, *hasan*, and *pol* are to be explained, according to the interpretation offered by Gilliéron and Roques (1912), as a kind of 'metalinguistic' reaction on the part of speakers of these dialects in order to avoid an 'homonymie fâcheuse' (a 'troublesome homonymy') between the original words for 'cat' and 'cockerel', which otherwise would both have given rise to *gat as a consequence of regular sound change. The phenomenon has become famous in the linguistic literature as 'avoidance of homonymic clash'; see also Bynon (1979:186-9). Map 7.6 reveals one of many pan-Romance lexical replacements, which were already under way in late Latin. These often seemed to favour more 'substantial' forms, so that the (to take the example of the infinitive) trisyllabic EMERE 'to buy' gave way to the tetrasyllabic COMPARARE). This map also shows a secondary lexical diffusion (that of reflexes of AD+CAPTARE), due to well-documented historical causes.

Map 7.9 reflects terminological variation in the early Christian Church (concerning the names of the days of the week) and the subsequent geolinguistic outcome. The three rival types (DIES MERCURII, MERCURII DIES both 'day of Mercury', MERCURIUS 'Mercury') were all present in the Christian Romània by the fourth century.

The even distribution of the grids used in the atlases may be very useful for the documentation of superstrate and substrate effects (see Maps 7.7 and 7.8). While for the lexicon, the assumption that such factors have been at work can be easily demonstrated by detailed comparision between the starting point and the endpoint, for sound change, where the transmission of linguistic contact effects is harder to track, this procedure is more complicated. Thanks to evidence from Osco-Umbrian for the development /nd/ > /nn/, we have better evidence in support of this (nonetheless controversial: see Varvaro 1979) hypothesis than for the alleged Celtic origin of the change /kt/ > /çt/ where there is a lack of historical documentation.

7.1.10 Conclusion

Of course the work required for the conception and completion of a linguistic atlas is not to be confused with linguistic geography itself. On the whole, geolinguistic work is carried out on the data of published linguistic atlases and takes on a variety of methodological approaches, including both qualitative (frequent in the past) and quantitative (employed for several decades in the field of dialectometry). The formal structuring of linguistic atlases in terms of a two-dimensional matrix (N enquiry points multiplied by p maps) and the Gilliéronian principle of intercomparability of the data have always offered the possibility (though long neglected) of analysing these data not only in considerable individual detail but also in global terms. A prerequisite for this, however, is the good metrological quality of the atlas data. Although this was guaranteed at the time of Gilliéron and of Jaberg and Jud, many of the atlases produced since no longer satisfy the formal principles embodied in *ALF* and *AIS*, preferring instead to limit themselves to the encyclopedic collection of data which do not lend themselves to intercomparability but which are readily localizable. Empirical excesses of this type have not been infrequent in variationist studies in the field of geolinguistics, which are expected to combine the survey of basilectal and mesolectal data. The result is a deterioration in the quality of the aforementioned two-dimensional matrix and the utility of the data for global analyses.

7.2 Dialectometry

7.2.1 Theoretical, empirical, and methodological preliminaries

Just like many of the sciences ending in the suffix '-ometry', dialectometry is an inductive discipline which sets out, through the quantitative synthesis of dialectal data drawn from traditional linguistic atlases, to identify and study the areal patterns (or, better, laws) hidden in the mass of data of these same atlases. As a rule, the original maps of the linguistic atlases often present highly complex, not to say chaotic, structural distributions, such that over the course of the last 100 years or so the belief, or rather conviction, has sprung up among many philologists and linguists that the areal distribution of linguistic features is exempt from intrinsic or significant regularities. Since early work in the 1970s (cf. Séguy 1971; 1973) dialectometry has progressively shown this belief to be false for the study of both synchronic and diachronic geolinguistics.

Within the framework of the Salzburg School of Dialectometry (SSDM), these laws are assumed to derive directly from the particular attitude of dialectal and basilectal speakers towards the geographic space of their habitat, referred to for some years now by the SSDM as the 'basilectal management of space by *Homo loquens*'. It is equally assumed that laws that apply on the spatial axis are the direct counterpart to those that apply on the temporal axis ('sound laws'), which were first discovered and widely debated by the Neo-grammarians at the end of the nineteenth century.

From a purely operational point of view, *qualitatively* the SSDM takes full advantage of the entire range of theoretical, conceptual, and methodological tools of traditional linguistic geography (based on atlases) and, *quantitatively*, uses a wide range of numerical and graphic methods at the heart of numerical taxonomy (cf. Sneath and Sokal 1973) and modern quantitative geography and cartography.

Since 1999 all dialectometric analyses carried out in Salzburg (and, to a certain extent, elsewhere) have employed Visual DialectoMetry (VDM) software which allows almost all the stages of the SSDM methodological procedure to be carried out by computerized means (Fig. 7.1).[10]

7.2.2 Dialectometrization of *ALF* and *AIS*

The examples given in Table 7.1 are generated from the dialectometrical analysis of about 40% of the original maps contained in the *ALF* (carried out between 1996 and 1999)

[10] The fundamental monograph on SSDM is Goebl (1984). Other works by the same author include, in French, Goebl (1981; 2002; 2003; 2005; 2008b; 2012), in Italian, Goebl (2008a; 2013), and in English, Goebl (2006; 2007; 2010). A full bibliography of Goebl's works on dialectometry can be found at <https://www.sbg.ac.at/rom/people/prof/goebl/dm_publi.htm>. Useful general information on dialectometry and on the VDM programme can be found at: <http://www.dialectometry.com>; <http://ald.sbg.ac.at/dm>.

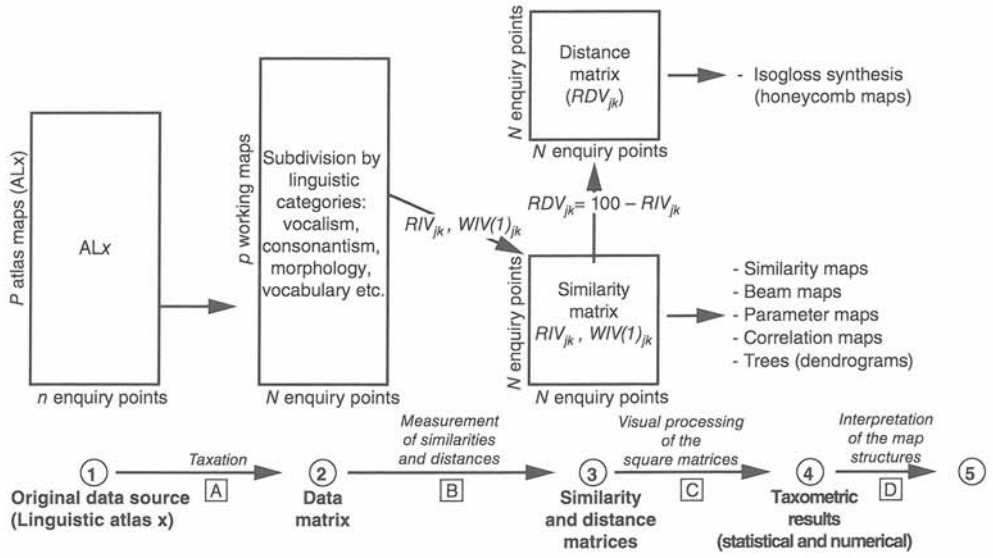


Fig. 7.1 Flow chart of the dialectometrical methods used by the Salzburg School of Dialectometry

Table 7.1 Key features of the dialectometrical analysis of the *ALF* and *AIS*

	ALF	*AIS*
No. of original maps analysed	626 (out of 1,421)	1,310 (out of 1,705)
No. of derived 'working maps' (WM)	1,681	3,911
Linguistic categories	Phonetics, morphosyntax, lexis	Phonetics, morphosyntax, lexis

and of all the maps contained in the *AIS* (carried out between 2007 and 2009).

In the case of *ALF*, only a part of the original data was analysed because of the potential amount of work involved, whereas in the case of *AIS* about a quarter of the original maps were discarded since they were found to contain empirical gaps. It is worth stressing that within the dialectometrical approach it is essential that the data to be analysed constitute a complete dataset. Furthermore, the number of 'working maps' is always far greater than that of the original maps, especially in the case of those dealing with phonetic features. Consequently, it is possible to extract from the data of a single original atlas map several working maps.

7.2.3 From the original (*ALF* and *AIS*) data to the data matrix

The basic task of applied Romance linguistic geography had always been the production of specific cartographations based on the reading of individual atlas maps. For this purpose blank paper maps, generally called 'silent maps', had always been available, circulated by the authors of the first linguistic atlases (*ALF*, *AIS*) and used by linguists for the preparation of cartograms of which a large number have been published. The founding masters of the Romance linguistic geography (cf. §7.1) produced a large number of these, many of which have since made their way into the Romance handbooks.

Maps 7.9 and 7.10 (generated from *ALF*) and 7.11 and 7.12 (from *AIS*) provide typical examples: Maps 7.9 and 7.11 are concerned with lexical features, whereas Map 7.10 is concerned with phonetic features and therefore based only on a selection of the information contained in the corresponding original *ALF* map. The same holds for Map 7.12, which is concerned with morphological features. In addition, the following facts should be noted: (i) each of the coloured areas of the four maps corresponds to a specifically defined linguistic type (known in the SSDM as a 'taxate'); (ii) the extension and configuration of the taxate areas are extremely variable; (iii) the number of taxates for each of the working maps also varies considerably, ranging between 2 and 91 (taxates/working map) for *ALF* and between 2 and 153 for the *AIS*.

The process of deduction for a working map which presupposes the definition of a precise classificatory criterion,

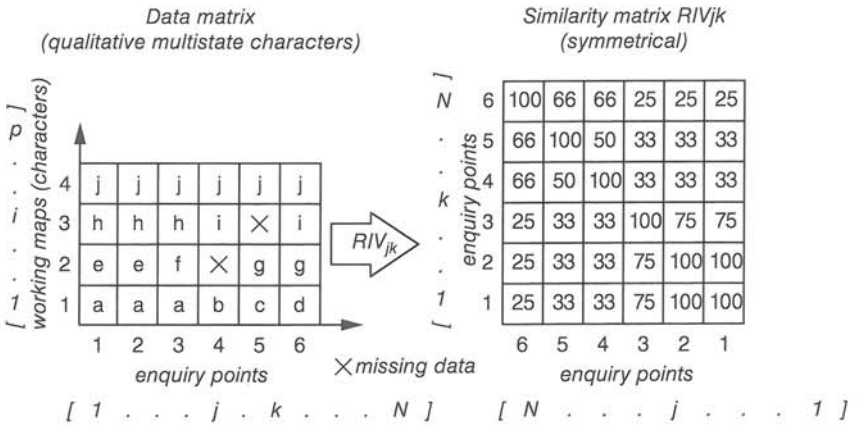


Fig. 7.2 Data matrix and similarity matrix: scheme of calculation of the interdialectal similarities via RIV_{jk} (Relative Identity Value)

is called (in the terminology employed in the SSDM) a 'taxatation'.

7.2.4 From the data matrix to the similarity and distance matrices

Fig. 7.1 clearly shows that the dialectometry methods used are aligned with one another in a chain-like formation. Consequently, the initial qualitative information gradually passes from the qualitative to the quantative only to emerge again, at the end, in cartographic form once more (stage 4). For this reason the cartographic language used in this regard is qualitative rather than quantitative.

Following the taxatation of the data from the original atlas maps (stage A), it is possible to establish, by gathering together all the analysed working maps, the data matrix (stage B). The latter therefore contains qualitative data which are situated, metrologically speaking, at the level of the cardinal (or nominal) measurement scale.

For *ALF* the respective dimensions are: 641 enquiry points by 1,681 working maps; the total number of taxate areas (= taxates belonging to all linguistic categories) is 20,043. *AIS* presents the following values: 382 enquiry points by 3,911 working maps; the total number of taxate areas (= taxates belonging to all linguistic categories) is 40,564. The internal variability of *AIS* data therefore considerably exceeds that highlighted on the basis of the original *ALF* maps.

The following stage (B) consists in the calculation of the existing similarities between N localities (or enquiry points) of the data matrix.

Looking now at Fig. 7.2, the standard index of similarity used by the SSDM is the 'Relative Identity Value' (RIV_{jk}), which from a statistical perspective is very simple in that it measures the percentage of identical taxates between two enquiry points (j and k). The result is a square similarity matrix (with the dimensions N by N) from which can be deduced, through a simple arithmetical transformation (similarity [RIV]) + distance [RDV] = 100),[11] a distance matrix (of the same dimensions).

An example calculation is given in Fig. 7.2: the similarity RIV between the vector points 3 and 4 is the quotient of the number of pairwise matchings of taxates (= 1; taxate j in the fourth working map) and the number of all the pairs of analysable taxates (= 3; without the second working map, which contains a gap): $RIV_{3,4} = 1/3 \times 100 = 33\%$.

