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The Meaning of Ancient Words for 'Earth': An Exercise in Visualizing Colexification on a Semantic Map

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This paper aims at investigating the polysemic patterns associated with the notion 'soil/earth' by using the semantic map model as a methodological tool. We focus on the applicability of the model to the lexicon, since most of past research has been devoted to the analysis of grammatical morphemes. The most concise result of our research is a diagrammatic visualization of the semantic spaces of twenty lexemes in nine different languages, mainly ancient languages belonging to the Indo-European and the Afro-Asiatic language families. The common semantic map for the various languages reveals that the semantic spaces covered by the investigated lexemes are often quite different from one another, although common patterns can also be detected. Our study highlights some shortcomings and methodological problems of previous analyses suggesting that a possible solution to these problems is the control of the data in the existing sources of the object languages. Finally, drawing upon the cognitive linguistics literature on the various types of semantic change, we show that some of the senses of the individual lexemes are the result of the function of such mechanisms as metaphor, metonymy, and generalization.

Semantic map; polysemy; lexicography; earth; space; metonymy; metaphor.

1   Introduction

This paper aims at investigating the polysemic patterns associated with the notion 'soil/earth,' a notion that is itself not spatial but has many spatial concepts as part of its polysemy. By using the semantic map model as a methodological tool, our goal is to visualize the semantic spaces of twenty 'soil/earth' words in nine different languages (mainly ancient). The open empirical questions are whether the semantic spaces covered by the investigated lexemes are different from one another and to what extent some commonalities can be detected. Interestingly, the construction of semantic maps on the basis of the data col-

lected, allows to check certain semantic hypotheses. In particular, the possible semantic connections between senses and the processes linked to these connections are discussed, highlighting the role of certain mechanisms in meaning extension. Since the relevant literature has mainly focused on the grammatical domain, the choice to test the applicability of the model to the lexical domain appears to be challenging and important. Finally, this paper may also foster a necessary awareness of the fallacies of polysemy and homonymy, not only in the case of ancient and modern lexemes in everyday life, but also in the scientific vocabulary ('language') of various academic disciplines.

The structure of the paper is as follows. In Section 2, we begin by situating our work relative to the monosemy vs. polysemy debate. We also present the basic principles of the semantic map model. Section 3 focuses on the colexification method, which is specifically designed for lexical semantic maps, and discusses some problems that arise using it. Section 4 gives information about the languages that constitute the empirical basis of this study. Section 5 introduces the notion of 'earth', presents some methodological notes (e.g., the use of linguistic glossing) and describes step by step the process of generating a semantic map. In Section 6, we propose specific sources and targets of meaning extension and relate them to similar developments that have been acknowledged in the relevant literature. The final section summarizes the results and offers some concluding comments.

2 Monosemy, polysemy, and semantic maps

2.1 Monosemy and polysemy

The nature of word meanings is an intriguing subject that has been the center of long-standing debates in both the linguistic and philosophical traditions. Our primary focus is on two of the major approaches to the topic, the monosemist position and the polysemist position. Both accounts provide solutions that are satisfactory for some problems and inadequate for others. Crucially, when monosemists and polysemists focus on the comparison between languages, the conflicting analyses by the advocates of each approach will often lead to a dead end. Recent literature has tried to overcome this problem by employing the semantic map tool, which, according to its supporters, is neutral with respect to this distinction between monosemy and polysemy.[1] Decisions concerning whether the different meanings of a word are stored as distinct semantic entities, or whether these meanings can be explained in terms of a single general sense, are irrelevant for this method. The semantic map tool is not interested in whether, for example, the different meanings of English *to* are different conventional senses or only different uses (see Section 2.2, below). This methodological principle constitutes one of its comparative advantages over other methods, since it facilitates the cross-linguistic comparison.

2.2 Semantic maps

In this subsection, we give a brief overview of the basic principles of the semantic map method and of its further advantages. Semantic maps are a methodological tool for visually representing the multiple senses of a linguistic unit and are particularly useful for cross-linguistic and diachronic studies.[2] Consider Fig. 1, the textbook example taken from Haspelmath's (2003) influential article, which exemplifies how the model works.

Fig. 1 presents the dative functions typically found in the languages of the world, according to Haspelmath. These functions are selected on the basis of cross-linguistic

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1   See, e.g., Haspelmath 2003.
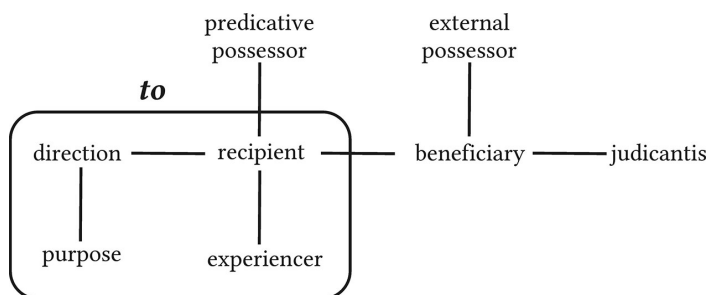2   See Haspelmath 2003.

Fig. 1 | A semantic map of typical ᴅᴀᴛɪᴠᴇ functions/the boundaries of English *to* (from Haspelmath 2003).

comparison and arranged geometrically in such a way that reflects the (dis)similarity of functions. In the semantic map model, similarity is not an arbitrary notion, but rather depends on the frequency of two functions co-occurring in (the respective samples of) the languages. On a second level, closeness is determined on the basis of the ontological properties of the various functions.[3] For example, it is more probable that functions like *direction* and *purpose* will be grouped together in a language, taking into account that both involve motion, (see Ex. 1 and 2 below), whereas functions like *direction* and *judicantis* will be kept apart, since the 'literal-movement' property is absent in *judicantis* (see Ex. 3).

(Ex. 1) Mary is going to the airport.

(Ex. 2) The lifeguard ran to the rescue of the child.

(Ex. 3) Mir ist schlecht (me.ᴅᴀᴛ is.3ꜱɢ bad 'I feel queasy').

Closeness of functions is conventionally shown by spatial adjacency. The more similar the functions are, the closer they appear in representational space. Ideally, connecting lines indicate more clearly which functions are closely related and can serve as starting points for the establishment of possible pathways of diachronic meaning change. The curved closed lines around a set of connected functions indicate the boundaries of a grammatical morpheme in semantic space. For example, the English preposition *to* is confined within the area that includes the functions *purpose*, *direction*, *recipient*, and *experiencer*. All the other functions fall out of its scope and therefore are not encircled in the curved closed line (Fig. 1). The iconic clustering of the various functions in contiguous areas of the map and the representational conventions which indicate how different words across different languages cut semantic space, are few of the many advantages of the method. Our choice to rely on this method is further justified by the following five reasons:[4]

1. *Semantic*: The method is neutral with respect to the monosemy–polysemy distinction. Decisions concerning whether the different meanings of a word are stored as distinct semantic entities, or whether these meanings can be explained in terms of a single general sense, are irrelevant for this method.

2. *Typological*: This method efficiently serves the purpose of cross-linguistic comparability. Each map may posit various implicational universals.

3. *Diachronic*: The map may indicate possible directions of semantic change.[5]

4. *Synchronic*: The semantic map can provide evidence as to which meanings speakers perceive as closer or more distant.

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3   See also François 2008, 178–179.
4   See Haspelmath 2003 for an overview.
5   See Narrog 2010.

5. *Scientific accuracy*: The validity of a map can be challenged in light of further data; this ensures the falsifiability of the hypotheses made within this approach.

3 Colexification: the method and some problems

The semantic map model was initially created in order to describe the polysemic patterns of grammatical morphemes.[6] The literature has tended to neglect the lexical domain, primarily because content words are generally considered less interesting in linguistic theory than function words. Not until very recently, however, have efforts been made to extend the model to include lexical semantics as well.[7] This paper aims to help fill this gap by focusing on the applicability of the model to the lexicon. In doing so, we build upon the model of lexical typology developed by François that follows the methodological steps identified by Haspelmath.[8]

A fundamental concept in the model is that of the *pivot* sense. A pivot is the specific sense taken as the object of the study. In our case study, the pivot sense is the sense 'soil/earth', which is understood here as the substance in which plants grow, its form/shape being irrelevant (cf. Section 5.1). A caveat should be kept in mind, however: the pivot sense of the described method should not be confused with the prototypical meaning of a lexical unit. It could be prototypical, but not necessarily. As François puts it:

> [T]he definition of a prototypical meaning […] constitutes an interpretative claim about this word that may be challenged or falsified. On the contrary, the selection of a given notion as the pivot of a (universal) lexical map entails no claim at all: it is simply an arbitrary choice, the starting point before any lexical map may even begin to be drawn.[9]

For a lexical unit to be inserted in our database, it is a necessary condition that this lexical unit include the pivot sense – in our case 'soil/earth' – as part of its polysemy. Once the words fulfilling this criterion are collected, the next step is to list all the other senses of these (and only these) words. François's method is dictionary-based in this respect, meaning that the analyst should rely on the knowledge that the lexicographer records. This approach has both advantages and disadvantages. On the one hand, it ensures that all the data is gathered using the same method. In addition, it makes possible the study of a larger set of languages, since an intimate knowledge of a particular language is not a prerequisite for this language to be included in the sample. On the other hand, one possible disadvantage is that not all dictionaries are designed according to the same criteria. For example, they may not apply the same rules on how to distinguish among the various senses of a word; the lexicographer chooses which nuances to include in the dictionary and which of these deserve separate treatment. Some differences between senses may not be considered important enough to be recorded.[10] It is obvious that such an approach to

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6   See, among others, Anderson 1986; van der Auwera and Plungian 1998; Croft 2001; Haspelmath 1997; Haspelmath 2003; Narrog and van der Auwera 2011; and the articles in the special issue of *Linguistic Discovery* (2010).

