

Epistemic Modals in the Past

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Abstract. The aim of this paper is to provide additional arguments against the view that on the epistemic reading of modal verbs, the time of the modal is always the utterance time. The hypothesis defended, also adopted by Eide (2002, 2003) and von Fintel and Gillies (2008) is that epistemic modals can be in the scope of Tense/Aspect. Three possible translations of *might have been* in French (with a *passé composé* or an *imparfait* on the modal and a simple infinitival, or with a present on the modal and a perfect infinitival) are semantically differentiated. The analysis describes the distribution of past tenses on epistemic modality and explains the differences in their interpretation.¹

Possibilities are the sort of thing that comes into and goes out of existence, that can be 'dated'
(Mondadori (1978):246)

It is obvious that we don't have a good understanding of what happens when a modal is combined with temporal operators. (Portner (2009):230)

1. Introduction: epistemic modals and tenses

It is generally assumed that on the epistemic reading of modal verbs, the time of the modal (MOD-T) is the utterance time (U-T), cf. e.g. Cinque (1999), Stowell (2004). In languages like French, where, contrary to English, modals can be fully inflected and bear Tense/Aspect morphology, it is often assumed that the past or perfect(ive) morphology on the epistemic modal originates between the modal and the verbal projection, raises to combine with the modal, but is interpreted in its original projection: PAST/PERF > MOD > P is interpreted as MOD > PAST/PERF > P, cf. e.g. Tasmowski (1980), Cinque (1999), Stowell (2004), Hacquard (2006), Borgonovo and Cummins (2007), Laca (2008). Thus, the French translations (3)-(4) of (1) are supposed to be equivalent.

- (1) *There might have been ice cream in the freezer.* (von Fintel and Gillies (2008):21)

1. In press in Berns, J., H. Jacobs and T. Scheer (eds), *Romance Languages and Linguistic Theory 2009*, Amsterdam, Benjamin.

- (2) *Il pouvait y avoir de la glace au frigo.* OK C1, OK C2, OK C3
It can-IMP. PRN have of the ice cream in the freezer.
- (3) *Il a pu y avoir de la glace au frigo.* # C1, # C2, OK C3
It can-PRES.PFCT PRN have of the ice cream in-the freezer
- (4) *Il peut y avoir eu de la glace au frigo.* # C1, OKC2, OK C3
It can-PRES. PRN have had of the ice cream in the freezer.

The aim of this paper is to provide additional arguments against this view. One of them is that as it will be shown below, each of the three translations (2)-(4) of (1) allows a different set of doxastic contexts (symbolised by 'C' above), which is unexpected if they are semantically identical. The hypothesis adopted, also defended by Eide (2002, 2003, 2010), Boogaart (2007), von Stechow and Gillies (2008) and Homer (2010), is that epistemic modals can be in the scope of Tense/Aspect. In Section 2, I present arguments against the idea that sentences like (3) are the result of an 'Aspect Raising'. Section 3 shows that the *passé composé* in sentences like (3) must have its perfect (as opposed to perfective) reading, since it cannot be replaced by the *passé simple* (a perfective tense) on the epistemic reading. Besides, it is shown that the perfect infinitival under a modal is underspecified with respect to Aspect (more precisely, it can have an imperfective value). The same section presents the analysis, delineates and explains the differences regarding the interpretation of sentences like (2), (3) and (4).² One of the principal ideas is that MOD-T (the time during which the possibility that *P* takes place) should be distinguished from EVAL-T, i.e. the time of the modal evaluation by the Evaluator³ and that EVAL-T can be either situated in the present or in the past, depending on the kind of viewpoint aspect provided by the Tense chosen.

2. The Cinque/Stowell hierarchy: counter-arguments from French

According to the hierarchy proposed by Cinque (1999) and Stowell (2004), the epistemic modality is always interpreted above the aspectual head PERF., including in cases where the perfect inflection is superficially on the modal. However, French provides several pieces of data challenging one of the classical premises behind this claim, namely that sentences in which the perfect is on the modal ((HAVE-MOD-SS) are semantically identical to the corresponding sentences where the perfect is on the infinitive (MOD-HAVE-SS).

2. Notational conventions : *P* = 'the adjacent', i.e. the proposition embedded under the modal, cf. von Stechow and Iatridou (2005); epist-mod.= epistemic modal; epist-mod.-s=epistemic modal sentences; IMP.= imperfective; PERF.= perfect; PERFIVE= perfective, PC=passé composé, PS= passé simple.

3. Term taken from Nuyts (2001).

Let us call this hypothesis H-IDENT.

