

The Fourth Dimension of Modality*

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Abstract

Kratzer (1991) assumes that a modal operator is characterised by three different dimensions: modal force (possibility/necessity), modal base and ordering source, both of them being some sort conversational background. In earlier work, Kratzer (1978, 1981) demonstrates the explanatory power of these three dimensions. Assuming that the ambiguity of modal verbs is due to a difference in the modal bases they select, she is able to account for the different interpretations. Each modal verb can involve two types of modal bases: circumstantial modal bases that consist of the facts of the external world and epistemic modal bases that are made up of the speaker's knowledge. However, in her original proposal she does not become very explicit as to how these modal bases are selected.

In contrast, this paper will account for the ambiguity of modal operators in terms of different types of event modification: whereas circumstantial modal operators turn out to be event modifiers, epistemic modal operators are modifiers that target a higher level, the proposition or even the speech act. Inspired by Hacquard (2006), one could assume epistemic modal operators modify some part of the speech event. Moreover, it will be shown that a fourth dimension of modality is needed in order to capture all the semantic subtleties of modal verbs.

Crucially, this speech event involves the epistemic agent, the attitude holder. In the case of epistemic operators, this epistemic agent serves as the source of modality. As it will be demonstrated, the nature of epistemic modal operators can be most efficiently described by means of a restriction on the modal source, which will be dubbed here *Condition on Deictic Centers* stating that the modified proposition is not part of the deictic center's knowledge. In order to evaluate an epistemic modal operator with respect to the *Condition on Deictic Centers*, the modal source has to be anchored. This process of identification underlies a strict hierarchical constraint: the modal source will always be identified with most local appropriate attitude holder: in case the modal predicate involves an argument specified as attitude holder, this will result in a quotative interpretation such as *wollen* 'want, claim' and *sollen* 'it is wanted, it is claimed' in German; in case there is super-ordinate clause that contains an appropriate attitude holder, the modal source will be anchored to this referent; in any other case the modal source will be linked to the speaker.

1 The modal source and types of event modification

This paper addresses the question how the systematic ambiguity of modal (auxiliary) verbs between a circumstantial and an epistemic interpretation can be accounted for. As it has been observed by Abraham (1991), the aspectual and temporal orientation of the infinitival complement might play a crucial role in this issue. Most of the past approaches suggested so far have turned out to suffer from major shortcomings. The Control vs. Raising Hypothesis in the spirit of Ross (1969), (Jackendoff 1972, 102) is based on the assumption that circumstantial modal verbs always involve control patterns whereas epistemic modal verbs involve raising patterns. As it has been shown by Wurmbrand (2001), accounts of this type fail since there are circumstantial modal verbs that are raising verbs. Other exponents of the Control vs. Raising

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Hypothesis such as Brennan (1993, 27) explicitly concede that there are circumstantial raising verbs like in the case of *ought-to-be* deontics. A different approach has been suggested by Cinque (1999), Wurmbrand (2001), Roberts (2003) and Butler (2003) who argue that the different modal interpretations correspond to different functional categories. Besides some difficulties in accounting for scope relations, they face the major problem in that they cannot account for the behaviour of quotative modals in German at all. Similar objections hold for approaches as well that try to explain the ambiguity in terms of Mental Domains. Sweetser (1990) assumes that modal verbs and related modifiers involve different readings because they can be interpreted in different Mental Domains: Content Domain, Epistemic Domain and Speech Act Domain. Unfortunately, the existence of Mental Domains is hard to prove and it is controversial as to whether the human mind is structured in a corresponding way. Moreover, accounts in the spirit of Sweetser (1990) face analogous challenges similar to approaches that assume a multitude of functional categories, they do not offer an explanation for the behaviour of quotative modals in German. Finally, Abraham (1991, 2001, 2005) and Leiss (2002) assume that the type of modality of the modal verb is determined by the aspect of the embedded infinitive. According to their analysis, perfective infinitive complements favour modal verbs with a circumstantial interpretation, while imperfective infinitive complements trigger an epistemic interpretation of the modal verb. However, Curme (1931, 411) and Leech (1971, 68) have demonstrated that epistemic *may* and *might* can embed eventive (perfective) predicates resulting in a future-oriented reading. In a similar fashion, Fritz (1991, 46) shows that canonical epistemic modal verbs in German are tolerant with respect to the temporal orientation of their infinitive complements: they are compatible with past, present and future-oriented complements. A lot of the examples with future-orientation that Fritz (1991, 46) provides involve eventive (perfective) predicates. Once again, this illustrates that epistemic modal verbs in principle allow for the selection of perfective infinitive complements and the approach elaborated by Abraham (2001, 2005) and Leiss (2002) requires some modification.

This paper here will pick up an idea that has been most prominently developed by Kratzer (1978, 1981). She accounts for the ambiguity of modal operators in terms of different modal bases. In her approach, modal operators involve quantification over sets of possible worlds. The crucial question is how these sets of possible worlds, so called modal bases are determined. If the set corresponds to set of the worlds that is consistent with the speaker's knowledge, the modal operator obtains an epistemic interpretation. If the set corresponds to the set of worlds that are consistent with specific facts of the world (e.g. wishes, laws,...), the modal operator is circumstantially interpreted. Yet, it remains unclear as to how precisely these modal bases are determined. Why are there exactly these two types of modal bases, epistemic ones and circumstantial ones? The analysis elaborated by Hacquard (2006, 138) could be the first step to resolve this riddle. As she argues, the interpretation of circumstantial modal operators is keyed to the event provided by the embedded predicate whereas the interpretation of epistemic modal operators is keyed to the speech act event. Following her analysis, each utterance involves a speech act event which is represented in the structural representation of this utterance. By means of this speech act event, the speaker's knowledge can be accessed. Therefore, a modal operator that takes scope over the speech act event involves a modal base that comprises the set of worlds that is consistent with the speaker's knowledge.

Adopting this sort of analysis, the restrictions on temporal orientation imposed on the complements of circumstantial and epistemic modal verbs can be easily accounted for. Circumstantial modal verbs turn out to be event modifiers that temporally specify future, whereas epistemic modal verbs target the speech act event and ignore the event argument provided by the embedded infinitive.

Furthermore, this paper deals with the question as to how modal operators select their modal bases. As it will be demonstrated, two criteria play a crucial role. First of all, Hacquard's (2006) hypothesis will be supported by showing that circumstantial modal operators are interpreted with respect to the event provided by the embedded predicate and epistemic modal operators are interpreted with respect to the speech act event. Second, it will turn out that the modal source plays a decisive role for the determination of the selection the modal base. As suggested by Kratzer (1991, 649), modal operators involve three dimensions of modality: modal force (possibility, necessity), modal base (circumstantial, epistemic) and a ordering source (deontic, ability, bouletic,...). As will be shown here, modal operators additionally introduce a fourth dimension: the modal source, such as the referent who imposes an obligation in the case of *must*, the referent who grants a permission in the case of *may*, or the referent who has a wish in the case of *wollen* 'want'. In the case of epistemic and quotative modal verbs this modal source serves as deictic center. In turn, this deictic center introduces a set of possible worlds corresponding to its knowledge which function

as modal base. As consequence, the selection of modal base is determined by two criteria: first, by the scope that the modal operator takes, and second, by the modal source.

The remainder of this paper is structured as follows. Section 2 reviews the properties of different modifiers that display an epistemic or related interpretation: epistemic modal verbs, quotative modal verbs, conditionals, causal clauses, VP-adverbs, locative modifiers. Moreover, some diachronic data will be reviewed. Finally, it will turn out that circumstantial modal operators are event modifiers whereas their epistemic counterparts are speech event modifiers. Section 3 discusses a range of potential counter examples and provides some suggestions how they can be accounted for. Section 4 focusses on the modal source and the crucial role it plays for the interpretation of epistemic modal operators. Furthermore, a restriction on the modal source will be introduced which neatly captures the behaviour of quotative and epistemic modal operators.

2 Systematic ambiguities across categories

Epistemic modification is a widespread phenomenon. Roughly speaking, it encompasses all sorts of modifiers that are evaluated with respect to the speaker's knowledge. Typically, they label the modified proposition as an assumption attributed to the speaker. These modifiers can be realised by very different types of syntactic categories such as verbs, adverbs, particles or even adverbial clauses. Any word or complex phrase which exhibits an epistemic interpretation typically occurs with a further interpretation. This non epistemic interpretation involves a high amount of lexical content, as opposed to epistemic modifiers which are canonically semantically bleached. Based on observations made by Sweetser (1990), Sweetser and Dancygier (2005) Wegener (1993), Kratzer (1995, 130), Haegeman (2002, 117), Haegeman (2004), Zimmermann (2004, 256), Maienborn (2004, 162) the upcoming section renders an overview over different types of epistemic modifiers and the properties they have in common.

2.1 Circumstantial and epistemic modal verbs

Epistemic modality has been most extensively investigated with respect to modal verbs or auxiliaries. Initially, the research focussed on West Germanic languages, in particular English, German and Dutch. In the course of time, different suggestions have been developed how to cope with the systematic ambiguity of these modifiers such as the analyses put forth by (Ross 1969, 86), Fourquet (1970), Jackendoff (1972, 102), (Lyons 1977, 791), Kratzer (1978, 1981), Palmer (1986), Öhlschläger (1989), Sweetser (1990), Brennan (1993), Diewald (1999), Abraham (2001), Reis (2001), Erb (2001), Wurmbrand (2001), Nuyts (2001a,b), Butler (2003), and Roberts (2003). Regardless of the different perspectives they take, they all agree that circumstantial modals denote a possibility or necessity in the external world and that epistemic modals refer to some abstract necessity or possibility in the internal knowledge of the speaker. While the circumstantial examples (1a) and (2a) express a duty or obligation in the external world, the examples in (1b) and (2b) denote an epistemic necessity. The speaker is "forced" by his knowledge to assume that the proposition expressed by the non finite complement is true.

- | | | | |
|-----|----|--|------------------|
| (1) | a. | John must work tomorrow. | (circumstantial) |
| | b. | John must be working now. | (epistemic) |
| (2) | a. | Alice muss heute noch lange arbeiten.
Alice must today still long work
'Given the circumstances in her office, Alice has to work until late today' | (circumstantial) |
| | b. | Mitja muss der Mörder sein.
Mitja must the murderer be
'Given my knowledge, Mitja must be the murderer' | (epistemic) |

As it has been pointed out, by Enç (1996, 354), Ziegeler (2006, 83) and Maché (2008, 403), circumstantial modal verbs modify events that will be only completed after utterance time, such as (1a) and (2a). Accordingly, the embedded infinitive complement typically exhibits a future orientation. In contrast, epistemic modal verbs are far less sensitive for the temporal and aspectual specification of their infinitive

complements. In particular, they allow for the selection of predicates that denote unchangeable states or which refer to some past event even in the presence of subject that refers to an determined individual. Under these circumstances a circumstantial interpretation becomes very unlikely if not impossible. In more recent research, the attention was extended to further languages: Germanic languages such as Danish (Boye 2010), Norwegian (Eide 2005) and further Scandinavian languages (Thráinsson and Vikner 1995), Romance languages such as Italian (Milan (2001), Pietandrea (2005) and Hacquard (2006, 31)), French (Hacquard 2006, 25) and Spanish (Demirdache and Uribe-Etxebarria 2008, 1809). As illustrated by Hacquard (2006, 31), the two Italian modal verbs which usually express a circumstantial modality, the possibility modal verb *potere* ‘can’ and the necessity modal verb *dovere* ‘must’ can alternatively be interpreted in an epistemic way, cf. (3) and (4). As for French, Hacquard (2006, 25, 55) provides examples for the possibility modal verb *pouvoir* and the necessity modal verb *devoir* which permit either interpretation, cf. (6) and (5). Moreover, (Demirdache and Uribe-Etxebarria 2008, 1809) point out that this type of ambiguity can be equally found in Spanish. The necessity modal verb *deber* which originally expressed a circumstantial modality admits in addition an epistemic reading, cf. (7).