7   See François 2008; Wälchli and Cysouw 2012.

8   François 2008; Haspelmath 2003.

9   François 2008, 181–182.

10 Furthermore, some dictionaries have already become quite old and do not include any new attestations, findings, or understandings of the sense(s) of certain words. For Akkadian, for example, the earliest volumes of *The Assyrian Dictionary of the Oriental Institute of the University of Chicago* (Chicago Oriental Institute 1956–2010) were published in 1956 (Volume 5 G, and Volume 6 Ḫ), whereas the last volume was published in 2010 (Volume 20 U/W). Another problem, especially for Hittite, is the fact that some dictionaries are not (yet) complete. The *Hittite Dictionary of the Oriental Institute of the University of Chicago* (Chicago Oriental Institute 1980–2005) has currently published volumes only for the letters L, M, N,

listing senses could seriously affect the resulting map, since one lexicographer working on a language might make more fine-grained distinctions than another. Enabling more detailed distinctions could give a different picture than an approach that treats senses that appear to be close as having one meaning. The problem is obvious and grave: if a sense is not recorded in the dictionary, this does not mean that the sense does not exist.

In trying to resolve this thorny problem, we chose to use not only dictionaries, but other existing sources of the object languages as well. The researcher who was responsible for ancient Egyptian, for example, classified the senses of all the text examples for the respective lexemes recorded in the digital text database *Thesaurus Linguae Aegyptiae*.[11] One or two convincing text examples of each of the senses for each language were chosen to be fully glossed for publication in a separate data appendix (PID: 21.11101/0000-0001-AE7C-1). This procedure often revealed a set of senses that were not listed in the respective dictionaries. Expanding the list was not an arbitrary choice made by the analyst, however, but one based on a very specific methodological criterion. We considered a sense as distinct on the basis of cross-linguistic comparison.[12] Assuming that in a language L1 a lexical element LE1a has the senses S1 (the pivot), S2, and S3, but in a language L2 a lexical element LE2a has the senses S1 (the pivot) and S2 but not S3 (which is expressed by another lexical element LE2b), this would suffice to justify the choice of distinguishing between S2 and S3. To put it in more concrete terms, the fact that ancient Greek *gê* lexifies 'soil/earth' with 'ground' but not with 'floor', as opposed to the German *Boden* ('ground'), which has all three senses, is sufficient reason to treat 'ground' and 'floor' as distinct senses.

A second fundamental concept in François's model is that of colexification. He calls "colexification" what is generally known as "polysemy," namely the use of words with a number of related meanings.[13] We prefer the term colexification over polysemy, because the former does not imply any claim about which meanings of a word are stored as distinct senses in memory.[14] Colexification is divided into two subcategories: "strict colexification" and "loose colexification." In the present paper, we consider only cases of strict colexification: polysemic patterns of the very same word in synchrony. In case of ancient Greek, for example, we picked the form *khthṓn* and identified its various senses, e.g., 'soil' and 'country'. The colexification of 'soil' and 'country' can be thought of as strict colexification because both are senses of the same form, i.e., *khthṓn* and inflected variants. Senses that form part of the colexification of a related but different form, e.g., the derivational form *khthónios* (with the sense 'under-the-earth'),[15] are not taken into consideration. Note that the addition of loose colexification would lead to a slightly different semantic map. We generally chose not to include it in our analysis. This eventually raised serious problems in some of the languages of our sample, however. In classical Arabic, for example, which is characterized by a root–and–pattern morphology system, it was difficult to always draw

P, and part of Š (to *šizišalla-*). Another Hittite dictionary that lists many attestations is the *Hethitisches Wörterbuch* (Friedrich et al. 1975–1984), of which currently the volumes A, E, Ḫ and the first fascicles of I are published. Smaller complete dictionaries exist (Friedrich 1991 [1952]; Tischler 2001), as well as an etymological dictionary (Kloekhorst 2008), but these generally do not list attestations. The etymological dictionaries of Tischler and Neumann 1977–2010 and Puhvel 1984– (also not yet completed) do list some attestations (Puhvel more than Tischler), but these are not intended to show the separate contexts in which the word occurs, but rather to give an overview of its attested forms.

11   TLA 2014.
12   See Haspelmath 2003; François 2008.
13   See Lakoff 1987; Taylor 1995, among many others.
14   In a similar vein, Haspelmath uses the term *multifunctionality* to avoid the problem of distinguishing between monosemy and polysemy.
15   For example, *khthónioi theoí* are 'the gods of the netherworld'. Note that the sense 'underworld' is attested in Akkadian, Classical Hebrew, and Hittite in our language sample. This means that if we had considered loose colexification as well, the change of the boundaries would have indicated a shared polysemy between all these languages.

a clear line between strict colexification and loose colexification, since some variations resemble inflection but others resemble derivation. Another tricky issue was the question of how far fixed collocations and/or compounds (e.g., in German) should be taken into account: we generally tried to disregard these.

	Language	Language Family	Period	Researcher
Ancient languages	Akkadian	East Semitic (Afro-Asiatic)	26th c. BCE – 1st c. CE	T. Kitazumi; L.E. van de Peut
	Classical Arabic	(Central) Semitic (Afro-Asiatic)	7th – 10th c. CE	A. Sundermeyer
	Classical Hebrew	(Central) Semitic (Afro-Asiatic)	12th(?) c. BCE – 2nd c. CE	J. Hartlieb
	Egyptian	Afro-Asiatic	23rd – 4th c. BCE	D.A. Werning
	Hittite	Anatolian (Indo-European)	17th – 12th c. BCE	T. Kitazumi; L.E. van de Peut
	Ancient Greek	Indo-European	8th – 4th c. BCE	Th. Georgakopoulos
Modern languages	English	Germanic (Indo-European)		D.A. Werning
	German	Germanic (Indo-European)		D.A. Werning
	French	Romance (Indo-European)		G. Chantrain

Tab. 1 | List of languages studied.

4   Language corpus

Our corpus consists of twenty words in nine languages. See Tab. 1 lists the languages that constitute the empirical basis of the present study and provides information about the language family for each language, the relevant time span examined in each language,[16] and the researcher who collected and analyzed the data. As can easily be seen, the sample has a Mediterranean bias because it consists of languages belonging to the Indo-European and Afro-Asiatic language families. These choices were necessary in order to overcome the problems arising from the dictionary method: such pragmatic problems, discussed in

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16   Although the data for some languages in our sample covers different periods of the language, it should be underlined that our study is by no means diachronic. Our analysis can be described as involving data from various synchronies. A diachronic investigation is definitely called for, especially since the semantic map method is particularly suitable for the inclusion of diachronic information (see Narrog 2010, which shows how information on paths of semantic change of grammatical morphemes is integrated into the map). Future research could identify probable (and improbable) directionalities of meaning extension, but this aspect is beyond the scope of this paper.

Section 3, could only be overridden if the researchers involved had good knowledge of the languages under investigation. In short, we sacrificed having a representative sample in favor of more precise analysis. After all, our study does not claim to have any universal validity, but can be a good starting point in this direction.

5   Collaborative research on the semantic map for 'soil/earth'

5.1   The pivot sense

In accordance with the overall research topics of the Excellence Cluster Topoi, we wanted to use a semantic map to visualize the different senses of a word related to either space or knowledge. These senses would function as a pivot to show the similarities and differences between languages.

After a preliminary exploration of four promising possible pivot senses, namely 'place', 'earth', 'face', and 'to know', we chose to focus on the specific notion of 'earth', more precisely the sense 'soil/earth' (as a substance). This was mainly a pragmatic choice: the collected colexified senses for 'soil/earth' were generally more concrete than the ones collected for the other three senses, and therefore more intersubjective agreement could be reached as to the definition of the collected senses. What's more, the semantic space covered by the lexemes studied promised to shed some light on the set of metonymical and metaphorical relations that motivate the colexification of spatial senses such as 'planet Earth', 'terrestrial body', 'ground', and 'country', as well as less or even nonspatial senses like 'world', 'homeland', and 'soil/earth' in certain lexemes. As mentioned above, we defined the pivot sense 'soil/earth' as 'the earth material in general, irrespective of its form/shape, potentially focused on fertility'.

5.2   Linguistic glossing

In order to help future readers as well as our fellow researchers to verify the senses attributed to the lexemes in different languages, we decided to present as many language examples with linguistic glosses as was feasible.[17] It must be mentioned, however, that the method of glossing used allows for a considerable number of glossing 'variants', and we did not try to force all contributors to use one specific glossing variant. Consequently, the analyses represented here are each the responsibility of their own individual researcher.

The difference between the prototypical sense of a word and its other senses in specific contexts highlighted a methodological problem with glossing in general: whether one should use the prototypical sense or the contextual sense of a word to gloss it in a given context. The practical solution that we adopted was to recommend glossing at least those lexemes that we studied in this investigation with their *prototypical* sense (or, if there was no obvious prototypical sense, the first sense listed in the dictionary). This emphasized the difference between the prototypical meaning mentioned in the gloss and the sense of the lexeme conveyed by the translation of the text example.

5.3   Collecting and evaluating senses

During the distributed research, we collected the attested senses in a common table (see Table 3 in the appendix). The table was updated and repeatedly discussed. The researchers

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17   The reader is also referred to collaborative online wiki *Glossing Ancient Languages* (Werning 2012–) (See also Kutscher and Werning 2014, x–xi, xxv–xxvii).

were asked to mark attested senses for their respective lexemes, as well as those that were almost certainly not colexified by the lexeme. There were animated discussions concerning the descriptions of the observed functions/(contextual) senses. Table 2 in the appendix lists the recognized senses by an (almost random) number and includes a *conventional* label, the common English words and German translations for the sense, and some additional comments and cross-references.

It is worth mentioning that, for various reasons, in the end we had to merge some senses that we had initially distinguished. For example, for the present paper we gave up on distinguishing between 'soil/earth' and more specifically 'clay' and 'sediments', between 'natural ground' and 'surface of the earth' (large-scale perspective), between 'world of the living' and 'whole world' (including underworld and heaven), and between 'terrestrial body' (not necessarily spherical) and 'planet Earth' (sphere).

