Does the thunder roll?
Mandarin Chinese meteorological expressions and their iconicity

Abstract
From a typological perspective, Chinese meteorological expressions are argument-oriented. However, using a lexical semantic approach, based on corpus data as well as dictionaries and Chinese WordNet, a taxonomical lexical field can be established to further analyze the basic level items. Five main clusters of meteorological expressions are identified: precipitation, wind, thunder, sunshine and cloud. A comparison of these clusters with frames derived from the English FrameNet shows that Chinese has a narrower conception of weather phenomena than English. There is significant influence from the script on the linguistic system, at least in relation to meteorological expressions. It is shown that Chinese uses iconicity in its writing system where it is lacking in its phonology. A special case study are weather-related ideophones, where two strata are found: those that are phonologically and semantically motivated and receive iconic support from the writing system vs. those that do not receive this support.

Keywords:
Chinese, weather, meteorological expressions, iconicity, ideophones

1. Introduction

Every day we are confronted with one of the most salient phenomena on this planet – the weather. Most people in the world tend to have a morning ritual that includes taking a good look outside or nowadays on our phones to judge what the weather outside is going to be like that day, in order to prepare ourselves both physically (raincoat? umbrella?) and mentally for the day to come. As can be expected with such a pervasive and salient phenomenon, there have been a number of studies that adopt a cross-linguistic approach. The most well-developed typological theory thus far can be found in the works of Eriksen, Kittilä and Kolehmainen (2010; 2012; 2015) in which they aim to propose a threefold cross-linguistic typology with regards to argument structure (see below). Previously, comparative research on meteorological expressions had focused on a specific language family or linguistic area. For the former, they refer to Salo's (2011) studies on Uralic languages among others; for the latter, to Saarinen's (1997) work on European languages and Mettouchi & Tosco's (2011) research on Afro-Asiatic languages (Eriksen, Kittilä & Kolehmainen 2012:383–385).

Partly in response to their study, this paper will analyze the typological traits of meteorological expressions in Mandarin Chinese (Sino-Tibetan, Sinitic), and then adopt an approach that is more grounded in lexical-semantic theories[1] to explore their construal and conceptualization. Below we will investigate if the particular conceptual grouping is motivated by the writing system, and whether there is any iconicity or systematicity (Dingemanse et al. 2015) at play. This will be supplemented by a discussion on Chinese weather-related ideophones, which typically are marked and motivated, to show how they differ from the more arbitrary terms that make up the rest of this study.

2. Methodology

As briefly referred to above, there are three issues that motivate this study: (a) investigating the typology of Chinese weather expressions; (b) exploring their lexical semantics; and (c) relating these findings to the notion of iconicity.

By first considering the place of Chinese meteorological expressions in the framework developed by Eriksen et al. (2010), we show (in section 3) that it makes sense to categorize most of these as argument-oriented constructions. This means that the most salient term, related to the weather, is usually construed as a bounded entity, and needs a processual term (Langacker 1987) in order to become the most frequent and prototypical utterance. For instance, in example (1, section 3), the salient part *yǔ* 'rain' is usually accompanied by *xià* 'down' to form *xià yǔ* 'it's raining'. The data sources for this section comprise available corpora, such as the Simplified Chinese TenTen corpus (Jakubíček et al. 2013) and the Traditional Chinese Gigaword corpus (Graff & Chen 2003), both available at the SketchEngine (Huang et al. 2005; Kilgarriff et al. 2014)[2].

To address the second research question, we consider three lexical semantics approaches. The first approach (section 4.1) is the organization of the argument terms in an onomasiological and paradigmatic lexical field that distinguishes between basic, subordinate, and superordinate levels. These terms in the taxonomy are obtained from the typological investigation, and are supplemented by studies on weather forecasts (Reiter et al. 2005), dictionaries (Luo 1986; Xu 1995; Handian 2004), and online encyclopedia, such as the Chinese version of Wikipedia.

[1] See for instance Geeraerts's (2010) overview.
[2] We value the use of real data. However, this is not a quantitative study of these expressions, but a qualitative exploration.

The second lexical semantics approach (section 4.2) uses the WordNet framework (Fellbaum 1998), to highlight basic relations[3] between the elements in the taxonomy that we establish in the preceding section. Because the data we are considering is small enough in scale, a manual exercise in clustering may reveal what expressions are conceptually similar in Chinese.

The third approach (section 4.3) attempts to extend the syntagmatic dimension even further by comparing the identified Chinese relations to the English FrameNet theory (Fillmore & Atkins 1992; Fillmore 2003), since the Chinese FrameNet is not exhaustive enough at the time of writing. This will provide further grounds for our claim that not only can languages differ typologically as to the constructions used for expressing meteorological events, but also in their lexical semantic construal:

> "Frame theory is specifically interested in the way in which language may be used to perspectivize an underlying conceptualization of the world—it is not just that we see the world in terms of conceptual models, but those models may be verbalized in different ways. Each different way of bringing a conceptual model to expression, so to speak, adds another layer of meaning: the models themselves are meaningful ways of thinking about the world, but the way we express the models while talking adds perspective" (Geeraerts 2010:225–229).

The FrameNet analysis offered is the endpoint of the lexical semantic exploration of Modern Chinese. However, after having established the salient clusters and their difference with English, we propose (section 5) that the writing system is partly responsible for this particular configuration of terms. While we support the importance of spoken language as the fundamental basis for language and language acquisition, it seems unwise to leave the Chinese script out of discussions on Chinese, especially given the claim that Cognitive Linguistics adopts a maximalist approach to language and cognition: *Chinese characters are psychologically and sociolinguistically real for the Chinese*, thinking of texts and utterances as sequences of characters (Chao 1968; Baxter & Sagart 1998:37). For this reason, even though a main concern of this paper is the conceptual organization of the semantics of weather-related basic level items, an etymological section devoted to the development of the formal pole**s** — the phonological form and the written script — is crucial for explaining the identified configurations. This also introduces the notions of iconicity and systematicity (Dingemanse et al. 2015) into the research, ultimately asking how idiosyncratic or systematic and language-internally or -externally supported weather terms are organized. In

[3] The WordNet project tries to describe paradigmatic lexical sense relations. Its basic relation is the *synset*, a relation of near-synonymy between words; or its converse, *antsets*, to describe antonymy. These synsets and antsets are then hierarchically structured according to their hyperonymy and hyponymy relations, and extended with holonymical and meronymical relations. Later applications include their use as a machine-readable dictionary and thus it is mostly used in computational linguistics (Geeraerts 2010:158–160). More recently, other computational models are being explored to semantically group related words, e.g. Word2Vec (Mikolov et al.), although the non-automated WordNet projects still provide more finegrained relations (Handler 2014).

the last section (6), we ask this question also to more marked words, namely weather-related ideophones, in order to find out if there are any notable differences. This is then followed by a discussion and conclusion.

3. The typology of Mandarin Chinese weather expressions

As mentioned before, the main starting point for this investigation is Eriksen, Kittilä and Kolehmainen's sequential cross-linguistic explorations of weather-related expressions. Their first collaboration on this subject (2010) examined a sample of 25 languages across 10 language families for a questionnaire with examples from an additional 29 languages. They devised a threefold constructional typology based on their data of meteorological expressions: predicate-oriented languages, argument-oriented languages, and argument-predicate-oriented languages, which then were further analyzed according to valency relations. In Table 1 these basic encoding types are shown and illustrated with examples from their research.