- (3) Bingley può aver parlato a Jane.
Bingley might have-INF speak-PPP to Jane
‘Bingley might have spoken to Jane’ (epistemic)
- (4) Bingley deve aver parlato a Jane.
Bingley must have-INF speak-PPP to Jane
‘Bingley must have spoken to Jane’ (epistemic)
- (5) Jane a dû prendre le train.
Jane has must-PPP take-INF the train
‘Given J.’s circumstances then, she had to take the train then.’ (circumstantial)
‘Given my evidence now, it must be the case that Jane took the train then.’ (epistemic)
- (6) Bingley a pu parler à Jane.
Bingley has can-PPP speak-INF to Jane
‘Given J.’s circumstances then, she managed to speak to Jane.’ (circumstantial)
‘Given my evidence now, it could be the case that Bingley spoke to Jane then.’ (epistemic)
- (7) Pedro ha debido ganar la carrera.
Pedro has must-PPP win-INF the race
‘Pedro must have won the race.’ (epistemic)

To a smaller extent, modal verbs exhibit such an ambiguity in Slavic languages, in Greek (*prepi* (‘must’) and *bori* (‘may’)) and in other Indoeuropean languages, too. Hansen and de Haan (2009) provide a comprehensive overview. As Drubig (2001) and Butler (2003) illustrate, Modal operators which display an ambiguity between circumstantial and epistemic modality are not restricted to Indo-European languages, but they are also attested in Finnish (*täytyy* ‘must’, *voi* ‘can’), Yoruba (*gbòdó* ‘must’) and Malay *mesti* ‘must’, *boleh* (*jadi*) ‘may’.¹

2.2 English *can* and German *können* – two unlike brothers

In most cases that involve a possibility modal verb, it is pretty hard to determine whether it is interpreted as factive a practical possibility or as an epistemic one. The information they convey is almost identical. Some authors do not distinguish between these two types of possibility. Differing in the availability of an epistemic interpretation only, the English possibility modal auxiliary *can* and its German counterpart *können* render an excellent minimal pair which allows us to identify this very subtle distinction. Being restricted to a non epistemic interpretation, the English modal auxiliary *can* demonstrates what the properties of a

¹In addition, Butler (2003) discusses the modal affixes *-laam* ‘may’ *-ñum* ‘must’ in Tamil. As indicated by Ophira Gamliel (pers. commun.), the situation is far more complex in Tamil and its cognate Malayalam. First of all, Butler (2003) segments the affixes in a wrong way: The modal affix is *aam* rather than *laam*. Moreover, an epistemic interpretation only becomes available if other affixes are involved such as the concessive marker *-aalum*. Thus, it is not clear to what extent the epistemic interpretation is caused by the concessive marker.

non epistemic, practical possibility modal operator are. In contrast its German cognate *können* involves an epistemic interpretation, so it becomes possible to identify what the precise nature of epistemic possibility is.

Such a comparison is very revealing, as it is based on two very closely related languages that only differ minimally with respect to this lexical item. Note that the epistemic reading for *können* is only attested from the 16th century onwards, as it has been pointed out by Fritz (1991, 45), Fritz (1997, 94), and Diewald (1999, 365). The grammaticalisation of its epistemic reading only took place after a couple of centuries after German and English became independent languages.

2.2.1 English *can*

As illustrated by Hofmann (1976, 94), Coates (1983, 85), Sweetser (1990, 62), Brennan (1993, 14) and Drubig (2001, 43), the English modal auxiliary *can* lacks an epistemic interpretation, at least whenever it does not occur in the scope of a negative operator, such as negation. Apart from its ability reading, *can* sometimes obtains a quantificational interpretation, as it has been pointed out by Brennan (1993, 97) based on the observations made by Carlson (1977, 119). In cases like (8), the possibility modal verb serves as an existential quantifier over individuals: among the set of basketball players there exists at least one who is short.

- (8) A basketball player can be short. (circumstantial)

Crucially, utterances which contain quantificational modal verbs are statements about the actual world and not assumptions based on possible worlds. Uttering (8), the speaker indicates that he explicitly knows that there is at least one individual that is a basketball player and that is short. If he does not know that there is such an individual, his contribution to the discourse would be a subtle lie. In a similar manner, *can* can function as quantifier over time intervals, like in (9).

- (9) The lake can be cold. (circumstantial)

Again, any speaker who utters (9) signals to the addressee that he explicitly knows of some time intervals when the lake has been cold. If he does not know, he is acting untruthfully. Both of these quantificational uses indicate that modal operators cannot always be considered as quantifiers over possible worlds. If example (8) was an instance of quantification over worlds, it would be expected that it would be true even if there is no small basketball player in the actual world. More explicitly, existential quantification over worlds expresses that there are some possible worlds where the proposition *a basketball player is short* holds. It does not make a statement about the actual world. Therefore, it predicts that it should be applicable in contexts where there is no small basketball player in the actual world. This is clearly not the meaning of (8). Rather, quantificational modal verbs make statements about the actual world. They express that there is at least one case where the predication about the subject holds. In a similar fashion, the modal auxiliary in example (9) does not involve quantification over possible worlds either. In this particular example, existential quantification over possible worlds would express that there is some world where the proposition *the lake is cold* holds. Since it does not make any statement about the actual world, it would be expected that this utterance is compatible with contexts where the lake never has been cold. Once more, this is counter-intuitive since the modal employed in (9) makes a clear statement about the actual world: there are at least some time intervals when the lake is indeed cold. Similar observations have been made by Brennan (1993, 109) in her discussion about *The Worlds Are too Big Problem*. Summing up, in this section it has been shown so far that it is possible to identify a non epistemic interpretation of modal possibility operators. This possibility interpretation is distinct from other circumstantial interpretations such as ability deontic or volitive reading and it can be described as quantification over elements that are less complex than worlds. It might be due to this peculiarity that quantificational modals do not specify their infinitive complements for future, as opposed to all other circumstantial modal verbs.

In order to investigate the nature of epistemic modifiers, let us turn to distributions where they typically occur. As already mentioned above, a circumstantial interpretation gets less likely whenever the modal verb embeds a predicate that denotes an unchangeable state, similar observations have been made by Barbiers (2002, 59). This type of predicate corresponds more or less to what is referred to as individual level predicate (ILP). Jäger (2001) and Maienborn (2003, 106) suggest refined alternatives to the traditional

conception of ILP that are compatible with the approach outlined here. Whenever the modal verb involves a subject referent which is identified in the discourse and a ILP (10a) or a past related complement (11a), the circumstantial interpretation is ruled out. Likewise Barbiers (2002, 61) argues that there are contexts where modal verbs are restricted to an epistemic interpretation whenever it is combined with an ILP and a subject which is a name.

- (10) a. * Smerdyakov can be the murderer. (circumstantial)
- b. Smerdyakov could be the murderer. (epistemic)
- (11) a. * Smerdyakov can have killed Fyodor Pavlovich. (circumstantial)
- b. Smerdyakov could have killed Fyodor Pavlovich. (epistemic)

check why format is so strange!
HAppens only at this position!?

As these examples indicate, circumstantial modal verbs are not compatible with ILPs or past related complements in the presence of a discourse linked subject referent. This is further confirmed by the fact that if *can* is replaced by its cognate *could*, embedded ILPs (10b) and past related complements (11b) become acceptable. Contrary to the quantificational reading of *can*, the semantic contribution of the modal *could* in the examples above cannot be considered as a statement about the actual world, but rather as an assumption about possible worlds which is undertaken by the speaker.

At this point it becomes possible to draw a clear cut distinction between circumstantial possibilities and epistemic possibilities. While abilities and permissions can easily be distinguished from epistemic possibilities, there are some sort of possibilities which cause much confusion. Most of these cases can be identified as quantificational uses which convey a communicative effect very similar to the one contributed by epistemic possibility modal operators. However, quantificational modals differ from epistemic modifiers with respect to some subtleties. Employing a quantificational modal verb, the speaker makes a statement about the actual world. He indicates that he knows that embedded predication is or was realised in the actual world. Moreover, utterances which contain quantificational modal verbs are compatible with contexts where the speaker knows at utterance time that the embedded proposition is true. This is evident for quantification over individuals. Uttering (8), the speaker will know that *a basketball player is short* holds. Whenever the operator quantifies over time intervals, the proposition need not to be true at utterance time. But in some instances it does and the speaker can even know about it. Consider a context where a scientist has just determined the temperature of a lake, he could say something like *As you can see here, this lake can be cold*. This demonstrates that a proposition in the scope quantificational modal operator can be part of the speaker's knowledge.

In contrast, epistemic modifiers differ drastically with respect to these points. First of all, they do not encode statements about the actual world but rather make assumptions about possible worlds. Second, they do not indicate that the speaker has knowledge about factive realisations of the predication. A sentence like *the lake could be cold* can even be uttered if the speaker does not know whether there was a single moment when the lake was indeed cold. Finally, a proposition in the scope of an epistemic modal operator can never be part of the speaker's knowledge. Similar observations have already been made by Westmoreland (1998, 12), Ziegeler (2006, 90), Fintel and Gillies (2010, 353), Kratzer (2011) and Martin (2011). Generally speaking, it seems that quantificational modals are more informative than epistemic ones with respect to the knowledge the speaker has about the embedded predication. He has to know that there is at least one instance of it which has been realised in the actual world. Epistemic possibility modal operators need not to meet this criterion. Therefore, they are compatible with more utterance situations than quantificational modals are. But the use of an epistemic modal operator always implicates that the modified proposition is not part of the speakers knowledge.

According to Aijmer (1978, 162), it is one of the conditions for a successful act of asserting something that the speaker must believe that what he says is true and have adequate supporting evidence for it. As it seems, epistemic modal operators interact with both aspects: the specification of the evidence for the proposition and commitment to the truth. More precisely, they can be characterised by two essential functions: Relativisation (12a) and Commitment to the Truth (12b). In the case of epistemic modal operators, these functions involve the modified proposition *p* and the speaker.