The following link in the dialectometric chain (C) is of capital importance for the purposes of linguistic geography: it exploits the quantitative data saved in the two square matrices according to the theoretical and heuristic requirements of diatopic linguistics.

7.2.5 Graphic processing of the similarity and distance matrices

The aim of stage C is to visualize, with appropriate graphic means, the numerical variability of certain sectors of the two square matrices. The selection of these sectors depends entirely on the assumptions and requirements of linguistic geography.

Two cartographic representations are used: maps with detached choric tessellations (choropleth maps) and maps with linear contour lines (isarithmic maps). Both are marked through a variation in colour progressions. The

[11] RDV = Relative Distance Value.

quantitative extension of the colour intervals is regulated by two algorithms, MINMWMAX and MEDMW, which attribute 'cold' colours to numerical values below the arithmetic mean and 'warm' colours to values situated above. The VDM software programme makes it possible to quickly change the number of colour intervals (between 2 and 20) and to choose between three visualization algorithms (including of course MINMWMAX and MEDW).

Each of our maps consists of three parts: the map itself, the numerical legend (bottom left), and a histogram (bottom right) which enables the visualization of the statistical nature of the underlying frequency distribution of the map.

All the grids of atlas enquiry points dialectometrized by us were polygonized in line with Voronoi geometric principles. This procedure has enormous heuristic advantages, in that it allows, above all, direct and unambiguous visual comparison of the profiles of choropleth and isarithmic maps. Of course, the number of polygons corresponds to the number of enquiry points taken into consideration. For *ALF*, the number of original enquiry points (= 638) was increased by three artificial points corresponding to the standard languages (French, Italian, and Catalan). For *AIS*, of the 404 original (Romance) enquiry points 29 were discarded since they presented empirical gaps, and two artificial points (corresponding to Italian and French) were added, as well as the five following cities surveyed by Scheuermeier: Turin, Milan, Venice, Bologna, and Ferrara. As a consequence, the grid of enquiry points for *AIS* is slightly smaller, with 382 points.

7.2.6 Similarity maps as a tool of dialectometry

The similarity map represents the most important tool of the SSDM. Besides the usual polygonized background, each similarity map has a preselected reference point and encodes through a variation in colour progressions a progressive fall in the linguistic similarity values in relation to the highest value (100%) associated with the reference point itself ($RIV_{jj} = 100$).

To enable a better understanding of similarity maps, four points in particular must be noted:

(i) The polygon for the reference point always remains white on the maps and is usually situated in the centre or at the edge of the red coloured area (interval 6) corresponding to the atlas survey points characterized by the highest degree of similarity.

(ii) In general, the profile of spatial patterning follows a regular structural partitioning comparable to the single peak of a mountain landscape with numerous accompanying slopes, inclines, and valleys. This regularity follows directly from the organization of space in accordance with the laws inherent in the 'basilectal management of space' evoked above.

(iii) The spatial configuration of the choroplethic profile of a similarity map (and of other dialectometrical visualizations) largely depends, regardless of the underlying corpus, on the nature of two very important heuristic tools, the similarity index and the visualization algorithm. Here we apply three standard SSDM tools: the Relative Identity Value (RIV_{jk}) and the two visualization algorithms MINMWMAX and MEDMW. Moreover, thanks to the numerous possibilities that the VDM software offers for calculating values and cartographation, the generation and subsequent comparison of a large number of choroplethic profiles from different sources can be carried out with considerable ease and in very little time.

(iv) Reduced similarity rates across space are directly related, albeit to varying degrees, to an increase in the respective geographic distances. This fact, which represents furthermore a high-ranking linguistic universal, will be used within the framework of correlative dialectometry (cf. §7.2.10).

Thanks to their very distinct choroplethic profiles, similarity maps highlight the following geolinguistic properties of the respective local dialect or basilect: its position within the surveyed grid, which is interpreted as a relational framework; the degree of integration (penetration, interaction, etc.) of its dialectality within the surveyed grid; and the 'communicative' efficiency of the respective dialect. Furthermore, similarity maps are amenable to various types of interpretation including, notably, diachronic and sociological interpretations (cf. Goebl 1981:369-81; 1984:100-113).

Particularly noteworthy is the incredible stability of (choroplethic) similarity profiles within a (geo)typologically coherent area. It is for this reason that the comparative consideration of a number of similarity profiles whose reference points are aligned along a suitably preselected path proves so informative. In this way there emerge some striking 'special' effects which cast new light on the abovementioned 'basilectal management of space by *Homo loquens*'.

7.2.6.1 *Presentation and interpretation of Maps 7.13-7.16*

The choroplethic structure of Map 7.13 displays a similarity profile which is typical for central Languedocian, while that for Map 7.14 (with standard French as reference point) highlights the degree of integration of French among the dialects of the Gallo-Romance area.

The choroplethic structure of Map 7.15 is 'typically' Lombard, with the extension of the warm areas limited to the Po Plain, the appearance of cold colours (indicating large linguistic distances) in the Raeto-Romance areas (Graubünden/Grisons/Grigioni/Grischun, South Tyrol, Friuli), and the compact cold coloration of the regions south of Rome.

Map 7.16, whose reference point is standard Italian, shows the degree of Italianization of the Italo-Romance, Raeto-Romance, and Sardinian dialects. Especially interesting is the very close position of the dialects of the Veneto (and Istria) to standard Italian (class 4, in yellow), most probably to be explained as a result of the specific conditions surrounding the Romanization of the area at the beginning of the second century BC.

7.2.7 Isoglottic (or interpunctual) synthesis as a tool of dialectometry

From a cartographic perspective, isoglottic (or interpunctual) syntheses belong to the class of isarithmic maps, whose basic iconic elements are based, not on polygon areas, but on polygon sides generated through a preceding geometric examination of the surveyed grid. The preparation of Maps 7.17 and 7.18 therefore involves the following stages:

(i) Triangulation of the atlas network in line with Delaunay geometric principles, yielding 1,791 triangle sides for the *ALF* grid and 970 triangle sides for the *AIS* grid.
(ii) Polygonization of the triangulated network in line with Voronoi geometric principles, yielding 1,791 and 970 polygon sides for *ALF* and *AIS*, respectively.
(iii) Preparation of the polygonized map based on relative distance values (RDV_{jk}).

From a taxometric or dialectometric perspective, the establishment of Map 7.17 is based on 1,791 RDV_{jk} ranging between 5.42% and 56.99%, whereas the same variation in Map 7.18 (derived from *AIS*) is based on 970 values ranging between 10.19% and 47.52%. The visualization of these distance values (1,791, 970) is encoded through variation in the colourings and the thickness of the lines representing the polygon sides: with higher RDV_{jk} come thicker lines and a greater use of blue colouring.

In this way there emerge, in many areas on our two maps, line-like phenomena which correspond to well-known bundles of isoglosses. In Map 7.17 this happens between the Oïl and Oc areas, and in Map 7.18 south of the Romansh-speaking area, along the western arc of the Alps, the Po and the Adige, between the Veneto and Friuli, along the Apennines, in northern Sardinia, and around all the linguistic islands of the south and Sicily.

Note furthermore that the configuration of the isogloss bundles, represented in dark blue and with thick lines, are not structured linearly. Actually, the segregation between the different enquiry points is in general rather more gradual and accompanied by marked compartimentalization effects. By contrast, the red-coloured polygon aggregate zones encoded by thin lines highlight linguistically coherent areas (or dialect kernels).

7.2.8 Parameter maps as a tool of dialectometry

The extremely variable statistical nature of N similarity distributions of a given similarity matrix soon led to the close examination not only of the values of the various statistical parameters (such as the minimum, the maximum, the arithmetic mean, etc.) but also of their geolinguistic significance. The synopsis of symmetry parameters, notably Fisher's skewness values, of a given similarity distribution was thus shown to be very useful in geolinguistic terms for the detection of so-called 'linguistic compromise' (Ger. *Sprachausgleich*), in turn closely connected to the often very complex overlapping of taxate areas contained within the same data matrix. In essence, linguistic compromise refers to the varying integration of a particular basilect within the larger geolinguistic grid through the intermixture of small-scale (oligo-choric), middle-scale (meso-choric), and large-scale (mega-choric) taxate areas with the rest of the atlas data.

The quantitative consideration of the occurrence of oligo-, meso-, and mega-choric areas in the various attribute vectors of a data matrix can be efficiently carried out by measuring the symmetry of the various similarity distributions computed on the basis of the data matrix.

It is obvious, and further supported by our own empirical experience, that among the various basilects of a given geolinguistic grid some are more isolated than others, whereas other basilects are perfectly connected with the other members of their given grid. To understand this phenomenon better, it will help to reflect upon the following observation. Each of the 641 attribute vectors of the corresponding number of localities in our *ALF* network is marked by 1,681 geolinguistic attributes (or taxates). Now, each of these 1,681 taxates corresponds to a taxate area whose size can range, theoretically, between 1 and 640 points (or polygons). The percentage of oligo-, meso-, and mega-choric areas among all 1,681 taxate areas thus proves of utmost importance for assessing the degree of integration of one of the 641 vector points in the entire *ALF* network. It follows from this that a vector point which is

largely associated with small (oligo-choric) taxate areas can only play a very limited communicative role within the entire network, and vice versa.

A comparison of the numerical legends of similarity Maps 7.13 and 7.14 reveals that the extremely variable symmetry of a given similarity distribution can have a particular linguistic meaning. The legend from Map 7.13 (relating to the Occitan dialect of Rieupeyroux, *ALF* point 724) reminds us that of the 640 similarity values which have been mapped, 212 (= 101+74+37) points, namely the minority, are above the arithmetic mean of 53.22%, whereas 428 (= 66+264+98) fall below the arithmetic mean. A different picture emerges for Map 7.14 in relation to standard French, where 347 (= 127+149+67) points, namely the majority, are above the arithmetic mean of 68.75%, with 297 (= 9+159+129) points below the arithmetic mean. The (relative) communicative connection between standard French and the rest of the grid is therefore higher than that for the dialect of Rieupeyroux.

In an absolutely symmetrical frequency distribution, there are the same number of scores on both sides of the arithmetic mean. If that is the case, Fisher's skewness value is zero. When, however, most of the measurement scores are concentrated above the arithmetic mean, the skewness values are negative. In the opposite case (the majority of the measurement scores are below the arithmetic mean), they are positive.

7.2.8.1 *Presentation and interpretation of Maps 7.19 and 7.20*

For a proper understanding of both maps, it is essential to explain the linguistic meaning of the use of different colours:

(i) Blue-coloured polygons: areas of great linguistic compromise characterized, both in diachrony and synchrony, by considerable interactive dynamism with respect to the rest of the *ALF* or *AIS* network. These are thus very active areas heavily marked by outward and inward linguistic contact.

(ii) Warm-coloured polygons: areas of little linguistic compromise characterized, both in diachrony and synchrony, by a high degree of linguistic conservatism (or immobilism) with respect to the rest of the surveyed grid. These are therefore areas whose original linguistic type has been preserved for some considerable time and protected to a great extent from all external influences.

An examination of (*ALF*) Map 7.19 reveals the presence of a large blue circular configuration in the north and a small semi-circular configuration in the southeast. The former is result of the centuries-old expansion of the linguistic type of the Langue d'Oïl from the Île-de-France, while the latter reflects the progressive retreat of Francoprovençal in the face of the Langue d'Oïl to the north and the Langue d'Oc to the south.

The three predominantly red-coloured polygon aggregates (intervals 10-8) in Gascony, Languedoc, and Provence represent the last bastion of opposition to the propagation of the pan-Gallo-Romance linguistic compromise.

The skewness profile for (*AIS*) Map 7.20 proves equally clear. On the Po Plain, the dark blue and light blue coloured polygons encode a well-defined departmentalization, in which the Adige and the Po, together with long stretches of the Apennines from Liguria to the Marches, stand out as important dividing lines characterized by very intense currents of interaction. Another cavity marked in part by class 1 and 2 polygons (and therefore potentially characterized by intense currents of interaction) can be found between central (Lazio, Umbria, Marche) and southern (Abruzzo, Molise, Campania, etc.) Italy. The 'warm' coloured zones are found in the Graubünden/Grischun/Grigioni/Grisons, Friuli, Tuscany, and above all in the south of the Peninsula and Sardinia.

It is clear that the linguistic islands situated in the south (*AIS* points 715 (Francoprovençal), 760 (Provençal)) and Sicily (*AIS* points 865, 836, and 817 (Gallo-Italic)), which since their genesis have been subject to continuous linguistic exchanges, are to be included among intervals 1 and 2. The same is true of the northern part of Sardinia, which, given its gradual Tuscanization through continuous demographic imports from Corsica over the centuries, displays many characteristics of a genuine linguistic island.

