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The "uphill" and "downhill" system in Meseño Cora

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ABSTRACT

This article shows that Meseño Cora (Uto-Aztecan) displays a frame of reference (FoR) derived from topographic features that is based on two strong axes. This system is the most favored strategy in the language for orientation descriptions. Examination of the topography of the community in which this research was conducted shows that both axes of the dominant FoR are extremely representative of a geomorphic FoR. Additionally, this article presents the use of a relative FoR in Meseño Cora mostly based on the relative uses of terms for 'right' and 'left'.

1. Introduction[1]

Spatial frames of reference (FoRs) are coordinate systems (Levinson, 2003, p. 24) that are used to describe an object's location with respect to a reference entity, enabling the description of a figure–ground relationship. By this definition I understand **figure** as the "moving or conceptually movable entity", which is located with respect to a **ground**, the object "with respect to which the figure's path, site, or orientation is characterized" (Talmy, 2000, p. 184). Little is known about (FoRs) in Uto-Aztecan languages. Previous studies on Mariteco Cora (Casad, 1982; Casad and Langacker, 1985), a southern Uto-Aztecan language spoken in northwest Mexico, have already reported the pervasive preference that speakers of this language have for giving accurate spatial descriptions through a pair of prefixes expressing topological meanings such as *a* – 'outside' and *u* – 'inside'. This was the first work suggesting the highly peculiar system of this language for depicting space. Yet, an in depth study on space based on the framework of semantic typology and spatial FoRs in any of the Cora languages has not been undertaken to date. This article offers a wider descriptive perspective on the study of space in a language closely related to Mariteco Cora, the Meseño Cora language, hereafter MEC, which is spoken in the town of Presidio de los Reyes, Nayarit, Mexico.

MEC shows a case of an extremely symmetric "uphill–downhill" system; it has terms that refer to "uphill" *tepwa/e* and "downhill" *te* on the axis that extends roughly east and west, respectively, as well as *tíbi/ti* "uphill" and *kɨ* "downhill" on the second axis that extends roughly south and north, respectively. The cardinal direction system described for Tseltal is based on two nouns *ta ajk'ol* "uphill" roughly south and *ta alan* "downhill" roughly north (Brown and Levinson, 1993, p. 48). Levinson has described this system as having asymmetric absolute axes (2003, p. 160), or displaying a weak absolute axis, since the east–west axis lacks linguistic labels (2003, p. 167). According to Levinson (1996, p. 111), "the coordinate system is deficient, in that the orthogonal *across* is labeled identically in both directions (east and west); the

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[1] The following abbreviations are used in this article: 2 – second person; 3 – third person; ASSERT – assertive; CONJ – conjunction; COP – copula; DEM – demonstrative; DHA1 – downhill axis one; DHA2 – downhill axis two; DIR – directional; INAL – inalienable; INTENS – intensifier; IT – itive; LOC – locative; MEC – Meseño Cora; PL – plural; POSS – possessive; SBJ – subject; SBR – subordinator; SG – singular; SP – Spanish; TOP – topic marker; UPA2 – uphill axis two; UPA1– uphill axis one.

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particular direction can be specified periphrastically, by referring to landmarks". The MEC "uphill–downhill" system shows a sharp contrast with the system described for Tseltal in the sense that it clearly has four distinct linguistic expressions for referring to the whole set of directions involved in a quadrant system. Thus, I have derived from Levinson that the notion of 'strong' axis corresponds to the availability of a distinct linguistic coding in a language for a given direction, as well as to the transparent semantics of the linguistic expression referring to a specific direction. Therefore in this work the description of the MEC "uphill–downhill" system as having two strong axes is the result of an extremely symmetric coordinate system. The four directions involved in the quadrant system are distinctly labeled and are not interchangeable.

There are several ways of classifying the "uphill–downhill" system found in MEC. In the Levinsonian ternary classification (2003, pp. 66, 90–91, 154) the kind of "uphill–downhill" system in MEC may be treated as a type of absolute FoR. This type of FoR involves coordinates that are abstracted from some environmental gradient or feature and provide fixed bearings throughout the totality of space, an example in English being *The ball is north of the chair*. However, within Levinson's classification, an "uphill–downhill" system could also be subsumed under the family of intrinsic FoRs, which also includes landmark-based FoRs (*The ball is seaward of the chair*), and geomorphic frames (*The ball is downriver from the chair*), as pointed out by Bohnemeyer (2011). Wassmann and Dasen (1998) and Li and Gleitman (2002) offer a third alternative for classifying the "uphill–downhill" system of MEC. These researchers group together absolute, landmark-based, and geomorphic FoRs as part of the geocentric family.

Bohnemeyer (2011) puts forward another alternative based on a fine-grained classification that widens the classification of FoRs proposed by the preceding authors. This reclassification of FoR types is explained extensively in Section 3 of this article. In the revised FoR classification, the "uphill–downhill" system found in MEC can be codified as a geomorphic frame of reference (FoR) in which the anchor is some feature of the environment and the two strong axes are projected from this feature onto the ground. An example of an orientation description using a geomorphic FoR is *The chair is facing upriver/downhill* (Bohnemeyer, 2011). Detailed examination of the salient topographic features that surround Presidio de los Reyes, the community in which this research was conducted, reveals that a plausible classification for the "uphill–downhill" system found in MEC corresponds to a geomorphic FoR. Up until now I have no convincing evidence for categorizing this system as absolute. Thus, I categorize the "uphill–downhill" system found in MEC as a geomorphic FoR based on two strong axes. This proposal does not conflict with Wassmann and Dasen (1998) and Li and Gleitman (2002) since their classification subsumes this type of FoR under the same higher category of geocentric, which includes the geomorphic, landmark-based and absolute types. However, it does raise the question within the Levinsonian classification as to whether the geomorphic FoR either belongs to the intrinsic category or is subsumed under the absolute type. Leaving aside all of these issues related to various FoR classifications, the main goal of this article is to expose clearly the descriptive features of the "uphill–downhill" system of MEC. Hopefully this descriptive information will contribute to further discussion of the various types of spatial FoRs to be found in the languages of the world.

Considering that the "uphill–downhill" system in MEC is not classified as an absolute system, I do not use the expression 'cardinal direction system' to refer to this system in MEC, as this expression implies an absolute FoR involving cardinal points. When used, this expression refers exclusively to the way it is used in the work of Brown and Levinson (1993), Levinson (1996, 2003), and Brown (2006) on Tseltal. In this article the expression 'cardinal direction system' is used in the context of describing the experimental set-up, the ritualistic use of cardinal direction terms in MEC, as well as in the instances where MEC speakers translated the "uphill–downhill" system in MEC as a cardinal direction system, borrowing terms from Spanish. In order to avoid confusion, I rely instead on the term 'quadrant system' for referring to the four directions expressed by the "uphill–downhill" system of MEC, which is not an absolute system.

This work is the first of its kind in providing an in depth description of both the geomorphic and the relative FoRs and in providing a brief overview and a quantified account of the FoRs available in a Cora language.

The grammatical devices for making reference to the geomorphic system generally use free (non-bound) words of the adverb class combined in many cases with a system of geomorphic prefixes. These are instances of double marking constructions in which the same information is expressed more than once in a single clause. In these cases both a free word and a bound morpheme express the appropriate FoR. These double marking constructions are the most common pattern for orientation descriptions, as in (1).

(1) *méh=**tepwa*** *=pu* *h-o'u-**tá**-ne*
there=UHA2 =3SG.SBJ 3SG.SBJ-LOC-UHA2-look
'It is looking "uphill"[a].' (B&C 3.10, A&S, p. 77, orientation description; speaker facing North)

[a] I use double quotes in the free translations of MEC into English in the cases of *uphill* and *downhill* to indicate that these terms do not refer exactly to the English words, but rather to the oppositions of the four directions that are part of the quadrant system in MEC. The adequate gloss for these terms is indicated in the interlinear gloss, e.g., UHA2 in example (1).

On the other hand, locative descriptions do not show the phenomenon of double marking. Linguistic structures that convey locative descriptions contain exclusively the free relator of the adverb class for making reference to the geomorphic FoR. This is the only attested pattern for locative descriptions; such an example is given in (2).

(2) *yúu=**te**-tse* *p-uihtá* *púhme'en* *watáka* *pelóota*
side=DHA2-LOC 2SGSBJ-CONJ side sit ball
'And you (have) the ball sitting on the "downhill" side.' (B&C 2.2, V&M, p. 80, locative description; speaker facing North)

This is an interesting phenomenon which warrants further notice. It occurs when certain linguistic structures interact differently either with orientation or locative descriptions. The double marking constructions are typical of orientation descriptions and the geomorphic adverb constructions are reserved for locative descriptions.

The article is organized as follows: Section 2 gives an account of MEC and its speakers. In Section 3 I discuss the FoR classification used for analyzing and coding the data. Section 4 offers a description of the tasks used to collect the data for this research. The core of this article is presented in Section 5: it gives a brief overview of the FoRs found in MEC, and summarizes the quantified results regarding FoRs in discourse in the Ball & Chair corpus. It examines in detail the salient topographic features which surround Presidio de los Reyes in order to test the analysis of the "uphill–downhill" quadrant system as instantiating a geomorphic FoR and also gives an extensive account of the grammatical devices used for expressing the geomorphic FoR in MEC. Finally, it describes in depth the relative frame of reference. Section 5 presents information relevant to a study of spatial semantics in MEC. I discuss first the semantics of the "uphill" and "downhill" system in MEC, the topography of the community in which this research was conducted, as well as a number of interesting anecdotal observations on spatial language use outside the formal elicitation of the Ball & Chair task. In Section 6 I conclude that the "uphill" and "downhill" system in MEC shows noticeable features that were not reported before for this kind of system: it is an extremely symmetric coordinate system having two strong axes distinctly labeled, it coexists with a relative FoR mostly based on the relative uses of the autochthonous terms *arɨ'ɨrinta'a* 'right' and *útata'a* 'left', and it shows a near absence of a landmark-based FoR in the data collected for this study.