- (12) Evaluative functions for epistemic modal operators
 - a. Relativisation
 - p is not based on the speaker's direct evidence

b. Commitment to the Truth

the speaker signals that p is consistent with his knowledge

By means of the first function (12a), the speaker labels the embedded proposition as information that is not based on his direct evidence. By means of the second function (12b), he stresses that he does not explicitly know that the modified proposition is false. The strength of the commitment to the truth is determined by the modal force (\Box /necessity, \Diamond /possibility). Crucially, in the case of epistemic modal verbs, each of the two functions is evaluated with respect to the speaker. As expected, both functions apply to the examples of epistemic modal verbs in (11b) and (10b) but not to the quantificational instances in (8) and (9). It is important to stress that epistemic modal verbs are restricted to environments where both functions are satisfied. However, circumstantial modal verbs can occur in similar environments, but most importantly, they are not restricted to such contexts in the way epistemic modal verbs are.

As demonstrated above, *can* fails to embed an ILP whenever it selects a discourse linked subject. This restriction can be extended to the remaining circumstantial modal verbs as well. This has independently been observed by Barbiers (2002, 59). How can this peculiar behaviour be accounted for? Following Kratzer (1995, 126), the essential property of ILP is that they do not involve an event argument whereas stage level predicates (SLP) which make up the remaining group of predicates do. Correspondingly, it is plausible to assume that circumstantial modals do not select ILP since they lack an event argument. Being restricted to the selection of SLP, circumstantial modal verbs could be considered as event modifiers. This is reminiscent of the account elaborated by Enç (1996, 354), who argues that deontic (circumstantial) modal verbs accede the time argument of its embedded predicate and shift it to the future. This could be also related to the *Prohibition Against Vacuous Quantification* as stated by Kratzer (1995, 131) which states the urge of a quantifier to bind a variable. In similar fashion, one could conclude that event modifiers require a predicate which involves an event argument. In contrast, epistemic modal operators are propositional modifiers or even speech act modifiers that modify assertions. This distinction is reminiscent of the one that has been elaborated by Bech (1949) who suggests that circumstantial modal verbs aim at the realisation of the predication encoded by the infinitive complement whereas epistemic modal verbs aim at the reality or validity of the embedded predication.

In this section it has been demonstrated that *can* never has an epistemic interpretation and that it is not compatible with an ILP or past related complement whenever it selects a discourse linked subject. Its cognate *could*, however, allows for the selection of ILPs and past related complements even in the presence of a discourse linked subject and in all these environments it is interpreted epistemically. Moreover, there is strong evidence that circumstantial modal operators are event modifiers since they are restricted to predicates which involve an event argument.

2.2.2 German *kann*

As illustrated in the last section, there are good reasons to analyse circumstantial modals as event modifiers. If this assessment is true, it is expected that there is a correlation between the availability of epistemicity and the ability to embed predicates which lack an event argument. In contrast to the English possibility modal *can*, its German counterpart *können* allows for an epistemic interpretation. According to the hypothesis outlined here, a couple of predictions should hold.

First, if it embeds a SLP a circumstantial interpretation should become available next to an epistemic one. Second, *können* should be acceptable with an ILP or past related complement. Third, whenever it embeds an ILP or a past related complement, the epistemic interpretation should be the only one available. As indicated in (13a) and (13b), all of these predictions seem to be confirmed.

- (13) a. Der See kann kalt sein.
the lake can cold be-INF
'The lake can be cold.' (circumstantial)
'The lake could be cold.' (epistemic)
- b. Der See kann tief sein.
the lake can deep be-INF
'The lake could be deep.' (strongly preferred: epistemic)

The modal verb selecting a predicate which denotes a temporally bounded state (SLP) in (13a) can either be interpreted circumstantially or epistemically. In the circumstantial case, *können* functions as a quantificational modal which quantifies over time intervals, as in the way of its English counterpart *can* in (9). In the epistemic case, it would typically denote an assumption about the temperature of the lake under discussion at utterance time, or about the nature of the lake. Though, most speakers of German would probably prefer the past subjunctive form *könnte* in this context. Nevertheless, *kann* is a viable option.

The predicate *tief* ‘deep’ in (13b), is most typically understood as a temporally unbounded state, hence, as ILP. As predicted, the prevailing interpretation is an epistemic one. A circumstantial reading is almost excluded, it only becomes possible if *können* acts as a quantificational modal verb which quantifies over locations, such as *there are some places where the lake is deep*. As already demonstrated in the other example, the typical speaker would possibly prefer the past subjunctive form *könnte* in the epistemic context. Nevertheless, *kann* is used with an epistemic interpretation, as the examples from the COSMAS II corpus indicate.²

First, there are numerous examples where it is used in the pattern *es kann sein, dass ...* ‘it could be that’ which is according to Doitchinov (2001, 119) one of the rare patterns where a modal verb in German unambiguously exhibits an epistemic reading. It is attested with past related *dass*-clauses (14) and *dass*-clause containing an ILP (15). Second, epistemic *kann* occurs with ILPs realised by an NP such as *Täter* ‘culprit’ (16) and with ILPs realised by an adjective such as *falsch* ‘false’ (17). Third, epistemic *kann* is attested with past related complements (18) and (19). Note that in each of these cases the modified proposition is not part of the speaker’s knowledge, which is the essential criterion for epistemic modality (‘Relativisation’):

- (14) Es kann sein, dass mich die neue Frisur ein wenig schneller und besser gemacht hat.³
it can be that me the new haircut a little faster and better made has
‘It could be that my new haircut enabled me to be faster and better.’ (epistemic)
- (15) Es kann sein, dass Ardi ein direkter Vorfahr ist.⁴
it can be that Ardi a direct ancestor is
‘It could be that Ardi is a direct ancestor.’ (epistemic)
- (16) Vieles spricht dafür, dass der festgenommene Mann der Täter sein kann.⁵
much speaks in.favour that the arrested man the culprit be can
‘There is much evidence in favour of the assumption that the arrested man may be the culprit’ (epistemic)
- (17) Diese traditionelle Schilderung kann allerdings auch falsch sein.⁶
this traditional description can however also false be
‘However, this traditional description may be false as well.’ (epistemic)
- (18) Ich kenne den Täter nicht, er kann die Taten auch begangen haben, um Macht und
I know the culprit NEG he can the crime also commit-PPP have-INF in.order.to power and
Kontrolle auszuüben.⁷
control exert-INF
‘I don’t know the culprit, he may have also committed the act in order to exert power and control.’
- (19) Es kann auch ein zusätzlicher Einsatz-Alarm das Signal überlagert haben.⁸
it can also a additional alarm the signal interfere have
‘An additional alarm could have interfered with the signal.’ (epistemic)

Summing up, whenever a modal verb embeds a ILP or a past related complement which predicates over a discourse linked subject, only an epistemic interpretation will be available. Opposed to that, circumstantial

²The COSMAS II corpus has been composed by the *Institut für Deutsche Sprache* and has a web interface that is accessible at <https://cosmas2.ids-mannheim.de/cosmas2-web/>. The data presented here has been extracted from the annotated archive TAGGED-C which encompasses around 1.4 billion words by the date of the inquiry in April 2011.

³COSMAS II: HAZ09/DEZ.03174 Hannoversche Allgemeine, 21.12.2009

⁴COSMAS II: NUZ09/OKT.00590 Nürnberger Zeitung, 08.10.2009

⁵COSMAS II: RHZ08/FEB.11333 Rhein-Zeitung, 13.02.2008

⁶COSMAS II: WPD/AAA.01884 Leipnizkeks, Wikipedia, 2005

⁷COSMAS II: HAZ09/FEB.00785 Hannoversche Allgemeine, 05.02.2009

⁸COSMAS II: NON09/DEZ.05190 Niederösterreichische Nachrichten, 08.12.2009

modal verbs turn out to be event modifiers that specify the event argument provided by the infinitive as event that is not accomplished at utterance time.

2.3 Volitive and quotative modal verbs in German

The majority of modal verbs in German *können* ‘can’, *müssen* ‘must’, *dürfte* ‘to be allowed’, *mögen* ‘may’, *werden* ‘will’, (*brauchen* ‘need’) turn into epistemic modal verbs in the environment of an ILP or past related complement and a discourse linked subject. Crucially, they label the modified proposition as an assumption undertaken by the speaker.

The remaining two verbs *wollen* ‘want’ and *sollen* ‘shall’ do not fit in this pattern. Similar to their epistemic counterparts, they undergo a shift in their meaning in the distribution of an ILP or a past related complement and a discourse linked subject. But they do not label the embedded proposition as an assumption made by the speaker as canonical epistemic modal verbs do, rather they obtain a quotative interpretation. Contrary to the canonical epistemic modal verbs, quotative modal verbs specify the modified proposition as a claim of the subject referent or of some other referent. They have received a lot of attention so far in past research, cf. Bech (1949, 6, 13), Palmer (1986, 72), Öhlschläger (1989, 233), Fritz (1997, 11), Diewald (1999, 225), Reis (2001, 289), Letnes (2002), Vater (2001), Hetland and Vater (2008, 96) and Schenner (2009). Some authors such as Ehrich (2001, 149) argue that there are even more modal verbs in German which allow for a quotative interpretation, such as *müssen*. Quotative modal verbs also exist in other Germanic languages, such as Danish *skal* (Palmer (1986, 72)) and Norwegian *skulle* (cf. Eide (2005) and Hetland and Vater (2008, 96)).

As soon as it embeds an ILP predicate with a discourse linked subject, *wollen* ceases to denote a volition attributed to the subject referent, rather it specifies the embedded proposition as a claim made by the subject referent. This holds for different types of ILPs, consisting of a NP such as *Täter* ‘culprit’ (20) or an AP such as *106 Jahre alt* ‘106 years old’ (21).

- (20) Er will angeblich der alleinige Täter sein.⁹
 he wants reportedly the sole culprit be-INF
 ‘He claims to be the sole culprit.’
- (21) Badhapur ist ein Sadhu, ein Weiser, Gerechter. 106 Jahre will die hagere Gestalt mit dem
 Badhapur is a Sadhu, a sage righteous 106 years wants the rawboned figure with the
 langen grauen Haar schon alt sein.¹⁰
 long grey hair already old be-INF
 ‘Badhapur is a Sadhu, a wise a righteous man. This rawboned figure with long grey hair claims to be 106 years old already.’

In a similar fashion, *sollen* does not obtain its circumstantial interpretation any longer whenever it selects an ILP with a discourse linked subject referent. Rather, it is interpreted as a claim by an unspecified referent that is not identical to the referent expressed by the subject:

- (22) Tom Cruise und Katie Holmes sind geschockt. L. R. Hubbard (kl. F.) soll Suris
 Tom Cruise and Katie Holmes are shocked L R Hubbard (small picture) shall Suri-GEN
 Vater sein.¹¹
 father be-INF
 ‘Tom Cruise and Katie Holmes are shocked. L. R. Hubbard is claimed to be Suri’s father.’
- (23) So soll das Kokain einen Reinheitsgehalt von 80 bis 90 Prozent besitzen und ca. 40
 so shall the cocaine a purity.degree of 80 to 90 percent have and about 40
 Millionen Euro wert sein.¹²
 million Euro worth be-INF
 ‘According to this, the cocaine is claimed to have a purity degree of around 80 or 90 percent and worth about 40 million Euro.’