Firstly, each translation of (1) above allows a different set of epistemic contexts, which is unexpected if sentences (3)-(4) are semantically identical. In the original context imagined for (1) by von Stechow and Gillies (2008), the speaker of (1) — let us call her Sophie — is looking for some ice cream, and checks the freezer at time *t*. There is none inside. She is then asked why she opened the freezer at *t*, and replies (1) (Context 1, or C1). In French, (2) is acceptable in C1, but (3) and (4) are not. Let us now imagine another context C2, where Sophie wants to check the freezer at *t*, but Paul stands in her way, and asks why Sophie wanted to open it. In C2, (3) is still unacceptable, but this time (4) is perfect. In another slight variant C3, Paul takes something from the freezer that Sophie cannot see, stands again in her way and asks again his question before she could open the freezer. This time, (3) is as acceptable as (4). The facts are summarized at the right of the examples (2)-(4) and will be explained in Section 3.3.

A second argument against H-IDENT comes from generic sentences. While MOD-HAVE-SS can have a generic reading, cf. (??), in a default context the corresponding HAVE-MOD-SS can't so easily, cf. (6).

- (5) *On peut (/pouvait) très bien avoir été membre*
 One can-PRES. (can-PAST.IMP.) very well have been member
d'un parti communiste sans avoir été véritablement
 of-a party communist without have been really
communiste.
 communist.

"One might very well have been a member of the communist party without having really been a communist."

- (6) *#On a très bien pu être membre d'un parti*
 One has very well can-P.P. be member of-a party
communiste sans avoir été véritablement communiste.
 communist without have been really communist.

"One might very well have been a member of the communist party without having really been a communist."

On the contrary, if it is assumed, as proposed here, that Tense/ Aspect morphology is interpreted *in situ*, this contrast can be accounted for: perfect(ive) sentences normally do not have a generic interpretation, cf. Carlson (1977), Dahl (1985).⁴

4. To be sure, epistemic sentences with the *passé composé* used as a present perfect may well be used with the generic reading, but only with a particular element like a temporal adverbial explicitly limiting the interval of the generic property, cf. (7), element which is absent of (6). On present perfect generic sentences, cf. Comrie (1985) and Giorgi and Pianesi (1997).

(7) *Dans les années 70, un jeune homme dans le vent a été-pres.perf communiste dans son*

A third argument against H-IDENT is that while the epistemic HAVE-MOD-ss are systematically incompatible with an adverbial denoting a future time point, cf. (9), it is not the case of MOD-HAVE ones, cf. (8). Again, this contrast remains unexplained if the perfect is interpreted below the modal in (8) as in (9).

(8) *Votre voiture peut très bien avoir été détruite demain.*
 Your car can-PRST very well have been destroyed tomorrow.
 "Your car might very well have been destroyed tomorrow."

(9) **Votre voiture a très bien pu être détruite demain.*
 Your car has very well (can-PP be destroyed tomorrow.
 "Your car might very well be destroyed tomorrow."

Note that (9) becomes acceptable if the present perfect on the modal is replaced by a past imperfective (the *imparfait* form 'pouvait'), cf. (10).

(10) *Votre voiture pouvait très bien être détruite demain.*
 Your car can-IMP. very well be destroyed tomorrow.
 "Your car might very well have been destroyed tomorrow."

Data (8)-(10) will be accounted for in Section 3.3, too.

As Laca (2008) reminds us, one of the strongest arguments in favour of H-IDENT and Tense/Aspect Raising in sentences like (3) is given by Tas-mowski (1980): the choice of the Tense/Aspect morphology on MOD in epistemic sentences seems *prima facie* to always match the choice that would be made in the adjacent *P* in the absence of the modal.

(11) a. *Marie a écrit un roman.*
 Marie write-PRES.PRFT a novel.
 b. → *Marie a pu écrire un roman.*
 Marie can-IMP. write a novel.

(12) a. *Marie écrivait un roman.*
 Marie write-IMP. a novel.
 b. → *Marie pouvait écrire un roman.*
 Marie can-IMP. write a novel.

However, several pieces of data show that the perfect (resp. imperfect) on MOD is compatible with an imperfect (resp. perfect) interpretation of the adjacent. This goes against the idea that to (11a) (resp. (12a)) always correspond (11b) (resp. (12b)).

Firstly, it is possible to have a perfect on the modal and a progressive on the infinitive, cf. (13). Since the progressive is not compatible with perfect

adolescence.

In the seventies, a cool guy had been (i.e. must have been) a communist in his teens.

aspect in standard French (cf. (14)), we have to conclude from the availability of sentences like (13) that PERF on MOD is compatible with an imperfect interpretation of the infinitival.