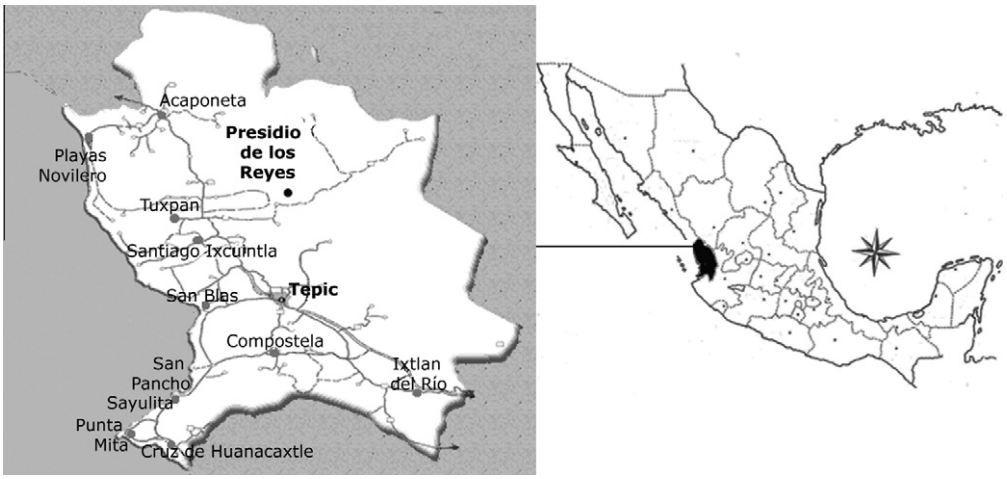
2. MEC and its speakers

Cora is a southern Uto-Aztecan language of the Corachol branch spoken in northwest Mexico. It has around 17,000 speakers who live in the state of Nayarit. A systematic and exhaustive study of dialect differences has not been undertaken to date. From my own fieldwork in many towns of the Cora area, I have identified six important dialects: MEC, which has approximately 5000 speakers, Mariteco Cora, with around 5000 or 6000 speakers, Tereseño Cora, which has possibly 5000 speakers; and finally three small dialects, Presideño, with no more than 300 speakers, Francisqueño, with also 300 or 400 speakers, and Corapeño, with around 1000 speakers. This is a very limited and impressionistic view of the dialect situation for the Cora language. Still, dialect differentiation might be high because all contemporary varieties are not mutually intelligible. Meseños argue that they can hardly understand themselves with both Tereseño and Corapeño speakers, although they do understand Mariteco speakers. All these facts lead me to be cautious and speak about different Cora languages until we have a reliable study on the dialectology of this Uto-Aztecan language.

The community in which my research was conducted is Presidio de los Reyes, a village of 705 inhabitants located in the municipal district of Ruíz, in the center of the state of Nayarit, Mexico. There are two varieties of the language that coexist in this small town. Out of these 705 inhabitants, 671 are speakers of an indigenous language; and out of these, approximately 400 are speakers of MEC and the other 271 speak Presideño.

The inhabitants of this community practice corn and bean cultivation, as their ancestors have for well over a thousand years. However, there has been an increase in coffee oriented agriculture destined for exportation in the last decade. Education is conducted mainly in Spanish. Both elementary school and middle school have been available for more than two decades. In the last decade, kindergarten and preschool have become obligatory. A great effort has been made to teach literacy in MEC in elementary school and nowadays children can write and read in their native language. Even though they are not taught to write vowel length or accent, which are phonological features of the language, they do write the glottal stop and the central vowel ɨ which Spanish lacks. Electricity and running water services have existed for the whole community since 2004. The benefits of having electricity jointly with the existence of an obligatory preschool and kindergarten program have produced one of the major linguistic changes that can be observed in younger generations. Since they have had access to national TV and are obliged to attend school at age 4, they are ceasing to be monolingual at an increasingly early age due to the more frequent contact with the Spanish language. Thus, younger generations are clearly bilingual earlier in their lives and many of them do not speak MEC fluently or are only passive speakers. Despite the fact that speakers of this generation learned to read and write in MEC in elementary school, once they reached their teens they hardly used their language in either the school or family context. On the other hand, speakers who are currently in their twenties grew up monolingual until 7 or 9 years of age and are very fluent in both MEC and Spanish. Speakers of this generation were not as likely to attend elementary school in early childhood as the younger generation as a result of economic incentives provided by the government that require proof of school attendance. Often, older generations from their thirties to their eighties are completely monolingual or understand and speak very little Spanish.

The location of Presidio de los Reyes is shown in Map 1. This community provides access to the Sierra Cora when coming from the west coast. Except for the west and for the north, the community is set on a large mountainous tract surrounded by



Map 1. Location of Presidio de los Reyes in the state of Nayarit, Mexico.

different foothills to the east and to the south. Its latitude is 22 degrees 2.20 north and its longitude is 104 degrees 55'.57 west. The river San Pedro runs along the neighboring communities of San Pedro Ixcatán, the *mestizo* village whose population has spoken Spanish for a long time, and Presidio de los Reyes, the Cora village whose population speaks either MEC or Presideño. The elevation of both communities is 80 m above sea level. However there exists a slight slope in the environment, which Meseño speakers perceive as a difference in the landscape. This has led them to locate Ixcatán as *te* "downhill", which in this case coincides with the west side and Presidio as *tepwa* "uphill", which in this case coincides with the east side.

MEC is a polysynthetic SOV language with a nominative–accusative alignment shown in several sets of person prefixes and clitics that express different subject functions. Clauses are formed by verbs, which are very often preceded by a second position subject enclitic which is also preceded by negation markers, any kind of adverbs, depictive predicates or complement predicates, as well as meronyms and noun phrases. A salient syntactic feature is information structure which is expressed by left-dislocation and a topic marker to reintroduce a topic lexical NP. Right-dislocation, on the other hand, is very commonly used in natural discourse for topic shift and after thoughts. MEC has very few postpositions, the most relevant for this study is the locative postposition *hetsén* approximately 'in' and its affix variant *-tse'e/-tse*. All of these morphosyntactic features are relevant to many of the examples shown in this paper.

For instance, note that in (3) the geomorphic adverb *yúh=tepwe-tse* 'on the "uphill" side' occurs in the first position of the clause. The locative postposition *-tse* is suffixed to this geomorphic adverb to reinforce the locative character of this lexical word. This adverb is followed by a second position subject enclitic, the third person singular *=pu*. The posture verb *káhka* is in final position. Finally we have a right-dislocation or a postposed subject *hɨpelóota* commonly used for topic shift clearly marked with a topic marker *hɨ*. This information structure strategy is very useful for topic shift, and through this device, the speaker clearly indicates that he is not talking anymore about 'the chair' but another referent 'the ball'. Those are the most important referents in the Ball & Chair stimuli which will be introduced in Section 4. Speakers constantly use this right-dislocation device for changing the topic of the main referents of these stimuli.

(3) ***yúh=tepwe-tse*** *=pu* *káhka* *hɨ* *pelóota*
side=UHA2-LOC =3SG.SBJ sit TOP ball
'On the "uphill" side sits the ball.' (B&C 2.12, A&S, p. 56, locative description) speaker facing North

3. FoR classification

Previous studies of cross-linguistic FoR preferences have typically employed the ternary FoR classification of Levinson (1996, 2003). This classification includes the following FoR types: intrinsic, relative and absolute. Definitions of these FoR types are provided below (following O'Meara and Pérez Báez, 2011).

3.1. Three-way FoR classification

- *Absolute* FoRs are coordinate systems whose bearings are fixed and generally involve an environmental gradient or feature that is constant, such as the places in the horizon where the sun rises and sets. The following is an example of an English utterance involving an absolute FoR: *My house is south of the city*.

- *Intrinsic* FoRs involve coordinate systems that are based on the inherent facets or parts of a ground object, as in the English example *Pete's bike is parked in front of the house*. English speakers know that conventionally the front of the house is the side that has a front door and/or is facing the street. In other words, the assignment of front does not come from the orientation or location of the speaker, but rather the conventionalized parts or facets of the ground object.
- *Relative* FoRs involve a coordinate system that is dependent upon the perspective of a viewpoint, which generally comes from the observer. This type of FoR is frequently used by speakers of English in descriptions of locations of objects in small-scale space (but can also be used in large-scale space), as in, for example *The plate is to my right*.

In this three-way classification (2003, pp. 66, 90–91, 154) the kind of "uphill–downhill" system that exists in MEC may be treated as a type of absolute FoR. This type of FoR involves coordinates that are abstracted from some environmental gradient or feature and provide fixed bearings. However, within this classification, an "uphill–downhill" system could also be subsumed under the family of intrinsic FoRs, which also includes landmark-based FoRs.

The coding of FoRs in this study is based on a fine-grained classification proposed by Bohnemeyer (2011) that has the advantage of providing a systematic way to classify certain FoR types which were a source of confusion under the three-way classification advanced by Levinson (2003), such as the case of the geomorphic FoR. Bohnemeyer's classification of FoRs is based on the notions of **anchor**, "an entity, or a featured entity, that serves as the basis for the definition of one or more axes of the FoR", and **origin**, "the ground or reference entity in locative and motion descriptions and the figure or theme in orientation descriptions" (cf. Levinson, 2003, pp. 39–55). In this way, the identification of particular relations between the anchor and the origin makes it possible to distinguish different types of coordinate systems (FoRs). A detailed account of the research and literature on which the fine grained classification used here is based can be found in O'Meara and Pérez Báez (2011), and includes references to Levinson, 1996, 2003, and Danziger, 2010; *inter alia*. For the sake of brevity, I move directly to the definitions for each of the types of FoRs in the horizontal plane as used in the MesoSpace project (details of the project are discussed in the section below):

Object-centered: The anchor is an entity distinct from the body of the observer. The axes of the FoR are projected from those of the ground. The truth conditions of spatial representations interpreted in this FoR depend on the orientation of the anchor/ground. Example: *The ball is at the chair's front*. Instead of the classification object-centered, I use the term 'intrinsic' for coding this FoR.