⁹COSMAS II: HMP09/NOV.00548 Hamburger Morgenpost, 05.11.2009

¹⁰COSMAS II: NUN99/OKT.02110 Nürnberger Nachrichten, 23.10.1999

¹¹COSMAS II: HMP08/JAN.00616 Hamburger Morgenpost, 08.01.2008

¹²COSMAS II: NON10/FEB.11326 Niederösterreichische Nachrichten, 17.02.2010

Furthermore, *wollen* and *sollen* turn quotative if they embed past related complements with a discourse linked subject. Again, the proposition modified by *wollen* will be interpreted as a claim made by the subject referent, and the one modified by *sollen* as somebody else's claim.

- (24) Sieben Packerl Rotwein will er vor dem Prozess konsumiert haben.¹³
 seven packets red.wine wants he before the process consume-PPP have-INF
 'He claims to have consumed seven packets of red wine prior to the process.'
- (25) So will sie eine "Depression mit psychotischer Färbung" bei Pleger erkannt haben.¹⁴
 So wants she a depression with psychotic color at Pleger recognise-PPP have-INF
 'Accordingly, she claims to have attested a depression with psychotic imprint in the case of Pleger.'
- (26) Sein Landsmann Frederick Albert Cook will bereits am 21. April 1908 dort gewesen sein.¹⁵
 his countryman Frederick Albert Cook wants already at 21 april 1908 there be-PPP be-INF
 'His countryman Frederick Albert Cook claims to have already been there on 21th april 1908 already.'
- (27) Horst Seehofers Ex-Geliebte Anette Fröhlich (35) soll den CSU-Chef laut "Bunte"
 Horst Seehofer-GEN ex-lover Anette Fröhlich (35) shall the CSU-head according.to Bunte
 zuletzt in Berlin "regelmäßig und lange" besucht haben.¹⁶
 recently in Berlin regularly and long visit-PPP have-INF
 'According to the "Bunte", Horst Seehofer's ex-lover Anette Fröhlich is claimed to have regularly visited the CSU head in Berlin recently and for long periods.'
- (28) Während eines Gottesdienstes soll sie sich einmal an seinem Messgewand festgekrallt
 during a church.service shall she REFL once on his liturgical.vestment cling-PPP
 haben. Im Beichtstuhl soll es sogar zu einem "Annäherungsversuch" gekommen sein.¹⁷
 have-INF in.the confessional shall it even to a advance come-PPP be-INF
 'During a church service, she is claimed to have clinged to his liturgical vestment. She is said to have made an advance in the confessional.'

At this point, the question arises as to why *wollen* and *sollen* differ drastically from the remaining modal verbs with respect to their interpretation. The solution is rather simple. According to Bech (1949, 5, 11), both verbs exhibit volitional semantics. Whereas in the case of *wollen*, the volition is attributed to the subject referent, the volition is attributed to a referent different to the one encoded by the subject argument in the case of *sollen*.

In order to illustrate the semantic core of epistemic modal verbs, Sweetser (1990, 60) circumscribes them in terms of modal force dynamics. An epistemically modified utterance such as *You must have been home last night* could be paraphrased as 'the available (direct) evidence compels me to the conclusion that you were home'. In a sketchy way, a deontic necessity could be rephrased as 'x compels y to do z' whereas an epistemic possibility roughly corresponds to a statement like 'the evidence compels the speaker to add z to the his knowledge'. Likewise, the modal volition can be circumscribed in a similar way. In its canonical volitional use, *wollen* roughly means 'x wants to do z; where x = subject' whereas its volitional cognate *sollen* is more or less interpreted as 'x wants to do z; where x ≠ subject', in the spirit of Bech (1949, 11). Analogously to necessity modal verbs, the non epistemic uses of *wollen* and *sollen* involve an action or event. Contrary to this, their quotative uses behave in a similar fashion as the remaining epistemic modal verbs do: they evaluate the factivity of a proposition. While quotative *wollen* roughly amounts to the interpretation 'x wants to add z to the speaker's knowledge; where x = subject', quotative *sollen* means more or less 'x wants to add z to the speaker's knowledge; where x ≠ subject'. In a similar fashion, Bech (1949, 6) suggests that *wollen* expresses a wish attributed to the subject referent which aims at either the realisation (volitional) or the reality (quotative) of the embedded predication. Furthermore, Bech (1949, 13) argues that *sollen* denotes a wish attributed to a referent different from the subject referent which aims at either the

¹³COSMAS II: NON09/JUL.08001 Niederösterreichische Nachrichten, 15.07.2009

¹⁴COSMAS II: NON09/JUL.02654 Niederösterreichische Nachrichten, 07.07.2009

¹⁵COSMAS II: RHZ06/NOV.30695 Rhein-Zeitung, 30.11.2006

¹⁶COSMAS II: HMP09/JUN.01135 Hamburger Morgenpost, 14.06.2009

¹⁷COSMAS II: A09/FEB.04884 St. Galler Tagblatt, 18.02.2009

realisation (volitional) or the reality (quotative) of the embedded predication. A similar circumscription has been suggested by Diewald (1999, 226).

Two things become evident now: first of all, quotative meaning can be derived from volitional modal verbs in the same manner as canonical epistemic meaning derives from deontic or other circumstantial modality. Likewise, this is reflected by the fact that volitive and deontic modal verbs are restricted to predicates which involve event arguments with future interpretation. On the contrary, epistemic and quotative modal verbs do not exhibit this restriction. Both of them allow for the selection of predicates which denote unchangeable states (ILPs) and complements with past meaning even if they are combined with discourse linked subjects. Second, in either interpretation, *sollen* reflects the behaviour of *wollen* denoting a wish that is attributed to a referent different from the subject referent. In the volitional interpretation this wish is aimed at the realisation of an event, whereas in the quotative interpretation it is aimed at the validity of the proposition, roughly speaking. As a consequence, quotative modality can be entirely derived from volitional modality. For both verbs there is an urge to keep their quotative interpretation apart from canonical epistemic interpretations that encode an assumption by the speaker. First of all, as already noticed by Reis (2001, 294, 296), quotative modals occur more readily in distribution where epistemic modals are rather bad, such as in non-finite environments or in questions. This becomes most obvious with adverbial infinitives which cannot involve epistemic modal verbs, but quotative ones, as indicated by the examples given below (29). Second, either of these verbs has an additional epistemic reading apart from its quotative interpretation.

- (29) Ohne das Finale von "Casablanca" jemals gesehen haben zu wollen, läßt Schlesinger seine
without the final fo Casablanca ever see-PPP have-INF to want let Schlesinger his
bittersüße Romanze wie ein Remake mit der Bergmann-Tochter ausklingen. Wer's glaubt
bittersweet romance as a remake with the Bermgann.daughter die.away the blood.empty
wird selig, der blutleere Versuch eines romantischen Thrillers wird dadurch allenfalls
attempt
nostalgisch.¹⁸

'Despite Schlesinger claims that he never saw the end of "Casablanca", his bittersweet romance ends as if it was a remake with Bergmann's daughter - Schlesinger's claims are hard to believe and his attempt to create a romantic thriller brings about a resonance of nostalgia.'

There are uses of *wollen* with an inanimate subject referent which cannot be interpreted as a claim that is attributed to the subject. These uses of *wollen* are very much reminiscent of the concessive epistemic interpretation of *mögen*, as it has been discussed by Bech (1949, 23), Welke (1965, 110), Allard (1975, 69,70). Diewald (1999, 236) explicitly analyses these interpretations as epistemic ones; Öhlschläger (1989, 187) is more doubtful about such an attempt. In analogy to the concessive epistemic use of *mögen*, *wollen* occurs in concessive clause in the example (30) and (31), more specifically in a *zwar/doch* pattern. In this context, *will* can be interpreted as an assumption with concessive resonance, such as in the case of *mögen*. In the clause given below, *will* could also be interpreted as a claim by some salient referent, such as *die Volvo-Leute* 'the Volvo people'.

- (30) Der etwa 69 800 Mark teure Cross Country [...] will zwar kein Geländewagen sein,
the about Mark expensive cross country wants although no all-terrain.vehicle be
doch in seiner Nähe sehen ihn die Volvo-Leute schon.¹⁹
but in his closeness see him the Volvo-people yet
'Though the Cross Country that costs 69 800 Mark might not be an all terrain vehicle it is considered by the Volvo people as something comparable.'
- (31) Warum hat Schwenker, wenn es tatsächlich so gewesen sein wollte, das nicht gleich
why has Schwenker if it indeed so be-PPP be-INF wanted that NEG immediately
erzählt?²⁰
told
'If it should have indeed been like that, why hasn't Schwenker immediately told it?'

¹⁸NUN93/SEP.01173 Nürnberger Nachrichten, 17.09.1993, S. 21

¹⁹COSMAS II: M97/712.03322 Mannheimer Morgen, 10.12.1997

²⁰COSMAS II: HMP09/DEZ.00650 Hamburger Morgenpost, 07.12.2009

Alternatively, the use of *wollen* in (30) could be analysed as metaphorical use of the quotative control verb variant, where the inanimate subject is anthropomorphic entity. However, under such an approach it remains unclear how the concessive resonance comes about. Likewise, *sollen* can encode an assumption by the speaker, as it has been already observed by Bech (1949, 16), Glas (1984, 104), Öhlschläger (1989, 236 Fn. 223) and Fritz (1997, 107). In all these cases, *sollen* does not necessarily refer to a claim by a salient referent. Rather, it is also consistent with an interpretation where the embedded proposition is a result of the speaker's reasoning. Such an interpretation is never possible with quotative modifiers. In all of the examples (32)–(34), the most plausible reading as one where *sollen* expresses a pure conclusion of the speaker.

- (32) Denn in vierzehn Tagen sollte es mit Kälte und Frost theoretisch vorbei sein.²¹
 since in fourteen days shall-SBJ.PST it with cold and freeze theoretically over have-INF
 'Since, theoretically, in these fourteen days the cold and the freeze should have already gone.'
- (33) Das Software-Problem sollte aber mittlerweile behoben sein, wie SBB-Sprecher
 the software-problem shall-SBJ.PST but meanwhile resolve-PPP be-INF as SBB-spokesman
 Jean-Louis Scherz sagte.²²
 Jean-Louis Scherz said
 'The software problem should be resolved by now, as indicated by the SBB-spokesman Jean Louis Scherz.'
- (34) Selbstbewusstsein sollte eigentlich auch bei der SG Unnertal in Massen vorhanden
 self.confidence shall-SBJ.PST actually also by the SG Unnertal in masses present
 sein.²³
 be-INF
 'SG Unnertal should actually have plenty of self confidence.'

Interestingly, these epistemic readings with *sollen* are only available with past subjunctive morphology. This behaviour is reminiscent of the case of *dürfen*, which can only be interpreted epistemically when inflected for past subjunctive. This is on a par with other observations made by Bech (1949, 37) that indicate that *sollen* and *dürfen* behave analogously in many respects.

Apart from these morphological peculiarities, epistemic *sollte* also exhibits a semantic peculiarity, just like its English counterpart *should*. As observed by Copley (2006, 11), epistemic *should* is only acceptable if it refers to remote evidence. In a scenario where the speaker sees that the lights are turned on in the guest's house uttering the sentence (35) would not be appropriate, whereas *must* would be. Copley's observation can neatly be extended to German (36).