- (13) *Pierre a très bien pu être en train de travailler.*
 Pierre has very well can-PP be PROG work.
 "Pierre might very well have been working."

- (14) ??*Pierre a été en train de travailler.*
 Pierre has been PROG. work.
 "Pierre has been working."

Inversely, it is possible to have an imperfect on MOD with a perfect interpretation of the infinitival; this is what happens in (15). We know that in (15), the infinitival is interpreted as a perfect (and not as an 'underspecified' past, cf. *infra*), because *P* is situated in the future by the adverbial *demain*.

- (15) *Votre voiture pouvait très bien avoir été détruite demain.*
 Your car can-IMP. very well have been destroyed tomorrow.
 "Your car might very well have been destroyed tomorrow."

The aspectual values of MOD and the infinitival can thus be different: there is no systematical match between the two (which of course does not impede the fact that the two aspectual values interact in the interpretation of the whole sentence).

Another problem for Tasmowski's argument in favour of H-IDENT is that it presupposes that the aspectual *inflections* are always interpreted the same way when on the modal or on the infinitival. However, this is not correct: while the perfect inflection always conveys a perfect(ive) interpretation on the matrix verb, it is *not* the case when on the infinitival. There are indeed several facts showing that the "perfect infinitival" is not always a perfect. Firstly, Eide (2005, 2010) notes that the Norwegian present perfect is always infelicitous with adverbials denoting the previous cycle (*yesterday, last week, last year*), cf. (16). This effect disappears with a perfect infinitival embedded under a modal, cf. (17). This already suggests that the "perfect infinitival" under the modal can be interpreted as an imperfect.

- (16) **Marit har spist grøten sin I går.*
 Marit has eaten porridgeDef PossRefl yesterday.
 "Marit has eaten her porridge yesterday."

- (17) *Marit må har spist grøten sin I går.*
 Marit must have eaten porridgeDef PossRefl yesterday.
 "Marit must have eaten her porridge yesterday."

The second argument comes from French and Dutch. In French, individual level predicates like *être albinos* 'to be an albinos' (which are normally 'hard-core ILPS', i.e. instantiated the whole life of an individual) are strange with

the present perfect, because it implies that the state is verified for only a part of the individual's life (cf. Martin (2008)). The same has been noted by Zwart (2007) for Dutch predicates like *een genie zijn*.

- (18) #*Scriabin is een genie geweest*.⁵
 "Scrabin has been a genius."

- (19) #*Pierre a été albinos*.
 Pierre has been albino.
 "Pierre has been an albino."

However, as already observed by Zwart (2007), the oddity disappears with a perfect infinitival:

- (20) *Scriabin moet een genie geweest zijn*.
 "Scrabin must have been a genius."
 (21) *Pierre peut très bien avoir été albinos*.
 Pierre can-PRST very well have been albino.
 "Pierre might very well have been an albino."

The 'perfect infinitival' can thus have imperfect as well as perfect values. This fact should not be surprising, since, as Hofmann (1976) already observed, the perfect infinitival is the only way of expressing a past under a (present) modal. Note that as (8) above illustrates, the perfect infinitival can also express a future under a present modal, which suggests that *infinitives are tenseless* (infinitive 'tense' is non-deictic/relative), a hypothesis which has been documented by Wurmbrand (2007).

In sum, we have the following situation:

- *peut avoir été P*: PRES(*pouvoir*(PERF + PAST \vee \neg PERF + PAST \vee PERF + FUT(*P*)))
- *a pu P*: PRES.PERFECT(*pouvoir*(IMP + PAST \vee PERF + PAST(*P*)))

Additional French data presented below are more specifically problematic for the hypothesis of Perfect Raising (and only incidentally for H-IDENT).

Firstly, French epistemic sentences can contain two perfects, one on the modal, and one on the infinitival, cf. (22). This type of sentences has already been observed in the traditional French literature (cf. Dubois and Dubois Charlier (1970), Sueur (1975): 200) but largely ignored later (see however Eide (2003) for Norwegian). To explain the possibility of having

5. As Le Draoulec (1997) observes, the French translation of (18) (*Scriabine a été un génie*) is much better than (18), and in fact acceptable. Moreover, it does not invite to infer that the composer was a genius during a proper subinterval of his whole life only. She suggests that the relevant difference between *être albinos* and *être un génie* is related to the fact that contrary to what happens with *être albinos*, the fact that Scriabine was a genius has still some relevance at the time of the utterance. I leave this point for further research, and simply note that Martin (2008) cannot account for the differences between the two.

simultaneously two perfects by means of the Perfect Raising hypothesis, one should make additional assumptions which explain why the perfect still sometimes remains on the infinitival after having raised to the modal.