Direct: This term is borrowed loosely from Danziger (2010). Direct FoRs, like relative FoRs, are anchored to the body of an observer (in linguistic representations typically, but not necessarily, the speaker and/or addressee), but unlike relative FoRs do not involve projection of the observer's body axes onto an external ground (or a figure in the case of orientation descriptions). In the example: *The ball is in front of me/you/us*, the body (or bodies) of the observer(s) are both anchor and ground. Instead in the example: *The ball is toward me/you/us (from the chair)*, the ground and the anchor are distinct entities. However, the axes of the observer's body are not projected onto the ground. Instead, an axis of the coordinate system is constituted as a vector pointing at the observer. The ground or reference point is the chair even if it is not explicitly mentioned whereas the anchor is the body of the observer. An example of an orientation description using a direct FoR is: *The chair is facing me/you/us*. In this kind of description there is no ground, just the figure (the chair) and the anchor (the body of the observer). In the former example, the truth conditions depend on the orientation of the observer, and in the second and third example, they depend on the location of the observer.

Relative: The anchor is the body of the observer. The axes of the FoR are projected from those of the anchor onto the ground. The truth conditions of spatial representations interpreted in this FoR depend on the orientation of the anchor. Examples: *The ball is in front of the chair*, in the observer-dependent sense of 'in front of'; *The chair is facing left*.

Absolute: The anchor is some entity or feature of the environment. One or more axes of the FoR are abstracted from the anchor such that the directions in which they point are exactly the same regardless of the actual location of the ground, or the observer, *vis-á-vis* the anchor. Examples: *The ball is north of the chair*; *The ball is uphill of the chair*, in case the direction denoted by 'uphill' remains the same regardless of which side of the mountain (range) the ground (or the observer) is on.

Landmark-based: The anchor is some (natural or human-made) entity or feature of the environment. One or more axes of the FoR are defined as vectors pointing towards the anchor. The truth-conditions of spatial representations interpreted in this FoR depend on the location of the anchor (the landmark). Examples: *The ball is seaward of the chair*; *The chair is facing the door*.

Geomorphic: The anchor is some entity or feature of the environment. One or more axes of the FoR are projected from an axis or gradient of the anchor onto the ground. The truth conditions of spatial representations interpreted in this FoR depend on the orientation of the anchor, but not on its location. Examples: *The ball is upriver of the chair*; *The chair is facing downhill*.

As Bohnemeyer remarks, direct, object-centered, geomorphic, and landmark-based FoRs are subsumed under the broad "intrinsic" category of Levinson (1996, 2003). Lastly, there is an additional type of absolute FoR (see Levinson, 2003, p. 75) where the Earth's field of gravity is the anchor. This type of FoR was coded under the label **vertical**.

4. Data collection, methods, coding

The research reported in this article is part of the project *Spatial language and cognition in Mesoamerica* ("MesoSpace") funded by the National Science Foundation (Award No. BCS-0723694; principal investigator J. Bohnemeyer). To study the use of spatial frames of reference (FoRs) in linguistic representations, the MesoSpace team developed the Ball & Chair (B&C) task (Bohnemeyer, 2008). The task is comprised of four sets of photographs. Each set includes twelve photos. The photos feature a ball and a chair in different spatial configurations. These stimuli are designed for use in a picture-to-picture matching referential communication task. The goal is to induce speakers to distinguish the pictures that make up a set from one another by making the spatial configurations they show explicit. As a referential communication task, B&C involved two speakers per trial, one acting as director and the other acting as matcher. Both speakers are seated side by side at a table, both facing the same direction. A screen is set between the two speakers to prevent any eye contact or use of gesture between them (see Bohnemeyer, 2011 and O'Meara and Pérez Báez, 2011).

The B&C referential communication task was run in the community of Presidio de los Reyes, Nayarit in the fall of 2008. The task was conducted with four pairs of speakers of mixed sex, age, degree of bilingualism and literacy level. This corpus is an adequate sample to illustrate the main points of this article. The participants were two teenage male literate and quite bilingual speakers that were monolingual until 7 years of age; four older male speakers in their late forties through eighties with limited competence in Spanish and complete fluency in MEC and with low literacy in Spanish; and finally two women in their late forties and fifties completely monolingual and illiterate. Except for one of the younger speakers who was born in the neighboring village of Santa Cruz del Guaybel, all were born in Presidio de los Reyes and reside there and they have never left their home town for more than a couple of weeks. B&C was applied to four pairs of speakers whose profiles are provided in Table 1.

The setting for running the task was a large patio normally used for storing coffee outdoors. All participants were sitting side by side and facing north, *yúu=kɨ* "downhill" side (on axis one). At their back the compass pointed south *yúh=tibi* "uphill" side (on axis one). The second axis was oriented *yúu=te* "downhill" side (on axis two) on the west, and *yúh=tepwa* "uphill" side (on axis two) on the east. The set up of the second axis was aligned west to east because the coast is on the west side and coincides with the lowlands or downhill, whereas the east side coincides with the entrance to the great Sierra Cora, the

Table 1
Profile of Ball and Chair participants in the experiment conducted in Presidio de los Reyes, Nayarit (Mexico).

Speaker	Sex	Age	MEC/SP	Literacy	Schooling
1	M	12s	Y	Y	Middle school
2	M	14s	Y	Y	Middle school
3	F	50s	MEC (monolingual)	N	None
4	F	45s	MEC (monolingual)	N	None
5	M	54s	Y	Some	None
6	M	47s	Y	Some	None
7	M	48s	Y	Some	None
8	M	78s	Y	Some	None

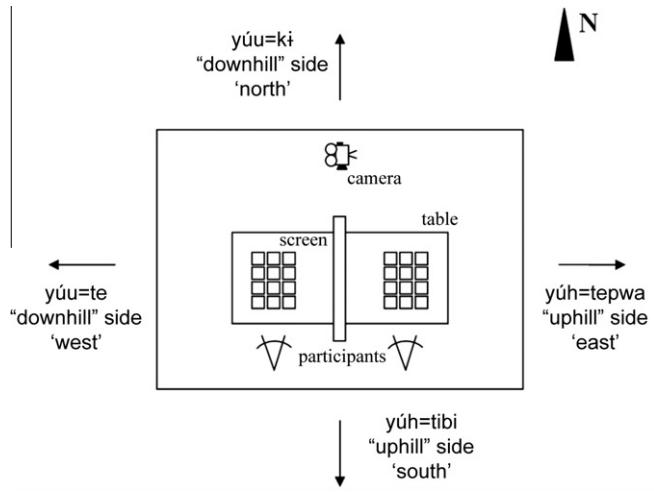


Fig. 1. B&C experiment in Presidio de los Reyes, Nayarit (Mexico). (Many thanks go to Néstor Green and Samuel Herrera for their help in making this diagram.)

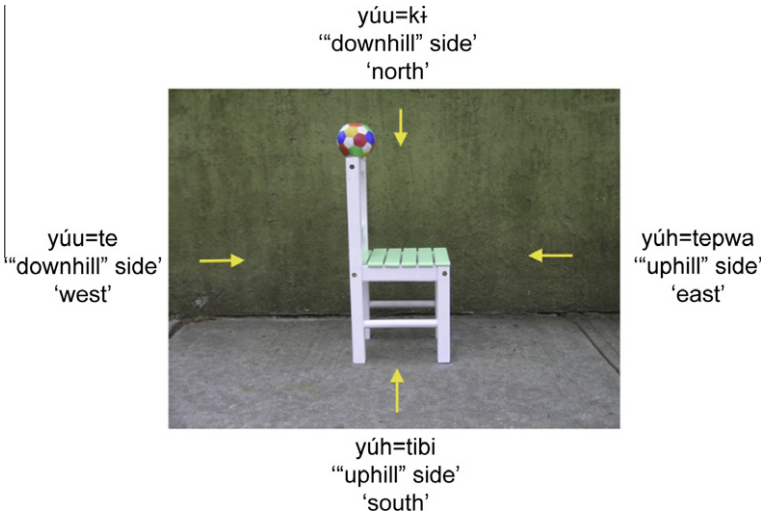


Fig. 2. Orientation of ‘‘uphill’’ and ‘‘downhill’’ in the two axes from north to south and west to east in the picture 1.1 from the B&C stimuli. (The linguistic expressions referring to the ‘‘uphill’’ and ‘‘downhill’’ system of MEC in two axes in Figs. 1 and 2 do not convey the meaning of the cardinal direction terms ‘north’, ‘south’, ‘east’ or ‘west’. The purpose of indicating the expressions of the cardinal terms in the physical layout of the experiment and the projection upon the picture of the B&C communication task is to orient the reader in the MEC system. This is only a practical procedure that does not suggest a similar meaning among the MEC terms and the cardinal terms. This would be totally misleading. The parallelism is a random effect of the intervention of the occidental compass.)

highlands or uphill. Thus the set up made ‘left’/‘right’ and ‘west’/’east’ referentially equivalent. This alignment makes sense with the different slopes that feature the environment in which Presidio is located, as I will explain in detail later. It also makes sense with respect to the orientation of the speakers with whom the stimuli was tested as is shown in Fig. 1. The analogy of the cardinal points of the occidental compass with the MEC ‘‘uphill–downhill’’ system is exclusively used for practical purposes in order to explain the physical layout of the experimental conditions. This use of cardinal direction terms does not mean to suggest referential equivalence between the MEC terms and the cardinal direction terms. It is relevant to note that the physical layout of the experiment was not predetermined nor motivated by the researcher’s agenda.

It is also important to note how speakers projected the coordinate system on the pictures of the B&C referential communication task, given the setting of the experiment as is shown in Fig. 2. In a sense, the virtual world of a photograph inherits the coordinate system and the directions of its orientation in the real world. A great number of the descriptions produced by speakers of MEC are based on the ‘‘uphill’’ and ‘‘downhill’’ system illustrated in the picture in Fig. 2. Therefore it is necessary to keep in mind the linguistic expressions that express the different orientations projected from the environment onto this picture.