CONSTRUCTION TYPE	VALENCY VARIATION	EXAMPLE
Predicate-oriented	Atransitive	*No-wande=(mo)* (Tukang Besi, Austronesian) 3R-rain(=PERF) 'It is raining.'
	Expletive	*Det sner udenfor* (Danish, Indo-European) it snow.PRES outside 'It is snowing outside.'
	Intransitive	*Id-dunya ti-shit* (Palestinian Arabic, Afro-Asiatic) ART-world 3F.SG-rain.IMPF 'It is raining.'
	Transitive	*kun harmaa taivas alkoi vihmoa vettä* (Finnish, Uralic) when gray.NOM sky.NOM start.PST.3SG drizzle water.PART '[…] when it started to rain from the gray sky.' (< when the gray sky started to drizzle water)
Argument-oriented	Intransitive	*Palam-i pwu-nta* (Korean, Koreanic) Wind-NOM blow-PLAIN.IND 'The wind is blowing.'
	Existential	*Éxi katejída.* (Greek, Indo-European) have.3.SG strom.ACC.SG.F 'There is a storm.'
Argument-predicate oriented	Transitive: cognate object	Èjí ō-dī rá. (Ma'di, Central Sudanic) rain 3-rain AFF 'It did rain.'

Table 1: Typological framework of meteorological expressions
(taken from Eriksen et al. (2010), with marked weather referent)

This model was then expanded through the addition of a semantically based typology of meteorological events (Eriksen, Kittilä & Kolehmainen 2012), in which they propose a main dichotomy between dynamic and static events. Dynamic events include precipitation (rain, snow, hail, sleet), as well as non-precipitation (thunder,

lightning, wind). Static events, on the other hand, include temperature (hot, warm, cold), atmospheric conditions (humidity), light conditions (daylight, darkness), and sunshine.

EVENT TYPE	METEOROLOGICAL TYPE	EXAMPLES	ENCODING FORMAT
dynamic	precipitation	rain	Argument
		snow	Predicate
		hail	Argument-predicate
		sleet	Generalized precipitation predicate
	non-precipitation	thunder	Argument
		lightning	Predicate
		wind	Argument-predicate
static	temperature	cold / warm / hot	Predicate
	atmosphere	humid / arid	
	light	daylight / darkness	
	sunshine	sunshine	Argument
			Argument-predicate

Table 2: Correlations between meteorological event types and their constructional encoding (Eriksen, Kittilä & Kolehmainen 2012:399)

Table 2 shows that static meteorological events tend to be expressed through predicate-oriented constructions, while there is much more variation in dynamic non-precipitation events and precipitation events. The canonical data of Mandarin Chinese meteorological expressions in examples (1-11) corroborate this observation.

In the category of dynamic events, examples (1-3) show precipitation expressions and (4-6) non-precipitation. Static events are shown in (7-11): (7) illustrates temperature, (8) humidity, while (9) displays light conditions, and (11) sunshine. Below (1-11) we will discuss how they fit in with the typological framework by Eriksen et al. (2010; 2012; 2015).

(1) 下 雨 (了)
xià yǔ le
down rain ASP
“It is raining.”

(2) 下 雪 (了)
xià xuě le
down snow ASP
“It is snowing”

(3) 下 冰雹 (了)
xià bīngbáo le
down hail ASP
“It is hailing.”

(4) 打 雷
dǎ léi
hit thunder
“Thunder is rolling.”

(5) 打 閃
dǎ shǎn
hit lightning
“There is lightning.”

(6) 颳 風
guā fēng
blow wind
“The wind is blowing.”

(7) 夏天 天氣 熱， 冬天 天氣 冷
xiàtiān tiānqì rè dōngtiān tiānqì lěng
summer weather hot winter weather cold
“In summer, the weather is hot; in winter, the weather is cold.”

(8) 不 受 天氣 乾(-燥) (潮)濕
bù shòu tiānqì gān-zào cháo-shī
NEG accept weather dry-arid humid-wet
“Don’t accept whether the weather is dry or wet.”

(9) 晴 天
qíng tiān
clear day
“A clear and sunny day.”

(10) 陰 天
yīn tiān
cloudy day
“A cloudy day.”

(11) 今-天 陽-光 普-照
jīn-tiān yáng-guāng pǔ-zhào
today-day sun-ray all-illuminate
“It’s a very sunny day today.”

Eriksen et al. (2012) claim that so-called static events (7-11) tend to be expressed by predicate-oriented constructions. This seems true for temperature and atmospheric events (7-8). The prototypical events semantically related to light in (9-10), however, are expressed by modification, which does not negate their stativity, (cf. Croft 1991; 2001). Sunshine in (11) does take the form of an argument-predicate construction, with the sunrays (*yángguāng*) shining (*zhào*).

As for the dynamic events, the only example the framework provides of a Sinitic language is Cantonese (Eriksen, Kittilä & Kolehmainen 2010:577), shown in (12-13):

(12) 嗰 天 好似 想 落 雨 咁 (Cantonese, Sino-Tibetan)
go3 tin1 hou2ci5 soeng2 luk6 jyu5 gam2.
CL sky seem want fall rain thus
‘It looks like it’s going to rain.’

(13) 天氣 好 凍 啊

tin1hei3 hou2 dung3 aa3.
weather very cold PRT
'It is cold.'

For some reason, they categorize both examples (and Cantonese) as a predicate-oriented language. While this may be true for the temperature event in (12), it is not true for the precipitation event in (13): *luk6 jyu5* 'fall rain' is a monovalent construction, but it is argument-oriented because it is the noun that semantically refers to the meteorological event[4]. As can be seen in examples (1-6) above, this actually holds for dynamic events in Mandarin Chinese as well.

Another interesting phenomenon illustrated by the Cantonese data is the "*atmospherical subject*", i.e. 'sky', 'weather', 'air' etc. (Eriksen, Kittilä & Kolehmainen 2010:575–577), that is added to the intransitive construction. Examples of this phenomenon are *tin1hei3* 'weather' in (13), and *tiānqì* 'weather' in (7). Bleotu (2012), based on Hayle (2011), goes out of her way to show that these verbs are actually transitive, with an empty PRO-slot in front of the verb and the noun behind the verb. A more convincing theory that only takes into account a surface level might include the acceptance of meteorological expressions as salient yet atypical (Langacker 1991:365), and a cognitive explanation in terms of Reference Point constructions as discussed in Langacker's (2000:84; 2001) Cognitive Grammar framework. It was Givón (2001:119) who noted that meteorological expressions in some languages take the world as the "formal dummy subject", as exemplified in (7) and (13). By adopting the explicatory power of Reference Point constructions, *atmospherical subjects*, but also *temporal subjects* and *locational subjects* can be analyzed this way convincingly and uniformly.