- (35) Our guests should be home by now.
- (36) Unsere Gäste sollten mittlerweile schon zuhause sein.
 Our guests should meanwhile already at.home be-INF
 'Our guests should be home by now.'

This peculiar restriction on the type of evidence is also reflected in the examples above. In each case, the speaker does not have immediate evidence for the validity of the embedded proposition. Rather, he has some past evidence upon which he is drawing a conclusion at utterance time. This partially reflects the behaviour of volitional *sollen* with past subjunctive morphology. Similar to its counterpart with indicative morphology, the pattern *sollte* + infinitive expresses a volition by a referent who is not identical to the subject referent. However, in opposition, it entails that the proposition encoded by the infinitive is not realised at utterance time. This 'counterfactuality entailment' is somewhat reminiscent of what Bhatt (1999, 173) and Hacquard (2006, 29) call 'actuality entailments'. Whereas in the volitional interpretation of *sollte* it is the actuality of the embedded proposition at utterance time that is negated, it is the availability of direct evidence at the utterance time in the case of epistemic *sollte*. Accordingly, it is not likely that the epistemic interpretation of *sollte* derives from the quotative use of *sollen*. Rather, the epistemic uses of *sollte* grammaticalised from its volitional counterpart that is inflected for past subjunctive.

²¹COSMAS II: O98/MAR.21556 Neue Kronen-Zeitung, 05.03.1998

²²COSMAS II: A09/DEZ.04148 St. Galler Tagblatt, 14.12.2009

²³COSMAS II: RHZ99/AUG.20012 Rhein-Zeitung, 28.08.1999

This section has illustrated that some languages such as German additionally involve quotative modal verbs. Though they resemble epistemic modal verbs in some respect they have to be kept apart from them. This distinction becomes necessary since there are at least two modal verbs in German, *wollen* and *sollen*, that exhibit a quotative and an epistemic interpretation at the same time. In a similar fashion, Ehrich (2001, 149) argues that *müssen* also involves independent quotative and epistemic readings.

There is one more crucial point where quotative modal verbs differ from their epistemic counterparts. Recall the two functions that determine epistemic modal verbs: Relativisation and Commitment to the Truth. As for epistemic modal verbs, both functions are evaluated with respect to the speaker. Since quotative modal verbs introduce an EXPERIENCER argument, there is another attitude holder that is available as potential candidate for the evaluation of the two functions. In the case of *wollen* the EXPERIENCER argument is grammatically realised as the subject, in the case of *sollen* as another covert argument. Accordingly, it is less evident for quotative modal verbs in respect to which referent the two functions are interpreted.

As for the Relativisation, the relevant referent seems to be the speaker again. In uttering a quotative modal verb, the speaker indicates that the embedded proposition is not an information that is based on his own direct evidence. However, the Commitment to the Truth is not evaluated with respect to the speaker in the case of a quotative modal verb. As pointed out by Faller (2011, 4), a speaker who employs a quotative use of *sollen* does not make any commitment about the truth of the embedded proposition: he might believe it, he might not believe it or he might even know that it is false. In a similar manner, Ehrich (2001, 157) has pointed out that the speaker can reject the validity of a proposition that is embedded by quotative *sollen* and that this is impossible with propositions embedded by an epistemic modal verb. Diewald (1999, 228) indicates that quotative *wollen* occurs even more frequently in contexts where the speaker raises doubt about the validity of the embedded proposition. Accordingly, the speaker is not at all committed to the truth when employing a quotative modal verb. This conclusion is further confirmed by Öhlschläger (1989, 235), but what about the referent of the EXPERIENCER argument? Diewald (1999, 225) argues that it is exactly this referent who evaluates the proposition with respect to the truth. According to her view, the referent of the EXPERIENCER argument labels the embedded proposition as [- non-factive]. A lot of examples can be found where the subject referent of *wollen* is completely convinced about the truth of his claim. Similar arguments apply to *sollen*, too. It seems then that the semantic peculiarities of quotative modal verbs can be more appropriately captured in terms of a commitment to the truth rather than in terms of non factivity. As it turns out, a suitable description of quotative modal verbs can be obtained assuming that it is the referent encoded by the EXPERIENCER argument who makes the commitment to the truth, as illustrated in (37b). Correspondingly, the semantic behaviour of epistemic and quotative modal verbs are characterised by the same sort of functions that only differ with respect to the instantiation of the referents.

(37) Evaluative functions for quotative modal operators

- a. Relativisation
 - p is not based on the speaker's direct evidence
- b. Commitment to the Truth
 - the referent encoded by the EXPERIENCER argument signals that p is consistent with his knowledge

This formulation of the semantic contribution of quotative modal verbs is obviously not precise enough and requires further refinement. In particular, the question arises as to what extent a proposition that is embedded by a quotative modal verb may be part of the speaker's knowledge, or the knowledge attributed to the referent encoded by the EXPERIENCER argument. Does the employment of a quotative modal verb imply that the modified proposition is not part of the knowledge of the speaker or the referent encoded by the EXPERIENCER argument? In order to find an answer to this question, two hypotheses will be examined: (i) the use of a quotative modal verb implies that p is not part of the speaker's knowledge and (ii) the use of a quotative modal verb implies that p is not part of the EXPERIENCER's knowledge. Hypothesis (i) is refuted in case quotative modal verbs occur in contexts where p is part of the speaker's knowledge, hypothesis (ii) is refuted in case quotative modal verbs occur in contexts where p is part of the knowledge attributed to the referent encoded by the EXPERIENCER argument.

Following the observation made by Faller (2011, 4), it seems not very likely that a speaker would employ a quotative modal if he knows that the claim of the referent encoded by the EXPERIENCER argument is indeed

true. This conclusion is much in favour of hypothesis (i). This hypothesis is refuted if there are contexts where the embedded proposition is indeed part of the speaker's knowledge. As indicated by the discourse illustrated (38), such cases exist. Assume that the speaker is a doctor who talks about a hypochondriac patient.

- (38) a. Der Schani ist ein alter Hypochonder, andauernd kommt er mit anderen Geschichten daher.
the Schani is a old hypochonder always comes he with other stories along
- b. Stell Dir vor, jetzt will_{quot} er Malaria haben.
imagine you PART now want malaria have-INF
- c. Und soll ich dir was sagen? Er hat wirklich Malaria, ich habe gerade die Blutproben
And shall I you something say he has indeed Malaria I have just the blood.test
vom Labor zurückbekommen.
from.the laboratory back.get-PPP
- 'Schani is an old hypochondriac. Each time he comes to see me he tells a different story. Imagine, he now **claims** to have malaria. But would you believe, I've just got back his blood test results from the laboratory and it says that he indeed has malaria.'

This example exhibits a context where the referent encoded by the EXPERIENCER argument makes a non verified claim about himself. Crucially, the proposition *I have Malaria* is not part of his knowledge, either he does not know whether it holds or he has a false belief. In opposition, the speaker knows that this referent has indeed Malaria. Arguably, the context given in (38) could alternatively be interpreted in a way that the referent encoded by the EXPERIENCER argument already knew beforehand that he had malaria because he had already made another blood test at another hospital. This seems to refute hypothesis (ii). However, this context deserves a closer look. Even if it turns out that the referent encoded by the EXPERIENCER argument indeed already knew that he had malaria, the use of the quotative modal verb in (38) contributes some resonance of doubt. How can this be accounted for? It is important to distinguish between what this referent really knows and what knowledge the speaker attributes to that referent. As it turns out, the latter type of knowledge is only relevant to the interpretation of quotative modal operators. In employing a quotative modal verb, the speaker expresses that he has no compelling evidence that the modified proposition *p* is indeed part of the referent's knowledge. In some cases, he could have even explicitly known that *p* is not part of the referent's knowledge. However, up to now, there are no examples of quotative modal operators attested where the speaker knows that the modified proposition is true and part of the knowledge that is attributed to the referent encoded by the EXPERIENCER argument. Moreover, in such a context a quotative modal operator would be redundant. As it seems then, a speaker who employs a quotative modal verb expresses that he does not attribute the modified proposition *p* to the knowledge of the referent encoded by the EXPERIENCER argument. Quotative modal operators reflect the perspective of the speaker rather than the objective truth. This explains why the speaker considers the information conveyed by quotatively modified propositions as not reliable even in contexts where it later turns out that the referent encoded by the EXPERIENCER argument did indeed know that the proposition was true. Accordingly, the acceptability of quotative modal operators does not hinge on whether the referent encoded by the EXPERIENCER argument knows that he has malaria. Rather, the use of a quotative modal operator signals that the speaker does not attribute the modified proposition to the knowledge of the referent encoded by the EXPERIENCER argument. Examples like (38) demonstrate two things: first of all, quotative modal verbs are compatible with situations where the speaker knows that the embedded proposition is true. This does not necessarily contradict the Relativisation function. The Relativisation function labels the modified proposition as it was claimed by the referent encoded by the EXPERIENCER argument as not reliable. However, this very same proposition may already be part of the speaker's knowledge, but based on a different evidence. What the speaker expresses then is that he does not know whether the proposition is indeed also part of the knowledge of the referent's knowledge or whether this referent lies, has a false belief or utters a proposition without having any evidence for its truth. Second, the speaker does not attribute the embedded proposition to the knowledge of the referent encoded by the EXPERIENCER argument.

Accordingly, all these observations are clearly in favour of hypothesis (ii). As a consequence, quotative modal verbs differ from their epistemic counterparts in some major respects. While in the case of epistemic modal verbs it is the speaker who is committed to the truth of the embedded proposition, it is the referent

encoded by the EXPERIENCER argument in the case of quotative modal verbs. Furthermore, the use of an epistemic modal verb indicates that the embedded proposition is not part of the speaker's knowledge. In opposition, the use of quotative modal verbs expresses that the embedded proposition is not part of the knowledge attributed to the referent encoded by the EXPERIENCER argument.

Summing up this section, it has turned out that quotative modal verbs behave like their epistemic counterparts with respect to the types of predicates that they select. As soon as volitive modal verbs such as *wollen* and *sollen* occur with ILP or with past related complements in the presence of a discourse linked subject, a quotative interpretation will be the only one available. However, they also differ in an essential property: whereas epistemic modal verbs are evaluated with respect to the speaker's knowledge, quotative modal verbs are evaluated with respect to the knowledge of the referent encoded by the EXPERIENCER argument which is realised as the subject in the case of *wollen*, some other covert argument in the case of *sollen*.

2.4 Conditionals

Following Kratzer (1978, 241) and Kratzer (1986, 8) conditionals involve covert modal operators. If this is correct, the approach outlined in the preceding section makes two predictions. First, conditionals should allow for an epistemic interpretation and second, only an epistemic interpretation should be possible with ILPs or past related predicates that select a discourse linked subject. Both predictions are confirmed.

As indicated by Kratzer (1986, 8), Sweetser (1990, 116), Kratzer (1995, 130) and Haegeman (2002, 125), modal operators in conditionals can indeed be alternatively interpreted in an epistemic way. Moreover, Kratzer (1995, 130) observes that there is a slight difference between generic *when*-clauses and *if*-clauses with respect to the acceptability of ILPs: whereas generic *when*-clauses are only compatible with Stage Level Predicates (SLP) (39), *if*-clauses are compatible with SLPs and ILPs (40).