All sessions involving the four dyads of participants were fully transcribed. Spatial descriptions regarding frames of reference were singled out and grouped into two kinds: descriptions referring to the orientation of the chair and descriptions referring to the location of the ball with respect to the chair. Each description was then analyzed or coded in terms of the FoR it involved. For the present work, I present quantified results of the following systems: geomorphic, direct, intrinsic, relative, vertical and landmark-based FoRs. Although topological descriptions are also quantified, I will not take them into account for my analysis since they are not projective relations and thus do not involve any FoR.

5. Results: FoRs in spatial descriptions in MEC discourse

This section constitutes the core of this article. First, it presents a brief overview of the FoRs that occur in the MEC B&C corpus. Second, it discusses the quantified results of this corpus and the final section studies in depth the uses of both the geomorphic and the relative FoRs in this language.

5.1. A brief overview of FoRs in MEC

The direct FoR is the second most preferred system in orientation descriptions. The discussion begins with this FoR type because the most favored strategy in the language for orientation descriptions, which is the geomorphic FoR, is discussed in depth in Section 5.3. Direct descriptions may be interpreted through the directional prefixes *be’e-/beh-/ba’a* – ‘in front of me/us’, ‘toward me/us’, ‘toward here’. These prefixes convey the meaning of a direction toward a deictic center that might come from the grammaticalization of a motion verb. An example is given in (4) (see Fig. 3).

Fig. 3. B&C 1.2.

Fig. 4. B&C 1.3.

(4) *me=* *ti'i-**bá'a**-tɨpu*
there= INTENS-DIR-back
'There (it has his) back clearly toward me.' (B&C 1.2, V&M, p.18, orientation description)

Direct descriptions are also interpreted through a free word, a locative adverb *mu hetsé/muétse/uuétse* 'on the other side of me/on the opposite side of me' formed by the locative marker *mu* and the locative postposition *hetsé*. While other languages of the MesoSpace sample use direct FoRs in locative descriptions as well, this MEC construction is unique in terms of its structural makeup. Note example (5) (see Fig. 4).

(5) ***mu*** ***hetsé*** *ho'u-táka* *pelóota*
LOC LOC LOC-sit ball
'The ball is sitting on the other side of me.' (B&C 1.3, V&M, p.58, locative description)

The former example of a direct FoR in (4) illustrates an orientation description. In this case, the chair is indeed the ground and the axis of the coordinate system is constituted as a vector pointing toward the observer. An axis orthogonal to this

vector divides a plane centered on the chair from the observer's side and the complimentary 'other' side (cf. Bohnemeyer and O'Meara, ms).

In MEC the intrinsic FoR is highly favored for locative descriptions. It is very often instantiated in descriptions combining an independent word like a locative adverb or a meronym with a set of prefixes expressing intrinsic meanings. The last case using a meronym which projects an angle from the back of the chair is quite illustrative of the intrinsic system. The relevant example is shown in (6) (see Fig. 5).

(6) ***wâri***-*ta'a-ra'an* *p-uitá*
back-LOC-3SG.POSS 2SG.SBJ-CONJ
*h-**eih**-téhka* *pelóota*
3SG.SBJ-back-sit ball
'And you (have) the ball sitting behind at its back.' (B&C 4.2, F&B, p. 120, locative description)

The intrinsic FoR in *strictu senso* (object-centered according to Bohnemeyer's classification, 2011) has the anchor as the ground, and the ground is an entity distinct from the body of the observer. In this case, the axes of the FoR are projected from those of the ground, which in the B&C task is the chair. This type of frame does not occur with orientation descriptions. Instead it is the most favored strategy for locative descriptions.

Fig. 5. B&C 4.2.

Fig. 6. B&C 1.5.

Fig. 7. B&C 1.8.

In a vertical FoR, the Earth's field of gravity serves as the anchor. Since vertical orientation and locative descriptions play a smaller role in the B&C task, they will not be discussed in as much detail as descriptions involving spatial relations along the horizontal plane. A relevant example is given in (7) (see Fig. 6).

(7) *pelóota* *h-**an**-**tehé**'**e**-kabe'e* *hé'ita'a*
ball 3SG.SBJ-above–above-hang in.the.middle
péero *há'atsuka* ***hapwán***
but a.little.bit above
'The ball is hanging from above in the middle but a little bit above.' (B&C 1.5, B&N, p.23, locative description)

This last example also serves to show that in a single description a vertical FoR as well as many topological expressions were produced to describe the location of the ball with respect to the chair, which was successfully used to match this picture in the B&C task.

Finally the landmark-based FoR, in which the anchor is some entity or feature of the environment, is illustrated in (8).[2] In this case, the orientation of the chair is the focus. The near absence of this FoR in the corpus of the B&C task is a feature worth noting within spatial descriptions in MEC (see Fig. 7).

(8) *méhka'i* *=pu* *hóu-ne*
over.there =3SG.SBJ LOC-look
kɨɨxɨɨe ***paré*** *tíiɨɨtɨɨ'ɨɨ*
seem wall something
'Over there it is looking to something which seems like a wall.' (B&C 1.8, B&F, p.31, orientation description)

A detailed account is presented in Sections 5.3 and 5.4 of geomorphic and the relative FoRs in MEC. Besides discussing these systems in depth, the sections provide a wide range of examples for illustrating orientation and locative descriptions which use these systems.

5.2. Quantified results of FoRs obtained in the B&C task for orientation and locative descriptions and general results of the stimuli

In this section I present quantitative data showing FoR preferences in MEC. It is worth mentioning again that topological descriptions were also taken into account when analyzing and coding the data as one more strategy for spatial description.

[2] Example (8) shows a description which takes into account a landmark within the picture itself, because the speaker refers to "the wall" of the picture and not to any other landmark in the discourse context. Recall that the experiment was run outdoors so there were no "walls", "doors" or "windows" of a room or a house properly speaking. The general principles for coding descriptions within the MesoSpace team excluded all kinds of descriptions, either topological or involving a FoR which refer to the picture itself. However, I did code orientation descriptions like the one illustrated in (8) because those were the only instances of a landmark-based FoR and were exclusively used by the dyad of younger speakers. This fact suggests that landmark-based FoRs are nearly absent in the MEC B&C corpus and when used seem to be driven by language change or generation gaps.

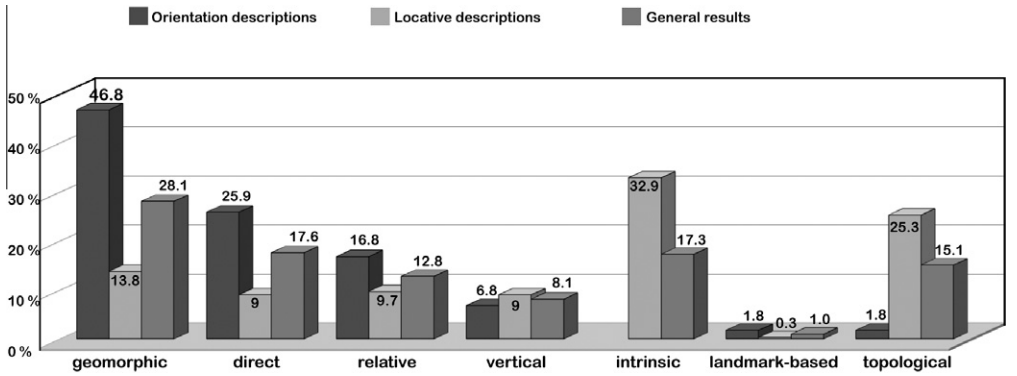


Fig. 8. Orientation and locative descriptions in the B&C task in MEC.

While topological relations are non-projective, they are briefly addressed and percentages of their use are provided as they are of relevance to the use of the object-centered FoR.

Fig. 8 summarizes the distribution of strategies used in orientation and locative descriptions and groups them together as the general results in the B&C task. The first column represents orientation descriptions, the second locative ones and the third the general results. The general results include both orientation and locative descriptions. This organization showcases the contrast in their frequencies more clearly. The chart shows that the geomorphic FoR does indeed make up the lion's share of orientation descriptions in the MEC B&C corpus: 46.8% belong to this category. Even if the geomorphic FoR overtakes the direct system (25.9%) by a wide margin, this last system was the second most common strategy for orientation descriptions in this language. The relative FoR plays a significant role as 16.8% of the descriptions used this system. It is relevant to note the near absence of landmark-based orientation descriptions within the whole picture of FoRs obtained in the MEC B&C corpus.

The middle columns in Fig. 8 corresponding to locative descriptions show a sharp contrast with orientation descriptions. In orientation descriptions, the geomorphic FoR has the highest percentage. With respect to locative descriptions, the intrinsic strategy and the topological descriptions are in the lead with 58.2%. These results might be due to the fact that in locative descriptions objects in contiguity are described with topological descriptions or with descriptions involving intrinsic FoRs, while objects separated in space are described using a geomorphic FoR, such as is concluded for Tseltal by Levinson (2003, p. 154). In locative descriptions, the near absence of the landmark-based category is once again attested.

5.3. The geomorphic FoR: A descriptive statement

This section approaches the analysis of the "uphill" and "downhill" system in MEC, exploring in detail the topography of Presidio de los Reyes to support the classification of the MEC quadrant system as a geomorphic and not an absolute FoR, given the topography surrounding the community. The MEC topography is compared with the landscape of Jesús María, a community where Mariteco Cora is spoken. From Casad's (1989) description it is possible to deduce that Mariteco Cora seems to also display a geomorphic quadrant system, although the work of this author is not at all elaborated within the framework of FoRs and he never uses this classification in his own studies.

5.3.1. Setting the scene in Presidio de los Reyes: The ritual and the every day quadrant system

In his work on Cora toponyms, Casad (1989, p. 114), introduces many important notions and terms about the study of space in Mariteco Cora. The cosmology of this culture consists of a center framed by four ritual cardinal points. The terms which refer to these cardinal points are: *téijmata'a* 'east', *huáahuta* 'west', *tzeréeme'en* 'north' and *cuameché* 'south'. Speakers of Mariteco Cora argue that *téijmata'a* 'east' makes reference to the sunrise whereas *huáahuta* 'west' makes reference to the sunset.