- (22) *Les enfants ont pu avoir mangé trop de fruits.*
 The children have can-PP have eaten too many of fruits.
 "The children might very well have eaten too many fruits."

The second relevant type of data problematic for the Perfect Raising hypothesis concerns the *passé surcomposé*, the French double- compound past (DOUBLE CPD PAST). This type of past is used to mark an anteriority wrt. a sentence with a *passé composé* (cf. Schaden (2007) and references therein), cf. (23a). French also has a double- compound infinitival, cf. (23b).

- (23) a. *Pierre est sorti quand il a eu fini.*
 Pierre is gone when he has had finished.
 b. *Avoir eu fini.*
 Have had finished.

The relevant observation is that the modal *pouvoir* cannot be used in standard French with a double compound past, cf. (24a)⁶, while a double compound infinitival can be embedded under a modal, cf. (24b). If one resorts to Perfect Raising, one should make additional assumptions to explain why Raising is not allowed with the double compound infinitival.

- (24) a. **Pierre a eu pu finir son repas avant que Marie ne soit arrivée.*
 Pierre has had CAN-PP finish his meal before that Marie
 EXPL.NEG BE-PRST.SUBJ. arrived.
 "Pierre might have had finished his meal before Marie arrived."
 b. *Pierre peut avoir eu fini son repas avant que Marie ne soit arrivée.*
 Pierre can-PRST have had finished his meal before that
 Marie EXPL.NEG BE-PRST.SUBJ. arrived.
 "Pierre might have had finished his meal before Marie arrived."

6. No occurrences of it in the Frantext literary database which contains 175 millions of words, and all the native speakers I consulted reject it categorically. However, one can find quite a few occurrences of *a eu pu* on the Internet. André Borillo and Anne Dagnac (p.c.) made me observe that this form is acceptable in some varieties of French in the South of France, where the *passé surcomposé* is much more used (but with different values than the ones characterizing the 'standard' *emphpassé surcomposé*). However, this does not impede that there is still a difference between (24a), which pertains to standard French, and (24b), which does not. Moreover, according to Borillo and Dagnac, the epistemic reading is not available in (24a) in the relevant varieties of French.

3. Proposal

3.1. Two words about the definition of epistemic modality

The analysis of past EPIST.-MOD.-ss proposed in sections 3.2 and 3.3 below slightly departs from the classical view about epistemic modality, according to which the truth conditions of an EPIST.-MOD.-s depend on the epistemic state of the speaker (cf. e.g. Palmer (1986)) or of a larger community determined by the context (cf. e.g. Stalnaker (1984), DeRose (1991)).⁷ According to all variants of this classical view, EPIST.-MOD.-ss describe epistemic states, cf. the paraphrase (25a).

- (25) a. *It is possible_{epis.} that it will rain.*
= Based on the evidence I/we have, it is possible that it will rain.
b. *It is possible_{epis.} that it will rain.*
= It is possible that it will rain (contribution of the modal) +
aspectual POV = present (contribution of Tense)

The view adopted here and sketched in (25b) is built from 'modal realists' like e.g. Cantwell (2009) and from Boogaart (2007). It keeps the idea that EPIST.-MOD.-ss describe epistemic states, but gives up the hypothesis that this is due to the modal verb alone. Rather, I claim after Cantwell (2009) that on the epistemic reading, the modal verb only contributes an alethic or metaphysical modality, understood as the most basic type of modality, rather than a subtype of modalities (cf. Portner (2009):10).⁸ Besides, I follow Boogaart (2007)'s claim that it is the *aspectual point of view* which provides the 'epistemic component' of EPIST.-MOD.-ss. In favour of this claim, I observe that in French, past tenses which do not provide an aspectual point of view, like the *passé simple*, tend to block the epistemic interpretation of modal verb, cf. below (see Caudal (2011):191 for the same observation). Following Jayez (1999), I will define the aspectual point of view adopted at *t* as the set of propositions known by the Evaluator at *t*.

I will call MOD-T the interval during which the (alethic or metaphysical) possibility that *P* takes place, EVAL-T the time of the modal evaluation by the Evaluator, and ADJ-T the interval during which *P* takes place in the worlds

7. A related view is that epistemic modal sentences do not have a fixed truth value. They can only be true-for-Jane-at-*t* (if Jane-at-*t* is not sure that *P* is false) — this is the relativist view —, or only 'express' the fact that the speaker is not sure that *P* is false — this is the expressivist view. See Cantwell (2009) or Portner (2009) for a state of the art.