Now that we have placed Chinese meteorological expressions in the typological framework provided by Eriksen, Kittilä & Kolehmainen (2010; 2012; 2015), it is clear that the dichotomy between dynamic and static meteorological events is necessary. Furthermore, the static events tend to be expressed with predicate-oriented or modification constructions. Dynamic events and sunshine, on the other hand, usually are coded by argument-oriented or argument-predicate oriented intransitive constructions. In the remainder of this study, the investigation will focus on the argument(-predicate) oriented constructions, viz. we will not touch upon static constructions (temperature, light, climate) below, in order to facilitate the construction of a lexical field of the WEATHER in Chinese in the next section.

[4] It is very curious that the 'precategorial' parts-of-speech and the 'hidden complexity' of Archaic Chinese and Classical Chinese (Bisang 2008) can be illustrated by yǔ 雨 (< Middle Chinese hjuX < Old Chinese *C.ɢʷaʔ), which used to be both the noun 'rain', as well as the verb 'to rain'. In this sense, Chinese used to have predicate-oriented strategies for dynamic precipitation events.

4. Lexical semantic approaches

4.1. Lexical field

In this section we will construct a lexical field of weather expressions in Mandarin, in the Structuralist sense as discussed by Geeraerts (2010:53–57). This section of lexical field theory studies words through both an *onomasiological* and a *paradigmatic* perspective. While most lexical semantic studies focus on the *meaning* side of a linguistic expression (Geeraerts 2010), an onomasiological perspective deals with the *naming* of certain concepts. A typical example of this are the different terms that exist in the famous study of naming types in German of *Stuhl* 'chair' vs. *Sessel* 'comfortable chair' (Gipper 1959). An advocate of onomasiological research within Cognitive Linguistics, Geeraerts has repeatedly shown that it is a dimension of lexical semantics that should not be left to its own devices (Geeraerts, Grondelaers & Bakema 1994; Geeraerts 2006; Zhang, Geeraerts & Speelman 2015). It is also the perspective that is usually adopted when constructing a lexical field or a taxonomy.

The terms paradigmatic vs. syntagmatic axes of language are borrowed from Saussurean Structuralism. Paradigmatic relations between linguistic signs are associations 'in the void'. Syntagmatic relations "concern the possibility for a lexical element to enter into larger wholes with other elements of the language: compounds and derivations in the morphological realm, and constituents and sentences in syntax" (Geeraerts 2010).

In the development of this paper we will gradually include the other perspectives as well, viz. a gradual shift to the syntagmatic axis can be seen in section 4.2 and 4.3.. The lexical field is presented in Figure 1. Salient phenomena and terms[5] are presented in a box with full lines. Combinations of two weather phenomena are presented with a dashed line, often representing less salient terminology. This is indicated with dashed lines as well. An English translation of the Chinese lexical field can be found in Figure 2, with the same conventions.

[5] This is based on discussions with native speakers of Mandarin Chinese.

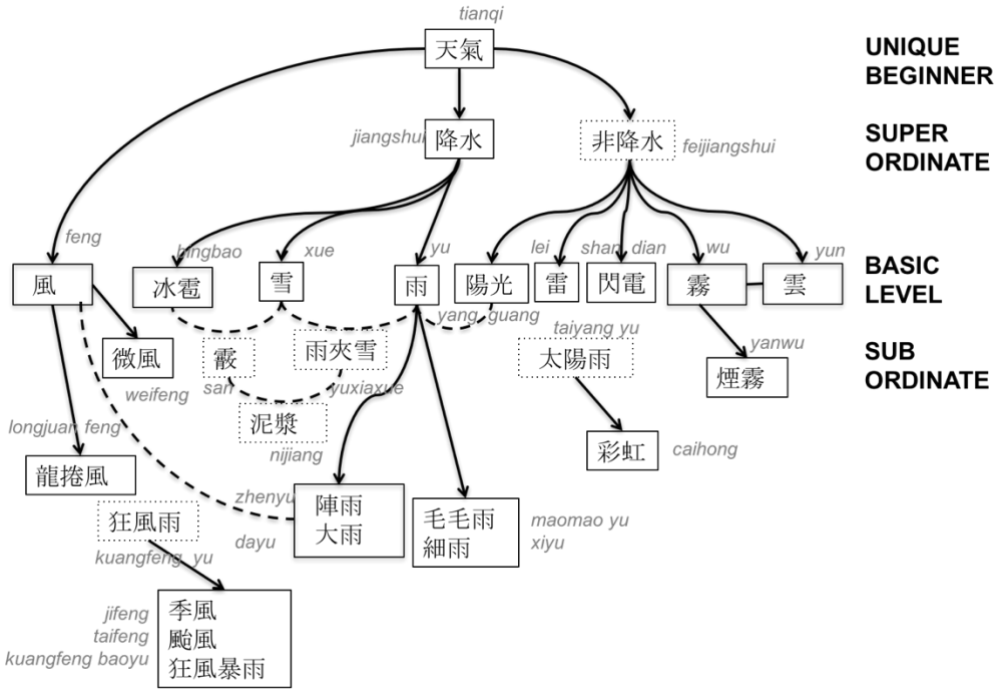

Figure 1. Lexical field of 'weather' in Mandarin Chinese

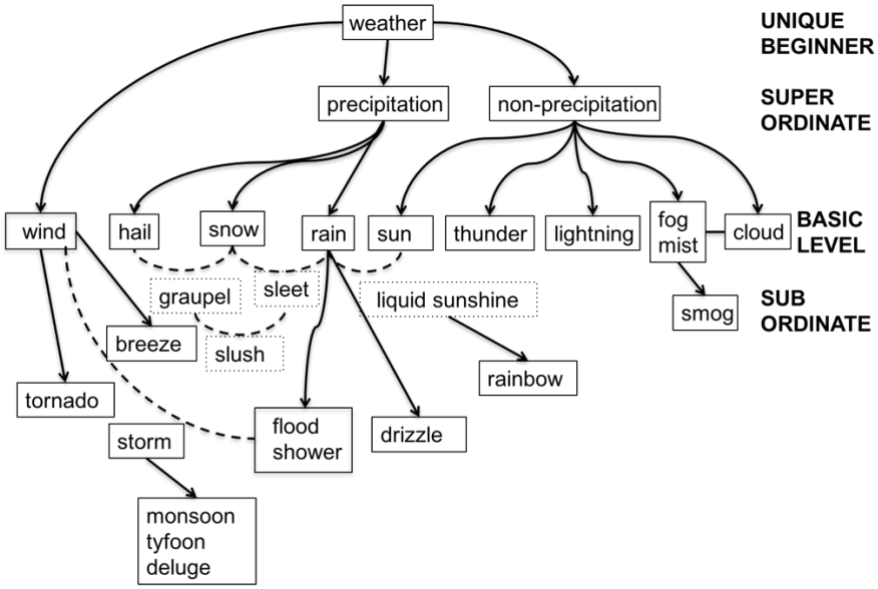

Figure 2. Lexical field of 'weather' in English

As can be seen in the figures above, the lexical field *tiānqì* 'weather' harbours a very rich set of concepts and construals. Because of the argument-oriented nature of dynamic meteorological expressions in Mandarin Chinese (cf. section 4) and the typical way of constructing taxonomies, we are presenting the core arguments of the expressions in their referential or object-like function, in the sense of Croft's cross-linguistic typology theory for basic parts of speech (1991; 2000; 2001). This means that we have chosen to provide 'sun' (*tàiyáng* 太陽) and

‘sunshine, sunrays’ (*yángguāng* 陽光) – nonrelational, stative, permanent, nongradable OBJECTs with REFERENTIAL use (Croft 2001).

