The Syntax and Semantics of Locating Adverbials

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Résumé

Cette étude porte sur les adverbiaux de localisation du français tels que *trois jours plus tard* ou *devant la maison* dont le rôle est de situer temporellement et/ou spatialement le procès évoqué par la phrase dans laquelle ils apparaissent. La description et la formalisation proposées tentent de combiner plusieurs plans d'analyse. Les interactions complexes entre la position des adverbiaux (dans la phrase) et leur contribution sémantique sont tout d'abord envisagées, de même que la structure syntaxique ('interne') de ces éléments. En se focalisant sur la position d'adjoint du syntagme verbal, on montre ensuite que le contenu sémantique des adverbiaux considérés est mieux saisi par une approche 'relationnelle' que par une approche 'référentielle', plusieurs caractéristiques supplémentaires de ces marqueurs étant recensées. Une sémantique compositionnelle des adverbiaux temporels et spatiaux en position de VP-adjoints est finalement proposée afin de rendre compte des phénomènes mis au jour.

Abstract

This study deals with French locating adverbials like *trois jours plus tard* (three days later) or *devant la maison* (in front of the house) that situate temporally and/or spatially the process described by the sentence in which they appear. The description and formalization proposed try to combine several levels of analysis. The complex interactions between the position of the adverbials (in the sentence) and their semantic contribution are first examined, as well as the syntactic ('internal') structure of these elements. Next, and focusing on the position of verb phrase adjunct, we show that the semantic content of the considered markers is better grasped by a 'relational' approach than by a 'referential' approach, several other characteristics of these markers being also outlined. Finally, a compositional semantics is proposed for temporal and spatial adverbials in VP-adjunct position, in order to account for the highlighted phenomena.

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1. Introduction

This paper deals with the semantics of locating adverbials in French. These are adverbials operating a single temporal or spatial localization such as *le 23 Mars 2002* (on March 23, 2002), *trois jours plus tard* (three days later), *à Toulouse* (at Toulouse) and *devant la maison* (in front of the house) in example (1):

> (1)　*Joan naquit le 23 Mars 2002 à Toulouse. Il arriva à Ayguevives trois jours plus tard. Les voisins l'attendaient devant la maison.* (Joan was born on March 23, 2002 in Toulouse. He went to Ayguevives three days later. The neighbors were waiting for him in front of the house.)

They are used to locate the main eventuality of the sentence in which they appear in space and/or in time. Quite complex adverbials can be formed from prepositions and noun phrases, and even from other complex adverbials, in a recursive manner, as in *deux jours après la réunion (d')avant les vacances* (two days after the meeting before the holidays). They are often anaphoric and as such contribute to the cohesion of a discourse.

These constructions, however, have not received a complete analysis. On the one hand their syntax as complex adverbial phrases has not been much described in the literature. On the other hand, their semantics lacks a full-fledged compositional analysis.[1] Further, the important discursive role of adverbials, observed in many descriptive accounts of discourse structure, has not been integrated with such a compositional semantic analysis.

We therefore adopt a transversal approach whose aim is to provide an analysis all the way from the syntactic level to the lexical semantics level and up to the discourse level. Built on the basis of a principled syntactic analysis, the required compositional semantics for locating adverbials typically needs to involve underspecified (e.g., anaphoric) elements. Then, this semantics has to be embedded within a theory of discourse structure and interpretation in order to resolve these underspecified elements.

In this paper, we tackle the first, sentential, part of this task, keeping the general, discursive, aim in mind. After having delimited our study and discussed the syntactic function of these adverbials within the sentence (Section 2), we describe the internal syntactic structure we propose for the whole class of complex locating adverbials (Section 3). Then, we describe how they behave meaning-wise (Section 4), and present our compositional semantic analysis (Section 5). We try to systematically account for the structural and semantic similarities between temporal locating adverbials and spatial ones. This is particularly relevant not only because these similarities are great, but also because these adverbials in trajectory contexts take up a spatio-temporal interpretation (Asher *et al.* 1995b), as those of (2):

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[1] Some proposals, as that of (Pratt & Francez 2001) do exist, though.