8. Among the arguments of Cantwell are the following. Imagine a context where nobody knows that the coin *a* is fake and can only land tails. A sentence like *The coin might land heads* is *false* on this context, but true according to the classical view. This simple argument shows that it is not clear at all that epistemic modal sentences are made true in virtue of human knowledge. Note that as Portner (2009):123 suggests, alethic modality is very close to Palmer (1986)'s objective epistemic modality. He proposes to use the term 'factual modalities' to cover the epistemic, alethic and metaphysical subtypes.

where P is true.

What is also kept from the classical view are the 'conditions of assertability' of EPIST.-MOD.-SS: these express a commitment to P that is weaker than the belief it is true. The speaker can properly assert an EPIST.-MOD.-S if and only if she is not sure in EVAL-T that P is false (one does assert now *It might rain* when one knows now that it is not raining).

In sum, according to my proposal, an epistemic modal sentence describes an alethic/metaphysical modality in MOD-T, which is evaluated by the speaker/ Evaluator in EVAL-T (who should not be sure in EVAL-T that P is false) that P is verified in ADJ-T. At this point, I should specify which element determines which of the three temporal intervals used.

As already suggested, EVAL-T (the epistemic evaluation time) corresponds to the perspective point given by the aspectual point of view (ASP.-POV). With the present tense and the present perfect, EVAL-T = U-T, and with the *imparfait*, EVAL-T > U-T (cf. *infra*). As for ADJ-T, it is determined, in the easy case, by the adverbial or the temporal clause in the adjacent, if present. In the complex case, it is determined by an interaction between Tense/Aspect on the infinitive and Tense/Aspect on the modal, too complex to be fully modeled here (but see partly below about the contrasts (8)-(10)). Finally, MOD-T is naturally given by Tense/Aspect on the modal. When the modal is under the scope of IMP., given that imperfect(ive) sentences are unbounded (in the sense e.g. of Depraetere (1995), EPIST.-MOD.-SS then describe what Mondadori (1978):244 calls *persisting possibilities* (i.e. possibilities that have not reached their right boundary yet). On the contrary, when the modal is under the scope of PERF., given that perfect sentences are bounded, EPIST.-MOD.-SS then describe *non-persisting possibilities* (Mondadori (1978), i.e. possibilities that have gone out of existence.

3.2. The distribution of past tenses on the epistemic modal

3.2.1. Introduction

The previous section presented the basic tools of the analysis. In this section, the point is made about the *distribution* of past tenses in EPIST.-MOD.-SS. Section 3.3. will be devoted to their *interpretation*.

In previous literature, it has been largely ignored (see e.g. Hacquard (2006), Laca (2008), Mari and Martin (2007, 2009)) that replacing the *passé composé* (PC) by a *passé simple* (PS, a perfective tense) in sentences like (3) tends to block the epistemic reading of *pouvoir*. Since the epistemic reading is the only plausible reading available in (3), the replacement of the *passé composé* with a *passé simple* makes the sentence odd, cf. (26). In (27), the availability of the circumstantial reading allows the sentence to be acceptable.

(26) ??*Il put y avoir de la glace au frigo.*
 It can-PS PRN have of the ice cream in the freezer.
 "It might have been ice cream in the freezer."

(27) *Il arriva à 9.05 et put donc très bien prendre son train.*
 He arrived at 9.05 and can-PS thus very well take his train.
 "He arrived at 9.05 and could thus perfectly take his train."

The fact that the *passé composé* has a present perfect reading (besides its derived perfective reading, cf. e.g. Squartini and Bertinetto (2000), Vet (2001), de Swart (2007)) is thus crucial to generate the epistemic reading of the modal, and the claim (cf. e.g. Hacquard (2006)) that the aspect on the modal in sentences with the *passé composé* like (3) is a perfective is an oversimplification. Rather, this fact supports Boogaart (2007)'s idea that if imperfective forms (present, imperfect tenses) are compatible with EPIST.-MOD.-SS, this is because they introduce a subjective POV in the discourse which may function as the evaluative point EVAL-P required by the modal, and that if perfective forms (like the *passé simple*) are incompatible with EPIST.-MOD.-SS, this is because they cannot introduce this point required by the modal. I simply add to this claim that *certain* perfect forms like the *passé composé* in French are, in this instance, similar to imperfective ones.