5.4   Generating the map

The first step towards a semantic map around the pivot sense 'soil/earth' was to collect the attested senses for the relevant lexemes of all languages in a table (see the latest version in Table 2 in the appendix). To get to a first preliminary layout of the semantic map, we exported the full list of attested pairs of *sense||lexeme*. This list was imported as a list of "edges" (the positive attestation of a sense) between two "nodes" (*sense* and *lexeme*) into the open-source graph program *Gephi*.[18] A preliminary arrangement of *sense* nodes and *lexeme* nodes was computed by applying the *Yifan Hu* algorithm that is implemented in the program. Afterwards, however, we repeatedly rearranged this and subsequent map versions in order to be able to neatly encircle *contingent* areas for all individual lexemes. Where possible (i.e., while still maintaining contingent areas for all lexemes), we also tried to group (intuitively) related senses close to each other. Repeated rearrangements were necessary, since the data from the individual languages changed continually during the research process. For the final map (see Fig. 17 in the appendix) all the edges between the *sense* nodes and the *lexeme* nodes were deleted, and the lexeme nodes were replaced by lines encircling the attested *sense* nodes for each individual lexeme (Venn diagram areas).

6   Observations

First of all, we can see that the semantic spaces covered by the investigated lexemes are often quite different from one another (see Fig. 17 in the appendix). The senses colexified by individual lexemes include some metonymies and metaphors. On top of this, we also find downward shifts in the taxonomy, namely specialization of senses, or, conversely, upward shifts in the taxonomy, namely generalization of senses. Some of the more interesting observations are discussed below, with the caveat that the proposed sources and targets of the meaning expansions are always interpretations based on a) the closeness of the senses in the diagram and b) the judgments of the researcher.

6.1   Metonymies

In our data, metonymy is one way that a lexeme gains semantic properties. Among the metonymies observed is the conceptual metonymy PLACE FOR INHABITANTS, as exemplified by the extension from (very probably) 'world' to 'humankind' and from 'country' to 'inhabitants (of a country)' in Egyptian:

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18   https://gephi.github.io/, v0.8.2b (visited on 06/06/2016).

(Ex. 4: Tale of Sinuhe, pAmherst m-q = B, 70; 20/19th c. BCE; from TLA 2014)

rš(w).wï	*t3*	*pn*	*ḥq3.n=f*
rš=wï	t3	=pn	ḥq3:n-f
rejoice:PTCP=ADMIR	land/earth(M)	=DEM:M.SG	rule:REL[M].ANT-3SG.M

'How happy are the (**inhabitants of**) this **country** that he became to rule.'

Here a connection is established between two conceptual entities that belong to the same conceptual domain; this is why the relation between PLACE and INHABITANTS is classified as metonymic.[19] That places may be understood as containers that contain people has been widely acknowledged in the literature dealing with metaphors and metonymies.[20] Note that this metonymy is not unidirectional, but that the opposite directionality is also possible, as is the case with many metonymies.[21]

Another evident instance of conceptual metonymy connects a SUBSTANCE and an OB-JECT (CONSISTING OF THAT SUBSTANCE), as exemplified by the colexification of 'soil/earth' (substance) and '(natural) ground'/'terrestrial body' (object) in nearly every lexeme investigated here, e.g., in the English *earth*, German *Erde*, and French *terre*.

Another case of conceptual metonymy is OBJECT FOR AN INNER SPACE OF THAT OBJECT, as exemplified by the sense 'underworld'; e.g., in the following example from Hittite:

(Ex. 5: The Song of Release, KBo 32.13 obv. ii 9–14, see Neu 1996, 221)

[d]IM-*aš=kán*	[d]*Šuualiiazaš=ša*	*kattanta*	*tankuuai*
DIVN.NOM.SG.C=PTCL	DIVN.NOM.SG.C=CONJ	down(wards):ADV	dark.DAT-LOC.SG.N

taknī	*iannir*
earth:DAT-LOC.SG.N	go.3PL.PRT.ACT

'The Storm-god and Šuwaliyatt went down to the dark **netherworld**.'

6.2   Functional extensions

We often find that one sense has an additional functional component as opposed to another sense. Compare, e.g., the relation between '(natural) ground' and 'plot of land' to that of 'homeland/native land', the latter of which adds the sense 'ownership'. Note the following examples from Akkadian and French:

(Ex. 6: MVAG 33 No. 25 VAT 9293:5, see CAD Q 119a)

kīma	15	*šiqil*	*kaspim*	*qa(q)qiri=šu*
as	15	shekel.STC	silver.GEN.SG.M	ground.OBL.PL=3SG.POSS.M

ša	*urki*	*bītim*	*ana*	*nuā'im*	…	*iddin*
REL	behind	house.GEN.SG.M	to	Anatolian.GEN.SG.M		give.3SG.PRT

'As (the equivalent of) fifteen shekels of silver, he gave his **plots of land**, which (are) behind the house, to the Anatolian.'

(Ex. 7: Sandeau, Mlle. de la Seiglière, 1848, p. 76)

« *Tous ses revenus passaient en achats de terres; […].* »

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19   See, e.g., Kövecses and Radden 1998; Werning 2014, §1.
20   See, e.g., Kövecses 2010.
21   See Radden and Kövecses 1999.

'He spent all his income buying **land**; […].'

In addition, the relation of 'ground' or 'terrestrial body' to 'world' (exemplified in the Akkadian *qaqqaru(m)*) adds the nuance of a 'habitat,' as does the extension to 'city' (in ancient Greek *gê*).

(Ex. 8: The Epic of Gilgamesh, Gilg. VII iii 44 and VIII 3, see CAD Q 123b)

malkū	*ša*	***qaqqari***	*unaššaqu*	*šēpē=ka*
ruler.NOM.PL.M	of	ground.GEN.SG	kiss.3PL.M.PRS	foot.DU=2SG.M.POSS

'The rulers of the **earth/world** kiss your feet.'

(Ex. 9: Euripides, The Trojan Women 867–868; 5th BCE)

κεῖνος	μὲν	οὖν	δέδωκε	σὺν	θεοῖς	δίκην
keînos	mèn	oûn	dédōke	sùn	theoîs	díkēn
DEM.NOM.SG.M	PTCL	PTCL	give:PRF.3SG	with	god:DAT.PL.M	penalty:ACC.SG.F

αὐτός	τε	καὶ	**γῆ**	δορὶ
autós	te	kaì	gê	dorì
DEM.NOM.SG.M	PTCL	and	earth:NOM.SG.F	spear:DAT.SG.N

πεσοῦσ᾿	Ἑλληνικῷ
pesoûs'	Hellēnikôi
fall:PTCP.AOR.NOM.SG.F	Greek:DAT.SG

'But he, by the gods' will, has paid the penalty, ruined, and his **city** too, by the spear of Hellas.'

The extension from 'soil' to 'mortar/grout' and/or 'plaster' adds a specific function to 'soil/earth,' or rather more specifically 'clay.'

(Ex. 10: Book of the Dead, spell no. 151, col. 393, pKairo CG 51189 = pJuja; 14th c. BCE; from TLA 2014)

jr(j)	*n=f*	*bb.w*	*ḥr*	*s3.wt*	*jmnt.(ï)t*	*ḥr=f*
jr	n-f	bb:w	ḥr	s3w:t	jmn:t:ï:t	ḥr-f
make:IMP	for=3SG.M	hole:M.COLL	on/at	wall:F	western:F	face(M)-3SG.M

r	*j3bt.(ï)t*	*jr(.ï)*	*db3*	*ḥr=f*	*m*	*t3*
r=	j3b:t:ï:t	jr:ï	čb3	ḥr-f	m=	t3
to=	eastern:F	to:ADVZ	clothe:IMP-3SG.M	face(M)-3SG.M	with=	land/earth(M)

'Make a hole for it in the western wall, facing its eastern (wall) and cover its front with **clay/plaster**.'

Similarly, a path that leads from 'soil' to 'agricultural land' (and then metonymically to agriculture) is detected. This is exemplified in Ex. 11:

(Ex. 11: 2 Chronicles 26:10)

"[King Uzziah of Judah] built [watch-]towers in the steppe and dug many wells, because he had a large live stock [there], also in the Shephelah-lowland and the Mishor-plateau,

and field farmers and wine farmers in the mountains and in the fruitful land. For he was loving [cultivating the] **agricultural land** (*ʔaḏɔmɔʰ*)."

Finally, we find the extension of (very probably) 'natural ground' to 'pastureland' (see Ex. 12) and/or 'farmland' (see Ex. 13).

(Ex. 12: Genesis 13:2.5f)

"Abram was very rich in flocks […] but also Lot, who traveled with Abram, had sheep, cattle and tents. But the **pastureland** (*ʔɛrɛṣ*) didn't supply them for living together, because their property was [so] large, [that] they couldn't live together."

(Ex. 13: Exodus 23:10f)

"For six years you (Israel) may sow your **farmland** (*ʔɛrɛṣ* 'land') and gather its income, but in the seventh year you shall leave it fallow and unused."

6.3   Metaphors

In some attestations, we observed that a connection was established between conceptual entities belonging to *different* domains or frames. We therefore classified these as metaphorical.[22] Such a connection can be identified between the concept of '(in the) dust'/'(in the) dirt' and the concept of 'humiliation/abasement' in Classical Hebrew.

(Ex. 14: 1 Samuel 2:7f)

"Yahweh makes poor and makes rich, humiliates and also exalts. He raises the nobody out of the **dirt** (*ʕɔp̄ɔr* 'dust'), out of the dunghill he lifts up the poor."

We can presume that our understanding and experience of humiliation is akin to lying in the dirt, the bare ground. This metaphor is consistent with other orientational metaphors present in many languages, including the metaphorical concepts SAD IS DOWN, BEING SUBJECT TO CONTROL OR POWER IS DOWN, and LESS IS DOWN.[23]

German exemplifies another case of a spatial metaphor, very likely extending the sense '(natural) ground'/'floor' as a kind of support for the inhabitants of the world to the sense 'shelf board', the support for items to be stocked on a shelf. Note, e.g., the description of IKEA's shelf "Ivar":

(Ex. 15: Description of a shelf, ikea.com 2014[24])

Mit	*versetzbaren*	*Böden;*					
with	transferable:DAT.PL	ground:PL					

der	*Abstand*	*dazwischen*	*kann*	*dem*	*Bedarf*	*angepasst*	*werden.*
the:NOM	distance	there:between	can	the:DAT	need	adapted	become

'With transferable **shelf boards**, the distance between them can be adapted to one's needs.'