- (39) a. When Mary speaks French, she speaks it well. (event related)
- b. * When Mary knows French, she knows it well. (event related)
- (40) a. If Mary speaks French, she speaks it well. (event related/epistemic)
- b. If Mary knows French, she knows it well. (event related/epistemic)

It is plausible to conclude then that *when*-clauses are modifiers that are restricted to an event related modification, analogously to the English modal auxiliary verb *can*. Event related modifiers are not compatible with ILPs and an epistemic interpretation is excluded. However, *if*-clauses turn out to be ambiguous between an event related interpretation and an epistemic one. As Kratzer (1995, 130) has pointed out, an epistemic interpretation is only available as soon as the *if*-clause selects an ILP. This is exactly the way in which the modal verbs discussed in the previous sections behave. According to Kratzer (1995, 131), this behaviour is due to the *Prohibition Against Vacuous Quantification* which states that each quantifier has to bind some sort of variable. This might not be the appropriate explanation here since the modal operator does not always quantify over the event variable provided by the embedded predicate.

In a similar fashion, generic *when*-clauses and event related conditionals fail to modify clauses that contain an event that temporally precedes the events, whereas epistemic conditionals are felicitous in such contexts, as it has been pointed out by Sweetser (1990, 123) (example (41b)).

- (41) a. * When they have to leave a message, he has gone already. (content)
- b. If they have to leave a message, he has gone already. (epistemic)
- (42) Wenn er jetzt noch nicht im Büro ist, hat er verschlafen.
 If he now yet NEG in.the office is has he overslept
 'If he isn't in his office yet, he must have overslept.' (epistemic)

Once more, it turns out that generic *when*-clauses and event related conditionals behave exactly like circumstantial modal verbs on the one hand and that epistemic *if*-clauses share a lot of properties with epistemic modal verbs. As expected by the analysis outlined in the preceding section, propositions that contain ILP's or events that precede the conditional/ *wenn*-clause event force an epistemic interpretation. In a similar manner Haegeman (2002) observes that there are two types of conditional clauses, event related conditionals that are attached to the VP and premise conditionals that are attached to the CP. The latter type roughly corresponds to the epistemic conditionals discussed here.

Likewise, epistemic conditionals ensure the same functions as epistemic modal verbs. In all the examples containing epistemic conditionals that were given above, (40b), (41b) and (42), the speaker signals that he has no direct evidence for the embedded proposition (Relativisation) and he indicates that the embedded proposition is consistent with the knowledge (Commitment to the truth).

2.5 Causal conjunctions

As it has been demonstrated by Sweetser (1990, 77) and Haegeman (2002, 142) for English and Wegener (1993) for German, causal conjunctions such as *because* and *weil* can come along with different interpretations: event related and epistemic. According to the analysis developed in this paper, it is expected that these adverbial clauses only exhibit an epistemic interpretation as soon as they modify a clause that contains an event that precedes the event encoded by the predicate in the adverbial clause, cf. the examples inspired by Wegener (1993):

- (43) a. # It hailed because the car has dents. (event related)
 b. It hailed, because the car has dents. (epistemic)

As predicted by the account here, event related *because*-clauses cannot modify proposition that contain events that temporally precede (43a): the circumstance that the car has dents at utterance time cannot be the cause for the past hailing event. As soon as the *because*-clause targets the proposition rather than the event argument provided by the matrix predicate, an interpretation becomes possible. In contrast to event related causal clauses, the *because*-clause in example (43b) expresses a premise which causes the speaker to assume the proposition expressed by the matrix clause to be true: knowing that the car has dents, the speaker concludes that it must have hailed. Once more, a modifier that takes scope over a past related proposition is restricted to an epistemic interpretation.

Similarly, causal clauses that modify propositions that contain an ILP do not exhibit an event related interpretation whenever the causal clause does not involve an event that happened prior to the one in the matrix clause. Examples like (44b), are always interpreted in an epistemic manner:

- (44) a. # Hermann ist Linkshänder, weil er die Uhr rechts trägt.
 Hermann is left-handed because he the watch right wears
 b. Hermann ist Linkshänder, weil er trägt die Uhr rechts.
 Hermann is left-handed because he wears the watch right
 1. # Because of the way he wears his watch Hermann became left-handed. (event related)
 2. I assume Hermann is left-handed, as he wears his watch on his right hand. (epistemic)

In German, the contrast between causal clauses with event related interpretation and epistemic interpretation becomes even more obvious. As it has been pointed out by Wegener (1993), the different readings typically come along with different word order patterns. Whereas event related *weil*-clauses are restricted to a pattern with the finite verb in clause final position (44a), epistemic *weil*-clauses usually exhibit a word order where the finite verb is placed in the second position (44b). As predicted by the analysis developed here, the example with the pattern typical for event related *weil*-clauses is not readily compatible with matrix clauses that contain a ILP's. In opposition, *weil*-clauses with verb-second- patterns which usually indicate an epistemic interpretation are compatible with them without restriction.

Likewise, epistemically interpreted causal clauses are characterised by the same sort of functions like epistemic modal verbs. Using an epistemic causal clause, the speaker indicates that he does not have direct evidence for the truth of the embedded proposition (Relativisation) and he signals that this proposition is in principle consistent with his knowledge (Commitment to the truth).

2.6 VP-adverbs

As discussed by Helbig and Helbig (1990, 58), there are a couple of adverb like modifiers in German that have grammaticalised into items that can be used to label a proposition as hypothesis: *bestimmt* 'definitely', *kaum* 'hardly', *sicher* 'certainly', *vermutlich* 'presumably', *vielleicht* 'maybe', *wohl* 'perhaps'. Some of them, such as *sicher*, still exhibit an ambiguity between an event related interpretation ('safely') and an epistemic interpretation ('certainly'):

- (45) a. Er hält den Ball nicht sicher.
 He holds the ball NEG safe.ADV
 ‘He doesn’t hold the ball safely’ (event related)
- b. Mitja ist sicher der Mörder.
 Mitja is safe.ADV the murderer
 ‘Certainly, Mitja is the murderer’ (epistemic)

Again, *sicher* in its event related reading is restricted to SLP’s (45a), but it does not show any selectional restrictions in its epistemic reading (45b). Accordingly, epistemic adverbs are also compatible with ILP’s. As it turns out, the analysis presented here can even be extended to adverbs that are ambiguous between an event related reading and an epistemic reading.

Moreover, they are used for similar purposes than epistemic modal verbs. They indicate that the modified proposition is not based on the speaker’s direct evidence (Relativisation) and that it is nevertheless consistent with the knowledge of the speaker (Commitment to the Truth). In a similar manner, Zimmermann (2004, 256) shows that *wohl* indicates that the modified proposition is not part of the speaker’s knowledge (Relativisation).

2.7 Locative modifiers

In a recent paper, Maienborn (2004, 162) has pointed out that under certain conditions locative modifiers may also be interpreted epistemically. According to traditional assumptions (cf. Kratzer (1995, 127)), locative modifiers are restricted to SLP and obtain an ungrammatical interpretation whenever combined with an ILP. As Maienborn (2004, 162) demonstrates, this is not quite true since locative modifiers such as *in the car* in (46b) can function as a frame modifier, conveying an epistemic reading.

- (46) a. In the car, Mary was tired. (event related)
- b. In the car, Mary was blond.
 ‘In the car, (you still claimed that) Mary was blond’ (epistemic)

As Maienborn (2004) observes, the epistemic interpretation arises whenever the locative modifier targets an ILP that is saturated by a definite subject. This is exactly what is predicted by the analysis elaborated in this paper.

The interpretation of epistemic locative modifiers is somewhat reminiscent of quotative modal verbs. The function of Relativisation applies with respect to the speaker who stresses that the modified proposition is based on his own direct evidence. However, the Commitment to the Truth is not evaluated with respect to the speaker. In example (46b), some other referent is committed to the truth who is indirectly introduced by the situation that the locative modifier *in the car* refers to. The referent has to be a person who was present in the car. Crucially, it is not the speaker who signals that the modified proposition is consistent with his knowledge. In some cases, he could know that this proposition is even false. In opposition, the referent introduced by the locative modifier has made a commitment to the truth of the proposition in the situation when he was in the car.

2.8 Diachronic evidence

Fritz (1991, 45), Fritz (1997, 94), Diewald (1999, 365) demonstrated that epistemic modal verbs only became frequent in the course of the Early New High German period. An investigation of a travel report from the 16th conducted by Maché (2008, 393) has demonstrated that all of the unambiguous occurrences of epistemic modal verbs select stative predicates, notably ILP, cf. (47)-(49). It is highly likely that the selection of ILP triggered the grammaticalisation of epistemic modal verbs in German.

- (47) Des Sontags / vngefehrlich vmb Vesper zeit / kamen die vnsern bey drey Inseln / die
 the-GEN sunday-GEN about at vespers time came the ours by three islands the
 alle sehr klein waren / vnd moechte eine von den andern vielleicht vier meil weit seyn.²⁴
 all very small were and may-SBJV.PST one from the others maybe four miles away be-INF

'They arrived on sunday with vespers at three islands that were all very small and that might have been away four miles from each other.' (epistemic)

- (48) Vnd wie er im wenden war / da vernam er sieben oder acht Blut Schiffe / die jm aus der
and as he at veer-INF was there noticed he seven or eight blood ships the him from the
Inseln mit auffgezogenen Segel nachfuhren / vnnd **mochten** von des Nicolas de Cocillo
islands with hoisted sails followed and may-PST from the-GEN Nicolas de Cocillo
schiff ein grosse meil wegs weit seyn.²⁵
ship a large mile way-GEN away be-INF
'And as he was about to veer, he noticed seven or eight blood ships that followed him from the island with hoisted
sails and they may have been about one large mile away from the Nicolas de Cocillo's ship.' (epistemic)

- (49) [...] hielte er dafuer / es **mueste** der Koenig auß Portugal ein dapfferer geherzter Mann
thought he that it must-SBJV.PST the king of Portugal a brave hearted man
seyn.²⁶
be-INF
'He thought that the King of Portugal must be a bold and brave man.' (epistemic)

Once more, it becomes clear that there is a strong correlation between the selection of ILP's and the epistemic interpretation of a modal operator. It seems then that circumstantial modal verbs being event modifiers always need predicates that involve an event argument, such as SLP's. In turn, epistemic modal verbs could be analysed as propositional or speech act modifiers. Accordingly, they can even embed predicates that lack an event argument.

Summing up, it turned out that modal verbs, conditional clauses, adverbial causal clauses and related types of modifiers exhibit an ambiguity between an event related interpretation and an epistemic interpretation. In their event related interpretation they act as event modifier. Accordingly, they are restricted to the selection of predicates that involve an event argument. Being propositional or speech act modifiers, epistemic modal operators do not impose such selectional restriction. As a consequence, they are compatible with ILP's and past related complements.

3 Critical data

However, there are different types of examples that seem to contradict an approach that accounts for the ambiguity of modal operators in terms of event modification on the one side and propositional modification on the other side. The next sections provide a couple of examples based on modal verbs.