7.2.9 Dendrographic dialectometry[12]

One of the most efficient means of numerical classification used by the SSDM has for over 40 years been Hierarchic Agglomerative Classification (HAC), which generates, as a heuristic output, dendrographic tree-like structures of various kinds. These trees, which thanks to a similarity matrix with the dimensions N×N always have N leaves, are generated by a reiterated process of binary fusions governed by a specific agglomerative algorithm. This process always begins from the leaves.

International numerical classification (or taxometry) employs a large number of algorithms to which correspond a similarly large number of trees. The utility of these trees for

[12] The following discussion is exemplified by Maps 7.21 and 7.22.

any given research project must be assessed on a case-by-case basis through the combined evaluation of the requirements of statistical analysis and Romance geolinguistics.

HAC trees consist of a hierarchy of disjunctive clusters with a binary structure, whose inner quantitative variability proceeds from the leaves (= foliage) towards the root (= trunk) of the tree. Consideration of the changing variability in the internal branching structure of these trees is of great relevance especially for geolinguistic classification and pattern recognition. The dendrographic algorithm applied in such cases is the Ward algorithm, whose utility in geolinguistics has been demonstrated on the basis of wide-ranging data.

As demonstrated by Maps 7.21 and 7.22, in dialectometry one must always begin with the projection in space of the resulting dendrographic classification of the tree (so-called 'spatialization'). In this process, the coloration of the clusters from the tree ('dendremes') are linked to the analogous areas ('choremes') of the spatialization. In the cases at hand, the colouring is not very extensive, with only seven dendreme-choremes (DC) for *ALF* and nine for *AIS*, representing well-known dialect areas. The linguistic interpretation must always begin with the first bifurcation after the root.

On Map 7.22 the biggest division (between DC *A-E* and DC *F-I*) highlights the famous La Spezia–Rimini Line. Thanks to the further bipartition based on the 'Padan' DC *A-E*, we can remove the entire Romansh area (DC *A*). The remaining area of the Padan Plain can be divided into the Veneto (DC *E*) and the rest of Gallo-Romance (DC *B-D*), and so on.

It should be emphasized, however, that the choremes show in all cases a spatially very compact distribution and that the higher ramifications of the tree prove extremely important for geolinguistic classifications.

7.2.10 Correlative dialectometry

Correlative dialectometry, which grew out of the detailed study of the correlation between linguistic distance and geography, is only a fairly recent instrument of the SSDM (Goebl 2005). The intimate relationship between space and language can be immediately exemplified by a comparison of a normal similarity map (computed using the RIV_{jk}) with a similar map based on proximity values calculated according to Pythagoras' well-known theorem and hence in accordance with Euclidean geometric principles. Application of Pythagoras' theorem proves quite straightforward given the prior integration of the geographic coordinates (x and y) of the *ALF* and *AIS* enquiry points into the VDM software.

In theory, it would be possible to ascertain the existing (cor)relations between the spatial variability of dialect similarities and Euclidean proximities by visually examining N similarity maps with an equal number of proximity maps. Clearly, such a simple visual examination would not produce scientifically robust results. The preferred solution is therefore to exploit modern statistical methods which make it possible to measure the relation between two series of values empirically ascertained through appropriate correlation indices, and to subsequently visualize a synopsis of their respective results. More concretely, this procedure consists in the preparation of a similarity and a proximity matrix of equal dimensions (N by N), whose duly matched vector pairs lend themselves to N calculations of the given numerical correlations. Following the computation of the N correlation calculations, the N calculated values are mapped in accordance with the usual norms of the SSDM.

The statistically most suitable correlation index is the Bravais–Pearson Correlation Coefficient r(BP). The r(BP) measures the linear correlation between two quantitative variables ranging between values of –1 and +1.

To better understand the correlation maps, it helps to think of the two correlated variables as forces or energies ready to extend across space. From this perspective, it is legitimate to ask whether this propagation of the two variables operates in perfect harmony (convergence) or in more or less marked disharmony (divergence). Naturally, both variables must in turn be given an appropriate diachronic and synchronic linguistic interpretation, which we take here to be the correlation between language and geography.

Incidentally, correlative dialectometry can also be successfully employed between two different linguistic categories or between two dialectometrical corpora with different numbers of working maps.

Looking at Maps 7.23 and 7.24, which reveal spatial distributions which can be readily interpreted from a linguistic point of view, we can note the following use of colours:

(i) Red and orange colours (intervals 5 and 6): areas where there persists a primitive harmony between the energies of language and space which, unlike 'natural' linguistic exchanges, are not found with shifts in phonemes and lexemes. These are conservative areas which have not been contaminated linguistically.
(ii) Dark blue and light blue colours (interval 1 and 2): areas where the primitive harmony between language and space has been deeply disturbed by outside factors through the interference of cultural, social, and political dynamic forces of various kinds. These are linguistically restless areas permeated by long-lasting (socio)linguistic dynamic forces.

Map 7.23 illustrates a clear bipartition of the Gallo-Romance domain caused by centuries-old friction and conflicts between forces from the north and the south. The trend revealed by the choroplethic profile of the map suggests that the impact of the forces from the north was always greater than that of the forces from the south. Also worthy of note is the perfect graduation of the spatial distribution of the r(BP) values.

Turning to Map 7.24, it can be seen that the restless zones (interval 1, in dark blue) are mostly situated in the northern part of Tuscany, Liguria, Veneto (including Istria), and northern Sardinia. This same map also underscores the highly plausible fact that the five linguistic islands in the south (points 715, 760) and Sicily (points 865, 836, and 817) are areas subject to considerable linguistic movement. The foundation of a linguistic island represents, in principle, a total breakaway from the primitive harmony between the energies of language and space.

The high degree of linguistic movement associated with the north of Tuscany and the Veneto is highly symbolic, especially in light of the early centralization ('medianizzazione') of the Veneto and the respective processes of exportation (out of Tuscany) and importation (on the part of the Venetan dialects) of linguistic material of various kinds.

7.2.11 Summary

To conclude this summary presentation, we reiterate some of the most salient characteristics of the SSDM:

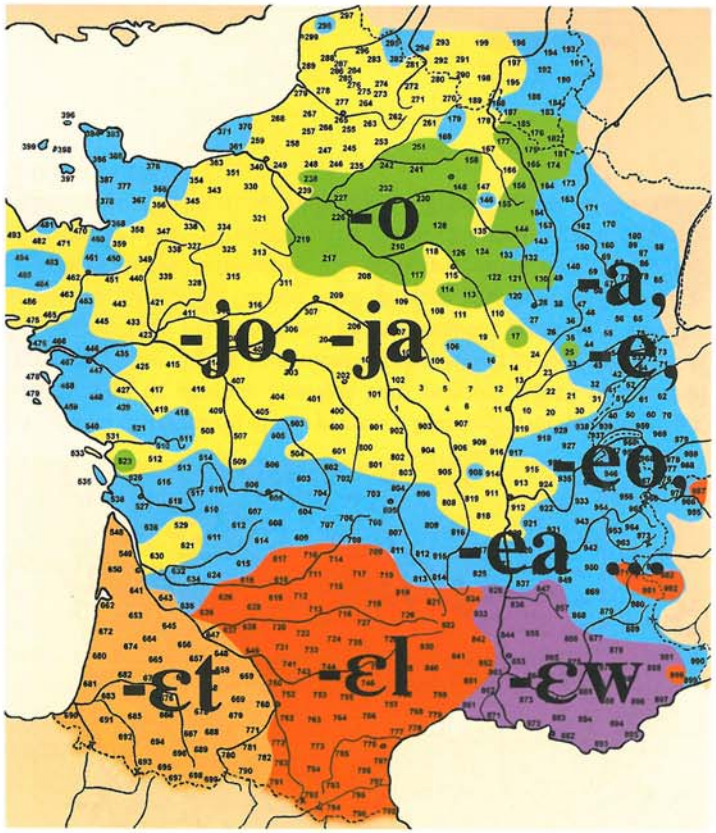
(i) It is an inductive method which, through the numerical synthesis of very diverse empirical data, leads to the discovery of regularities and geolinguistic laws, otherwise hidden within the analysed data.

(ii) It is a method based on the quantitative analysis of space which, precisely for this reason, considers the general mapping (or visualization) of its numerical results as the optimal heuristic process.

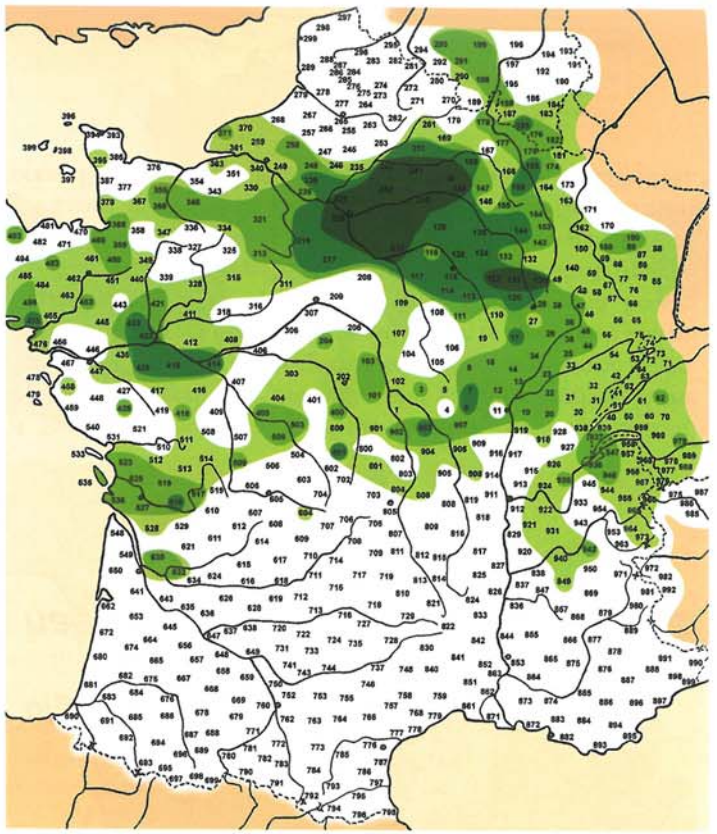
(iii) It is a method which, on account of its intrinsic comparative approach, is always open to interdisciplinary collaborations of all kinds.

(iv) It is a method empirically based on linguistic atlases proper and similar empirical collections.

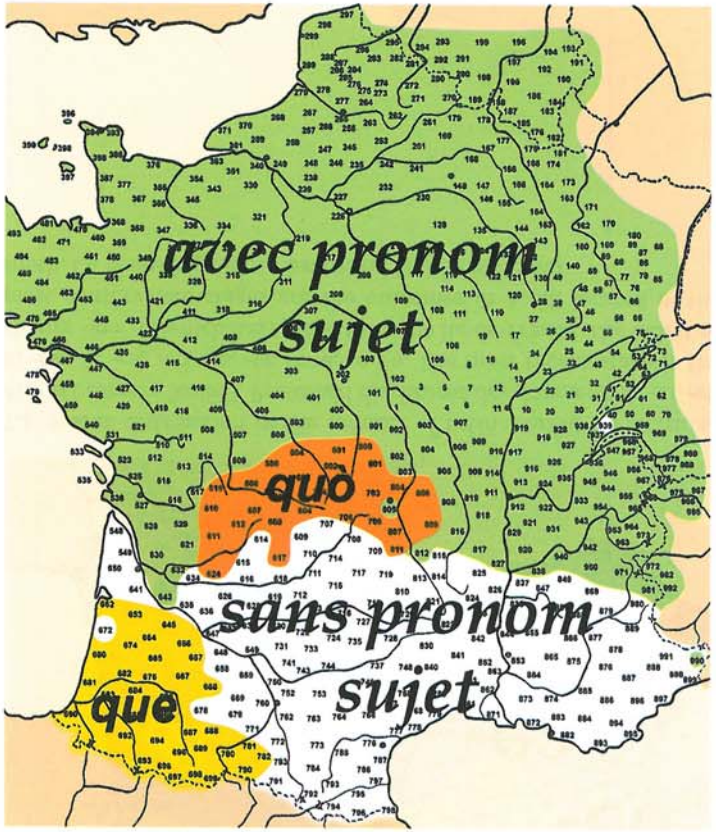
(v) It is a method, whose origins lie in Romance linguistics, which is a part of the tradition of classical linguistic geography that prides itself on the harmonious reconciliation of traditional knowledge with the latest in methodological and technological innovations.