In the same study, Casad (1989, p. 121), presents a set of "topographic suffixes", which combined with "locative particles" form "topographic adverbs". These "topographic adverbs" point out the location of a place or a speaker with respect to the direction in which the river flows or the direction the slope of a mountain takes. Among these "topographic suffixes" *-tye* refers to "downriver", *-tyapua* to "upriver", *-ti* to "uphill" and *-cü* to "downhill". It is not surprising that all these "topographic suffixes" in Mariteco Cora are etymologically related to the linguistic labels that express the quadrant system of MEC: *te* "downhill", *tepwa/e* "uphill", *tibi/ti* "uphill" and *kɨ* "downhill". The glosses corresponding to the "topographic suffixes" identified by Casad are representative of the landscape of the town of Jesús María. A salient feature of the environment in this community is a great river called the 'Jesús María river' that runs to the south of this town. According to Casad's analysis, the coordinate system in Jesús María would be best defined as both an "uphill–downhill" and "upriver–downriver" system. On the other hand, in Presidio de los Reyes there is a different scenario regarding the topographic features of the environment including exclusively the mountains and the slopes of the terrain. This fact explains the different systems that

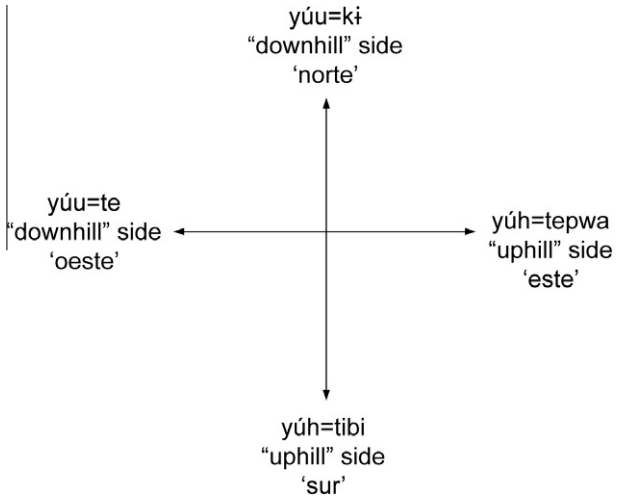


Fig. 9. The cardinal direction system of speakers of MEC in Presidio de los Reyes.

characterize two different Cora communities, and represents an interesting clue supporting the analysis of a geomorphic FoR in the Cora area. Thus, Casad's description of the use and the features of the environment in which the "topographic adverbs" are based corresponds with what we understand as a geomorphic FoR. Recall that in a geomorphic FoR the anchor is some entity or feature of the environment in which one or more axes of the FoR are projected from an axis or gradient of this entity/feature onto the ground. The truth conditions of spatial representations interpreted in geomorphic FoRs depend on the orientation of the anchor, the environmental entity/feature, but not on its location.

The MEC terms *téihmata'a* 'east', *wáahuta* 'west', *tsaréeme'en* 'north' and *kwameché* 'south' are unknown to almost all speakers of MEC living in Presidio de los Reyes.[3] Yet nowadays these terms are clearly familiar to the elite within this community. Part of this group includes those who practice ritual festivities such as the *mitote* singers, the *xú'umwabi'ika* 'the ones painted black'[4] that dance and sing during the Holy Week. Alongside them are the *tɨti'ichewáara* 'the ones who practice witchcraft', literally 'one who does you harm', or the shamans *tɨti'iwá'ataka* 'one who cures you'; the most common illness being the *espanto* 'fright'. It is interesting to note that even if speakers do not know these terms, they are aware of their ritual relevance since many festivities, such as food offerings, are always based on the shape of a cross. Furthermore, speakers argue that this cross represents the cardinal system of the actual Cora cosmology using the terms *te* "downhill", *tepwa/e* "uphill", *tibi/ti* "uphill" and *kɨ* "downhill" as illustrated in Fig. 9. Thus, speakers of MEC in Presidio had already made a new representation from the quadrant system of ritual festivities using more familiar linguistic labels employed in everyday life.

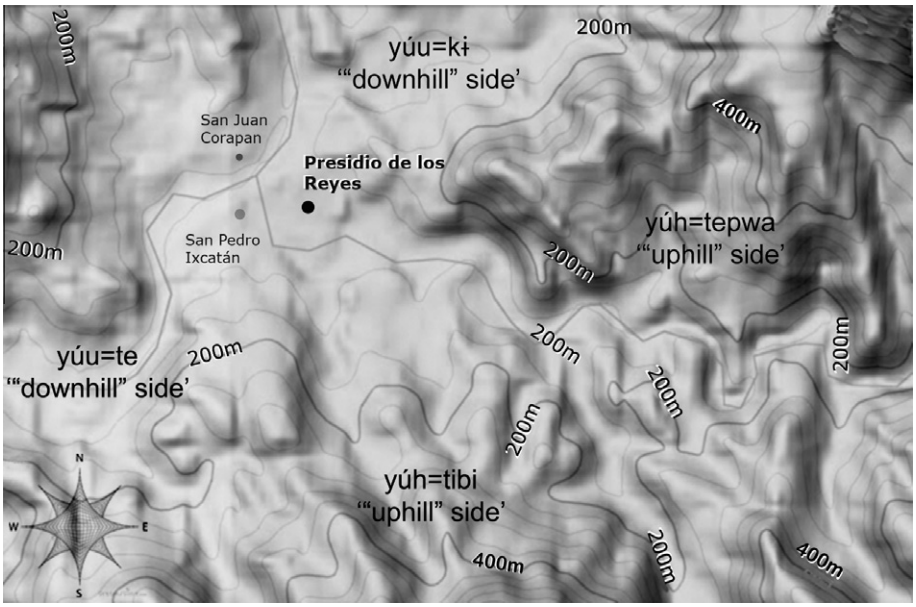
Monolingual speakers are able to draw the cross and name the terms that correspond to each of the points represented in this design. Bilingual speakers have gone one step further in this remarkable and continuous meta-representation chain since they gloss in Spanish the MEC terms in Fig. 9 as *te* "oeste" ('west'), *tepwa/e* "este" ('east'), *tibi/ti* "sur" ('south') and *kɨ* "norte" ('north').[5] Despite the fact that this glossing process is totally misleading and betrays the original MEC coordinate system by making it appear as an absolute system, bilingual speakers exhibit this linguistic and cultural practice. This glossing process within the MEC language reveals that this language has been under great pressure by contact with Spanish. Recall that in Section 2 it was pointed out that the benefits of having electricity, the existence of an obligatory preschool and kindergarten program jointly with economic incentives provided by the government requiring proof of school attendance have produced one of the major linguistic changes that can be observed in younger generations.

This scenario is quite different from the one described for Tseltal by Brown and Levinson (1993, p. 6). Contrary to what has been described for this Mayan language, MEC bilingual, but not necessarily literate, speakers accept a complete correspondence between the "uphills" and "downhills" within their system and the Spanish terms *norte*, *sur*, *este* and *oeste*. Instead of the situation depicted for Tseltal, MEC displays a full quadrant system that still has a high ritual function in the culture. Despite all these discrepancies, Tseltal and MEC share a crucial trait. When asked 'How do you know where "uphill" is?' informants stressed the topography of the landscape, the mountains, the salient cliff-faces and even the slightest slopes

[3] The ritual cardinal points do not have a transparent compositional meaning in MEC. With the exception of *tsaréeme'en* 'north' which is etymologically related to the word *tsáre'e* 'side' in MEC. The Spanish glosses corresponding to the cardinal points are probably conventional translations based on an analogy from the occidental cardinal system derived from contact with Spanish.

[4] Literally *xú'umwabi'ika* in MEC means 'the ones painted black'. The term refers to the participants in the Holy Week who paint themselves black and fool the spectators of this festivity. The Spanish term for these participants is *judíos* 'Jews', which is used to make reference to these important ceremonial figures of the Cora Holy Week.

[5] I thank Jürgen Bohnemeyer for calling my attention to the fact that MEC speakers are producing an ongoing process of representations with respect to the different cardinal systems available from their ritual culture, every day language and the categories available from contact with Spanish.



Map 2. Topographical map of the area of Presidio de los Reyes, north 200 m above sea level, west 200 m, east 400 m, and south 400 m. (The topographic map was obtained from *Yahoo Maps* being totally faithful to the altitudes signaled in this site, but with important modifications regarding the names and location of the communities because this information is not indicated in this topographic source.)

of the terrain. This last argument is a piece of evidence for considering that MEC displays a geomorphic FoR in which a feature of the environment is projected onto the ground.

5.3.2. Topography, sunset and sunrise in Presidio de los Reyes

As mentioned above, Presidio de los Reyes is the community that provides access to the Sierra Cora if coming from the west coast. The community is set on a large mountainous tract surrounded by different foothills to the east and to the south, as shown in Map 2. A view from Presidio to the west makes the lowlands visible which have an altitude of 80–200 m above sea level. The area is called *yúu=te* '"downhill" side' by Presidio speakers. Lowlands are also visible from Presidio to the north having an altitude of 200 m. To Presidio speakers this region is called *yúu=kɨ* '"downhill" side'. A view from Presidio to the south and east displays the area of the highlands. The east provides access to the Sierra Cora, which has an altitude of 200–400 m and is named by Presidio speakers *yúh=tepwa* '"uphill" side'. On the highlands to the south is where one finds all of the coffee plantations. This area has an altitude of 200–400 m above sea level and is known to Presidio speakers as *yúh=tibi* '"uphill" side'.

This detailed examination of the topography in which Presidio de los Reyes is located reveals that the linguistic labels that express the coordinate systems of MEC are neatly based on salient features from the environment and thus the most prevalent system can be interpreted as an instance of a geomorphic FoR.