3.1 Quantificational modals

According to the analysis developed above, circumstantial modal operators are event modifiers. This assumption is based on the observation that circumstantial modal verbs were not felicitous within all the examples discussed so far. However, there are instances of modal verbs that selects an ILP and that clearly do not exhibit an epistemic interpretation, such as the examples provided by Brennan (1993, 96) in (50) and (51).

- (50) A basketball player can be short.
 $\exists x [B(x) \wedge S(x)]$
(51) A basketball player will have good eyesight.
 $\forall x [B(x) \wedge E(x)]$

²⁴Ulrich Schmid, *Neuwe Welt*, 7, right column, (1567)

²⁵Ulrich Schmid, *Neuwe Welt*, 7, right column, (1567)

²⁶Ulrich Schmid, *Neuwe Welt*, 15, left column, (1567)

The circumstantial interpretation of a modal verb that selects an ILPs can be only maintained as long the subject is realised as indefinite NP. As soon as the subject here is replaced by a definite NP, an epistemic interpretation only will be available. As demonstrated by Maché (2009, 36), modal operators seem to always have to bind some sort of variable, reminiscent of *Prohibition Against Vacuous Quantification*, as it is proposed by Kratzer (1995, 131). In the canonical case, a circumstantial modal operator binds the variable provided by the event argument of the embedded predicate. However, if the embedded predicate does not involve an event argument in the first place, two scenarios are possible. Either the clause contains another suitable variable such as an indefinite NP, or no such variable is present at all. In the first case, a circumstantial interpretation is still possible. The modal verb binds the variable provided by the indefinite NP obtaining a quantificational interpretation, in the same manner as those cases described in Section 2.2. In the second case, an epistemic reading will be forced. This is typically the case with predicates that select a definite subject NP. This is how the epistemic interpretation still can be maintained, even if the embedded predicate does not contain an event argument, like in the case of ILPs.

3.2 Intensional subjects

An epistemic interpretation becomes mandatory as soon as an modal operator embeds a proposition that does not contain any variable. As it has been pointed out in the last section, this is most obviously exemplified in an environment where a modal verb embeds an ILP that selects a definite subject. However, there are some cases in German where a circumstantial modal verb most readily occurs with an ILP and a definite subject (52). An analogous example for English is given by Barbiers (2002, 61) who argues that a modal verb that selects an ILP can be interpreted in a circumstantial way whenever the reference of the subject NP is not identified (3.2).

- (52) Der Bewerber muss polnischer Muttersprachler sein.
the applicant must Polish native.speaker be-INF
‘The applicant has to be a native speaker of Polish.’
- (53) Der Bewerber ist polnischer Muttersprachler.
the applicant is Polish native.speaker
‘The applicant is a native speaker of Polish.’
- (54) The new professor must be a native speaker of English

Note, however, that the definite subjects in the examples above behave in a peculiar way. Contrary to canonical definite subjects (53), those embedded under circumstantial modals do not refer to an identified referent. It is even not necessary that there is such an individual at all in the actual world. Accordingly, the subjects exemplified in (52) and behave like NPs in intensional contexts. In contrast, canonical definite subject NPs always refer to a given individual that is identified in the discourse (53). An intensional interpretation where the reference is not clearly determined or where such an referent does not exist at all is ruled out in these cases. The existence of the referent is presupposed then with canonical definite subject NPs.

Again, it is plausible to assume that this sort of intensional subjects introduce some sort of variable. Accordingly, a similar reasoning can apply to intensional subject as it was exemplified with indefinite subject NPs: there is a further variable available that can be bound by the modal operator. As a consequence, an epistemic interpretation can be circumvented. It seems then that a circumstantial interpretation is blocked as soon as the modal operators embeds a ILP and a subject referent that is clearly identified and discourse linked.

3.3 Veronika Ehrich’s counter example

There are further examples that seem to refute the analysis outlined above according to which circumstantial modal operators are event modifiers and as a consequence not compatible with ILP or past related complements. As pointed out by Veronika Ehrich (pers. commun), in some cases, discourse linked subject such as names even occur with adjectives and nouns that are typically considered as ILPs. Ehrich provided the following example, which undeniably exhibits a circumstantial interpretation.

- (55) Benedikt XVI muss fromm sein.
 Benedikt XVI must pious be-INF
 'Benedict has to be pious (behave in a pious way)'

At this point, the question arises as to what can be precisely considered as ILP? As Kratzer (1995, 148), Jäger (2001) and Maienborn (2003, 216) point out, the border between ILP and SLP is rather blurry; there are certain mechanism that can turn a stative predicate that lacks an event argument into a stative predicate that involves such an event argument. In Kratzer's terms, an ILP can be changed into a SLP under particular conditions. In a more explicit manner, Maienborn (2003, 216) discusses two specific mechanisms by means of which a stative predicate that usually lacks an event argument can obtain one: the Temporariness Effect and the Agentivity Effect. Whereas the first causes a stative predicate to be interpreted as a temporally clearly bounded state, the latter provides an interpretation where the stative predicate is construed as activity, like in agentive *be*-readings. These mechanism of reinterpretation can be easily applied as long it is conceivable that to dissociate the subject referent from the property expressed by the predicate. In the case of *pious*, it is possible to imagine that Benedikt XVI could give up his piety under certain conditions. Accordingly, agentive *be* interpretation is possible for the copula *sein* in example (55). However, the tighter the property is associated with the subject referent, the less likely it becomes that these mechanisms of reinterpretation will succeed.

- (56) Benedikt XVI muss ein Deutscher sein.
 Benedikt XVI must a German be-INF
 Intended reading: 'Benedict is obliged to be a German (behave like a German/become a German)' (circumstantial)
 Preferred: 'Benedict must be a German (behave like a German/become a German)' (epistemic)
- (57) Benedikt XVI muss ein Mann sein.
 Benedikt XVI must a man be-INF
 Intended reading: 'Benedict is obliged to be a man (behave like a man/become a man)' (circumstantial)
 Preferred: 'Benedict must be a man (behave like a man/become a man)' (epistemic)
- (58) Benedikt XVI muss am 16. April 1927 geboren worden sein.
 Benedikt XVI must at 16 April 1927 born PAS.AUX.PST be-INF
 Intended reading: 'Benedict is obliged to be born on the 16th April' (circumstantial)
 Preferred: 'Benedict must be born on the 16th April' (epistemic)

Nationalities can be changed, though it is not very likely to happen. The sex of an individual is even less likely to change. Finally, he date of birth will always remain the same. Correspondingly, the examples (56)-(58) decrease in their appropriateness for an circumstantial interpretation. Since the date of birth is a property that cannot be dissociated from the subject, the pattern in (58) is restricted to an epistemic interpretation.

At the point, it becomes possible to provide a clearer definition of what is called 'ILP' here. In fact, the term 'ILP' does not refer to a homogeneous class of stative predicates. Most predicates can be reinterpreted as elements that denote temporally bounded states or even activities. An ideal ILP expresses a property that cannot be dissociated from its subject referent. As it seems, there are very few predicates of this type. Nevertheless, it has turned out in this section that predicates that denote a property that cannot be dissociated from its subject referent are restricted to an epistemic interpretation if they are embedded by a modal operator.²⁷

Summing up, it has been demonstrated here that all the apparent counter-examples do not contradict the generalisations elaborated in the previous sections. As a consequence, the analysis presented so far need not to be rejected.

²⁷As Martin Schäfer (pers. commun.) has pointedout, there is an additional way to capture the distinction between SLP and ILP in terms of agent control, based on theories elaborated by Dik (1975) and Geuder (2006). It seems to be fruitful to pursue such an approach.

4 The modal source

Up to this point, it has been shown that circumstantial modal operators and related modifiers are most efficiently analysed as modifiers of events. Contrary, it is less clear what exactly is the target of epistemic modal operators. Some arguments are in favour of an analysis in terms of propositional modification, other arguments are in favour of an analysis in terms of speech act modification. Hacquard (2006, 138) argues that the interpretation of circumstantial modal operators is keyed to the event provided by the embedded predicate whereas the interpretation of epistemic modal operators is keyed to the speech act event. Accordingly, epistemic modal operators could be analysed as modifiers that somehow target the speech event. The precise relationship remains to be investigated yet.

The second important finding concerns the semantic contribution of epistemic and quotative modal operators. As it has turned out, both of them convey an important restriction on discourse referents. While the use of epistemic modal verbs indicates that the modified proposition is not part of the speaker's knowledge, the use of quotative modals signals that the modified proposition is not part of the knowledge attributed to referent encoded by the EXPERIENCER argument, which is co-referent with the subject NP in the case of quotative *wollen*, and a covert argument in the case of quotative *sollen*.

How does these two findings relate to each other? In her original proposal, Kratzer (1991, 649) assumes modal operators involve three relevant dimensions of modality. (i) A modal force which is instantiated by a quantifier that quantifies over possible worlds, whereas possibility is treated in terms of existential quantification ('There is a possible world such that *p*') and necessity as universal quantification ('For all possible worlds: *p*'). According to Kratzer (1991) modal force can have a whole range of values: necessity, weak necessity, good possibility, possibility, slight possibility, at least as good as possibility, a better possibility. (ii) A modal base which determines the set of possible worlds. In particular, it decides whether these are worlds consistent with the facts of the actual world (circumstantial) or worlds that are consistent with the speakers knowledge (epistemic). (iii) An ordering source which is another conversational background that further specifies the properties of the worlds that are subject to the quantification. A deontic ordering source selects those world that are consistent with the law and ethics, a bouletic ordering source selects those worlds that are consistent with the wishes of the subject,... There seems to be a big number of different types of ordering sources. Apparently, the three dimensions of modality as suggested by Kratzer (1991, 649) are not sufficient to account for this relationship. Apart from that, the account developed in Kratzer (1981, 51) and Kratzer (1991, 646) cannot explain why circumstantial and epistemic modals select different modal bases either and how the respective sets of worlds are determined in particular. As it seems, a fourth dimension of modality is required.

Indeed, The missing link between the two findings discussed above is the entity that imposes the modality: the modal source. As for circumstantial modal verbs, this modal source is typically instantiated by the individual who imposes the obligation in the case of *müssen* 'must', who grants the permission in the case of *dürfen*, who is attributed the volition in the case of *wollen* and *sollen*. A systematic description of the modal source has been undertaken by Bech (1949, 4). In some cases, the modal source is already specified in the lexicon entry. According to Bech (1949, 37), *wollen* and *sollen* have to be analysed as necessity modal verbs.²⁸ Adopting this idea, it is plausible to assume that *wollen* and *sollen* specify their modal source as [+animate], while other necessity modal verbs such as *müssen* do not exhibit such an specification. As it has been shown by Diewald (1999, 102), the modal source is always instantiated by the speaker in the case of epistemic modal verbs. Strictly speaking, the speaker is the one who evaluates the embedded proposition with respect to its validity, who makes the commitment to the truth. In opposition, the discourse referent who makes the commitment to the truth in the case of quotative modal verbs is the referent encoded by the EXPERIENCER argument, as it has been observed Diewald (1999, 225). Following the terminology elaborated by (Levinson 2004), the modal source of epistemic and quotative modal operators will be referred to as 'deictic center' in the remainder of these paper, as it involves an evaluation of the validity of propositions.