It should also be mentioned that the provided lexical field is very likely not exhaustive, but aspires to include the most frequent and most salient weather terms. In other words, it should be possible to discern a basic level in the taxonomy. The basic level hypothesis, first advanced in the 1970s (Berlin, Breedlove & Raven 1973; 1974; Berlin 1976; 1978), argues that taxonomical structures usually organize the lexical items or concepts into multiple levels (Geeraerts 2010:199–203). On top of the structure is the ‘unique beginner’ — the semantic domain one is investigating, in this case WEATHER (*tiānqì* 天氣). Below the unique beginner we find the intermediate level, with PRECIPITATION (*jiàngshuǐ* 降水) and NON-PRECIPITATION (*fēi-jiàngshuǐ* 非降水). Below that is the level where the most salient items that are used on a day-to-day basis reside: the basic level, e.g. rain, snow, thunder, sun etc. This is the level that is the “most inclusive level at which there are characteristic patterns of behavioural interaction, […] for which a clear visual image can be formed, [… with] the most rapid categorization, […] used in neutral, everyday reference” (Cruse 2011:61–63). Below these levels is the subordinate, specific level: it includes combinations of weather phenomena that may not be very salient to most language speakers, e.g. the difference between ‘hail’ and ‘sleet’ may not be obvious to every speaker.

It may be clear that such a taxonomy adheres to the features laid-out above. However, in the lexical field (Figure 1) there are some dubious cases that are arguably more basic than specific, e.g. a rainbow (*cǎihó*ng 彩虹) is a very salient phenomenon, but it will probably not be the first one a speaker of Chinese mentions when asked about the weather. The same goes for ‘stormy weather’ or ‘typhoon’, even though they are quite common in some parts of the Sinosphere, e.g. Taiwan and Southern China.

4.2. WordNet

Now that we have proposed a taxonomy of weather-related lexical items, we will attempt to unravel the relations between the different construals. The WordNet project is suited for this, because it brings us one step closer to a syntagmatic approach, viz. we propose that some items are closer to one another based on shared collocations.

For Chinese, two WordNets are in existence. The first, Chinese Open WordNet (*Hanyu kaifang ciwang* 汉语开放词网) (Wang & Bond 2013–2014) is developed at Nanyang Technological University in Singapore. It relies heavily on the Princeton WordNet, enriched with Chinese lexical units and is used with simplified characters. The second, Chinese WordNet (*Zhongwen cihui wanglu* 中文詞義網路) (Hsieh & Huang 2009–2015) is developed at National Taiwan University. It uses traditional characters and works similarly.

Since none of these Chinese WordNets were 'complete' at the moment of writing, we decided to take the most prototypical lexical structures for the basic level categories as the basis, but to expand them using dictionaries such as *Handian* (2004–2018). The result can be found in Figure 3. More precisely defined relations such as synomymy, meronymy etc. have been reduced to a simple association relation, indicated by a full line between construals. Since we are dealing with a taxonomy, the different clusters do not show a relation of antonymy between each other, nor can it be said that they are synonymous – just different instances of the unique beginner 'weather'.

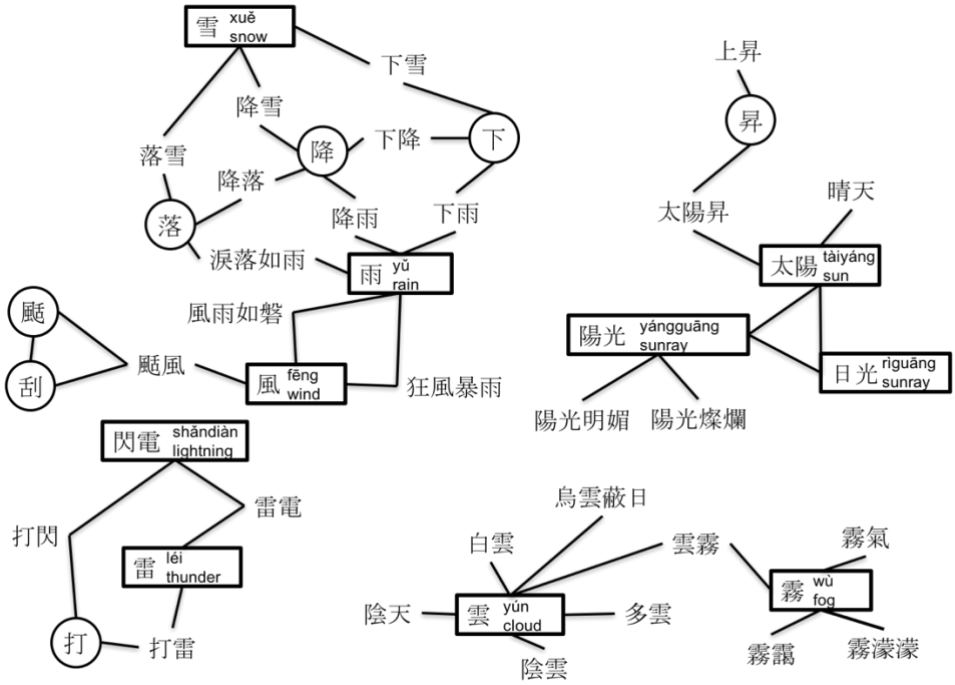

Figure 3. WordNet representation of basic levels of 'weather' in Chinese

Firstly, it should be noted that Figure 3 shows the paradigmatic objects we saw above in Figure 1, as well as some basic syntagmatic expressions discussed in examples (1-11) in section 4, e.g. 'to rain' *xià yǔ* 下雨, 'to thunder' *dǎ léi* 打雷, 'to blow wind' *guā fēng* 颳風 etc.

Based on collocations, we can discern five different clusters surrounding the basic level terms (marked by a thick-lined frame), presented in (14-18). Noun combinations that would belong to the specific, subordinate level (marked by a thin-lined frame) are onomasiological extensions of the basic level items.

(14) Precipitation cluster: RAIN (*yǔ*), SNOW (*xuě*), HAIL (*bīngbáo*)
(15) Wind cluster: WIND (*fēng*)
(16) Thunder cluster: THUNDER (*léi*), LIGHTNING (*shǎndiàn*)
(17) Sunshine cluster: SUN (*tàiyáng*)
(18) Cloud cluster: CLOUD (*yún*), FOG (*wù*)

However, apart from the paradigmatic items surrounding the basic level items, it is immediately apparent that these clusters tend to share the same lexical verbs or construction type. For the precipitation cluster, the verbs are *xià* 下 'down > fall', *jiàng* 降 'descend, drop', and *luò* 落 'fall, drop'. The semantics of these three verbs match the meteorological event of rain and its salient downward motion path. Wind has its own verb *guā* 颳[6] 'blow (wind)', setting it apart collocationally from the precipitation cluster. The thunder cluster is characterized by the verb *dǎ* 打 'hit, beat', which fits in with its semelfactive Aktionsart (Comrie 1976). It is remarkable that the thunder doesn't *roll* in Chinese; instead it *hits* or *beats*! The sunshine cluster, argued to have an argument-predicate construction in section 3, displays verbs like *shēng* 昇/升 'rise', *zhào* 照 'illuminate'. However, when the sunshine is construed more statively, e.g. 'sunny day', we see once more the modifier expression of *qíng*(*tiān*) 晴天 'sunny (day)'. The same goes for what we have called the cloud cluster: a modifier expression in *yīn*(*tiān*) 陰天 'cloudy (day)'.