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22   See, e.g., Werning 2014, §1.
23   See Lakoff and Johnson 1980; Lakoff and Johnson 1999.
24   See   http://www.ikea.com/de/de/catalog/products/S29896362/,   "IVAR",   "Produktinformationen" [06.06.16].

An old collocation in Classical Hebrew testifies to a structural metaphor that extends the sense 'dust' to the 'innumerable' amount of its basic particles. Note the following example:

(Ex. 16: Genesis 13:16)

"(To Abraham:) I will make your offspring **very high in number** (literally like the **dust** [ʕɔp̄ɔr] of the terrestrial body [ʔɛrɛṣ]), so that [only] if someone could count the **dust** of the earth could he count your descendants, too."

We also find another interesting metaphor based on 'dust' in classical Arabic. Here 'dust' may be used in the sense 'nothing (valuable)':

(Ex. 17: Lane 1997 [1863], vol. 1, 301/2)

<div dir="rtl">له التراب</div>

la-hu	*at-turāb*
for-3SG.M	DEF -dust

'May he have **nothing**!'

6.4   Generalizations

We can observe that some senses extend to more general senses. The mechanism involved in this kind of extension is 'generalization', which refers to the semantic relationship between a more general sense and a more specific one.[25] A representative example from Akkadian is the extension of a sense denoting a limited terrestrial area (like 'territory') to an 'area' in general ('area', 'area in the sky', 'open/free/black space').

(Ex. 18: A letter, ABL 744 r.1, see CAD Q 121 a; Neo-Assyrian)

ina	*qaqqar*	MUL.SIPA.ZI.AN.NA	*ittamar*
in	ground.STC	(constellation)	see.3SG.PRF.PASS

'(Jupiter) became visible in the **area/region** of Orion.'

(Ex. 19: ABL 17:8, see CAD Q 122b)

kittu	*qaqquru*	*ana*	*sadāri*	*ēṣi*
reality.NOM.SG	ground.NOM.SG.M	for	place_in_order.INF.GEN	few

'As a matter of fact, there is little **room** for maneuvering.'

Another case is the (very probable) extension of '(natural) ground'/'floor' to any 'bottom/base' of a container in the German *Boden*[26] and to any 'lower part' in classical Arabic.[27] This metaphorical extension seems to presuppose a conception of the habitat 'world' as a container and the 'ground' as the 'bottom/base' of it.

The linkage between the specific and the more generalized sense can be accounted for via such mechanisms as metaphor and metonymy (see above).

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25 See Geeraerts 2010.
26 DWB 1854–1971, 2, 210: "2) boden ist uns noch heute wesentlich der grund eines fasses, glases, bechers, sackes, beutels" ("boden is basically still the bottom of a barrel, glass, mug, sack, [or] pouch for us today"); DWDS 2014, 'Boden', 3: "das Unterste von etw." ("the lowest part of something").
27 See Lane 1997 [1863].

6.5   Indirect evidence of connections

Some of the collected lexemes that colexify 'soil/earth' demonstrate the contextual sense 'humankind.' Compare the following examples from Egyptian and Hebrew:

(Ex. 20: Great Hymn to the Sun, Amarna, Col. 5; 14th c. BCE; from TLA 2014)

tʒ	r-ḏr=f	jr(j)=sn	kʒ.t=sn
tʒ	r_čr-f	jr-sn	kʒ:t-sn
land/earth(M)	whole-3SG.M	do:IPFV-3PL	work:F-3PL

'(The **population of**) **the whole world**: they do their work.'

(Ex. 21: Genesis 9:19)

"These three were the sons of Noah and from these all **humankind** (*ʔɛrɛṣ*) spread."

It is most likely no coincidence that the word meaning 'soil/earth' has the additional sense 'humankind.' The linkage between the two senses is also evidenced by the fact that in some language families, the lexicon referring to earth underlies the many formations for designating humans. As a matter of fact, in Indo-European,[28] we have the form *$d^h\hat{g}^h$m-on*- with the meaning 'human being,' which derives from *$d^h\hat{g}^h$om*- 'earth' (cf. Lat. *humus* 'earth' vs. *homō* 'human being')[29]. In our case, however, the pathway seems to be an extension from the sense 'world' to its inhabitants 'humankind' (for the conceptual metonymy case for these inhabitants, see Ex. 4, above), suggesting an indirect connection between the sense 'soil/earth' and the sense 'humankind.'

7   Concluding remarks

The goal of this paper was to investigate the polysemic patterns associated with the notion 'soil/earth' by using the semantic map model as developed in Haspelmath and François.[30] Most of past research on polysemy focused on the analysis of grammatical morphemes, while simultaneously the lexical domain was neglected. This paper helped fill this gap by focusing on the applicability of the semantic map model to the lexicon. It also highlighted some shortcomings and methodological problems of previous analyses suggesting that a possible solution to these problems is the control of the data in the existing sources of the object languages. The most concise result of our research is a diagrammatic visualization of the semantic spaces of twenty words in nine different languages (Fig. 17 in the appendix). However, already the research process was influenced by the repeated creation and evaluations of hypotheses in the form of preliminary semantic maps. These preliminary maps allowed to check semantic hypotheses and to identify potentially problematic input data. The research practice was, therefore, also a practical exercise in 'diagrammatic reasoning.' The common semantic map for the various languages revealed that the semantic spaces covered by the researched lexemes are often quite different from one another, although common patterns can also be detected. Finally, drawing upon the cognitive linguistics literature on the various types of semantic change, this study showed that some of the senses of the individual lexemes are the result of the function of such mechanisms as metaphor, metonymy, and generalization.

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28   Especially in the branch termed "North-West Indo-European" (see Mallory and Adams 2006, 74, 109).
29   Mallory and Adams 2006, 74, 120–121.
30   Haspelmath 2003; François 2008.

8 Appendix

8.1 Tables of senses

No.	Conventional label	English / German	Comments
#010	SOIL / EARTH	soil / earth / Erdboden / Erdreich	earth material in general, irrespective of its form/shape, potentially focused on fertility, possibly including more specific soils like clay, sediments; see soil in specific functions: PLASTER, MORTAR/GROUT; see shape-oriented (NATURAL) GROUND
#040	PLASTER	plaster / Putz	to cover a wall; see MORTAR/GROUT
#050	MORTAR / GROUT	mortar / grout / Mörtel	e.g., to join bricks; see PLASTER
#060	DIRT	dirt / Dreck / Schmutz	unwanted stuff; see DUST, RUBBLE/DEBRIS
#065	EXPECTORATION SUBSTANCE	expectoration substance / Auswurf	
#070	RUBBLE / DEBRIS	rubble / debris / Schutt	result of mechanical destruction; see DIRT
#080	DUST	dust / Staub	very fine unspecific substance; see ASH, DIRT
#085	NOTHING	nothing	
#090	ASH	ash / Asche	burned wood or similar; see DUST, DIRT
#100	ORE	ore / Erz	
#110	PHYSICAL MATTER	physical matter / Materie	the material of a thing, without any other specified features; see A NATURAL ELEMENT
#120	A NATURAL ELEMENT	earth as a natural element / Erde als Naturelement	culture-specific philosophical notion; see PHYSICAL MATTER, SOIL, ORE
#135	(NATURAL) GROUND	(natural) ground / (natürlicher) Boden	ground, surface of the earth; see construed FLOOR
#150	DRY LAND	mainland / dry land / Festland	in opposition to/as viewed from the sea/ocean
#160	FLOOR	floor / Fußboden	man-made; see (NATURAL) GROUND
#170	CARPET	carpet / Teppich	
#190	TERRESTRIAL BODY	terrestrial body / Erdkörper	specifically 3D, not necessarily a globoid planet Earth; see WORLD
#195	EARTH'S INTERIOR	interior body of the earth	in mining and other contexts, deep inside the earth
#165	ATTIC	attic / Dachboden	
#200	MATH. VOLUME	mathematical volume / Volumen	technical language
#210	UNDERWORLD	underworld / netherworld / Unterwelt	habitat located deep in the TERRESTRIAL BODY, see GRAVE
#215	DEN / LAIR	den / lair / Tierbau / Tierhöhle	
#220	GRAVEYARD	graveyard / Friedhof	area with graves or tombs and fixed perimeter
#230	GRAVE	grave / Grab in der Erde	pit in the ground or similar; see UNDERWORLD
#255	WORLD	world / Welt	habitat on the surface of the earth, mainly for the living, possibly including gods and/or the dead on/in the earth; see UNDERWORLD

No.	Conventional label	English / German	Comments
#270	HUMANKIND	humankind / Menschheit	see INHABITANTS
#280	FAUNA	fauna / Tierwelt	
#290	INHABITANTS	inhabitants / Bewohner	here: specifically inhabitants of a country
#300	COUNTRY	country / Land	political notion; political border
#310	TERRITORY	territory / Territorium	bordered, owned/under someone's influence; see subpart DISTRICT; see AREA
#320	DISTRICT	district / Bezirk	bordered, administrative; subpart of a CITY/TERRITORY/COUNTRY
#330	TERRAIN	terrain / Gelände	textured landscape
#340	AREA	area / Gebiet	under someone's influence; with fuzzy/unclear boundaries; see TERRITORY/DISTRICT; see REGION
#341	AREA IN THE SKY	area in the sky / Himmelsgebiet	
#345	REGION	region / Region	area around a deictic center; see AREA
#350	MATH. AREA	mathematical area / mathematische Fläche	technical language
#355	STRETCH OF LAND / ROAD	stretch of land/road / Landstrecke / Wegstrecke	
#360	BLANK SPACE	blank space / Leerfläche	Akkadian: on a clay tablet; see OPEN/FREE SPACE
#370	PLACE/LOCATION	place / location / Platz	see PLOT OF LAND, AREA, …
#380	PLOT OF LAND	plot of land / Grundstück	personal property; see FARMLAND
#390	PASTURELAND	pasturage / Weideland	for cattle
#395	AGRICULTURAL LAND	Landwirtschaftliche Nutzfläche	hyperonym for PASTURELAND and FARMLAND
#400	FARMLAND	farmland / Ackerland	for plants; for cattle see PASTURAGE; see PLOT OF LAND
#410	CITY	city / settlement / Stadt / Siedlung	
#420	COUNTRYSIDE	countryside / Land	in opposition to CITY
#430	HOMELAND / NATIVE LAND	homeland / native land / Heimatland	
#435	FOREIGN COUNTRY	abroad, foreign country / Ausland	