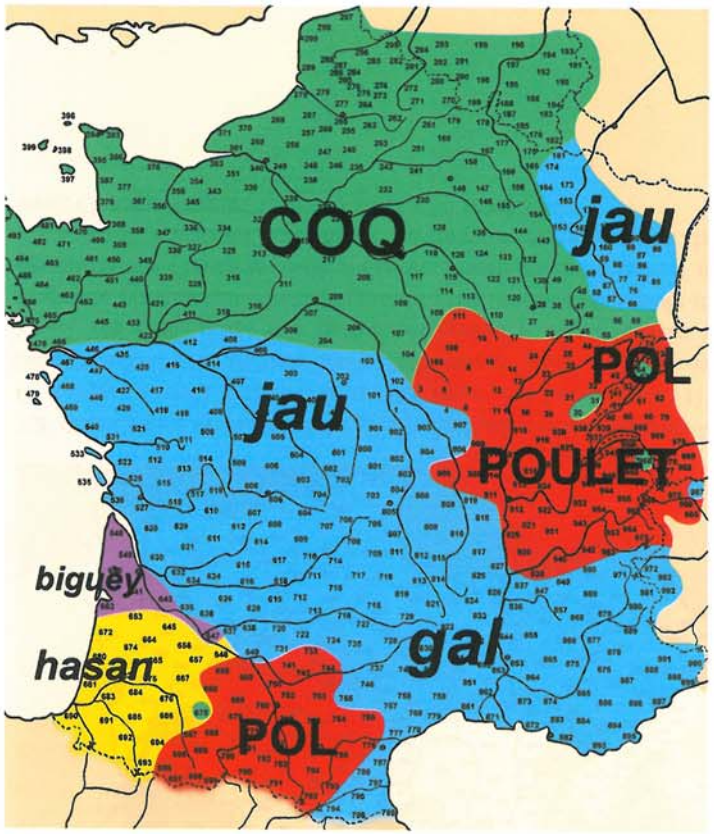
7.1 Spatial distribution of the reflexes of Latin -ELLU(M) (in CULTELLUM, *ALF* 341 *couteau* 'knife'). Presumed diachronic development: A: -el, -et; B: -ew; C: -ea, -eo, -jo, -ja; D: -a, -e, -o. The most recent stage is the change -jo > -o, which has spread from the Île-de-France. The oldest or most conservative stages are the outcomes in A, all located in the south. Cf. Brun-Trigaud, Le Berre and Le Dû (2005:250).



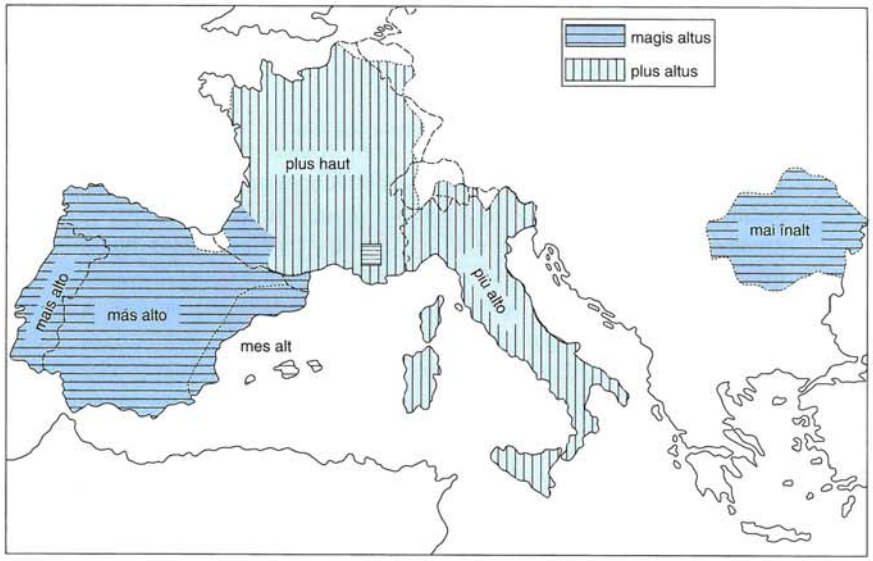
7.2 Quantitative synthesis of the areas of diffusion of the outcome -o (< -ELLU(M), -ELLE(M)), as found in six *ALF* maps: 115 *bateau* 'boat', 117 *beau* 'beautiful', 252 *château* 'castle', 341 *couteau* 'knife', 810 *manteau* 'coat', 986 *peau* 'skin'. This pattern of spread is characteristic of linguistic phenomena which originate in the Île-de-France. Note its discontinuous ('tentacle-like') diffusion as well as the presence of 'parachuted' advanced outposts of the form -o, particularly in the west. Cf. Brun-Trigaud, Le Berre and Le Dû (2005:310).



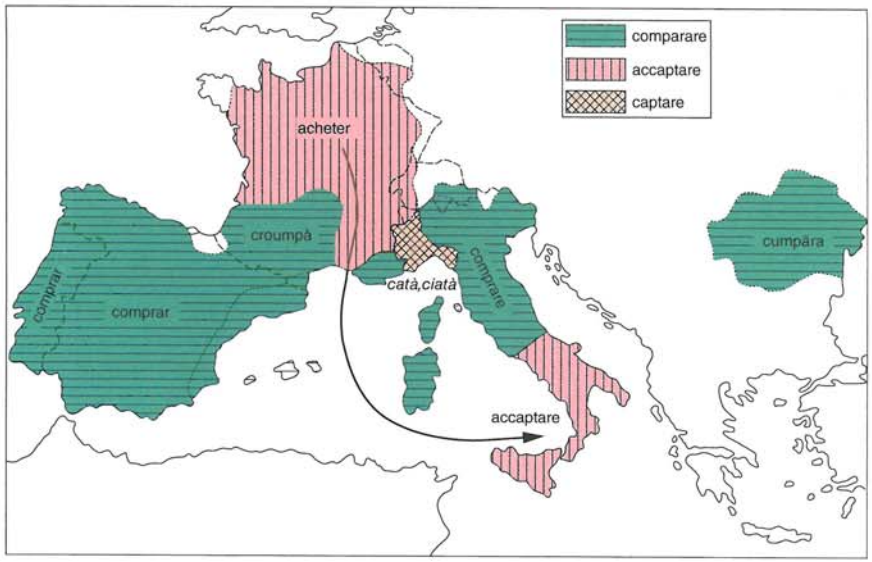
7.3 Spatial distribution of the presence (marked 'avec pronom sujet' on the map) or absence (marked 'sans pronom sujet') of personal pronouns in the dialect equivalents of the French phrase *il tonne* 'it is thundering' (*ALF* 1315). Absence of the personal pronoun is also the position in Latin. The Gascon form *que* (see §§19.4, 52.2.1) is obligatory in assertive utterances. The *auvergnat* form *quo* (< HOC) has pronominal value. Throughout the green-coloured region, pronominal reflexes of Latin ILLUM are in use. Cf. Brun-Trigaud, Le Berre and Le Dû (2005:105)



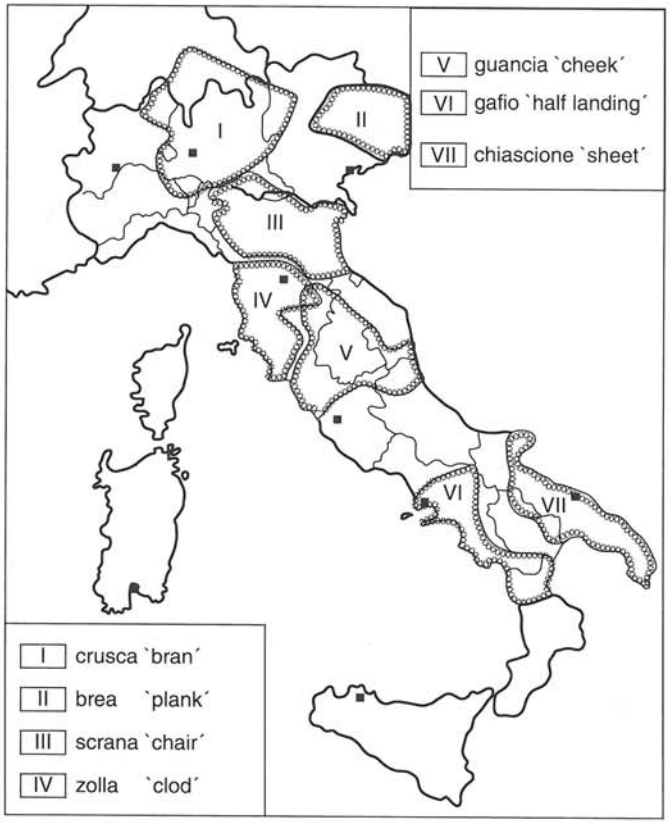
7.4 Spatial distribution of the Gallo-Romance and Celtic (Breton) words for 'cockerel' (*ALF* 320 *coq*). Latin gallu(m) survives in the types *gal* and *jau*. The majority type *coq* is of onomatopoeic origin. In Gascony the types *biguey* (< UICARIU(M)), *hasan* (< PHASIANU(M)) and *pol* (< PULLU(M)) are explicable, according to Gilliéron and Roques (1912:121-31), by speakers' metalinguistic reactions against 'troublesome homonymy' between the locally identical outcomes (gat, in both cases) of the word for 'cat' (< CATTU(M)) and the word for 'cockerel' (< GALLU(M)). Cf. Brun-Trigaud, Le Berre and Le Dû (2005:266).



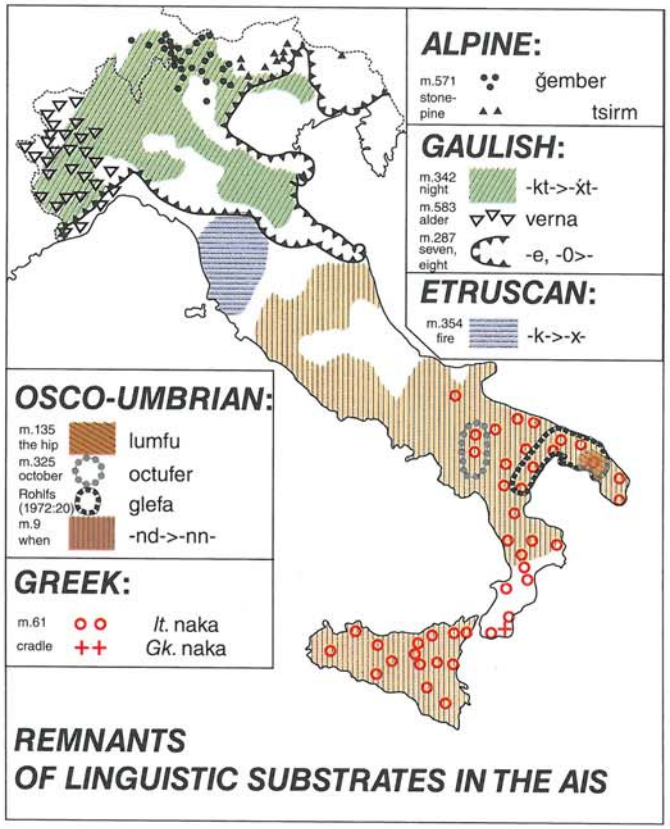
7.5 Broad geographical distribution of comparative markers. For comparison of adjectives, the usually synthetic structure found in Latin was replaced, by the time of late Latin, by analytic constructions based on the Latin adverbs PLUS 'more' (continued in Gallo- and Italo-Romance) and MAGIS 'more' (in Ibero- and Daco-Romance). Note the clear division of the Romània into two. The peripheral position of the MAGIS type suggests the greater antiquity of this type. Cf. Rohlfs (1971:239, 35).



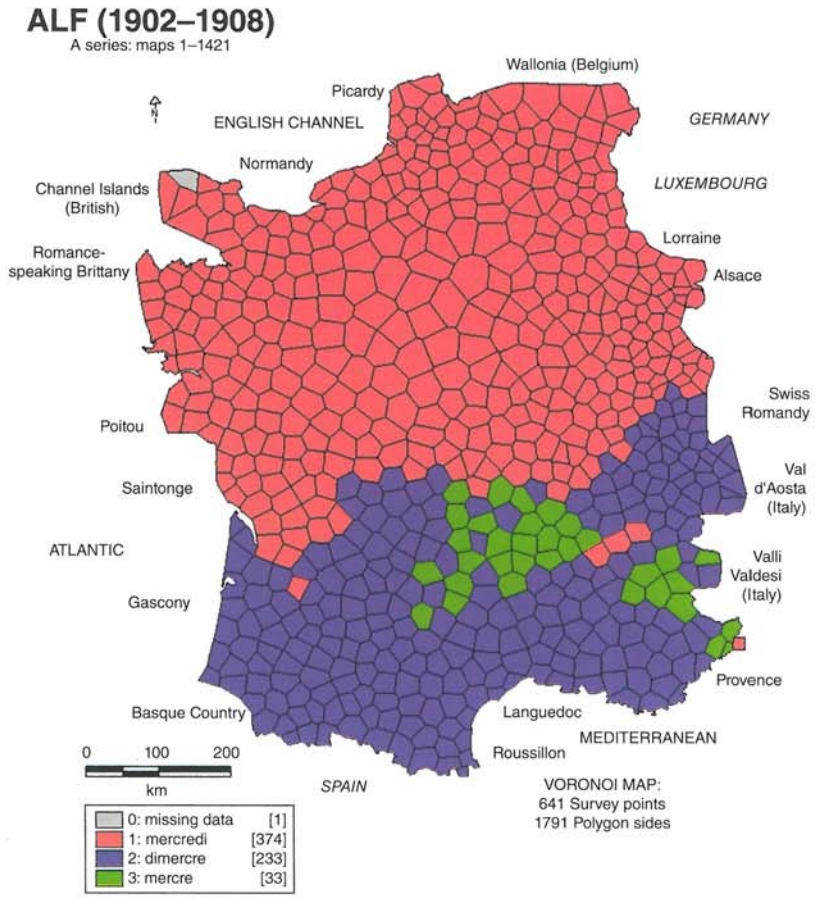
7.6 Broad geographical distribution of Romance terms for 'to buy'. Classical Latin EMERE, which rapidly disappeared from use, was replaced by COMPARARE 'procure, obtain', initially present throughout the Romània. Subsequently, there emerged in northern France the type AD+CAPTARE 'seize' (> Fr. *acheter*), and in Piedmont and Liguria the type CAPTARE. For specific historical reasons (French expansion into Sicily and southern Italy in the thirteenth and fourteenth centuries), the type corresponding to French *acheter* has been 'exported' to these areas. Cf. Rohlfs (1971:306;140).