One could wonder if these expressions and clusters appear similarly in syntagmatic constructions of other languages. In the next section, we will compare the clusters identified in Figure 3 and the examples provided in (1-11) to the FrameNet project (Fillmore & Atkins 1992; Fillmore 2003).

4.3. FrameNet

While a Chinese FrameNet exists, it has not yet reached the exhaustiveness[7] of English FrameNet, which can also be consulted online[8]. The relevant frames for this study include the Weather Frame (*storm*, *rain*, *snow*, *sunshine* etc.), the Precipitation Frame (*rain*, *hail*, *drizzle*, *snow* etc.), the Being Wet Frame (*dewy*, *damp*, *soaked* etc.), the Level of Light Frame (*dark*, *light*, *sunny* etc.), and the Sound Frame (*thunder*). However, there does not seem to be a frame associated with 'wind'.

(19) Weather
Ambient conditions of temperature, precipitation, windiness, and sunniness pertain at a certain Place and Time. Further Specification of the conditions that pertain may also be indicated.
e.g. A blustery STORM **blew in**.
There was a thick BLIZZARD last night.
An armada of HAILSTORMS **swept** through the region.

[6] It should be noted that the Mainland simplification of the traditional character guā 颳 to guā 刮 'shave' may influence the psychological experience and construal of 'blowing wind' (guā fēng) to a metaphorical extension of 'shave wind > blow wind', instead of having a separate construal of 'blowing wind'.
[7] Chinese FrameNet (Hanyu kuangjia wang 汉语框架网) is developed at Shanxi University and can be consulted at http://sccfn.sxu.edu.cn/. At the moment of writing it holds 323 frames, 3947 lexical units (LUs), 20,000 annotated sentences and 200 annotated discourses. However, it is not yet as developed as the English FrameNet, which holds 1223 frames, 13,638 LUs, 174,022 lexicographic annotation sets and 28,207 full text annotations.
[8] Available at http://framenet.icsi.berkeley.edu/fndrupal/. The following definitions are all pasted from the Frames available on this website.

(20) Precipitation

Water in some solid or liquid form (the Precipitation) falls from the sky at a particular Place and Time, lasting for a particular Duration. The Rate or Quantity of precipitation may also be indicated.

e.g. It RAINED in Berkeley yesterday.

(21) Being_wet

An Item is in a state of wetness with the possibility of the wetting Liquid being mentioned, along with the Degree of wetness.

e.g. The mop *is* DRENCHED with water from last night's rain.

(22) Level_of_light

There is a gradable amount of light in a particular Location. In some cases the Source of light may be indicated instead of the Location.

e.g. The small print was bearly readable by the light of the very DIM torch.

Tal flew over the barrier and into the DARK tunnel.

(23) Sounds

This frame is concerned with the percepts that vibrations which travel through the air or another medium produce in hearing organs. […]. A Noisy_event may be mentioned which gives rise to the sound. Alternatively, the sound may be attributed to a Sound_source, which is construed as a point source emitting the sound. […]

e.g. I awoke to the CLASH of a jackhammer on concrete.

The frames shown above discuss the different arguments that can be involved in the linguistic expressions in English that are relevant to the weather. They share the argument that denotes the weather phenomenon and are in this light similar to the Chinese expressions that were analyzed through our exploration of WordNet (section 4.2). However, when these two types of research are compared, it is possible to spot some differences in conceptualization between the two languages. The five clusters and their relation to the frames can be found in Figure 4.

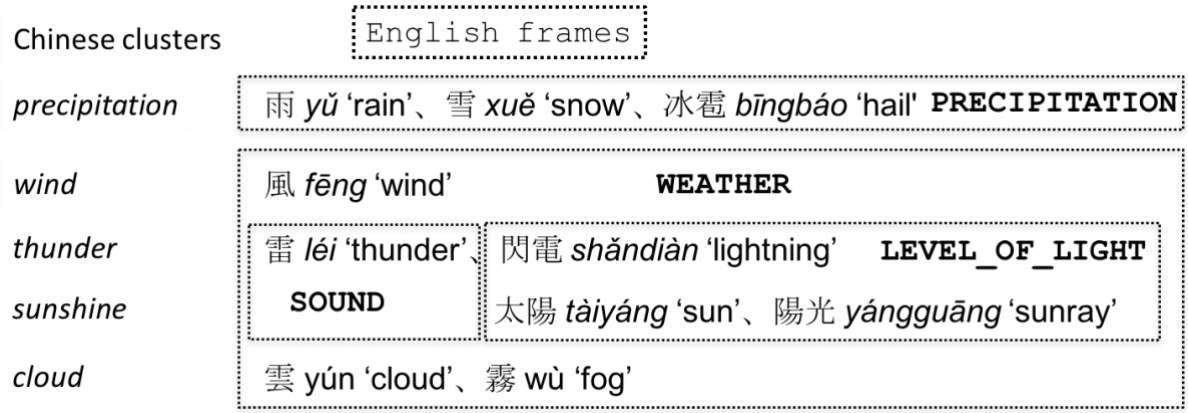

Figure 4. Chinese clusters compared to English FrameNet

In Figure 4 the English frames are grouped together. The five rows of terms represent clusters of basic levels that were marked as the nucleus of an expression in Figure 3. We can see that Mandarin seems to conceptualize them

differently from English, even though weather phenomena are supposed to be similar for us all. In the next section, we explore the possibility that the differences can be viewed as remnants of earlier times and the interplay with the Chinese writing system.

5. Iconicity and cultural influence of the writing system

Cognitive Linguistics can be characterized by three fundamental ideas: the primacy of semantics in linguistic analysis, the perspectival nature of linguistic meaning, and the encyclopedic nature of linguistic meaning (Geeraerts & Cuyckens 2007:5). Part of this encyclopedic perspective of language usage should include the tools and writing system a linguistic community uses. Some studies have argued in favour of this, e.g. Koriat & Levy's (1977) exploration of writing systems, or Komatsu et al.'s (2014) finding that the Japanese *hiragana* is conceived as rounder and softer than the angular *katakana* script. A corpus study of Japanese mimetics recently confirmed this distribution (Akita 2017).

Turning back to Chinese, then, we do not propose equating Chinese spoken language to a study of the written language, but we do believe this interaction between the spoken and written language merits detailed study, especially in lexical semantics. Within the lexical field of WEATHER this level sheds some light on the construal of the different categories outlined above (see Figure 4). For this reason, we turn to the etymology of the basic level items (see Figure 1).

An adequate etymology of Chinese should provide an analysis of the written form, in the way that this is usually done in Chinese or Sinological studies. However, attention should be given as well to the phonological evolution, a dimension of etymology that is unfortunately often overlooked (Baxter & Sagart 1998).