(2)   On ne voyait rien du paysage. Il pleuvait à verse depuis Toulouse. À Cordes, la pluie se transforma en grêle, et, dix minutes plus tard / dix kilomètres plus loin, le tonnerre se mit à gronder. (We couldn't see anything of the landscape. It had been pouring from rain from Toulouse. At Cordes, the rain became hail, and ten minutes later / ten kilometers further, there were rumbles of thunder.)

The discursive role of these adverbials will be fully discussed in a follow-up article.

2. Adverbials Considered in this Study and their Syntactic Role

We have already quoted some adverbials we want to deal with: *le 23 Mars 2002*, *à Toulouse, trois jours plus tard, devant la maison, depuis Toulouse, dix kilomètres plus loin*. We could add to this list: *à huit heures* (at 8), *le premier jour des vacances* (on the first day of holidays), *depuis une heure* (for one hour / since 1 o'clock), *jusqu'à midi* (until noon), *au bout de trois kilomètres* (after three km). From a syntactic point of view, these adverbials are all Preposition Phrases, as we will see in the next section. From a semantic point of view, they all include nouns whose lexical semantics bears a temporal or spatial feature such as *heure, jour, midi, lundi* for the temporal ones, and such as *kilomètre, maison, Toulouse* for the spatial ones. Be they spatial or temporal, they can be classified in two groups: those expressing a duration or a spatial span such as *deux heures, un mois, deux kilomètres* (two hours, one month, two kilometers), and those expressing a temporal or spatial location such as *ce matin-là, la semaine suivante, Noël, le jardin, Toulouse* (that morning, the following week, Christmas, the garden, Toulouse).

We exclude from our study adverbials like *tous les matins* (every morning) that introduce multiple localization through a quantification; indeed, temporal quantification adverbials have already been well-studied. Adverbials based on an NP denoting a temporal or spatial extension are locating adverbials if they involve an anaphoric element anchoring them, like *depuis deux jours* or *dix kilomètres plus loin*; we do not consider here those adverbials that only express a duration or spatial extension and do not actually locate the eventuality in space or time, such as *pendant trois jours* (during three days), *sur trois kilomètres* (over three kilometers) or *en deux heures* (in two hours). We won't say anything about adverbial constructions such as *quand Luc était à Toulouse* (when Luc was in Toulouse), *depuis que Paul était entré dans la ville* (since Paul had entered the town), *jusqu'à ce qu'il fût passé devant la maison* (until he passed (in front of) the house) because they introduce subordinate clauses and, as a consequence, call for other kinds of analyses and tools. Last, we will not consider adverbs whose semantics primarily plays a part at the discourse structure level rather than at the spatio-temporal structure level, as we showed it for *puis* (then) in (Bras *et al.* 2001). Other adverbs such as *alors* (then) or *ensuite* (next) are also discourse connectives, and as such are not considered here.

A number of studies have regarded the syntactic and semantic roles of French temporal and spatial adverbials, or their English or German equivalents. Some of them consider adverbials in general, and are not specific to temporal and spatial locating adverbials (Quirk & Greenbaum 1973, Leech & Svartvik 1975, Bellert 1977, Mélis 1983, Gross 1990, Nølke 1990, Parsons 1990, McKercher 1996, Molinier & Lévrier 2000); most studies concerned with temporal adverbials are actually dealing with temporal clauses or with quantificational adverbials (de Swart 1991, Johnston 1994, Le Draoulec 1997, Pratt & Francez 2001); only a few address temporal or spatial locating adverbials specifically (Maienborn 1995, Pratt & Francez 2001).

Some of these studies distinguish various syntactic functions, and accordingly different positions on the trees; others take for granted a single possible position, usually VP-adjunct. In a similar way as Maienborn (1995) does, we will consider the two IP-adjunct (sentential modifier) and VP-adjunct (VP modifier) positions and distinguish them from the V'-adjunct (verb modifier), and V-complement (verb argument) positions.

In VP-adjunct position, a temporal or spatial locating PP modifies the verb phrase, which, semantically speaking, means that it specifies the location of the eventuality described by the VP. For instance, we take the two PPs in (3) to be VP-adjuncts:

> *(3)   Marie dansa sur la terrasse jusqu'à l'aube.* (Marie danced on the terrace till dawn.)