No.	Conventional label	English / German	Comments
#440	LOWLANDS	plain / lowlands / *Flachland*	in opposition to, e.g., hill country
#450	LOWER PART	lower part / down / *Unten / unterer Teil*	see BASE/BOTTOM
#460	LOWER LEGS	lower legs / *Unterschenkel*	see LOWER PART
#465	FOUNDATION	foundation area / base area / *Grundfläche*	see FLOOR, AREA, MATH. AREA, BASE/BOTTOM
#470	BOTTOM / BASE	base / bottom of e.g. a container	see LOWER PART, (NATURAL) GROUND
#475	SHELF BOARD	shelf board / *Regalboden*	see BASE/BOTTOM
#480	HUMILIATION / ABASEMENT	humiliation / abasement / *Erniedrigung / Herabsetzung*	
#500	OPEN COUNTRY	open country / freies Gelände / *offenes Gelände*	
#510	OPEN/FREE SPACE	open space / free space / *offener Raum / Freiraum*	see BLANK SPACE
#520	ELECTRICAL EARTH	electrical earth / *Erdung*	
#530	INNUMERABILITY	very large in number / *hohe Zahl, Übermaß*	
#550	AREA ON AN ORGAN	a certain area of an organ	here: a certain area of the liver/lung

Tab. 2 | Description of senses attested for words colexifying the sense 'soil/earth'

No.	Conventional label	Cl. Arabic		Akkadian			English		Egyptian			French	German		Anc. Greek		Classical Hebrew				Hittite
		arḍ	*turba/turāb*	*eperu*	*erṣetu(m)*	*daqqaru(m)*	*earth*	*soil*	*ꜣ*	*jwtn*	*zꜣtw*	*terre*	*Erde*	*Boden*	*gễ*	*kbtbn*	*ʕᵃpᵃr*	*ʔᵃdᵃmᵃ*	*ʔɛrɛṣ*	*tēbēl*	*tēkan*
#010	SOIL/EARTH	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x?	x
#040	PLASTER			x													x				
#050	MORTAR / GROUT			x													x				
#060	DIRT		x	x?					[x]	?							x				
#065	EXPECTORATION SUBSTANCE			x																	
#070	RUBBLE / DEBRIS			x					x								x				
#080	DUST		x	x						?							x				
#085	NOTHING		x																		
#090	ASH																x				
#100	ORE			x									x				x				
#110	PHYSICAL MATTER																x				
#120	A NATURAL ELEMENT		x									x	x?		x						
#135	(NATURAL) GROUND	x	x	x?	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x
#150	DRY LAND		x		x	x			x	x		x	x?		x	x		x?	x	x	[x]
#160	FLOOR	x				x			x	x	x		x?	x		x		[x]	x		[x]
#165	ATTIC													x							
#170	CARPET	x												x							
#190	TERRESTRIAL BODY	x	x		x	x	x		x	x		x	x		x	x			x		x
#200	MATH. VOLUME			x	x	x															
#210	UNDERWORLD			x	x	x			x								x	x	x		x
#215	DEN/LAIR						x														
#220	GRAVEYARD		x																		
#230	GRAVE		x														x				

No.	Conventional label	Cl. Arabic		Akkadian			English		Egyptian			French	German		Anc. Greek		Classical Hebrew				Hittite
		ʾard	turba/turāb	eperu	erṣetu(m)	daqqaru(m)	earth	soil	tꜣ	jwtn	zꜣtw	terre	Erde	Boden	gê	khthn	ʿāpār	ʾadāmā	ʾereṣ	tēbēl	iškan
#255	WORLD	x	x	x?	x	x	x		x			x	x		x	x	x	x	x	x	
#270	HUMANKIND						x		x			x				x			x	x	
#280	FAUNA																		x?	x?	
#290	INHABITANTS								x										x		
#300	COUNTRY	x			x	x			x						x	x		x	x		
#310	TERRITORY	x		x	x	x		x		x			x		x			x	x		
#320	DISTRICT				x	x													x		
#330	TERRAIN					x										x			x		
#340	AREA			x?	x	x							x					[x]	x		
#341	AREA IN THE SKY					x															
#345	REGION					x					x							[x]	x		
#350	MATH. AREA					x															
#355	STRETCH OF LAND / ROAD			x		x															
#360	BLANK SPACE		?			x															
#370	PLACE / LOCATION					x															
#380	PLOT OF LAND					x				x	x	x			x			x	x		?
#390	PASTURELAND																	[x]	x		
#395	AGRICULTURAL LAND																	x	x		
#400	FARMLAND							x	?				?				x	x	x		
#410	CITY														x	x	x				
#420	COUNTRYSIDE															x			x?		
#430	HOMELAND / NATIVE LAND							[x]	x			[x]						x	x		
#435	FOREIGN COUNTRY																		x		

No.	Conventional label	Cl. Arabic		Akkadian			English		Egyptian			French	German		Anc. Greek		Classical Hebrew				Hittite
		ʾarḍ	turba/turāb	eperu	erṣetu(m)	dannatu(m)	earth	soil	tꜣ	jwtn	zꜣṯw	terre	Erde	Boden	gễ	khthōn	ʿɔpɔr	ʾₐḏāmā	ʾɛrɛṣ	tēḇēl	tēkan
#440	LOWLANDS								x												
#450	LOWER PART	x																			
#460	LOWER LEGS	x																			
#465	FOUNDATION										x										
#470	BOTTOM / BASE					x								x							
#475	SHELF BOARD													x							
#480	HUMILIATION / ABASEMENT																x		x		
#500	OPEN COUNTRY					x															
#510	OPEN/FREE SPACE					x															
#520	ELECTRICAL EARTH						x					x	x								
#530	INNUMERABILITY				x												x				
#550	AREA ON AN OR-GAN				x	x															

Tab. 3 | Senses attested for words colexifying the sense 'soil/earth' ("x": sense verified; "?": sense verified by a questionable example; "[x]" sense assumed, but no example available; includes external links to online dictionaries).

8.2 Semantic maps

8.2.1 Language specific semantic maps
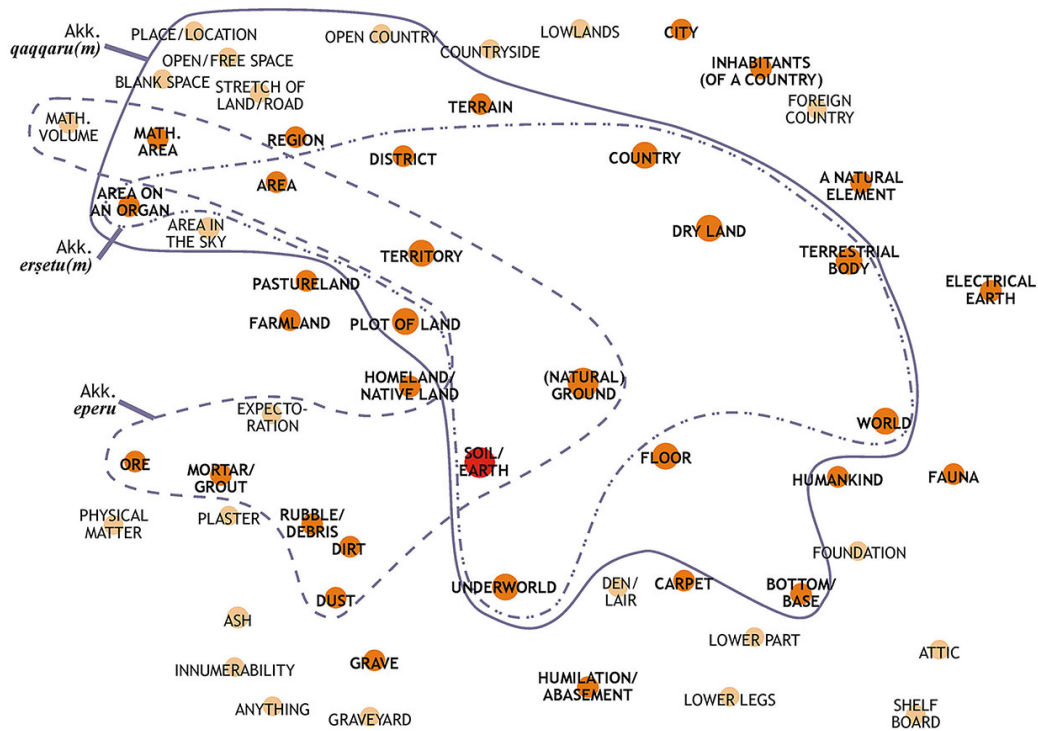
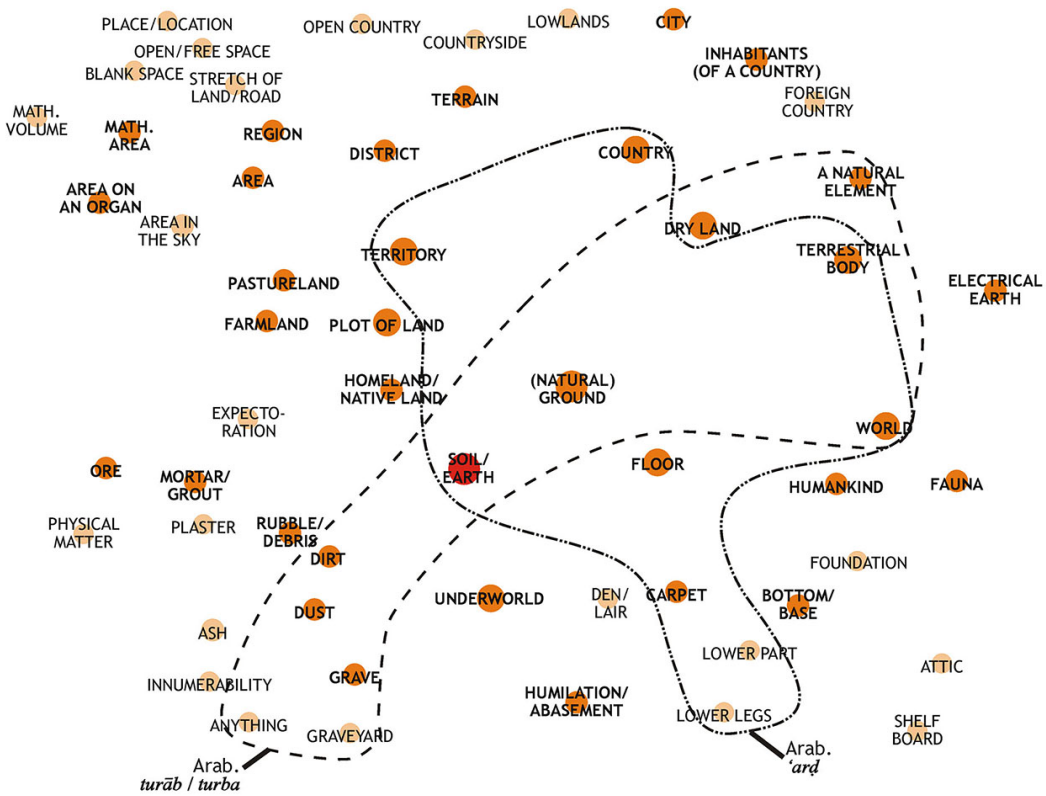Fig. 2 | The semantic space of relevant lexemes in Akkadian.