For the semasiological etymologies of the characters, we relied on three sources: the first is the *Shuōwén jiězì* 說文解字 'Explaining graphs and analyzing characters', a second century dictionary whose main contribution to the traditional study of characters is the identification of so-called 'radicals' (*bùshǒu* 部首) or 'functional components' (*piānpáng* 偏旁)[9] —elements that approximately designate the semantic domain of a given lexeme. The correlation is not hermeneutically sealed, but can be inferred within most of the system. The second source is the *Kangxi Dictionary* (*Kāngxī zìdiǎn* 康熙字典), compiled during the reign of the Qing-dynasty Kangxi Emperor (r. 1662-1722). The major innovation of this project lies in the structuring characters according to a set of 214 radicals, a system still used by many modern dictionaries. Both the *Shuowen jiezi* and the *Kangxi Dictionary* are

[9] A good reader-friendly introduction can be found in DeFrancis (1984).

available at the online dictionary *Handian* (2004–2018). However, because they are both naïve classifications which were only aware of contemporary characters and did not include rigorous study (e.g. archeological evidence) on the evolution of those characters, increasingly more experts are elevating the tradition to modern standards[10].

First, we show the character development of the basic level items (Figure 5). The most important stages in the development are *jiǎgǔwén* 甲骨文 ("oracle bones": ca. 14th — 11th century BC), *jīnwén* 金文 (bronze script: ca. 10th century — 500 BC), *xiǎozhuàn* 小篆 (small seal script: ca. 3rd century BC — 200 AD), and *kǎitǐ* 楷體 (regular script: 200 AD — now).

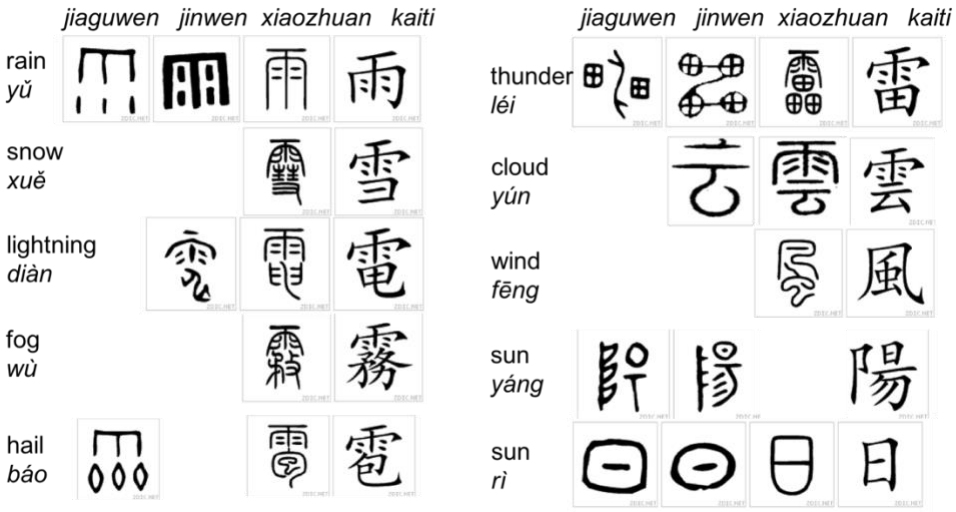

Figure 5. Character development

It is clear that the RAIN radical 雨 dominates the table: 'rain', 'snow', 'lightning', 'fog', 'hail', but also 'thunder' and 'cloud'. The last two of this set merit some explanation. 'Thunder' originally used to consist of two or more connected FIELD radicals, an iconic writing form of a thunderstorm (Lu 2006:135–136). 'Cloud' used to have its own form 云 but was later reanalyzed as 雲 because 云 grammaticalized into a quotative particle ('to state'). It is ironic that in traditional characters the 雲 variant is still in use, while the simplified character is once again 云. The radical for SUN 日 is pictographic. The last radical, WIND, does not have a very well-established etymology, although some etymologists like Chi (2014:898) argue that WIND was written as PHOENIX in older stages, making it a phonetic loan, that was later reanalysed as the functional component 几 (or 凡) (also see example (31) for modern characters). In any case, 3/4 of the table of basic level characters uses the pictographic RAIN

[10] See for instance the works by Liu Zhao 劉釗 (2006) and Chi Hsiu-Sheng (2014), or the more popular science book series edited by Liao Wenhao 廖文豪 (2012; 2014; 2013a; 2013b).

component. This high type frequency suggests that even in ancient times, the Chinese literati saw this as the prototypical marker of meteorological events.

Apart from formal character etymology, which is a widely studied discipline in Chinese departments, we stand behind the view that such studies should also take their phonological development into consideration – a practice still adopted only marginally. This is worth exploring because previous research conducted by Sagart (1999) features case studies of word families in Old Chinese that share the same root but change meaning through affixation. Based on the reconstruction system devised by Baxter and Sagart (Baxter 1992; Sagart 1999; Baxter & Sagart 2014), we present the sound changes in the format Mandarin Chinese < Middle Chinese (MC) < Old Chinese (OC). This is followed by the earliest semantic meaning we could find, based on Liu (2006), henceforth LZ.

(24) rain: 雨 yǔ < MC hjuX < OC *C.ɢʷ(r)aʔ
Water falling down from the skies (一)(LZ:813-814)

(25) snow: 雪 xuě < MC sjwet < OC *sot
Sweeping away (the lower part was originally 彗 'broom') the precipitation (LZ: 815)

(26) lightning: 電 diàn < MC denH < OC *lˤin-s
Praying (申) to the gods for rain, they answer with lightning (LZ: 820).

(27) fog: 霧 wù < MC mjuH < OC *kə.mok-s
Probably a phono-semantic compound from the RAIN-radical and 'troubled eyesight' 瞀 mào < MC maewk < OC *mˤ<r>uk.

(28) hail: 雹 báo < MC baewk < OC *C.bˤruk
Probably a thicker variant of 'rain or precipitation falling down' (own interpretation), later reanalyzed as a phono-semantic compound from the rain-radical and 'wrap, bundle' 包 *bāo < MC paew < *pˤ<r>u.*

(29) thunder: 雷 léi < MC lwoj < OC *C.rˤuj
Praying (申) to the gods for rain, they answer with a sound that resembles wheels (cf. Fig. 5) (LZ:814-815).

(30) cloud: 雲(云) yún < MC hjun < OC *ɢʷən
Cloud (and reanalyzed with the RAIN component) (LZ:819)

(31) wind: 風 fēng < MC pjuwngH < OC *prəm-s
Presumably written with the character for PHOENIX (currently: 鳳), which was pronounced similar (OC *prəm-s) and differentiated after the introduction of the component 凡 (LZ:898)

(32) sun: 日 rì < MC nyit < OC *C.nit
Pure pictogram of the sun (LZ:519)

(33) sun: 陽 yáng < MC yang < OC * laŋ
'high and clear spot / hill' > 'sunny side of a hill' > 'sun'. This became the opposite of the *yīn* 陰 in the well-known pair yin-yang (following Gao & Tu's (2014:1256) argument).