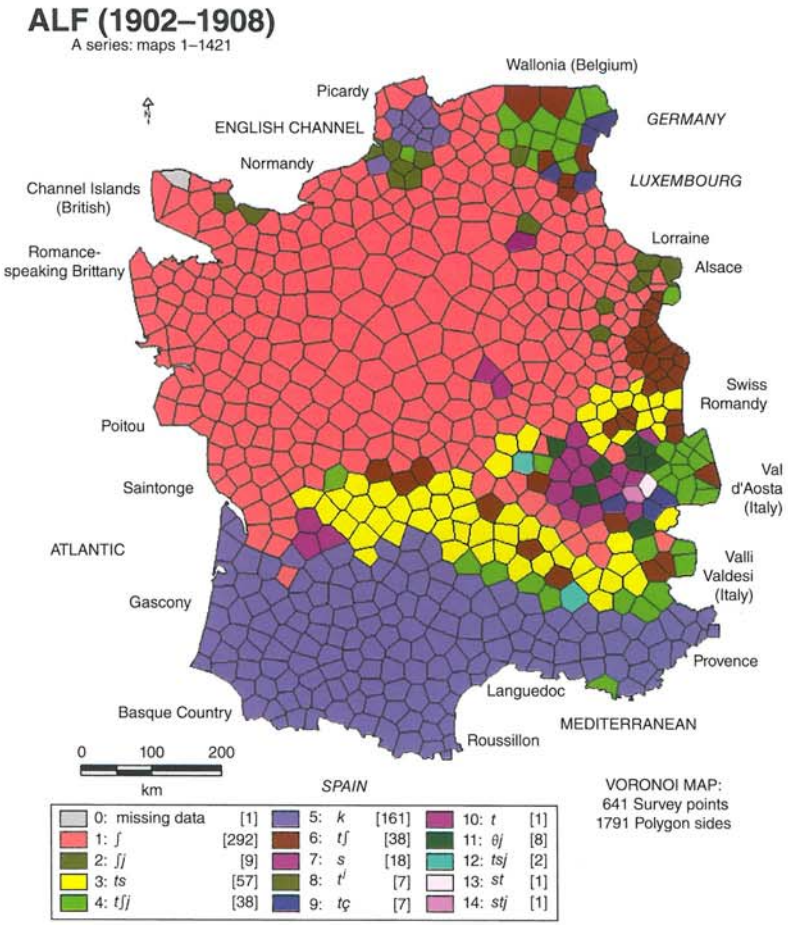
7.7 Superstrate effects. Spatial diffusion of some lexemes of Germanic origin from seven *AIS* maps: the type I *crusca* 'bran' (*AIS* 257); type II *brea* 'plank' (*AIS* 232 *due assi* 'two planks'); type II *scrana* (*AIS* 897 *seggiola* 'chair'); type IV *zolla* (*AIS* 1420 *zolla* 'clod of earth'); type V *guancia* (*AIS* 113 *guancia* 'cheek'); type VI *gafio* (*AIS* 870 *loggia* 'balcony, landing'); type VII *chiascione* (*AIS* 1531 *lenzuolo* 'sheet'). All seven types are of Langobard origin and their disparate spatial distribution reflects the decentralization of Langobard rule during its existence as an independent political entity (588-774). The types *crusca*, *zolla*, and *guancia* have entered standard Italian. Cf. Rohlfs (1971:293;119).



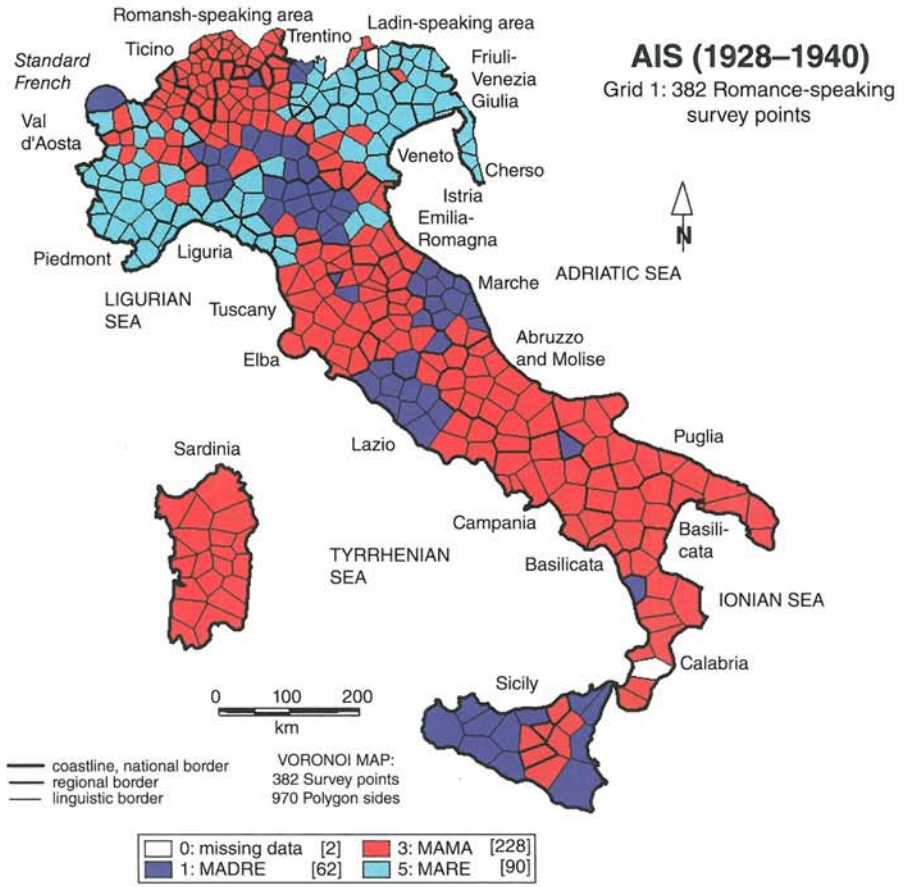
7.8 Alleged substrate effects. Spatial diffusion of some linguistic features of various origins. The map shows the area of diffusion of phonetic and lexical features. The Alpine lexemes *ğember* and *tsirm* are of pre-Indo-European origin. The type *verna* is of Celtic origin, while the type *naka* comes from the Greek of southern Italy. The words *lumfu*, *octufer*, nd *gleba* are Osco-Umbrian variants, respectively, of the synonymous Latin *lumbus*, *october*, and *glaeba*. The developments /kt/ > /çt/ as well as the fall of final unstressed /e/ and /o/ have been attributed, but far from unanimously, to the Celtic substrate. The same goes for the spirantization of Latin intervocalic /k/ in northern Tuscany, attributed by some to the remote influence of Etruscan. A case can also be made for Osco-Umbrian origin of the development /nd/ > /nn/. Cf. Kuen (1962/1970:240;223).



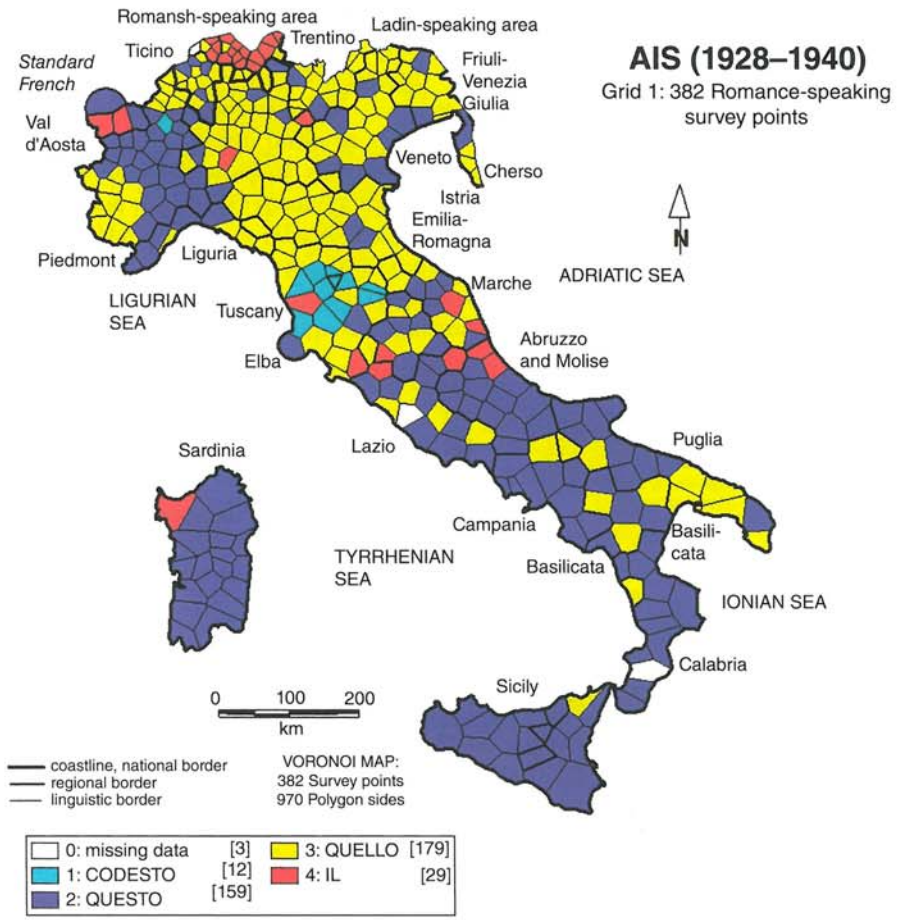
7.9 Spatial distribution of the Gallo-Romance terms for 'Wednesday'. The map shows the domains of the early Christian types MERCURII DIES (> Fr. *mercredi*), DIES MERCURII (> Oc. *dimecres*), and MERCURIUS (> Auv. *mercres*) (*ALF* 839 *mercredi*). For the other days of the week (except Sunday) the geolinguistic structures are very similar: cf. *FEW*, s.v. LUNA.