3.2.2. The imperfective

Boogaart (2007) convincingly argued that the (past) point of view introduced by the imperfective, which conveys simultaneity with a past act of perceiving or thinking, may function as the evaluation point EVAL-P required by the epistemic modal. Thus, according to the analysis proposed in Section 2, a sentence like (2) describes a past possibility taking place in MOD-T, and evaluated from the "present of the past" EVAL-T.

Besides, Boogaart (2007):52 assumes that for an imperfective tense to be acceptable in an EPIST-MOD-S, it has to be an instance of (free) indirect speech (FIS) of reported thought. But Homer (2010) convincingly showed that this claim is incorrect, quoting examples like (28) .

(28) #*Tu pouvais très bien avoir une crise cardiaque, alors qu'hier tu étais en bonne santé.*
 You can-IMP. very well have a stroke cardiac, whereas yesterday you were in good health.
 "It was very possible that you had had a heart attack, while you were perfectly well the day before."

Homer (2010) rightly observes that if *pouvais* were an instance of FIS in (28), the deictic *hier* 'yesterday' should be acceptable too, which is not

the case (see Homer (2010) *id.* for additional arguments against Hacquard (2006)'s similar claim that imperfective sentences of the type (28) always involve a hidden attitude verb, the *imparfait* being analysed as a fake past).⁹

In fact, according to the analysis of the *imparfait* of e.g. Jayez (1999), this tense introduces a POV simultaneous to the event referred to by the sentence in any of its (imperfective) uses, which leaves intact Boogaart's explanation of its compatibility with EPIST-MOD-Ss even without assuming FIS in examples like (28).

3.2.3. The present perfect vs the perfective

Recall that EPIST.-MOD.-Ss accept the PC on MOD, but not the PS (an aorist/perfective). Why is that so?

According to its classical analysis, the PC differs from the PS in that it presents the past fact as viewed from the present.¹⁰ The U-T can thus function as the evaluation point EVAL-P required by the epistemic modal. Hence, sentences like (3) describe a past possibility in MOD-T ('pu'), contemplated from the U-T ('a'), that *P* is verified in ADJ-T.

On the other hand, the PS is an "objective past tense" (Imbs (1960), Wagner and Pinchon (1962)): it does not relate a past eventuality to a past or present POV. The PS is thus unable to provide the evaluation point required by the epistemic modal.

An additional indication for the ASP.-POV to introduce the evaluation point required by EPIST-MOD-Ss is the non-availability of the epistemic reading of *pouvoir* in its infinitival form, cf. (30). Indeed, infinitives do not relate the denoted eventuality to a point of view either. Note that the acceptability of (31) shows that the unavailability of the epistemic reading in (30) does not come from the embedding of *pouvoir* under the necessity modality (since the epistemic reading is available in (31)).

9. See also Eide (2003):126 against the idea that the past on the epistemic modals in 'Sequences of Tenses' context is a fake past. In support of Eide's view, I observe in French a difference between sentences (29a) and (29b) below.

- (29) a. J'ai entendu qu'il pouvait être le meurtrier, mais personne ne le croit plus. "I heard he might very well have been the murderer, but nobody believes it anymore."
 b. #J'ai entendu qu'il peut être le meurtrier, mais personne ne le croit plus. "I heard he might very well be the murderer, but nobody believes it anymore."

As Eide proposes, with a past tense on the modal, the speaker signals that the proposition expressed by this sentence belongs to some individual's belief system at some previous points in time, hence is the contradiction avoided in (29a).

10. And contrary to the English present perfect, the PC does not block temporal relations with the event time, cf. de Swart (2007), which might be responsible for the fact that in English, epistemic modal sentences are not acceptable with the present perfect on the modal.

- (30) *Pierre a dû pouvoir la voir.*
 Pierre has MUST-PP CAN-INF. see her.
 "Necessarily, Pierre might have seen her." (intended reading)
- (31) *Nécessairement, Pierre a très bien pu la voir.*
 Necessarily, Pierre has very well CAN-INF. see her.
 "Necessarily, Pierre might have seen her."

3.3. The interpretation of past tenses on the epistemic modal

3.3.1. A brief comparison with von Fintel and Gillies

Now that the distribution of past tense in EPIST.-MOD.-S has been addressed, I will explain their interpretation so that the new data presented in Section 1 can be accounted for. Before anything else, I would like to emphasize the difference between what is proposed here and the way von Fintel and Gillies (2007, 2008) analyse past epistemic sentences.

Von Fintel and Gillies already admitted that past Tenses can scope over EPIST-MOD. They assume that the epistemic evaluation is provided by MOD itself and thus also under the scope of Tense. I therefore suppose they would interpret the French example (2) as suggested by the paraphrase below.