Reconstructing the phonology of the basic level items in (24-33) was necessary because, as previously stated, word families in Old Chinese may emerge. However, the phonological reconstruction did not exhibit any signs of a coherent word family system. Instead, what we have here is a conceptual organization influenced by the writing system, because of its system-internal network of supporting components (as shown above). But is there no systematicity or iconicity reflected in the phonological form of the items? That is a question we attempt to answer in the next section.

6. Iconicity and ideophones

As seen in the previous section, the phonological form of the basic level items in the WEATHER domain did not reveal any discernible method of grouping them together. However, what could be identified were descriptions that arguably served as the reasoning behind the composition of some of the characters. On a higher level, we see conceptual grouping between these lexical items based on functional components (Figure 5). This not only shows that the two systems of spoken language and written language intersect at some points, as was argued in section 5, but that languages can take different strategies to economically adopt measures of iconicity for their organization.

It is worth pointing out that we understand iconicity here as understood in ideophone research (Hinton, Nichols & Ohala 1994; Voeltz & Kilian-Hatz 2001), viz. with lexical items mimicking their referent in one way or the other. This can be called absolute iconicity in the case of onomatopoeia, e.g. *woof-woof* to resemble the barking of a dog. It can also mean relative iconicity or diagrammatic iconicity, e.g. *fuwafuwa* 'fluffy' and *dokidoki* 'one's heart throbbing' (cf. section 5), where the consonants and word structure of the form analogically resemble their referent (Dingemanse 2012; Dingemanse et al. 2015).

In relation to the weather we follow Magnus's (2001) analysis of English phonesthemes: *if* many items in the English lexicon display a level of sound-symbolism, phonesthemes related to meteorological events include /w/ in *snow*, *blow* for dripping and blowing; /l/ in *sleet, slush, flood* for liquid motion etc. They do not necessarily constitute absolute iconicity, but rather a systematic correspondence network *in the phonological system*.

However, the findings from previous sections make it clear that different languages indeed can take on different strategies for their lexical organization. In terms of iconicity, most of the basic level items have an identifiable radical: RAIN 雨/𠫓, SUN 日, WIND 几 (and CLOUD and THUNDER in earlier times). While it is debatable if the WIND radical is iconic or pictographic (cf. supra), it is widely accepted that RAIN and SUN are prototypical

pictographs. These radicals figure as indices in the characters, but do so as stylized icons by themselves. This affords a certain economy in the writing system, viz. an intersection between the conceptual and lexical systems.

This discussion on iconicity leads us to the final topic to be addressed in this paper: how do these different strategies relate to ideophones? Ideophones, cross-linguistically defined as "marked words that depict sensory imagery" (Dingemanse 2011; 2012), tend to be marked in Chinese in their phonological form by partial or full reduplication (Mok 2001; Lu 2006; Meng 2012; Van Hoey 2015), as well as depicting a large set of sensory imagery that includes audition, vision, texture, and feelings among others (Van Hoey 2016; Van Hoey & Lu in prep.).

As the data[11] in ((34)-(38)) shows, Chinese also has ideophones related to the weather. As illustrated below, they are marked by full reduplication ((34), (37)) or partial reduplication ((35), (36), (38)), as well as phonesthemes such as the liquids /l/ and /m/ for liquid motion, or bilabials /f/ and /p/ for heavy rainfall events ((37)-(38)). Furthermore, there is radical support in the written forms: the WATER radical 氵 in ((34)-(35)) and the RAIN radical 雨/雨 in ((36)-(38)).

(34) 淋淋 *línlín* < MC *lim lim* 'streaming and sluicing', 'dash and spatter'
(35) 淋漓 *línlí* < MC *lim lje* 'light drizzle, mizzle'
(36) 霢霂 *màimù* < MC *mweak muwk* 'soaked and steeped, sluicing and spewing'
(37) 霏霏 *fēifēi* < MC *pjɨj pjɨj* 'heavy fall of snow or rain; flurried, pelting'
(38) 霹靂 *pīlì* < MC *phek lek* 'thunderclap, thunderbolt'

Apart from this group of ideophones, it is possible to identify another group of ideophones (presented in (39)-(42)) that are marked in their phonological form but do not fully get the same support in the written form. The 'sound of thunder' in ((39)) adheres to the prototypical reduplication with *lónglóng* but can be preceded by the rhyming *hóng*. It is presumed that the nasals and rounded back vowels iconically depict the thunder. The ideophones for rainfall in ((40)-(41)) display some variation in their written form. However, ((41)) is felt to be more visual because of the usage of xī 希 'scattered, scarce'[12].

(39) (轟)隆隆 (*hōng) lóng lóng* 'sound of thunder'
(40) 唏哩嘩啦 *xīlī huālā* 'streaming and sluicing, heavy rainfall'
(41) 稀裡嘩啦 *xīlī huālā* 'streaming and sluicing, heavy rainfall' + VISUAL
(42) 滴滴答答 *dīdī dādā* 'lighter rainfall, just beginning or about to end'

The two groups of ideophones ((34)-(38)) vs. ((39)-(42)) also differ in the system they belong to, viz. the first group tends to be more literary and more formal, while the second group is more used in spoken language. A

[11] They are gathered from a database project we are working on, provided with a Middle Chinese reconstruction in the Baxter and Sagart (2014) notation, and translated with definition based on Kroll (2015).
[12] Based on informal surveys with native speakers.

similar observation of two strata of ideophones was hinted at by Mok (2001), and further corroborates the discussion on the renewed attention writing systems deserve in lexical semantics and cognitive linguistics in general. A conceptual model that visualizes the tension between the two systems can be found in Figure 6, in which the ideophones in (40) and (47) are used to illustrate the phenomenon.