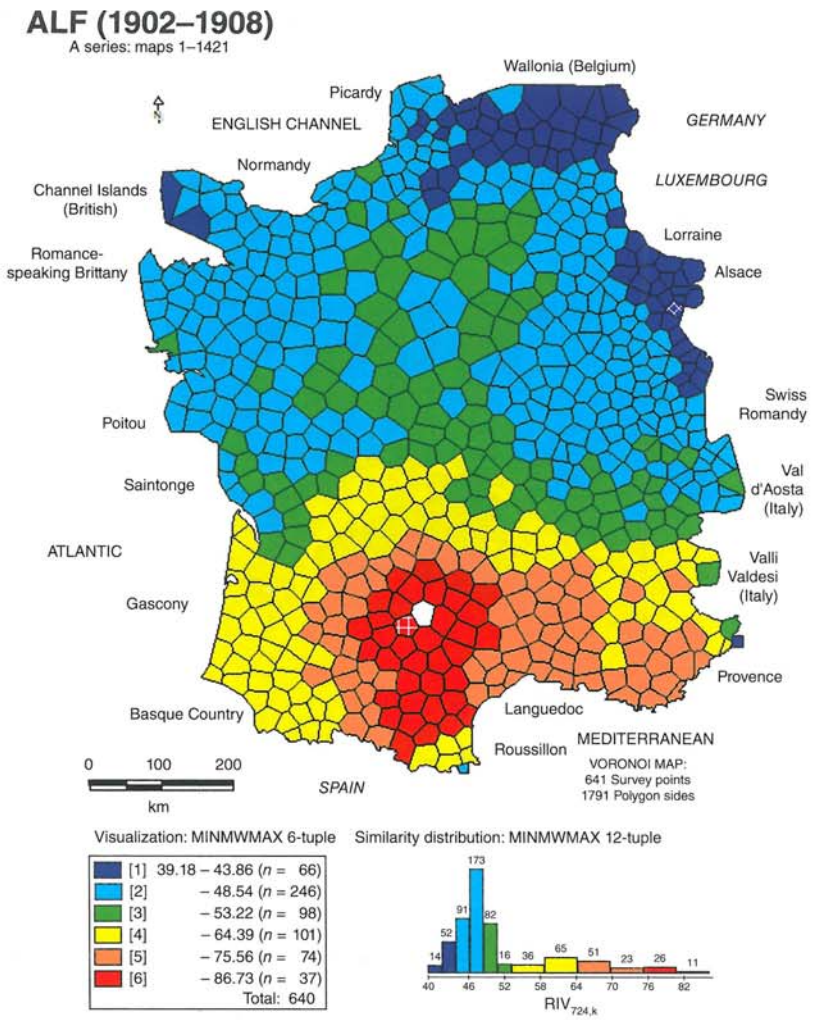
7.10 Spatial distribution of the outcomes of Latin /k/ before stressed /a/ (in reflexes of mercatus, *ALF* 812 *marché* 'market'). Presumed diachronic development: A: /k/ (= type 5); B: /tj/ (= type 8), /ts/ (= type 3); C: /tʃ/ (= type 6), /tç/ (= type 9); D: /ʃ/ (= type 1). The oldest forms (stage A) are found in the south and in Picardy. The more recent outcomes (stage B) occur in transitional areas between the south and the north. Stage D represents the 'French' outcome, which can be shown to have arisen by the fourteenth century. Cf. *FEW*, s.v. LUNA.



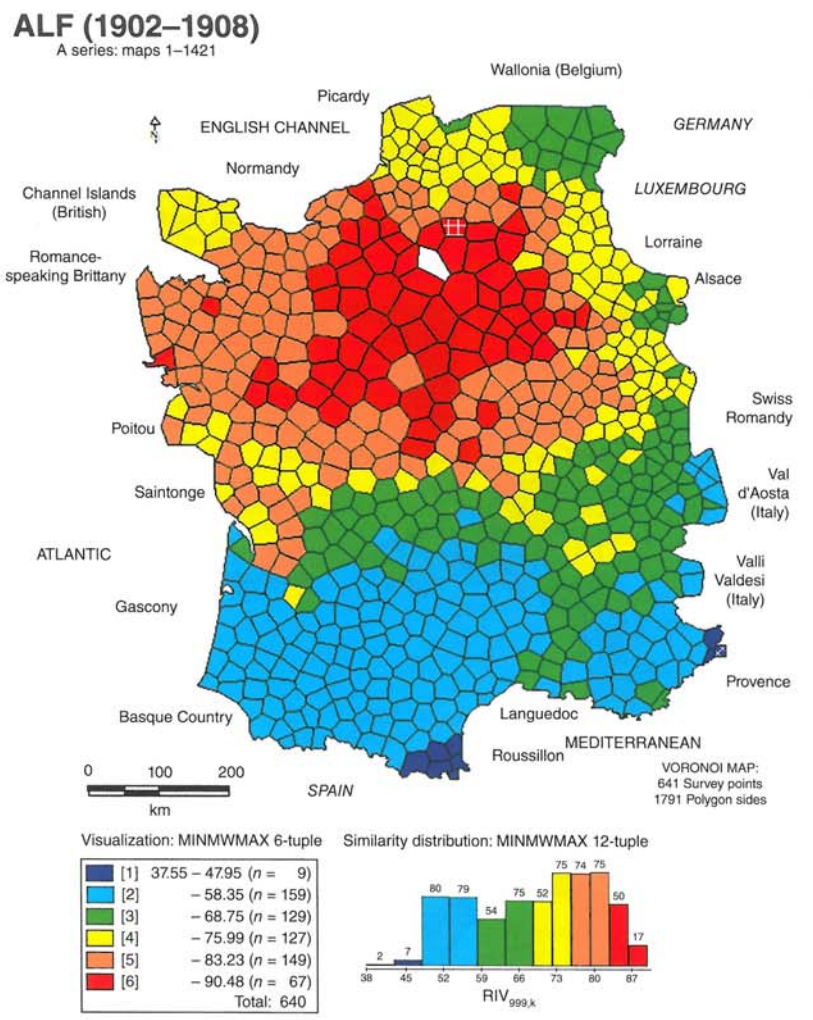
7.11 Spatial distribution of the Italo-Romance, Raeto-Romance, and Sardinian words for 'mother' (*AIS* 8 *mia madre* 'my mother'). The type *madre* is the most ancient.



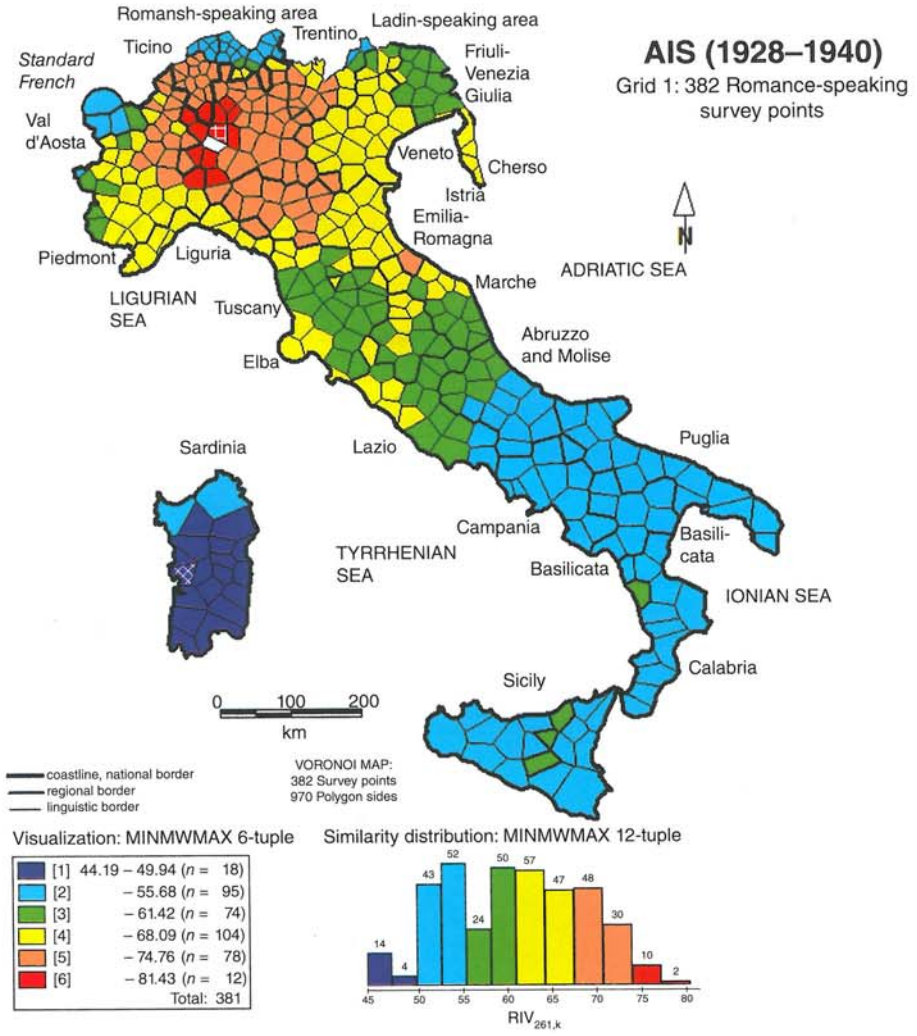
7.12 Spatial distribution of the Italo-Romance, Raeto-Romance, and Sardinian demonstrative adjectives in the phrase 'to this child' (*AIS* 42 *a codesto bambino* 'to this child'). The type *questo* is the most ancient.



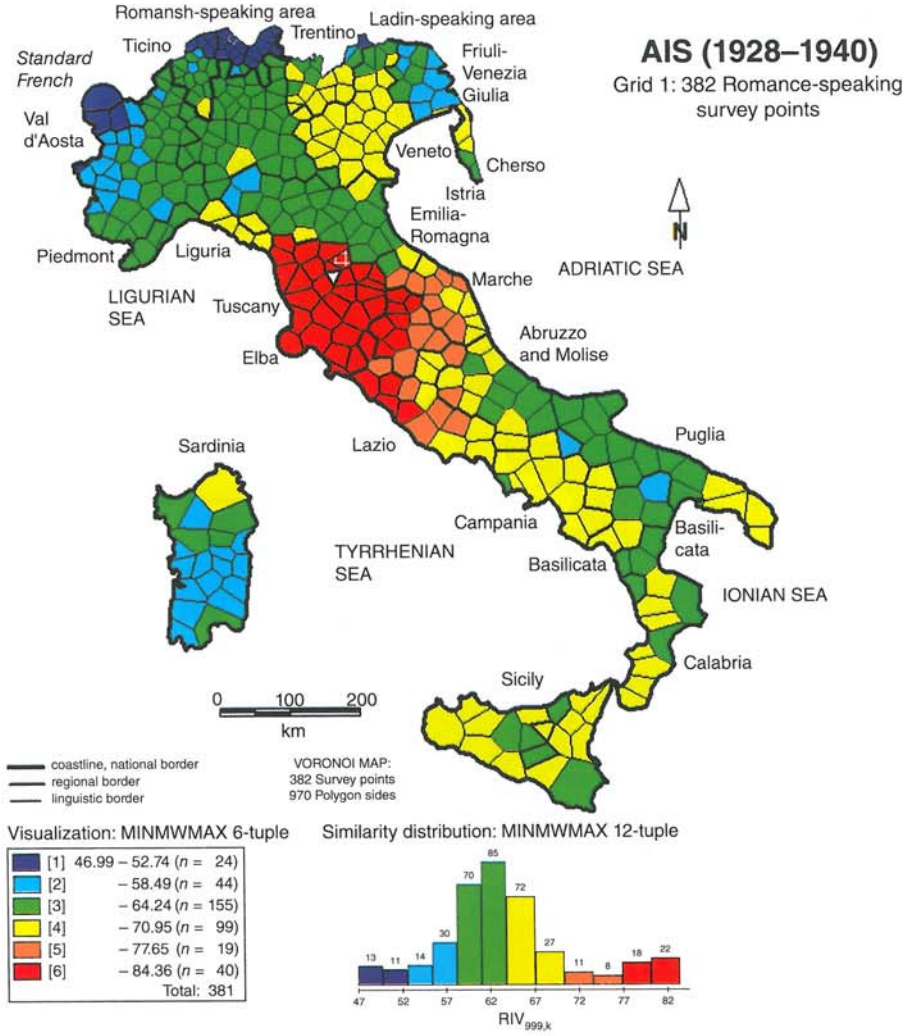
7.13 A typical Languedocien similarity profile: similarity map to the *ALF* point 724 Rieupeyroux, Département Aveyron). Similarity index: $RIV_{724,k}$. Corpus: 1,681 working maps (= total *ALF* corpus). Algorithm of visualization: MINMWMAX (6-tuple).