- (2) *Il a pu y avoir de la glace au frigo.* There might have been ice cream in the freezer.
 PAST > EPIST.EVALUATION + POSSIBILITY
 "Based on the evidence we **had in the past**, it **was** possible that there was some ice cream in the freezer."

Since I adopt Boogaart's claim that the epistemic evaluation point is provided by ASP-POV, I consider that it is not under the scope of Tense/Aspect. The sentence (2) is thus here paraphrased as in (32) below, which contrasts with the one I attribute to (3).

- (32) *Il a pu y avoir de la glace au frigo.*
 PAST > POSSIBILITY; EPIST.-EVALUATION = PRST POV (EVAL.-T = U.-T)
 "Based on the evidence I **have now** [present point of view], it **was** possible that there was some ice cream in the freezer."
- (3) *Il pouvait y avoir de la glace au frigo.*
 PAST > POSSIBILITY; EPIST.-EVALUATION = PAST POV (EVAL.-T > U.-T)
 "Based on the evidence we **had in the past** [past point of view], it **was** possible that there was some ice cream in the freezer."

3.3.2. Present perfect vs imperfective on MOD

As our paraphrases of (2) and (3) given above make clear, the analysis predicts that MOD is not interpreted the same way with a PC or an *imparfait* on

it.

Remember the context that von Fintel and Gillies (2008) built for their example (1) (Context 1) : Sophie is looking for some ice cream, and checks the freezer at t . There is none inside. She is then asked why she opened the freezer at t . My observation in Section 1 was that in C1, Sophie's reply (1) translates in French with an imperfect on the modal (cf. (2)), while a present perfect would be infelicitous in the same context; cf. (3). This infelicity has two sources.

Firstly, with a present perfect on MOD, EVAL.-T=U.-T. This is problematic, since Sophie then knows in EVAL.-T. that P is false (given the conditions of assertability of epistemic modal sentences recalled in Section 2, she should not – recall the *It might rain* sentence quoted above).

Secondly, given that MOD is in the scope of the PC (a bounded tense), (3) denotes a *past non-persistent possibility*, i.e. which has already reached its right frontier before U-T. Why would Sophie justify in U.-T her past attempt to find ice cream in the freezer, by claiming that there was a *past and gone* possibility of ice-cream-in-the-freezer in a time $t' > U.-T$, in a context like C1 where it is not taken for granted that between t' and U.-T, the ice cream had possibly disappeared? ¹¹Without assuming anything of this sort, the only way to conceive the past possibility as bounded and thus already gone by is to assume that it was over even before she opened the freezer, which makes her attempt irrational (why bother opening the freezer then?). ¹²

The example (3) is acceptable in our Context 3 because it solves the two problems just described. Remember C3: Sophie wants to check the freezer at t , but Paul stands in her way and takes something from the freezer before asking his question: the state of the freezer might have changed between her attempt to open it and U-T, second problem solved – it is rational from Sophie to justify her attempt by invoking a gone (past and bounded) possibility to find ice-cream in the freezer. Besides, Sophie cannot see what Paul took: she does not know in EVAL-T=U-T whether P is true or not, first problem solved – she as an Evaluator is not sure that P is false in EVAL.-T.).

As for the *imparfait*, it is fine in Context 1 because when on MOD, we take the Evaluator's (i.e. Sophie's) perspective in the past, when she was opening the freezer. Thus EVAL.-T. is in the 'ignorant' past: the first problem is avoided. Besides, an EPIST.-MOD.-S with the *imparfait* denotes a *past persistent* (unbounded) possibility, i.e. which can still hold in U-T. Sophie's answer thus does not require a change of state of the freezer between t and U-T in order to be felicitous (second problem solved).

11. As already said in the introduction, assuming a freezer's change of state of this type precisely makes (3) acceptable, which confirms that this plays a crucial role in the inacceptability of (3) in C1; cf. below.

12. I make here the additional assumption that the possibility is conceived as bounded by the Evaluator (here Sophie). This seems to fit the facts and should be captured in a proper formalisation of the analysis.

We can explain the same way the contrast between (9) and (10) involving a future adverbial in the adjacent. As sentence (9) contains a PC on the modal, it describes a bounded (past) possibility that P occurs in ADJ-T: the possibility is thus presented as over in U-T (i.e. MOD-T precedes U-T). It thus generates a contradiction to locate ADJ-T after U-T by the adverbial *demain* 'tomorrow': locating the possibility that P in the past, but P in the future, generates a contradiction (if P is the case at t , then necessarily, $\Diamond P$ is the case at t).¹³ On the other hand, since sentence (10) contains an *imparfait* on the MOD, it describes an unbounded (past) possibility. This persistent possibility can thus perpetuate until and after U-T, and the previous contradiction vanishes.