A word of caution, the neighboring communities of San Pedro Ixcatán, a mestizo village, and Presidio de los Reyes, a Cora village, share exactly the same elevation. Both communities have an altitude of 80 m above sea level. However, Meseño speakers perceive a slight slope in the environment, a difference in the elevation of the landscape that in topographic measures is not registered. With great accuracy they place Ixcatán as being *te* "downhill", which coincides with the west area, and Presidio as being *tepwa/e* "uphill", which coincides with the east area. This suggests that MEC speakers divide their landscape into two areas with respect to the coast and the mountains, in other words, at a geographic scale. They locate Ixcatán as part of the lowlands to the west toward the coast, which has an altitude of 80–200 m above sea level, while they place Presidio as being part of the highlands to the east in an area with 200–400 m above sea level. The fact that MEC speakers divide their territory at a geographic scale involving long distances is an interesting way of partitioning their surroundings culturally and linguistically. Therefore the geomorphic FoR is projected in long distances and does not exclusively gauge the landscape in small-scale space, at least in the case of Presidio de los Reyes. According to language use as well as the B&C stimuli, Ixcatán is then on the coast side, "the lowlands", whereas Presidio is on the Sierra area, "the highlands", although both communities share the same altitude.

Monolingual and bilingual speakers of MEC argue that *tepwa/e* "uphill", which coincides with the east in Presidio, makes reference to the sunrise whereas *te* "downhill", which coincides with the west, makes reference to the sunset. However in the B&C task, they never used the expressions *hé'ininei xɨ́ká* '(where) the sun first appears' (literally '(where) the sun sprouts') or *hé'inkaru'ipi xɨ́ká* '(where) the sun goes down' (literally '(where) the sun sinks') as a kind of absolute axis abstracted from the ever changing path of the sun during the year, or as a kind of a landmark-based system. Both expressions do

not represent the conventional terms used to refer to east or west, respectively in MEC. They are the MEC expressions to describe the events of the sun setting and the sun rising and not directions that are derived from such events. This is further evidence for claiming that spatial orientation descriptions in MEC are mostly based on a geomorphic FoR at least in the B&C linguistic task. Speakers of MEC do undoubtedly make a connection between the solar directions and the "uphill–downhill" system directions, but they do not use the terms periphrastically for referring to landmarks, at least as far as the B&C corpus is concerned.

It seems that Cora languages provide a novel case of a geomorphic FoR. This might be strengthened by the fact that in Mariteco Cora the salient features in the town of Jesús María are both the river and the mountain, whereas in MEC the salient features in the town of Presidio de los Reyes are always the inclined planes of the mountains. Or this feature might be the division of the territory in long-scales locating which community is on the side of the coast and which town is on the side of the great Sierra.

Another interesting anecdotal observation that provides additional clues for the analysis of a geomorphic FoR is the fact that when MEC speakers are transported to unfamiliar places, such as Mexico City, they are quick to learn their present position with respect to other locations they may wish to refer to. And when asked 'How do you know where *yúu=te* or *yúh=tepwa* is?' informants stressed the topography of the landscape, the mountains and the slopes of the terrain. They have never claimed to locate their current position according to either sunrise or sunset. This is additional evidence to argue that the direction terms of the quadrant system of MEC are not solar based. Moreover when Isabel de Jesús López, my Cora teacher, was in Mexico City I took her to visit Xochimilco, which is located south-east of Mexico City in a cardinal direction system, she argued that we were going *mée=te* 'there "downhill"'. Instead my home in Tepepan, which is located southwest of Mexico City, was located according to her MEC coordinate system *méh=tepwa* 'there "uphill"'. This is the mirror image of the setting in Presidio de los Reyes. Recall that in this town *méh=tepwa* is 'there "uphill" roughly east' whereas *mée=te* is 'there "downhill" roughly west'. However, Isabel de Jesús López's MEC coordinate system when located in Mexico City always coincides with a cardinal direction system regarding the east–west axis or the north–south axis. Her MEC coordinate system never failed with regards to the axes. She reversed the east versus the west or the north versus the south axes as a kind of mirror image, but she never reversed directions between the two axes, such as south versus east. Her MEC coordinate system was attested both outdoors and indoors in Mexico City. This fact suggests that there might be an ingredient of an absolute system in the MEC coordinate system described in this article. Therefore associating the cardinal points with the "uphill–downhill" system of MEC might be misleading since there is no systematic correspondence.

Further research based on a comparative study among Meseño communities with different topographical features is needed to approach the debate between an absolute and a geomorphic FoR. Experiments such as the B&C linguistic task and other kinds of experiments have to be done on the other side of the mountain in which Presidio de los Reyes is located to seriously understand this issue. Studies on gesture are also needed to fully test this analysis. It might be that the answer is not a clear-cut distinction but a case of a mixed system in which both categories, the absolute and the geomorphic, coexist within the Meseño region. Nevertheless the results of the B&C communication task conducted in Presidio de los Reyes show that the geomorphic FoR is an essential aspect of spatial descriptions. It represents 46.8% of orientation descriptions of the chair and 28.1% in the general results considering orientation and locative descriptions. It is the most frequently used FoR in the language according to the data collected with the B&C stimuli.

5.3.3. The linguistic devices used for expressing the geomorphic FoR

One of the most interesting features of the geomorphic FoR in MEC is that it can be expressed by means of two different linguistic relators: a system of dependent geomorphic roots, as well as a system of geomorphic prefixes. I will follow the assumption that a 'relator' is the expression of a relation, either between an object and its orientation or between a ground and the location of a figure. According to Bohnemeyer (2010, p. 4) the notion of 'relator' "denotes a large and heterogeneous set of things that includes different categories in different languages–adpositions, case markers, meronyms, particles, and perhaps even verb forms. Relators may be morphologically simple or complex, and they are not necessarily always lexical expressions, but can be syntactically complex as well. Crucially, every relator–except for the topological ones–is assumed to be interpreted in a FoR." The notion of relator applies to MEC with respect to free words such as meronyms, dependent roots, locative adverbs, relational nouns, lexical expressions, postpositions, syntactically complex expressions, as well as to bound morphemes, mainly prefixes conveying geomorphic, intrinsic, vertical and also directional senses. The relators involving intrinsic, vertical and directional senses are fully explained in Section 5.1. The geomorphic relators are discussed in the following section.

5.3.3.1. The system of dependent geomorphic roots and its use in locative descriptions. Relators that express the geomorphic FoR in MEC are part of a set of linguistically dependent roots that are always attached either to a set of deictic or lexical proclitics. These dependent roots occur initially in the clause in the position usually occupied by adverbs, depictive predicates, independent subject pronouns, and many other constituents, which in terms of an X-bar theory correspond to the Specifier node. This analysis differs from the one presented by Casad (1989, p. 121) for Mariteco Cora, who argues that these lexical items are "topographic suffixes" that when combined with "locative particles" form "topographic adverbs". This analysis is not consistent because what Casad calls "particles" are not independent or free words, at least in MEC, thus they are unable to receive suffixation. In my analysis, what Casad calls "particles" are in fact proclitics that may be attached to different lexical classes, one of them being the dependent geomorphic roots. Once they are attached to another constituent, very often

Fig. 10. B&C 2.12.

from the verb class, they can function as free words. However, I do agree with Casad's claim that dependent geomorphic roots, when attached to a proclitic, form geomorphic adverbs. They occur in the same syntactic position of this lexical class and are unable to receive possessive, person or aspect markers typical of the noun and verb classes. An example of such a dependent root that expresses a geomorphic meaning and is used in a locative description is *tepwe* '"uphill in axis two" roughly east', given in (9) (see Fig. 10):

(9) *yúh=**te**-tse* *=pu* ***káhka*** *h+* *pelóota*
side=DHA2-LOC =3SG.SBJ sit TOP ball
'On the "downhill" side is sitting the ball.' (B&C 2.12, A&S, p. 56, locative description; speaker facing North)

It is clear from this example that the speaker is using a geomorphic FoR for locating the ball (the figure) with respect to the chair (the ground). Note crucially that the posture verb *káhka* 'to sit', which is generally used for round objects, does not carry a geomorphic prefix. Locative descriptions expressing a geomorphic FoR never show the presence of a geomorphic prefix in posture verbs and this FoR is interpreted exclusively through the free relator, which functions syntactically as a geomorphic adverb. In the same study about toponyms, Casad (1989, p. 102) notes that "topographic adverbs" are well-rooted grammatically in Mariteco Cora. This is a very astute observation with which I agree absolutely. My analysis of the geomorphic FoR will move one step further in this sense to reveal to what extent the relators expressing this FoR in MEC show a high degree of grammaticalization in the language.

Therefore the generalization that must be kept in mind is that locative descriptions expressing a geomorphic FoR never show the presence of a geomorphic prefix in posture verbs. This FoR is interpreted exclusively through the free relator which functions syntactically as a geomorphic adverb.

5.3.3.2. The system of geomorphic prefixes and its use in orientation descriptions. There is evidence of the geomorphic FoR based on ascending and descending motion verbs that refer to the four directions expressed by geomorphic FoRs in MEC. This evidence reveals the morphological side of the geomorphic FoR based on topographic features. The set of examples from (10) to (17) illustrates the pair with the dependent root and the geomorphic prefix, and an example including only the verb with the geomorphic prefix obligatorily attached to it.

(10) *yúh=**tepwa*** *=pu* *h-o'u-**tá**-me*
side=UHA2 =3SG.SBJ 3SG.SBJ-IT-UHA2-walk
'He is going "uphill" side.'

(11) *h-o'u-**tá**-me*
3SG.SBJ-IT-UHA2-walk
'He is going "uphill".'

(12) *yúu=**te*** *=pu* *h-o'u-**rá**-me*
side=DHA2 =3SG.SBJ 3SG.SBJ-IT-DHA2-walk
'He is going "downhill" side.'

(13) *h-o'u-**rá**-me*
3SG.SBJ-IT-DHA2-walk
'He is going "downhill".'

(14) *yúu=**kɨ*** *=pu* *h-o'u-**ká**-me*
side=DHA1 =3SG.SBJ 3SG.SBJ-IT-DHA1-walk
'He is going "downhill" side.'

(15) *h-o'u-**ká**-me*
3SG.SBJ-IT-DHA1-walk
'He is going "downhill".'

(16) *yúh=**tibi*** *=pu* *h-o'u-me*
side=UHA1 =3SG.SBJ 3SG.SBJ-IT-walk
'He is going "uphill" side.'