Fig. 3 | The semantic space of relevant lexemes in classical Arabic.
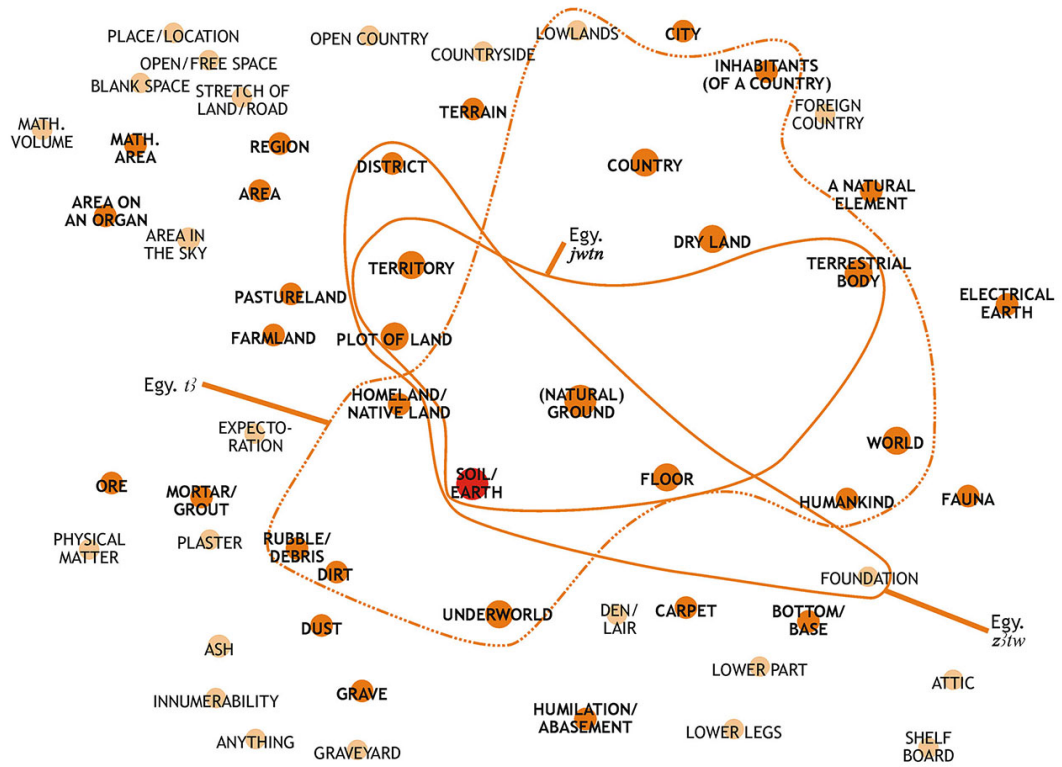
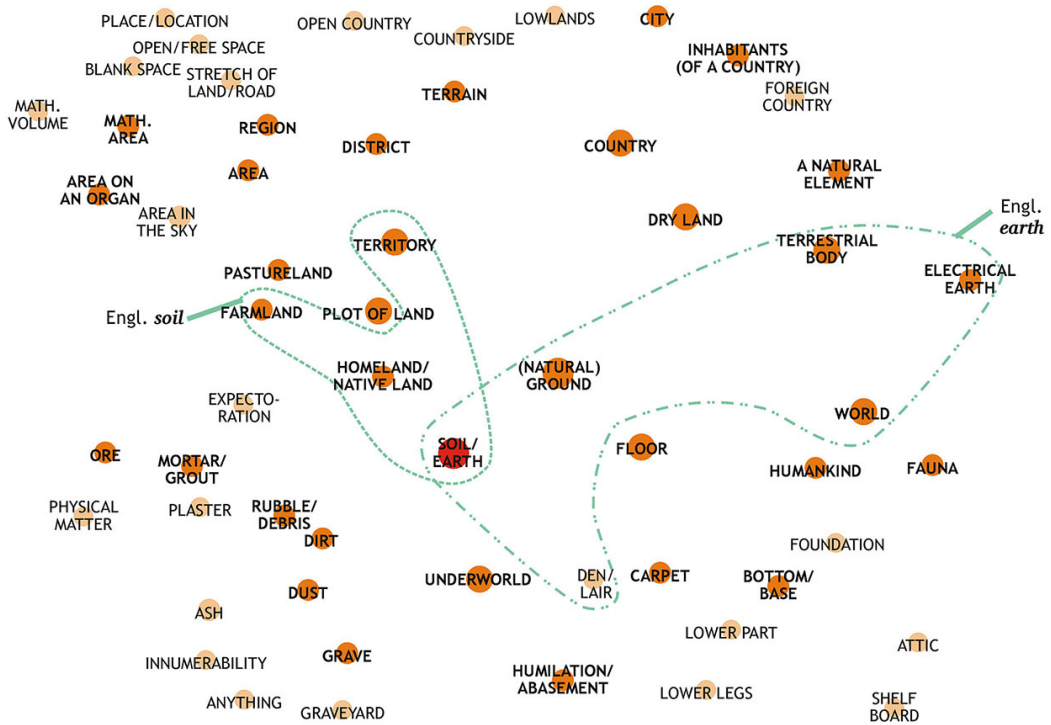Fig. 4 | The semantic space of relevant lexemes in Egyptian.