3.3.3. Present perfect on MOD vs perfect infinitival

The analysis also captures the differences between sentences like (3) (with a present perfect on MOD) and (4) (with a present on MOD and a perfect infinitival). While the PC is always used as a past, we saw that the perfect infinitival is much more underspecified wrt. Tense and Aspect : it can be used as a perfect wrt. a past or a future point (no intrinsic past value), and it can lose its perfect value and translates in the infinitival domain all kinds of tensed pasts (cf. Hofmann's insight illustrated through the examples (15)-(17) and (20)-(21)).

Thus, while sentences like (3) systematically describe a past bounded possibility in MOD-T ('pu'), contemplated from the U-T ('a'), that P is verified in ADJ-T, sentences like (2) systematically describe a present unbounded possibility in MOD-T=U-T, contemplated from the U-T, that P is verified in ADJ-T. In the latter case, ADJ-T can be situated in the future without generating a contradiction (the possibility that P being unbounded, it can continue after U-T). The contrast between sentences (8) and (9) is thus explained. Note that it is possible to state that the bounded possibility described by the PC in (8) is followed by another unbounded possibility of the same nature, and thus to cancel the implicature that one deals with a non-persistent possibility, cf. (33). In this case, we rightly predict the future adverbial to become acceptable again:

- (33) *Votre voiture a très bien pu et peut toujours*
 You can-PRES.PFCT very well and can-PRST still very well
très bien être détruite demain.
 be destroyed tomorrow.

"It was and it is possible that your car is destroyed tomorrow."

We can also explain the difference of acceptability between (3) and (4) in C2. Recall that in C2, Sophie wants to check the freezer at t , but Paul stands

13. Cf. the reflexivity axiom $\Box P \rightarrow P$ and the axiom $P \rightarrow \Box \Diamond P$ of modal logic.

in her way, without taking something from the freezer and asks Sophie why she wanted to open it. Sentence (3) is infelicitous in C2 because it only solves one of the two problems described above; as required, Sophie is ignorant about *P* in EVAL-T=U-T, but the fact that the possibility is bounded is still problematic. If (4) is acceptable, this is (apart from the fact that again, Sophie is ignorant about *P* in EVAL-T=U-T) because the perfect infinitival can lose its imperfect value. Thus, (4) can describe a present possibility that there was (bounded *or unbounded* state) ice cream in the freezer. Thus, (4) does not necessarily mean "from what I know now, there is a possibility that there *had been* (gone state) ice cream on the freezer", which would have made (4) an irrational reply to Paul's question. Given the underspecified aspectual value of the 'perfect' infinitival, (4) can also mean "from what I know now, there is a possibility that there was (*and maybe still is*) ice-cream on the freezer", which does not raise problems in C2.

4. Conclusions

In conclusion, I have shown why it is useful to distinguish MOD-T from EVAL-T to understand better the interaction between Tense and Modality. The subtle distribution of Tense/Aspect morphology on French modals suggests that the reason why past modals resist an epistemic reading is not so much that epistemic modality cannot be in the scope of the past, but rather that epistemic modality is incompatible with the perfective aspect (Boogaart (2007)). Besides, I suggested that if the present perfect is compatible with this modality in French, this is because it has a non-perfective reading. Finally, several new data were provided showing that HAVE-MOD EPIST-Ss semantically differ from MOD.-HAVE ones, which shows that the Perfect Raising hypothesis is not tenable. However, not all problems have been solved. For instance, the analysis cannot explain the old observation of Tasmowski (1980) that one cannot use a past adverbial in the adjacent with a present in the modal and a simple infinitive (cf. *Pierre peut-PRST très bien être malade hier*, 'Pierre might be ill yesterday'). Secondly, the analysis cannot be extended to other Romance languages like Spanish: the epistemic reading is compatible with the Spanish perfective (cf. Laca (2008)'s example 45), and Spanish prefers the present on the modal to the 'Perfect Raising' linearisation. As Laca states, the tendency to (overt) Perfect Raising is much more pronounced in French. Thirdly, although as a general rule, the *passé simple* blocks the epistemic reading of modal verbs, it seems nevertheless sometimes possible to have a reading very similar to the one studied here, cf. Martin (prep). A better understanding of past epistemic modal sentences in Romance languages thus require still more efforts.

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