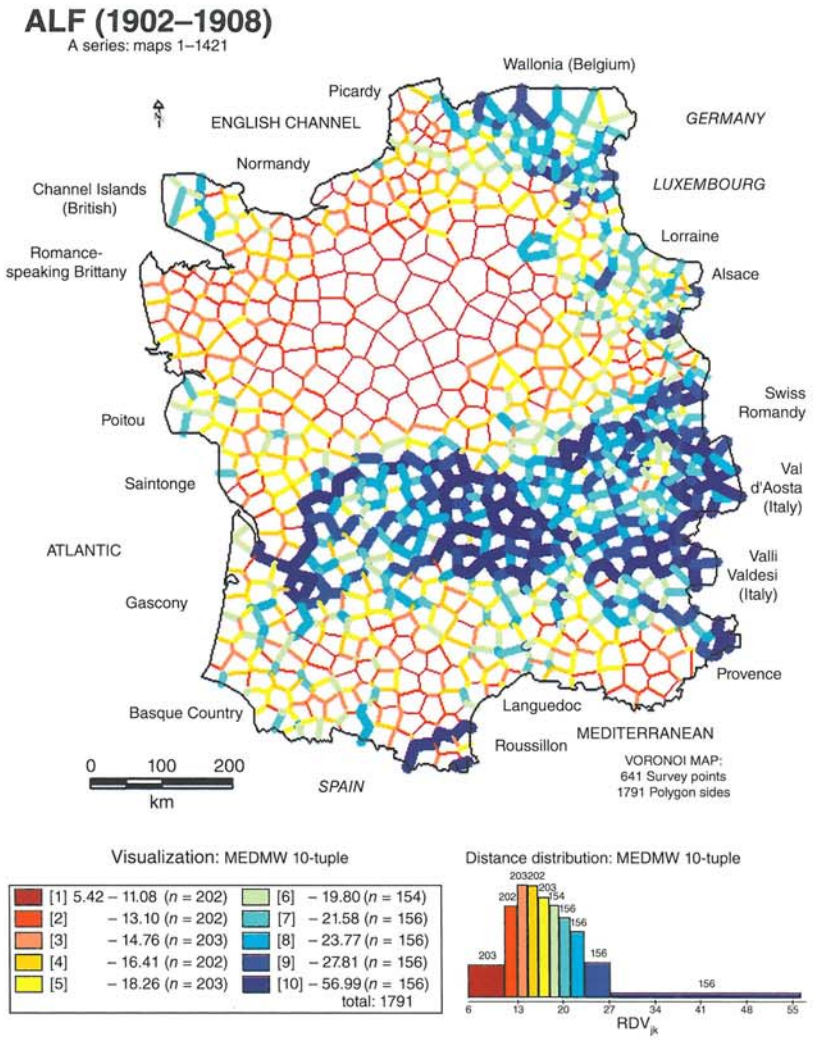
7.14 A typical similarity profile of the northern Domaine d'Oïl: similarity map to the artificial *ALF* point 'Standard French' (= P: 999). Similarity index: $RIV_{999,k}$. Corpus: 1,681 working maps (= total *ALF* corpus). Algorithm of visualization: MINMWMAX (6-tuple).



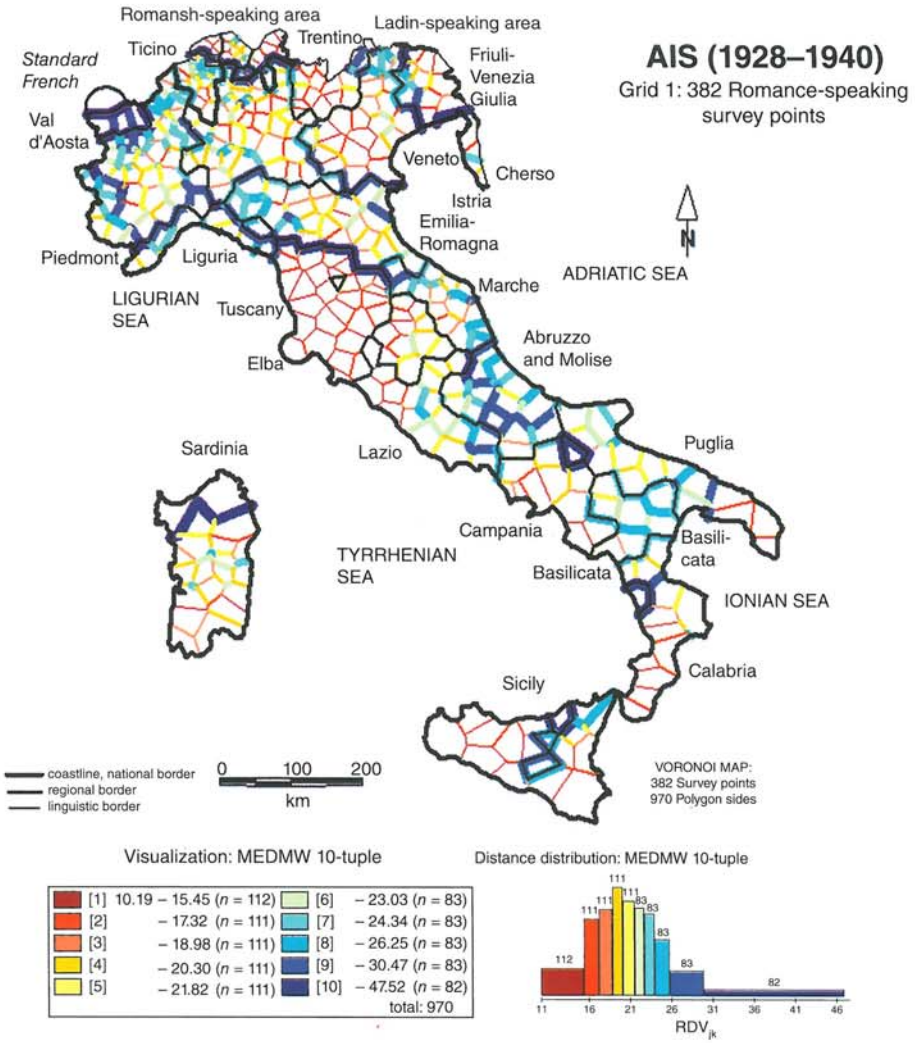
7.15 A typical Lombard similarity profile: similarity map to *AIS* point 261 Milan. Similarity index: $RIV_{261,k}$. Corpus: 3,911 working maps (= total *AIS* corpus). Algorithm of visualization: MINMWMAX (6-tuple).



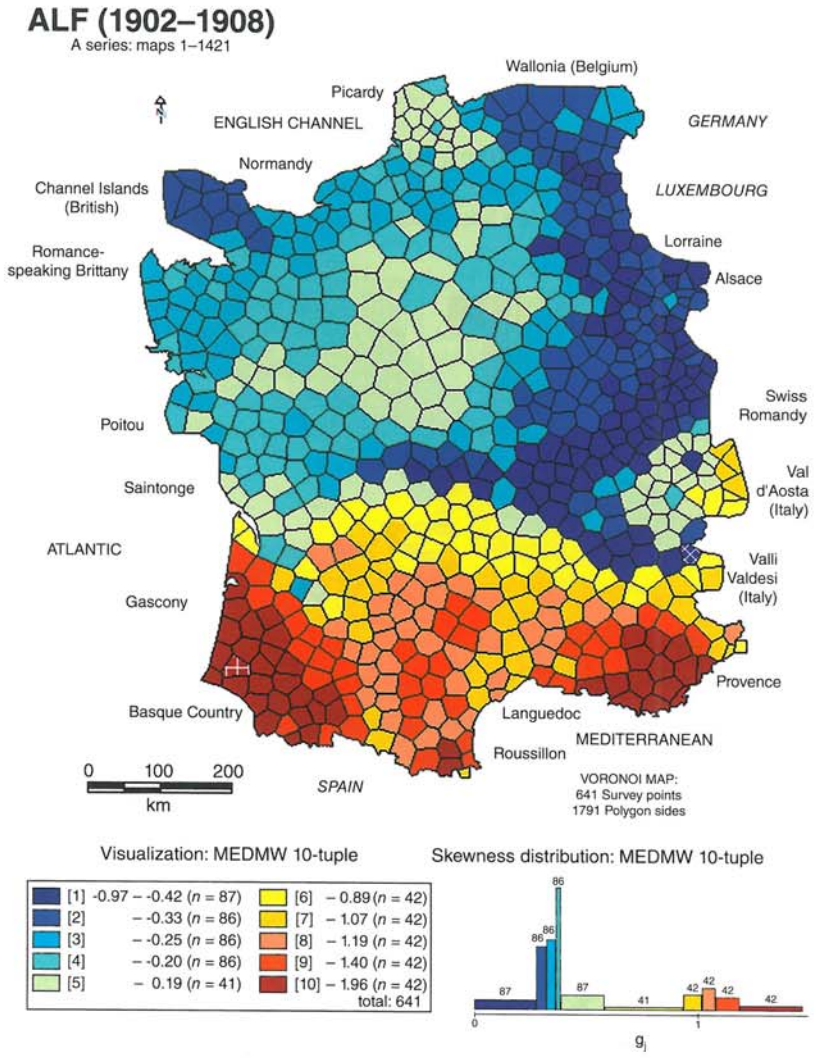
7.16 A typical similarity profile of central Italy: similarity map to the artificial *AIS* point 'Standard Italian' (= P: 999). Similarity index: $RIV_{999,k}$. Corpus: 3,911 working maps (= total *AIS* corpus). Algorithm of visualization: MINMWMAX (6-tuple).



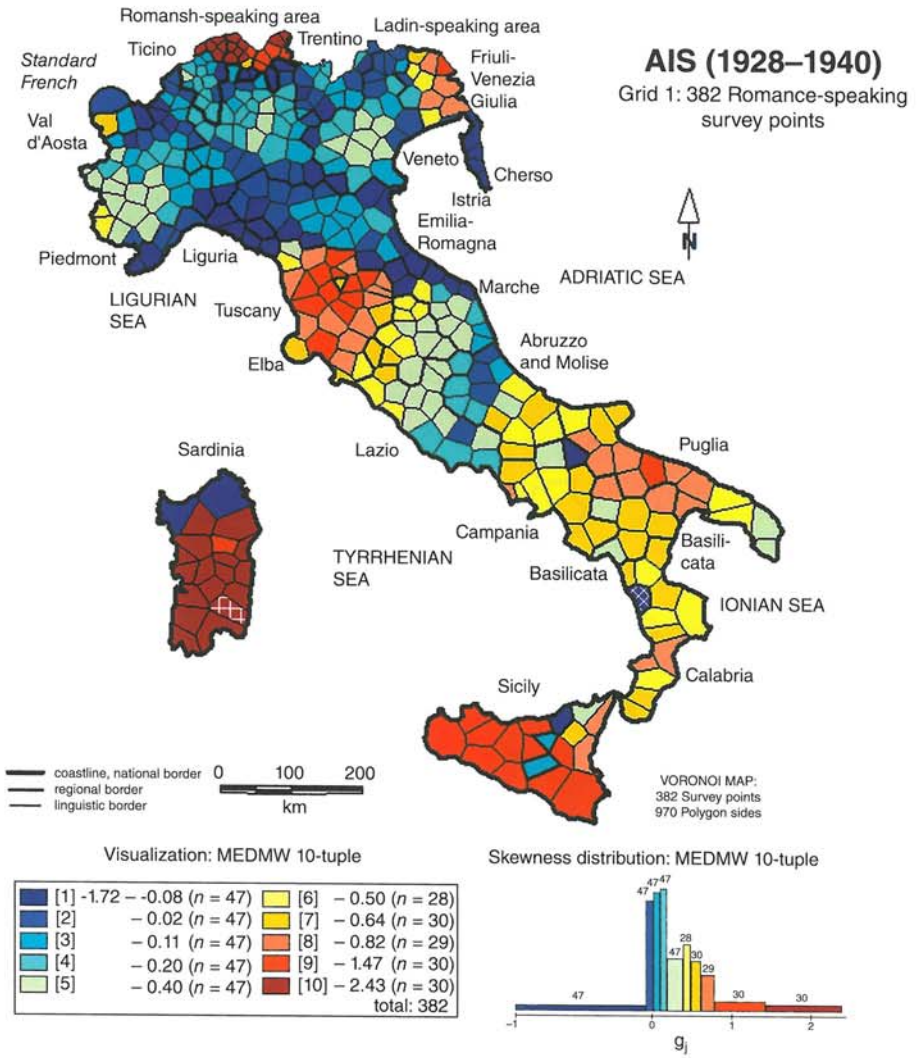
7.17 Honeycomb map (isogloss synthesis) showing a synopsis of 1,791 interpoint distance values.Distance index: $RDVj_k$. Corpus: 1,681 working maps (= total *ALF* corpus). Algorithm of visualization: MEDMW (10-tuple).