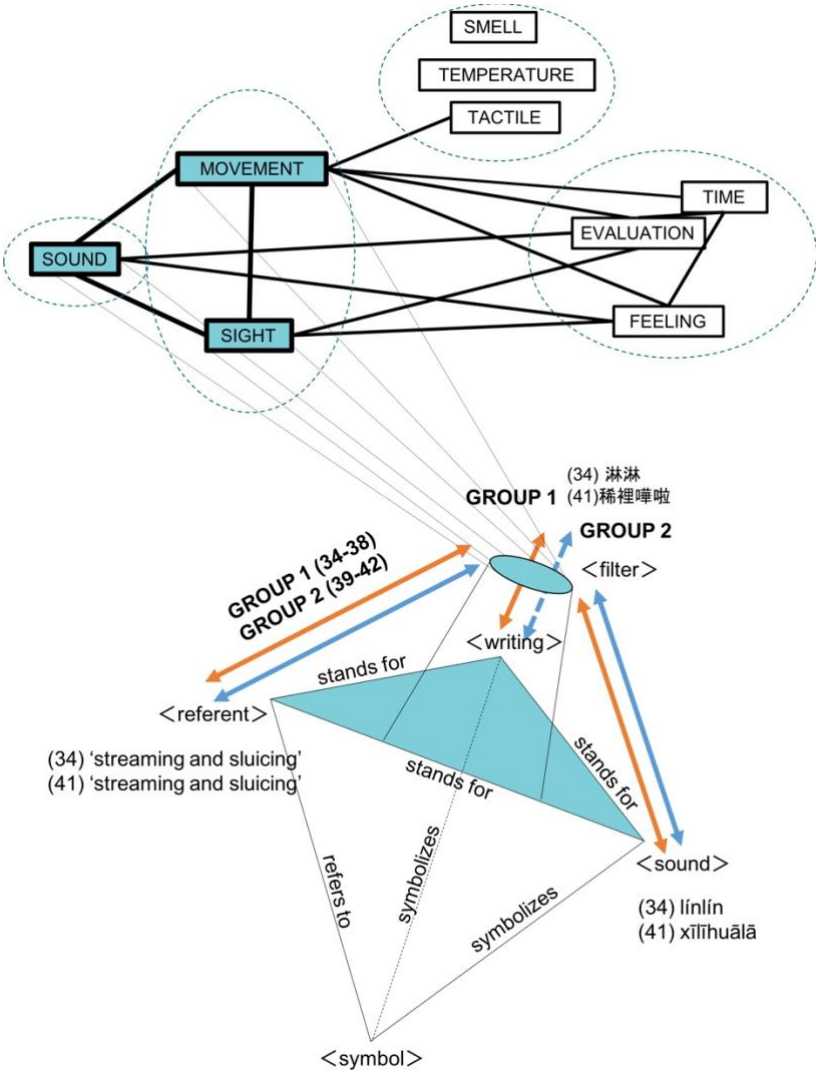

Figure 6: Spinning top model for ideophones

The lower three-sided pyramid in Figure 6 is a conceptual model that was established in Lu's study (2006) for Japanese ideophones and their Idealized Cognitive Models (Lakoff 1987). She noticed a similar interplay between the <writing> system, the <spoken> system, and the <referent>. These three poles share a stand-for relation between each other, and converge in the other pole below, the <symbol>. The model was expanded later (Van Hoey 2016; Van Hoey & Lu in prep.), as a response to the sensory hierarchy for ideophones that was proposed by Dingemanse (2012). The cloud that can be seen on top of Figure 6 is a tentative chart of the different sensory

domains that ideophones in Chinese can express, with the synesthetic links between the different domains marked by a black line. Van Hoey and Lu established this selection of the conceptual semantic map as the language-specific <filter> or <selector> to account for the variation and similarity between ideophones across languages.

In Figure 6 it can then be seen that the ICM of *línlín* ((34)) and *xīlī huālā* ((41)) must connect their sensory imagery (SOUND, as well as SIGHT and MOVEMENT) to the <referent> pole across the <filter>. Because of the markedness of ideophones (by definition, cf. supra) a link can also be posited to the <sound> pole. However, the support offered by radicals in the Chinese writing system is absent in the <writing> pole for ((41)), but it does exist for ((34)). The question should be raised if this semiotic model, named the spinning top model after its shape, can also be applied in other parts of the non-marked lexicon. Based on the discussion above, the answer seems that for the WEATHER domain, this is an effective model.

7. Discussion and conclusion

We began this paper (section 3) with a discussion of the typological framework for meteorological expressions (Eriksen, Kittilä & Kolehmainen 2010; 2012; 2015). It was shown where Chinese meteorological expressions fit within their framework. Contrary to what they proposed for Cantonese, another Sinitic language, we argue that Mandarin is mostly argument-oriented. An exception to this tendency is static meteorological events like temperature, climate or light conditions. It will prove fruitful to compare findings from this research with other Sinitic languages in a synchronic manner, as well as sketching the diachronic evolution of these events. As briefly mentioned in footnote 1, previous stages seemed to code *yǔ* 雨 'to rain' as a predicate *and* as an argument. The evolution of this lexeme and other lexemes deserves more attention.

Drawing conclusions from the argument orientation of Mandarin Chinese weather expressions, section 4.1 attempted the construction of a taxonomy: a paradigmatically organized lexical field. Very clearly, different levels of saliency could be differentiated, with the basic level being the most prominent. Figure 1 shows that this level is occupied by 'wind', 'hail', 'snow', 'rain', 'sun', 'thunder', 'lightning', 'fog, mist', and 'cloud'. While this differentiation into different levels was accomplished with the help of native speakers, psycholinguistic experiments could prove the robustness of this schema. Such experiments could then be used for cross-linguistic comparison and shed more light on how people conceptualize the weather.

For now, however, we exploited the basic levels as described above to look for conceptual clustering based on WordNet approaches in section 4.2. We found that Chinese WordNet provided expressions that are mostly paradigmatic or prototypically syntagmatic, viz. it was possible to discern which basic level items cluster together

based on the verb they share. Since they are argument-oriented, they lack a verb in basic linguistic usage. Subsequently, five different clusters emerged from the data: precipitation, wind, thunder, sunshine and cloud. An interesting and necessary comparison with frame data from the English FrameNet project (section 4.3) revealed that Chinese groups similar phenomena more precisely, in smaller clusters than English. English frames differentiate between two main clusters: precipitation and weather, with special subframes in the weather frame for the level of light ('sunshine') and sound ('thunder'). This finding instigates two questions: how would other languages fare in this comparison? And how can (Chinese) FrameNet be improved to accommodate both language specificity and cross-linguistic descriptive power? This is a question that has been the subject of discussion, e.g. Haspelmath (2010) who disambiguates 'cross-linguistic concepts' as opposed to 'language-specific categories', and requires more studies.

In section 5, the cultural influence of the writing system on the linguistic system was discussed. It should be repeated that we accept the spoken language as the primary system — as is evidenced by countless indigenous peoples worldwide that may not have a writing system, yet do use language. However, in cultures that do have a writing system, this can sometimes influence the primary linguistic system and should therefore not be fully ignored in linguistic research, since it constitutes an integral part of the psychological reality of these language users.

Because the Chinese writing system has been in usage for a very long time (see section 5), it made sense to inspect the etymology of the basic level items related to the weather. However, we argued in favour of including a (reconstructed) phonological evolution *and* a semasiological evolution next to the formal evolution of the written characters. Phonology revealed little to nothing in search of the discovery of a word family. However, it was particularly revealing that five different radicals could be identified in the oldest stages of the characters, but that they later were reanalyzed according to three radicals. These original five radicals are the same as the five clusters identified in section 5. Furthermore, these radicals were argued to function as indices, but by themselves are iconic (pictograms). It was then summarized that there are two strategies for iconic economy that languages can follow: they can display iconic features (as in e.g. phonesthemes) in the phonological form, or, as is the case of Chinese, they can also use the writing system for conceptual organization.

This fact led us to investigate ideophones related to the weather in Chinese, because ideophones are by definition formally marked and often employ phonesthemes. Using the semiotic model recently proposed by Van Hoey and Lu (in prep.), it was possible to account for two strata of ideophones identified in Chinese: one stratum that is both phonologically and semantically marked as well as supported by iconicity in the writing system; the

other in which there is only formal and semantic markedness. The limits of this semiotic model remain to be seen, but at least in the context of the domain of the weather it has proven to be revelatory. The question of iconicity is a fascinating one and deserves more research, not only for meteorological expressions in Chinese but also for other lexical domains, other languages, and other approaches. It is our hope that this study will inspire more research into this domain.

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