There are a couple of relationships to investigate with respect to the modal source. First of all, how is the modal base related to the modal source; what role does the speaker's knowledge play? Second, is there

²⁸This is not quite precise. In his own words, Bech (1949, 37) calls the modal verbs *müssen*, *wollen* and *sollen* 'active' that indicate some 'tendency' that the modified predicate would be realised. However, his concepts of 'active' and 'passive' corresponds exactly to the notion of necessity and possibility.

relation between the modal source and the restriction to event modification for circumstantial modals? The first question seems easy to answer. The relation between the modal source and the modal base in the case of epistemic modal operators is quite evident. As already indicated above, epistemic modal operators select a modal base that contains the set of those worlds that are consistent with the speaker's knowledge. Since the speaker is always identical to the modal source in matrix clauses that contain an epistemic modal operator, it follows that the modal base is always linked to the modal source for epistemic modal verbs. As it has been shown in Section 2.3, the modal base of a quotative modal verb does not contain the set of worlds that are consistent with the speaker's knowledge, rather it contains those worlds that are consistent with the knowledge attributed to the referent encoded by the EXPERIENCER argument. But once more, this is exactly the referent that corresponds to the modal source of the modal verbs under discussion, in this case here: *wollen* and *sollen*.

As a consequence, epistemic modal verbs and quotative modal verbs can be considered as operators that minimally differ with respect to the identification of the modal source: it is instantiated by the speaker in the case of epistemic operators and by the referent encoded by the EXPERIENCER argument in the case of quotative ones. This leads to a generalisation for the selection of modal bases: epistemic modals and quotative modal bases contain those worlds that are consistent with the knowledge of the modal source. Since in both cases the modal source makes a commitment to the truth of the embedded proposition, this type of modal source is also referred to as deictic center.

Whereas the modal base can be clearly identified as the knowledge attributed to the modal source in the case of epistemic modal operators, the link between the modal source and the respective modal base is less obvious in the case of circumstantial modal operators. It appears that modal operators that express a volition (*wollen*, *sollen*), obligation *müssen* or a permission *dürfen* all contain worlds that correspond to the preferences of the modal source. Given a modal source imposes some obligation *p*, or has a wish that *p*, this can be captured by a description in terms of preferred worlds: *for all the worlds the modal source prefers: p is true*. Likewise, any situation where a modal source grants a permission *p* can be circumscribed as: *for some of the worlds the modal source prefers: p is true*. However, this reasoning does not apply to the ability readings of *können*, its quantificational readings and practical possibility or necessity readings (*müssen* and *können*). It is not clear whether it is possible to provide semantic generalisation that captures the meaning of all the different circumstantial modal bases or whether there is a relevant semantic feature at all that they have in common. Since this issue goes beyond the scope of this paper it will not be addressed any further here. Nevertheless, there is no doubt that a circumstantial modal base consists of a set of worlds that reflect some attitude or property of the modal source. Accordingly, any modal base of a modal operator is introduced and determined by the modal source.

Given the fourth dimension of modality, the modal source, it becomes possible to provide a clear cut definition for epistemic modality. As pointed out by Westmoreland (1998, 12) and Ziegeler (2006, 90), epistemic modal verbs are characterised by the property that they always label the modified proposition as a proposition that is not part of the speaker's knowledge. Similar observations have been made by Fintel and Gillies (2010, 353) and Kratzer (2011) who argue that epistemic *must* is not compatible with direct evidence. As they argue, this behaviour is due to a lexical constraint. Analogously, Diewald (1999, 207) claims that in the case of epistemic modal verbs the deictic center values the embedded proposition as [\pm non-factive]. Finally, Zimmermann (2004, 256) demonstrated that a similar condition holds for modal particles in German such as *wohl* 'perhaps' as well.

In correspondence with the insights that have arisen from the observations made in Section 2.2 and 2.3, the semantic contribution of epistemic modifiers can be described in a new way. They always involve a modal source that introduces a modal base that corresponds to its knowledge. Accordingly, this type of modal source is called deictic center. As it turns out, deictic centers are subject to an essential condition:

(59) Condition on Deictic Centers (CoDeC)

p is not part of the deictic center's knowledge

This condition corresponds exactly to the observations made in the previous sections. In the case of epistemic modal operators, the deictic center is identical to the speaker. Accordingly, it is the speaker's knowledge that is subject to the CoDeC. A speaker who uses an epistemic modal verb signals that the modified proposition is not part of his knowledge. In the case of quotative modal operators, the deictic center is instantiated by the referent encoded by the EXPERIENCER argument. As a consequence, it is the knowledge

attributed to this referent that is relevant to the CoDeC. And indeed, as it has been illustrated in Section 2.3, it is the referent encoded by the EXPERIENCER argument that is committed to the truth in the case of quotative modal verbs, rather than speaker. This condition also captures the epistemic adverbial clauses, locative modifiers and adverbs discussed in this paper.

This condition is further confirmed by the behaviour epistemic modal operators that are embedded in complement clauses. As it seems, in these cases the deictic center is always identified with the appropriate argument of the super-ordinate predicate rather than with the speaker. In the canonical case, this is an AGENT or EXPERIENCER argument that is realised as the subject NP such as (60), (61), and (62). Sometimes, an EXPERIENCER is also realised as (indirect) object such as in the example (63) where it remains covert. The pattern in (64) indicates that there are also further types of epistemic modal operators apart from modal verbs that are attested in complement clauses, such as adverbs. This is throughout confirmed by Zimmermann (2004, 265), who demonstrates that the epistemic discourse particle *wohl* can be embedded in complement clauses.

- (60) Ein Kollege hat mir erzählt, dass es da schlimm ausgesehen haben muss.²⁹
 a colleague has me told that it there bad out.look-PPP have-INF must
 'A colleague told me that it must have been quite a mess at this place.'
- (61) Außerdem kenne ich den Richter und weiß, dass er kein Unmensch ist und schon seine Gründe
 besides know I the judge and know that he no monster is and PART his reasons
 dafür gehabt haben wird.³⁰
 therefore had have will
 'Aside from that, I am familiar with the judge and know that he is no monster and therefore he will have had good reasons.'
- (62) Polizeisprecher Thomas Figge erklärte gestern auf Anfrage, dass der 33-Jährige mindestens
 police.spokesman Thomas Figge declared yesterday on demand that the 33.year.old at.least
 Tempo 100 gefahren sein muss.³¹
 tempo 100 drive-PPP be-INF must
 'The police spokesman Thomas Figge declared yesterday on demand that the 33 year old must have driven at least 100 km/h.'
- (63) Aber der aktuelle Fall zeigt, dass die Bank ihre Linie geändert haben dürfte.³²
 But the actual case shows that the bank its line change-PPP haveHAVE might
 'But the actual case shows that the bank might have changed its strategy.'
- (64) Ich wusste, dass es vielleicht ein Frühstart war, probierte aber, gut zu schwimmen³³
 I knew that it maybe a false.start was tried but good to swim
 'I knew that it could have been a false start but I tried to swim on as good as possible.'

Zimmermann (2004, 265) argues that related epistemic modifiers such as the discourse particle *wohl* may never take scope out of a complement clause. In other words, as long as such a modifier occurs in a complement clause the deictic center will be identified with an argument of the super-ordinate predicate rather than the speaker. This observation seems to extend to all types of epistemic modifiers. Moreover, it turns out that embedded modal operators are exclusively evaluated with respect to the local deictic center, which need not to be the speaker. This becomes most obvious in examples such as (62), where the deictic center is anchored to a referent that is not present in the utterance situation. The person that draws the conclusion encoded by the modal operator in this example is the police spokesman rather than the speaker. In some of the utterance contexts where this sentence is applicable the speaker can now that the 33 year old indeed drove 100 km/h. This indicates that it is the police spokesman's knowledge that is at stake here. Similar to quotative modal verbs, the speaker expresses that he does not have any evidence that the modified proposition is indeed part of the deictic center's knowledge which is instantiated by a referent that is not

²⁹COSMAS II: RHZ01/NOV.07278 Rhein-Zeitung, 10.11.2001

³⁰COSMAS II: NON09/SEP.18873 Niederösterreichische Nachrichten, 29.09.2009

³¹COSMAS II: BRZ09/MAI.05146 Braunschweiger Zeitung, 12.05.2009

³²COSMAS II: BVZ09/OKT.00654 Burgenländische Volkszeitung, 07.10.2009

³³COSMAS II: SOZ07/MAR.06486 Die Südostschweiz, 30.03.2007

part of the utterance situation in the example given above. As it seems then, the CoDeC also applies to epistemic modal operators that are embedded in complement clauses. How do all these restrictions come about?

As illustrated above, all epistemic modal operators are subject to the CoDeC. In order to apply the CoDeC, the deictic center must already be identified. As it appears, this process of identification is subject to clear restrictions. It is quite likely that each modal operator contains some variable that represents the deictic center. In the lexicon, this variable is not identified yet. As soon as a modal operator becomes part of an utterance, the variable has to be instantiated by some discourse referent. Obviously, the deictic center of a modal operator is always identified with the closest candidate according to a Hierarchy of Salience.

(65) Hierarchy of Salience

1. Arguments of the predicate that involves the modal operator.
 2. The EXPERIENCER argument of an attitude predicate in the super-ordinate clause.
 3. The speaker (or the addressee in questions and conditionals)
- No operators may occur between the potential deictic center and the modal operator.

The hierarchy of salience roughly reflects the clausal hierarchy. The most salient candidates for the deictic center are those who occur adjacent to the modal verb, as in the case of quotative modal verbs. And indeed, with quotative modal verbs the deictic center will never be the speaker. If the modal verb does not introduce an argument on its own, the next viable candidate would be an argument of a super-ordinate clause. If such a predicate does not exist in the context of the utterance, the next possible candidate comes into play: the speaker. Some recent theories assume that the speaker is syntactically represented as an argument on the very top of the clausal hierarchy. As a consequence, the picture drawn here is highly reminiscent of Binding theory for Pronouns and Anaphora, and indeed the identification of deictic centers also deals with some anaphoric element and its co-indexing.

The analysis outlined here is thoroughly supported by some recent insights in the research of modality. First of all, there are approaches that provide evidence that the modal sources have to be represented in a syntactic or semantic way. As Abraham (2005, 263) argues, the modal source is a covert argument of each modal verb. In a similar fashion, Depraetere and Verhulst (2008, 3) demonstrates that each type of necessity has its source of modality, including epistemic necessities. Lasersohn (2005) shows that there are expressions such as predicates of personal taste that have to be evaluated with respect to a judge, which is most typically instantiated by the speaker. Extending his analysis to epistemic modal verbs, Stephenson (2007, 497) illustrates that also epistemic modal verbs have to be evaluated with respect to some judge. Finally, the relationship between the deictic center and the speech act event remains to be investigated. As pointed out by Hacquard (2006, 138), epistemic modal operators take scope over the speech act event. As it is obvious, the deictic center is involved into that speech act event: it is the instance who evaluates the proposition with respect to the validity. If the deictic center wants to express that he believes that the proposition holds in the actual world he would encode his proposition as assertion. Now, we can turn back to the initial question of this paper: how is selection of modal bases driven? The selection of the modal base is mediated by the deictic center.

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