(17) ***hánti*** *=pu* *h-o'u-me*
up =3SG.SBJ 3SG.SBJ-IT-walk
'He is going "uphill".'

The examples in (10), (12) and (14) show that each construction with the dependent root can be combined with the geomorphic prefix. On the other hand, the examples in (11), (13) and (15) show that the verb does not need the dependent root for packaging the correct orientation; it can do it exclusively by means of the geomorphic prefix. Except in the case of '"uphill" on axis one', shown in (16) and (17) that does not have a geomorphic prefix on the verb and requires either the dependent root or an adverb meaning 'up', the system of geomorphic prefixes is almost symmetrical and can be schematized as in Fig. 11.[6]

It is relevant to note that the prefix *o'u-* is a complicated issue within the system of geomorphic prefixes in MEC. Its analysis deserves further research for a complete assessment. I will limit myself to say that one of the productive meanings of *h-o'u-/h-a'u-* in MEC conveys an 'itive' morpheme which indicates departure from the deictic center or an indexically determined location, similar to the one described for Ewe (Bohnemeyer et al., 2007, p. 501). This meaning was illustrated in examples (10) to (17), which provide examples of ascending and descending motion verbs in MEC.

A further observation worth making is that in the data collected from the B&C stimuli a group of orientation descriptions involving a geomorphic FoR used exclusively bound relators for orienting a part of the chair. Just in one case a pair of speakers used only the geomorphic prefix to orient the entire chair. I have chosen a pair of examples that are very illustrative of how MEC speakers identify the distinctive parts of the chair. An example of the orientation of the backside of the chair is given in (18). Note that the back legs of the chair are considered its backside which is pointing '"downhill" on axis one' (see Fig. 12).

(18) *tɨ=* *h-o'u-**ká**-kɨtsa*
SBR= 3SG.SBJ-LOC-DHA1-backside
'The one with (its) backside (facing) "downhill"' (B&C 1.6, A&S, p. 21, orientation description; speaker facing North)

In contrast, the front legs of the chair are considered its legs, which in example (19) are facing '"uphill" on axis two' (see Fig. 13).

[6] My analytical approach to the set of geomorphic prefixes differs from the analysis proposed in Casad (1984, p. 371) for these morphemes in Mariteco Cora. This author analyzes this group of prefixes as a set of "attitudinal paths" assigning them glosses and categories such as, *ra-* 'facing away', *ka-* 'down', *ta-* 'across', *tya-* 'in middle', *tyi-* 'up'. Instead, I propose to understand these prefixes in the context of motion and orientation descriptions as a geomorphic category indicating direction toward "uphill" or "downhill" areas in two strong axes. The present work intends to propose an alternative analysis for this set of prefixes in MEC, focusing in particular on the geomorphic FoR so pervasive in this language in orientation descriptions. However, I do agree with Casad's proposal (1989, p. 121) concerning the semantics of "topographic suffixes" in Mariteco Cora, which I call in MEC "geomorphic adverbs".

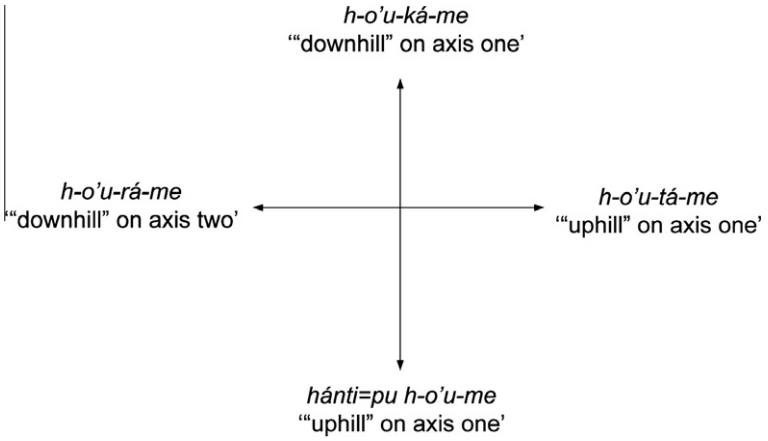


Fig. 11. The quadrant direction system of geomorphic prefixes in MEC.

Fig. 12. B&C 1.6.

(19) *hée mée= =pu h-o'u-**ta**-ɨɨkah-men*
yes there= =3SG.SBJ 3SG.SBJ-LOC-UHA2-leg-PL.INAL
'Yes, it (is) there (with) legs (facing) "uphill".' (B&C 3.5, B&N, p. 74, orientation description; speaker facing North)

Although it is very common to use the strategy of the geomorphic prefix for orienting the parts of the chair, this cannot stand as a generalization because, as I will show in the next section, double marking constructions are a unique feature of MEC orientation descriptions.

The fact that MEC exhibits a system of geomorphic prefixes for expressing motion and orientation descriptions proves that the quadrant system of this language is a highly grammaticalized and morphologized system of relators. Levinson (2003, p. 109) points out that an additional locus for absolute information is verbal affixes and clitics. He cites the case of Central Pomo, which has directional suffixes on verbs that indicate motion up, down, north, south and so on (Mithun, 1999, p. 139). MEC is another language of the Americas that shows this fascinating way of constructing linguistically spatial descriptions.

5.3.3.3. Double marking construction involving geomorphic FoRs and their use in orientation descriptions. As mentioned in Section 5.2, the geomorphic system makes up the lion's share of orientation descriptions in the MEC B&C corpus: 46.8% of the orientation descriptions used this FoR. Likewise, the double marking constructions in which the same information is expressed more than once in a single clause form the greater part of the linguistic constructions used for expressing

the geomorphic FoR in orientation descriptions. These constructions consist of both the geomorphic adverb and the geomorphic prefix. In (20) the back of the chair, called *mu'ú* 'head' in MEC, is oriented by means of this linguistic strategy (see Fig. 14); in (21) the entire chair is oriented using this unique MEC style (see Fig. 15).

(20) *háa=**te*** *=pu* *h-o'u-**rá**-mu'u*
there=DHA2 =3SG.SBJ 3SG.SBJ-LOC-DHA2-head
'It (is) there (with its) head (facing) "downhill".' (B&C 3.5, M&V, p. 90, orientation description; speaker facing North)

(21) *háa=**kɨ*** *=pu* *h-o'u-**ká**-ne*
there=DHA1 =3SG.SBJ 3SG.SBJ-LOC-DHA1-look
'There it is looking "downhill".' (B&C 2.12, B&N, p.12, orientation description; speaker facing North)

As mentioned above, even if the geomorphic FoR, which was used in 46.8% of the descriptions in the B&C corpus, overtakes the direct system by a wide margin, accounting for 25.9% of the descriptions in the B&C corpus, this last system was the second most common for orientation descriptions in MEC. Interestingly, the direct FoR was the most frequent alternative

Fig. 13. B&C 3.5.

Fig. 14. B&C 3.5.

Fig. 15. B&C 2.12.

description in almost all populations for picture 2.12 in Fig. 15, such as is shown in (22). One of the dyads of men, whose ages ranged from 48 to 78, produced a description like that provided in (21). Their strategies were predominantly geomorphic and they very rarely used a direct strategy. The description provided in (22) was also produced by a dyad of male speakers in the B&C task using the direct system.

(22)

mée=pu	*he'e-**bá'a**-tɬpu*
there=3SG.SBJ	DIR-DIR-back

'There it is one (with its) back facing toward us.' (B&C 2.12, A&S, p.55, orientation description)

The last example of this section shows the orientation of the entire chair looking '"uphill" on axis one' (see Fig. 16). The description was also produced by the dyad of men who provided the majority of the geomorphic orientation descriptions in the whole sample of the B&C task. The description in (23) is particularly revealing since there is no double marking construction, it shows only the free relator that I have analyzed as a geomorphic adverb. Recall that the system of geomorphic prefixes is not fully symmetric and lacks a bound relator for '"uphill" in axis two'.

(23)

*méh=**ti***	*tɬ=*	*h-ó'u-ne*	*ɬ'ɬpwári*
there=UPA1	SBR=	3SG.SBJ-LOC-look	chair

'There is one that is looking "uphill", the chair.' (B&C 4.6, B&N, p. 132, orientation description; speaker facing North)

The same observation that was made for the previous picture applies in the case of picture 4.6 in Fig. 16 as well. It was mostly described by all populations using a direct strategy, such as in (24). This description was produced by the youngest dyad of the sample: the teenage male literate speakers.

(24)

háa=pu	***bé'e**-ne*	*hɬ'ɬkwi*	*ɬ'ɬpwári*
there=3SG.SBJ	DIR-look	DEM	chair

'There it is looking toward us, this chair.' (B&C 4.6, B&F, p. 128, orientation description)

To conclude this section, the use of a geomorphic adverb to locate an object is the third most common strategy in the MEC B&C corpus; it represents 13.8% of these descriptions, preceded by topological descriptions with 25.3% of the descriptions and by the intrinsic FoR, which is the most frequent pattern in locative descriptions accounting for 32.9% of the descriptions. These results show a sharp contrast with orientation descriptions in which the geomorphic FoR gets the highest position with 46.8% of the descriptions. I have already remarked that these results might be due to the fact that in locative descriptions, objects in contiguity are described by topological descriptions or by descriptions involving an intrinsic FoR, while objects separated in space are described by utterances involving the geomorphic FoR, such as is concluded for Tseltal by Levinson (2003, p. 154).

Fig. 16. B&C 4.6.

5.4. The relative FoR

The relative FoR in MEC is worth discussing because it is the only FoR that co-exists in single clauses of spatial descriptions with the geomorphic FoR. The relative FoR is defined (Bohnemeyer, 2011) as one in which the anchor is the body of the observer and the ground is a distinct entity. The most common pattern in MEC for interpreting this FoR is based on the autochthonous nouns *ar-ɨ'ɨrinta'a* 'right' and *útata'a* 'left', and even if it does not play a major role in orientation and locative descriptions for the speakers of this language in the B&C corpus, its role is still significant. It represents 16.8% of the orientation descriptions, 9.7% of the locative descriptions and 12.8% within the general results of the corpus produced by the application of the B&C stimuli. Example (25) shows a case in which the orientation of the chair is in an utterance involving the relative use of the noun *há'a-utata'a* 'to your left'. This style, which uses only a relative FoR, is typical of the dyad of teenage male literate speakers (see Fig. 17).