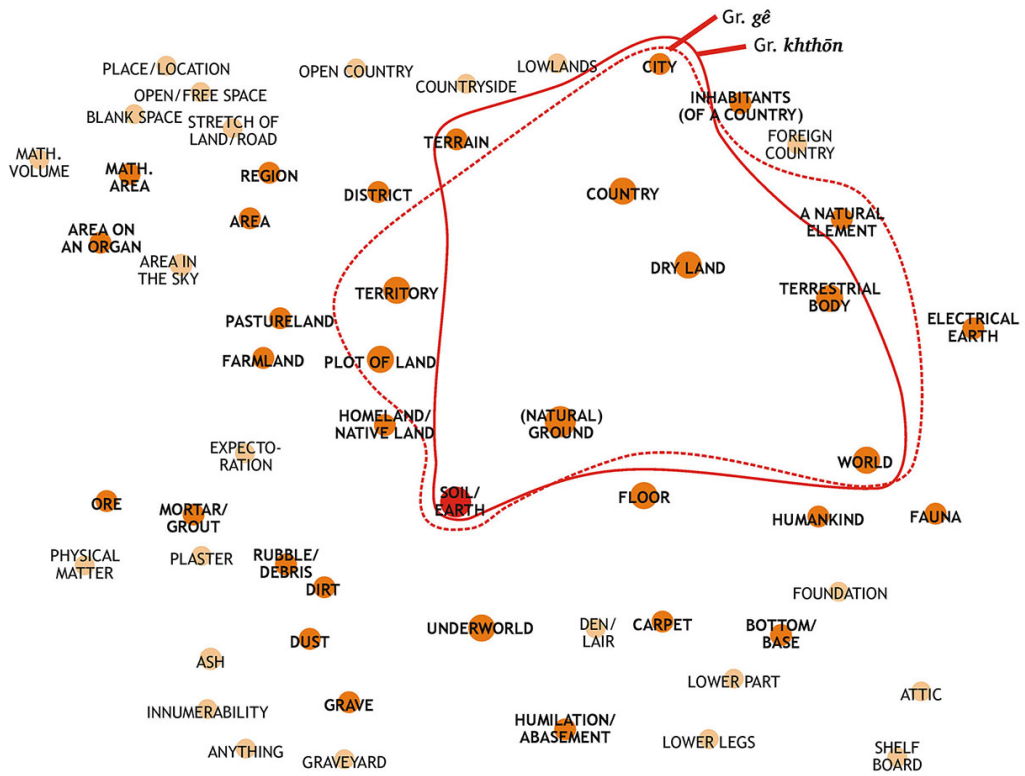Fig. 5 | The semantic space of relevant lexemes in English.
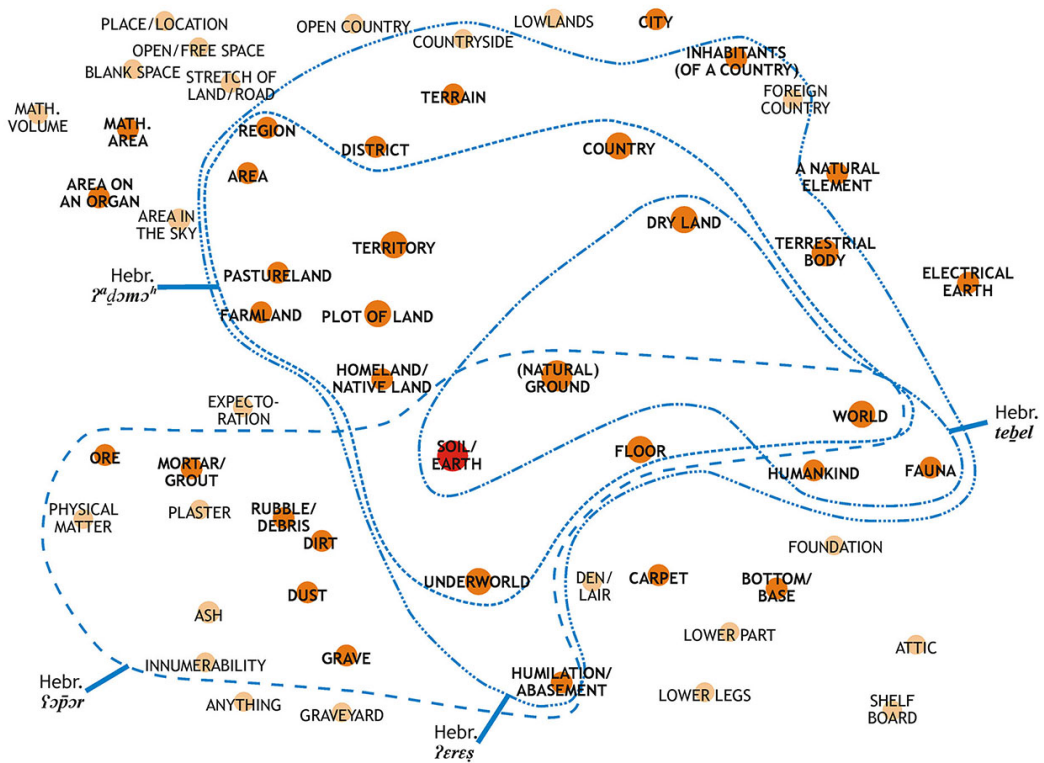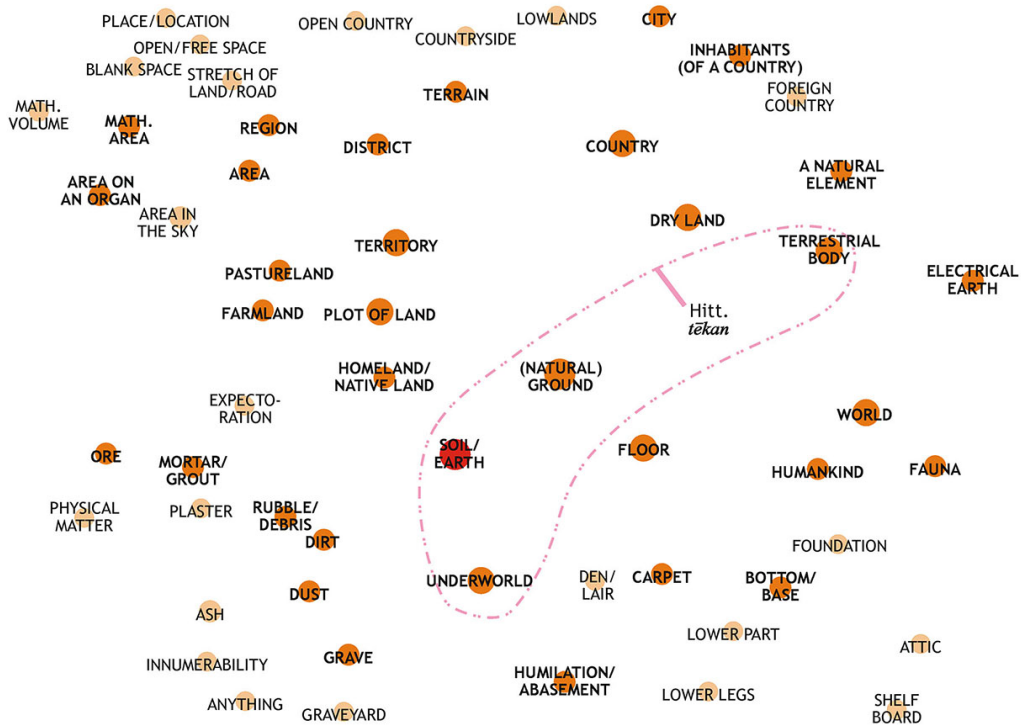
Fig. 6 | The semantic space of relevant lexemes in French.

Fig. 7 | The semantic space of relevant lexemes in German.

Fig. 8 | The semantic space of relevant lexemes in classical Greek.

Fig. 9 | The semantic space of relevant lexemes in classical Hebrew.

Fig. 10 | The semantic space of relevant lexemes in Hittite.

8.2.2 Semantic maps of lexemes with the same main sense
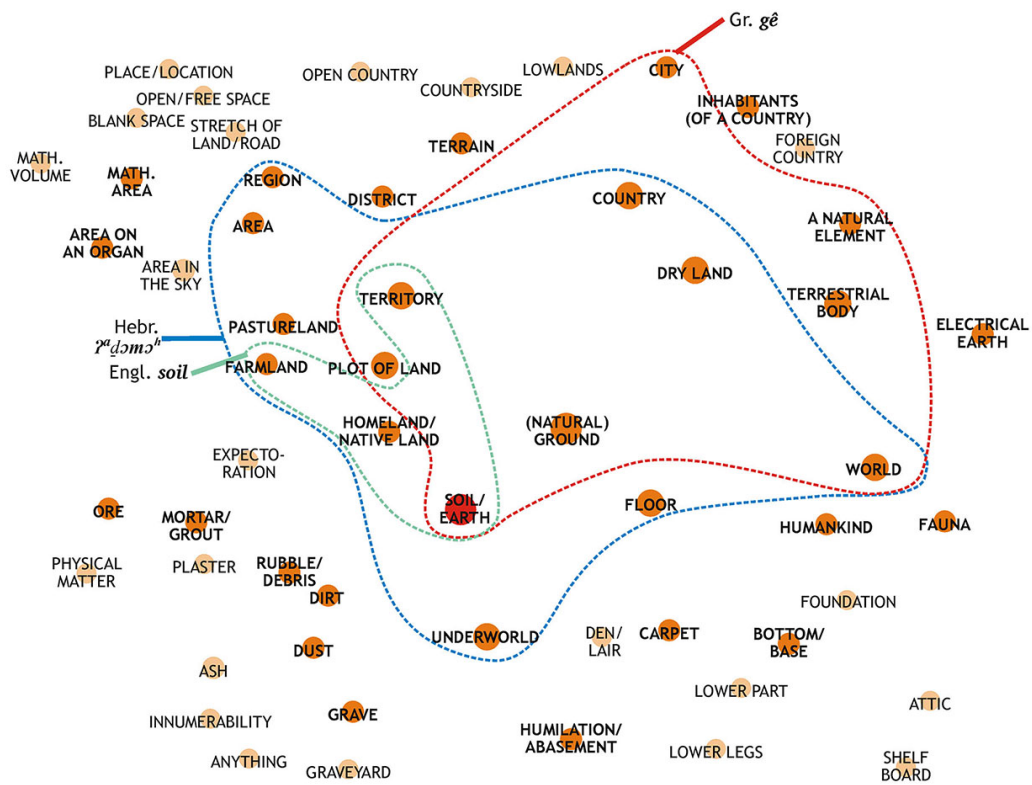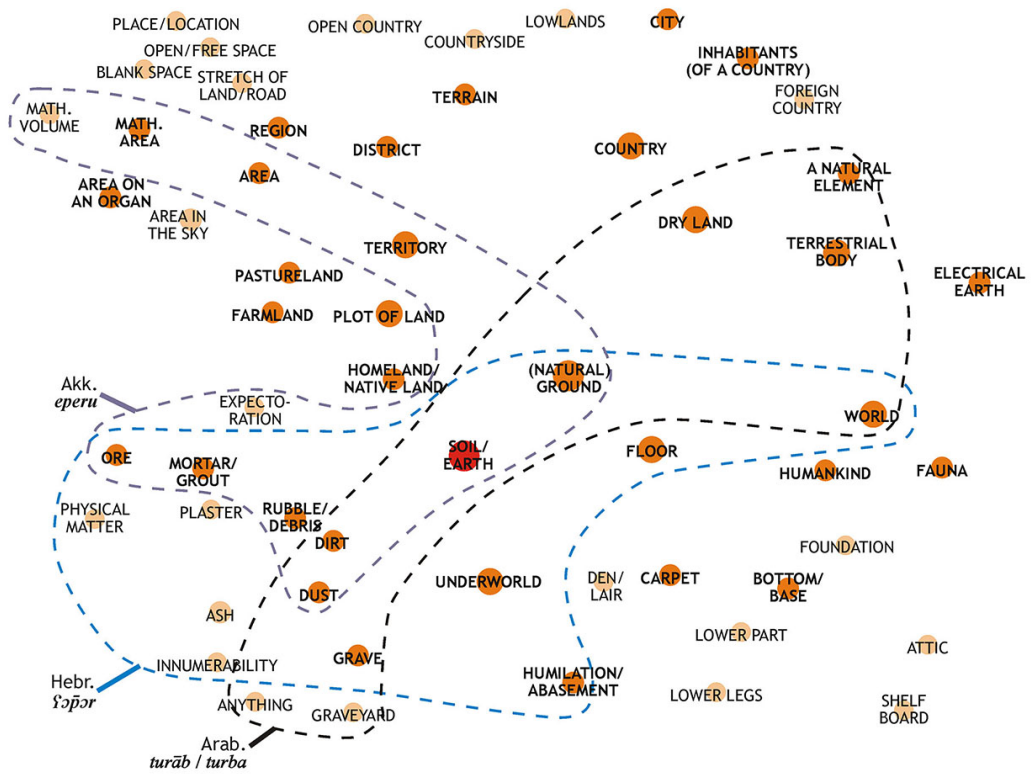
Fig. 11 | The semantic space of 'soil' lexemes.