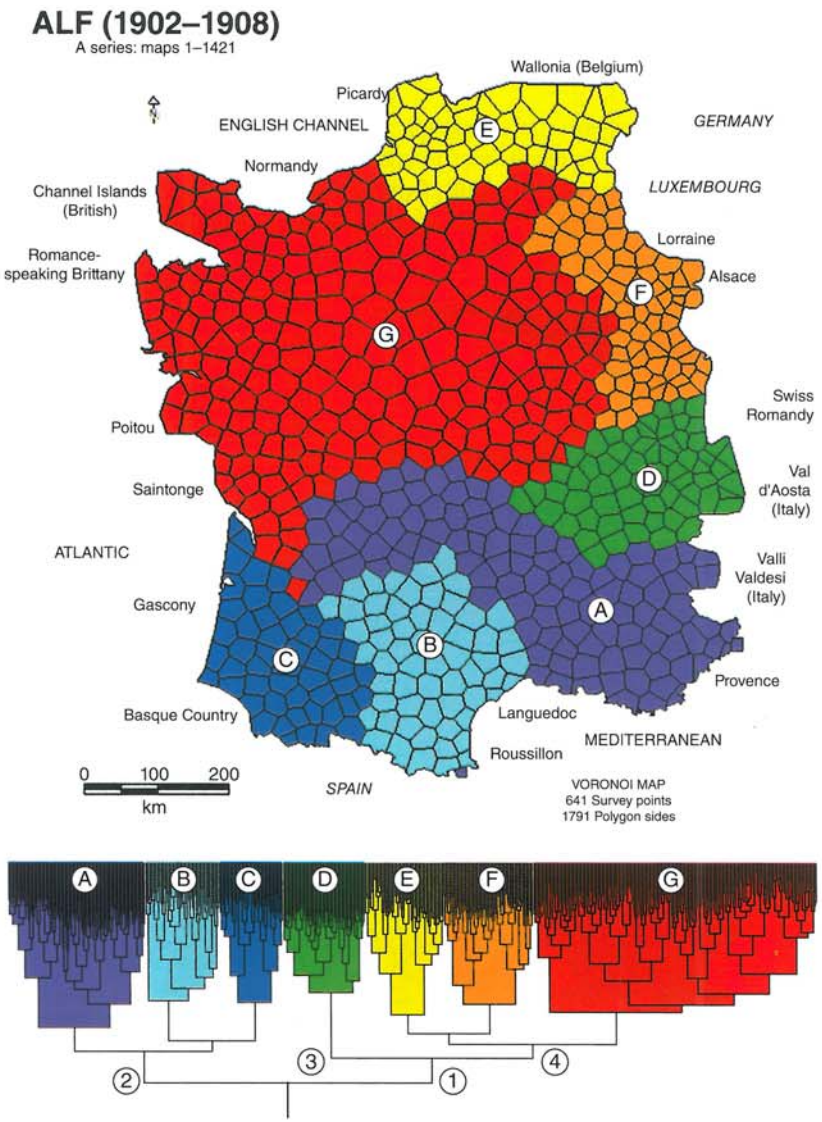
7.18 Honeycomb map (isogloss synthesis) showing a synopsis of 970 interpoint distance values. Distance index: $RDVj_k$. Corpus: 3,911 working maps (=total *AIS* corpus). Algorithm of visualization: MEDMW (10-tuple).



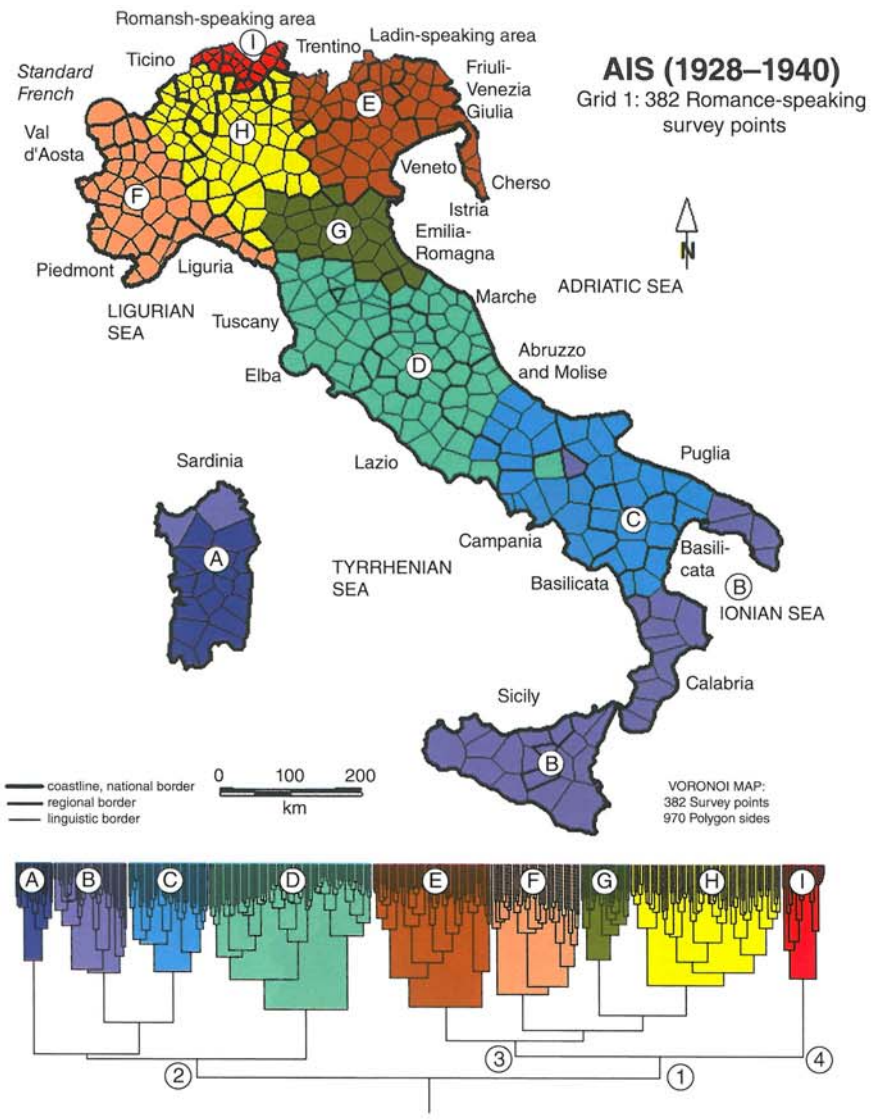
7.19 Choropleth map of the synopsis of the skewness values of 641 similarity distributions. Similarity index: $RIVj_k$. Corpus: 1,681 working maps (= total *ALF* corpus). Algorithm of visualization: MEDMW (10-tuple).



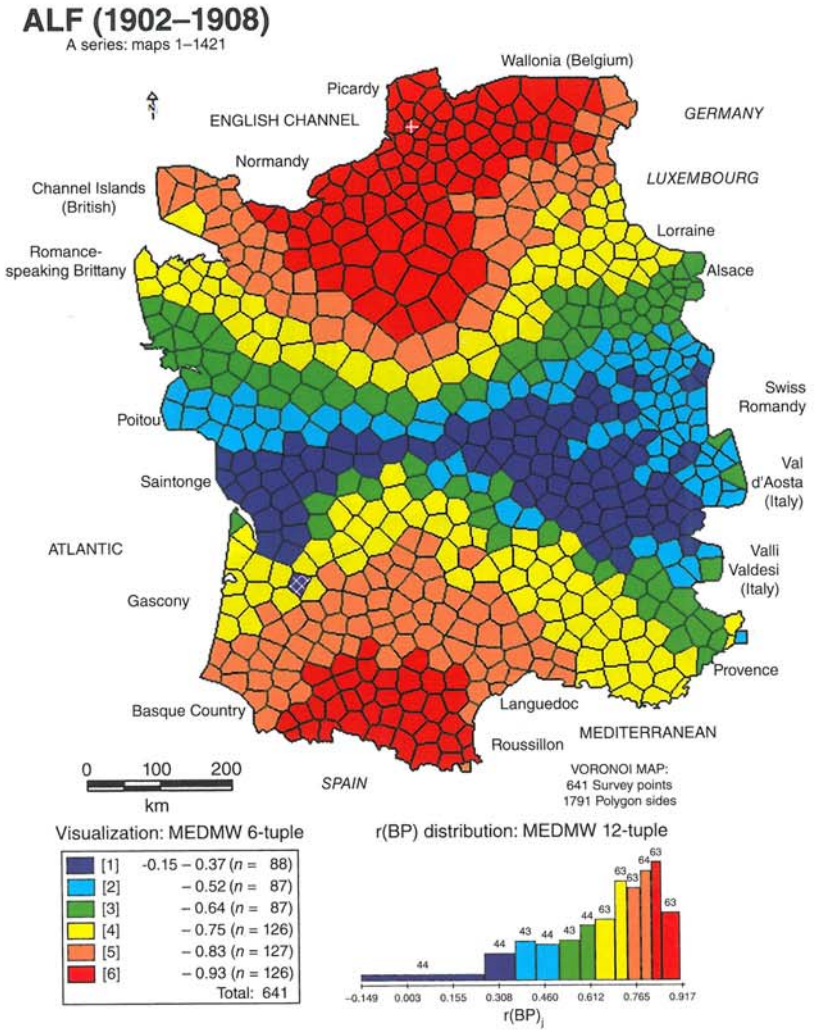
7.20 Choropleth map of the synopsis of the skewness values of 382 similarity distributions. Similarity index: $RIVj_k$. Corpus: 3,911 working maps (= total *AIS* corpus). Algorithm of visualization: MEDMW (10-tuple).



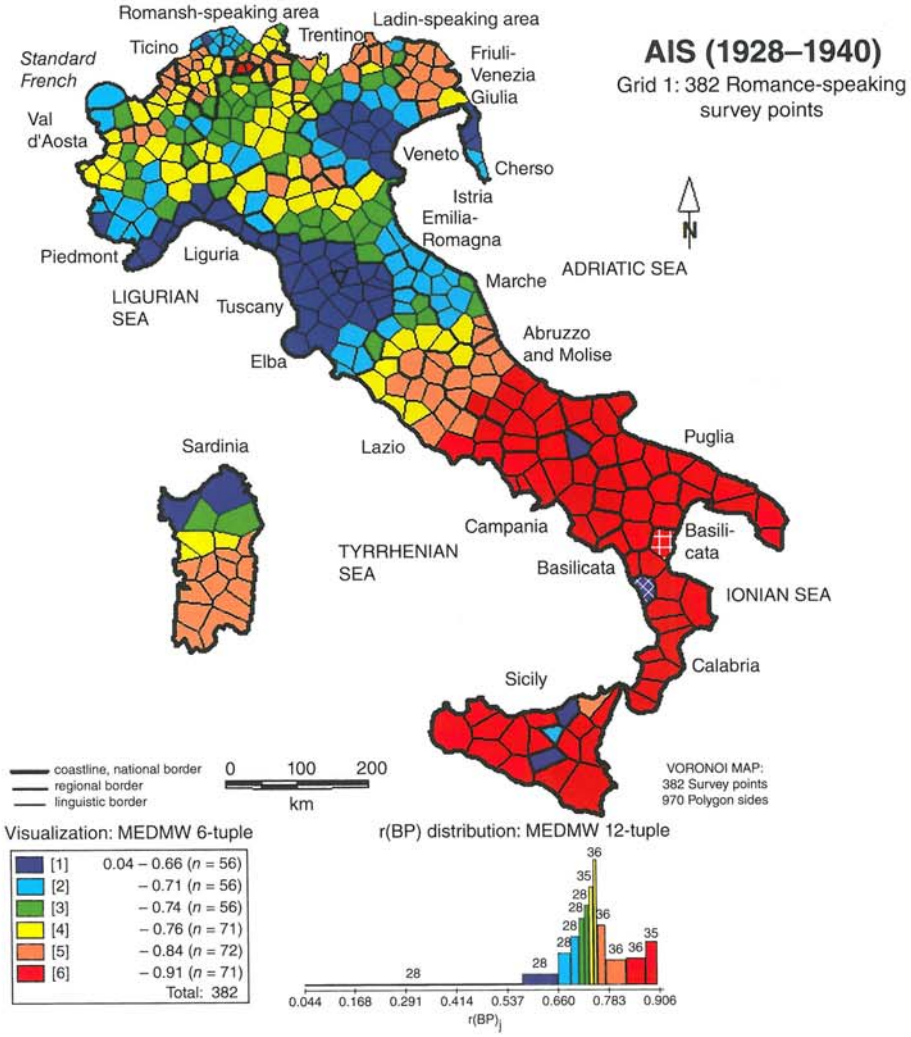
7.21 Dendrographic classification of 641 locolects (= *ALF* points). Similarity index: $RIVj_k$. Corpus: 1,681 working maps (= total *ALF* corpus). Dendrographic algorithm: hierarchical grouping method of Joe Ward Jr. Number of dendremes/choremes (A-G): 7. 1, 2: the two first ramifications (Domaine d'Oïl vs Domaine d'Oc). 3, 4: two subsequent subgroupings of the Domaine d'Oïl.



7.22 Dendrographic classification of 382 locolects (= *AIS* points). Similarity index: $RIVj_k$. Corpus: 3,911 working maps (= total *AIS* corpus). Dendrographic algorithm: hierarchical grouping method of Joe Ward Jr. Number of dendremes/choremes (A-G): 9. 1, 2: the two first ramifications (northern Italy vs central and southern Italy). 3, 4: two subsequent subgroupings of northern Italy.



7.23 Choropleth map of the correlation values (according to r(BP)) between 641 similarity values (according to RIV_{jk}) and 641 proximity values (according to the Euclidean proximity). Corpus of the similarity measurement: 1,681 working maps (= total *ALF* corpus). Algorithm of visualization: MEDMW (6-tuple).



7.24 Choropleth map of the correlation values (according to r(BP)) between 382 similarity values (according to RIV_{jk}) and 382 proximity values (according to Euclidean proximity). Corpus of the similarity measurement: 3,911 working maps (= total *AIS* corpus). Algorithm of visualization: MEDMW (6-tuple).

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Hans Goebl: Romence linguistic geography and dialectometry, pp. 73-87
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