(25)

háa=	*=pu*	*hóu-ne*
there=	=3SG.SBJ	LOC-look
hɨ'ɨkwi	*ɨ'ɨpwári*	***há'a-utata'a***
DEM	chair	2SG.POSS-left

'There it is looking, this chair to your left.' (B&C 4.9, B&F, p. 129, orientation description)

The pair of examples in (26) and (27) show a very common MEC style that low bilingual and monolingual speakers use in orientation and locative descriptions. This example shows an instance of the relative and the geomorphic FoRs occurring in a single description to orient the chair. The pair of examples is especially interesting in the sense that they exhibit a "minimal pair" between two opposite orientations *mée=te* "'downhill" on axis two', *há'a-utáta'a* 'to your left' and *méh=tepwa* "'uphill" on axis two', *ha'a-rɨ'ɨrínta'a* 'to your right'. This pair of examples provides convincing evidence for the alignment between 'left'/'right' and "'downhill" on axis two'/ "'uphill" on axis two' and the referential equivalence between the relative and geomorphic FoRs (see Figs. 18 and 19).

(26)

*mée=**te***	*=pu*	*h-o'u-**rá**-ne*
there=DHA2	=3SG.SBJ	3SG.SBJ-LOC-DHA2-look
há'a-utáta'a		
2SG.POSS-left		

'There it is looking "downhill" to your left.' (B&C 3.9, A&S, p. 84, orientation description; speaker facing North)

(27)

mɨ	*ɨ'ɨpwári*	*méh=**tepwa***	*=pu*
DEM	chair	there=UHA2	=3SG.SBJ
*h-o'u-**tá**-ne*		***ha'a-r ɨ' ɨrínta'a***	
3SG.SBJ-LOC-UPA2-look		2SG.POSS-right	

'This chair it is there looking "uphill" to your right.' (B&C 3.11, A&S, p. 83, orientation description; speaker facing North)

Fig. 17. B&C 4.9.

Fig. 18. B&C 3.9.

We now turn to locative descriptions involving a relative FoR and a geomorphic FoR. In (28) the locative description involves the term *ha'a-utáta'a* 'to your left' for locating the ball. (29) provides an example of locative descriptions including both a geomorphic FoR through the free relator *yúu=te* '"downhill" side, on axis one', and a relative FoR interpreted by the relative use of *ha'a-utáta'a* 'to your left' (see Figs. 20 and 21).

(28)

yue-tse	*p-uihtá*		*watáka*	*hɨ*	*pelóota*
side-LOC	2SG.SBJ-CONJ		sit	TOP	ball
ha'a-utáta'a	*tɨ=*	*=pu*	*tí'i-rɨk-ɨ*		
2SG.POSS-left	SBR.3SG.SBJ=	=3SG.SBJ	INTENS-ASSERT.COP		

'And you (have) a ball sitting on the side that is clearly to your left.' (B&C 1.8, V&M, p. 48, locative description)

(29)

*yúu=**te***	*púhme'en*			
side=DHA2	side			
ha'a-utáta'a	*=pu*	*watáka*	*pelóota*	
2SG.POSS-left	=3SG.SBJ	sit	ball	

'On the "downhill" side it is a ball sitting to your left.' (B&C 2.5, A&S, p. 66, locative description; speaker facing North)

Fig. 19. B&C 3.11.

Fig. 20. B&C 1.8.

As mentioned above, posture verbs do not take part in double marking constructions since they are not licensed to receive geomorphic prefixes; they convey the geomorphic locative description exclusively by means of the free relator, which is the geomorphic adverb *yúu=te* "'dowhhill" side, on axis one'. Thus, the generalization that locative descriptions do not contain double marking constructions with the free and the bound morpheme still holds for locative descriptions involving a relative and a geomorphic FoR.

It is interesting to note that these descriptions involving geomorphic and relative FoRs are exclusively observed in data from monolingual and low bilingual speakers; a fact which suggests the coexistence of both systems. The dyad of young speakers did not produce any descriptions of this type. In quantitative terms in the B&C corpus, out of all of the descriptions including the pure "relative system", the pure "uphill–downhill" system and this mixed type, 9.84% belong to the latter category. This does not represent a marginal strategy. Instead, it is quantitatively relevant to indicate that both systems coexist in the language. Moreover, if we take into account only the descriptions involving both geomorphic and relative FoRs, 26.32% correspond to the orientation type, whereas 73.68% are concentrated in locative descriptions. This suggests that speakers tackled the problem of locating the ball using two FoRs available in the language in one single clause. This mixed type seems to be a powerful tool for a task which speakers considered more difficult to complete than the orientation tasks.

As mentioned above, there seem to be some correlations between different generations of MEC speakers and the rising preference of the relative FoR. Polian and Bohnemeyer (2011) report that in Tseltal projective uses of left and right are

Fig. 21. B&C 2.5.

emerging through contact with Spanish and thus, they observe a significant spread of this FoR through several communities which speak this language. This reflection is also applicable for the MEC speakers living in Presidio de los Reyes in which the dyad of teenage literate speakers is not using the geomorphic FoR and is adopting a relative FoR. In quantitative terms this dyad produced 70.45% of the descriptions using a pure "relative system" involving the native nouns *arɨ'ɨrinta'a* 'right' and *útata'a* 'left'. On the other hand, the rest of the three dyads produced only 29.54% of the total descriptions involving this type of FoR. These results clearly tell us that young speakers are inclining toward a relative FoR. Moreover, quantified results of the use of a pure "uphill–downhill" system are even more revealing because they tell us that young speakers are dramatically losing the geomorphic FoR. They produced only 1.52% of the descriptions involving a pure geomorphic FoR as opposed to the 98.48% which were produced by the three dyads of low bilingual and monolingual speakers. Undoubtedly we are facing a phenomenon of language change and future research will have to show whether the absence of the "uphill–downhill" system in younger speakers is a result of late acquisition or if it is driven by literacy, generation gaps or contact with Spanish. However, I do not consider that these results show that the existence of the relative system is totally marginal in the other three dyads of speakers, 29.54% is a quantitatively relevant piece of data. And if the relative uses coming from this population are the result of language change, this phenomenon is difficult to track because it has been instilled in the language and culture for several centuries. The reasons why this aspect of language change demands a deeper analysis of sociolinguistic parameters that might come into play is beyond the scope of this article and constitutes more research on its own.

For the present work it is important to note that the relative FoR involving the autochthonous terms *arɨ'ɨrinta'a* 'right' and *útata'a* 'left' and the geomorphic FoR coexist in MEC. These FoRs are attested in monolingual and low bilingual speakers that have resided in Presidio their whole lives and have left their community for no more than a couple of weeks. This is convincing evidence for claiming that a robust geomorphic community can also be a significant relative one and it is not right and left blinded.

6. Conclusions

This article contributes to the knowledge of geomorphic FoRs in the Mesoamerican *sprachbund* (Campbell et al., 1986). It introduces a case of a geomorphic FoR consistently symmetric in two strong axes: it has an "uphill" *tepwa/e* and a "downhill" *te* component located on the axis one, as well as *tibi/ti* "uphill" and *kɨ* "downhill" on the second axis. The B&C data in MEC exhibits the coexistence of both geomorphic and relative FoRs in which in a single description both FoR types occur. Both monolingual speakers and bilingual speakers with limited Spanish competency use this unique strategy in orientation and locative descriptions.

Regarding the linguistic devices used for expressing and interpreting the geomorphic FoR, this article discussed the use of a free relator, which corresponds to a geomorphic adverb for locative descriptions. On the other hand, orientation descriptions are based on double marking constructions. They combine a free relator, the geomorphic adverb, and a bound relator, the geomorphic prefix, to accurately identify these kinds of descriptions. The interaction between the geomorphic adverb and the geomorphic prefix in orientation descriptions is supported by evidence from ascending and descending motion verbs.

The fact that MEC exhibits a system of geomorphic prefixes for expressing motion and orientation descriptions proves that the quadrant system of this language is a highly grammaticalized and morphologized system of relators.

I argue that the near absence of a landmark-based FoR in the B&C corpus, either visible such as "facing the mountain", "facing the river", "toward the camera", "toward Verónica (who is videotaping the experiment)", or non-visible landmarks like "toward San Pedro Ixcatán", "toward El Naranjo" might be due to a robust geomorphic FoR based on two strong axes. This FoR is a pervasive and powerful tool to gauge the environment, and represents the most dominant strategy in MEC. Levinson (1996, p. 111) predicted that an "uphill–downhill" system in two strong axes would not need to express directions making reference to landmarks. This is contrary to the system found in Tseltal, in which the east and west axes lack distinctive labels and there is a need to specify a particular direction periphrastically by referring to landmarks.

The physical layout of the experiment might have given the maximal experimental encouragement to thinking in outdoor names of nearby settlements as landmarks around Presidio de los Reyes. Nevertheless, this was not attested at all in the MEC B&C data. This might be a conjecture formulated in the same way in which Bohnemeyer (2011) argues that an important factor which may account for the pervasive use of direct FoRs in Yucatec is that in the B&C task the participants are seated side by side, facing the same direction, and the photographs in front of them give them the fixed angle of the camera onto configurations that are "frozen" in the image space. It is well known that stimuli bias results. But it is also true that despite this negative side of experiments in many fields of science, the application of these stimuli produces findings which in the case of semantic typology reflect linguistic diversity and clarify the different systems available to speakers. Thus I would rather be cautious when fully ascribing unexpected results produced by the stimuli to the setting or the experiment itself and try to consider first the system of the language under investigation.

This article represents a pioneering work in the Uto-Aztecan family and in a Cora language in particular. Future research will have to be developed in order to test the hypothesis whether MEC definitively is a geomorphic language or that it also displays features of an absolute language. Further work is needed to compare and study in depth the topography, the spatial linguistic descriptions and the system of gestures in several Cora communities to fully understand what characterizes space and cognition in Cora language and culture.

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