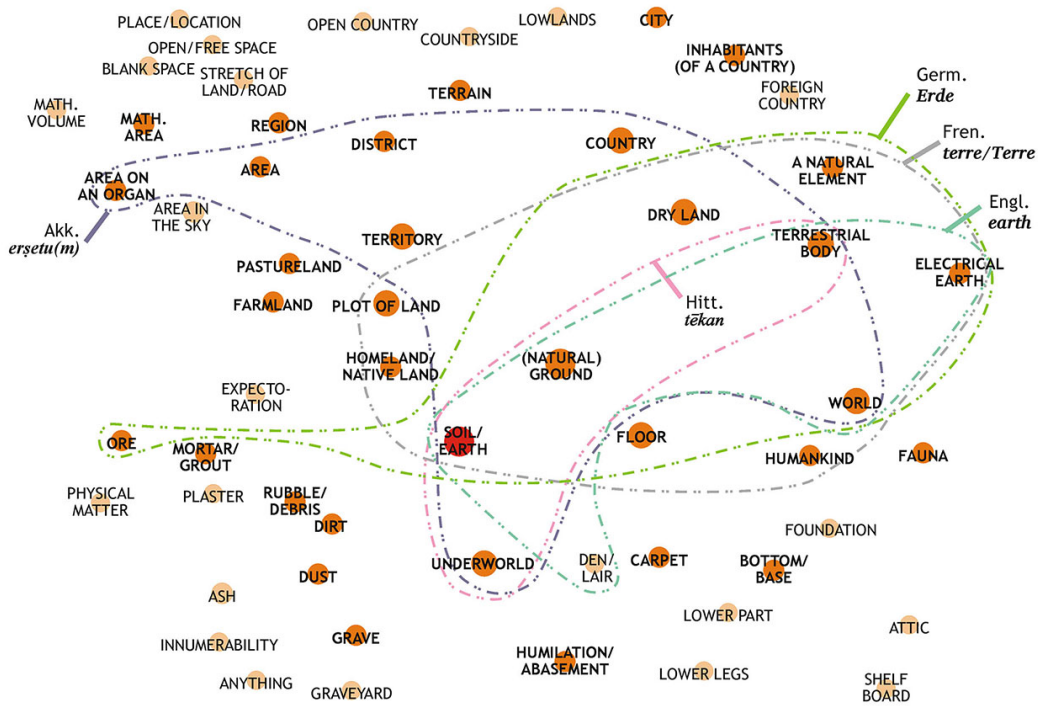Fig. 12 | The semantic space of 'dust' lexemes.

Fig. 13 | The semantic space of 'earth' lexemes.

Fig. 14 | The semantic space of 'world' lexemes.

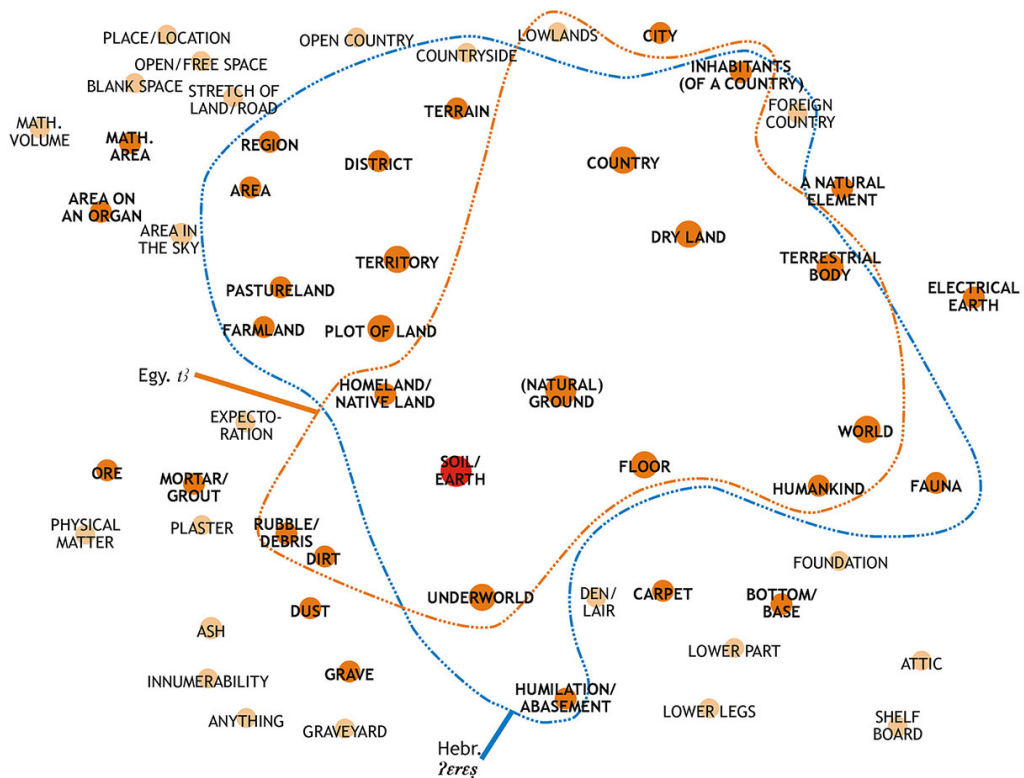
Fig. 15 | The semantic space of 'ground' lexemes.

Fig. 16 | The semantic space of 'land' lexemes.

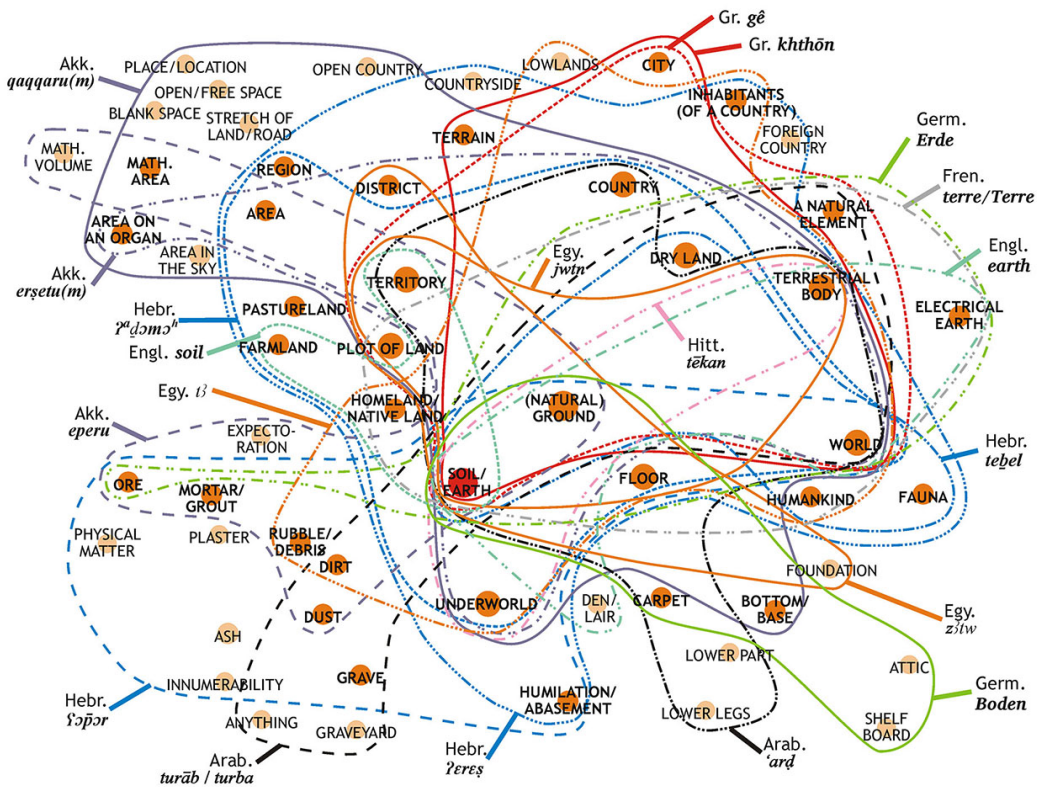## 8.2.3 Semantic map of all researched lexemes

Fig. 17 | The semantic space of lexemes colexifying the sense 'soil/earth' in different languages.

8.3   Data appendix

The language data appendix is available here: http://hdl.handle.net/21.11101/0000-0001-AE7C-1.

8.4   Glossing abbreviations

1	1st person
2	2nd person
3	3rd person
ACC	accusative
ACT	active
ADMIR	admirative
ADV	adverb, adverbial
ADVZ	adverbializer, adverbialization
ANT	anterior
AOR	aorist
C	communis (common gender)
COLL	collective
CONJ	conjunction
DAT	dative
DEF	definite
DEM	demonstrative
DU	dual
F	feminine
GEN	genitive
IMP	imperative
INF	infinitive
IPFV	imperfective
LOC	locative
M	masculine
N	neuter
NOM	nominative
OBL	oblique
PASS	passive
PL	plural
PL	plural
POSS	possessive
PRF	perfect
PRON	pronoun
PRS	present
PRT	preterit
PTCL	particle
PTCP	participle
REL	relative
SG	singular
SG	singular
STC	*status constructus*

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