This VP-adjunct position is to be distinguished from the argument position, i.e., mandatory (although not necessarily realized) complements of the verb, as in (4) and (5), as well as from the V'-adjunct position, or facultative complements, as *sur la terrasse* in (6). Real complements and V'-adjuncts do not locate the eventuality as a whole but rather interact with the verb to make its semantics more precise (Boons 1987, Asher & Sablayrolles 1995, Maienborn 1995), and as a result will not be considered any further here.

> *(4)   Marie sortit (de la maison)* (Marie came out (of the house))

> *(5)   La fête dura du matin jusqu'au soir* (The party lasted from the morning to the evening)

> *(6)   Marie sortit de la maison sur la terrasse* (Marie came out of the house onto the terrace)

In IP-adjunct position, a temporal or spatial locating PP modifies the whole sentence, which, semantically speaking, means that it modifies the truth-conditions of the whole proposition, i.e., it says when or where the sentence is true. This is what happens in Maienborn's (1995) example (7) which can be paraphrased with a when-clause: when she was in Bolivia, Maria had red hair. So-called frame-adverbials are also IP-adjuncts: they introduce a temporal or spatial referent that serves as an index at which a number of propositions are evaluated, as in (8) and (9).

> *(7)   In Bolivia, Maria had red hair.*

(8)   Le lundi, Luc arriva et Paul partit. (On the Monday, Luc arrived and Paul left.)

(9)   A Toulouse, il faisait soleil et le vent était doux. (At Toulouse, the sun was shining and the wind was warm.)

As suggested by examples (7-9), an initial position with a separating comma is typical of IP-adjuncts. Symmetrically, an ending position without a separating comma, as in (1-3), is typical of VP-adjuncts. Indeed, some adverbs which are only sentence modifiers like *heureusement* (fortunately) cannot occur in ending position without a comma:

(10)   Heureusement, Luc arriva. (Fortunately, Luc arrived.)

*(11)   *Luc arriva heureusement.*

It may seem that since locating adverbials can appear both in IP- and VP-adjunct position, this distinction is not really relevant to us. This is not so. In some cases, the two positions yield very different readings. In (12), the adverbial *à huit heures* introduces a time referent at which it is said to be true that Marie has eaten earlier, whereas in (13), the adverbial situates the eating event itself at eight o'clock while the pluperfect tense situates this event before some other salient temporal referent.

(12)   A huit heures, Marie avait mangé. (At eight, Marie had eaten.)

(13)   Marie avait mangé à huit heures. (Marie had eaten at eight.)

A large number of tests have been devised to distinguish the IP- and VP-adjunct positions for adverbials in general, both for French (Molinier & Lévrier 2000) and for English (McKercher 1996). According to these tests —and as seen with (12-13) for instance—, temporal and spatial adverbials have an ambivalent status: they cannot be categorized as either IP-adjuncts or VP-adjuncts once and for all, contrarily to an adverbial like *heureusement*, for instance. Molinier and Lévrier (2000) show that while temporal adverbials are closely related to the verb (possibility of a cleft construction: *c'est à huit heures que Marie mangea* (it is at 8 that Marie ate)), their scope can nevertheless include the whole sentence (possibility to appear in an initial detached position in a negative sentence: (14)). Similarly, McKercher (1996) underlines that spatial adverbials often behave as 'sentence adjuncts', although they clearly fulfill the properties of 'predicate modifiers'. These observations are not really contradictory; they just point out that it is necessary to identify the right syntactic position on each occasion of use.

In order to determine the position and function of a given locating adverbial (and since the initial/final position criterion is a good but not decisive enough indication) we will use a test that assumes that IP-adjuncts cannot fall under the scope of the negation, while VP-adjuncts can:

*(14)   A huit heures, Marie ne mangea pas (mais à dix heures *ø/si).* (At eight, Marie did not eat (but at ten ø/she did).)

(15)   Marie ne mangea pas à huit heures (mais à dix heures). (Marie did not eat at eight (but at ten))

In (14), the negation bears only on the event, which means that the sentence asserts that Marie did not eat. In contrast, in (15) the reading in which the negation bears on the adverbial is available, and the sentence could even presuppose that Marie did eat (as with the paraphrase: *ce n'est pas à huit heures que Marie mangea* (it is not at eight that Marie ate)), as the possible continuation shows it.

In the remainder of this paper, we will focus our analysis on the VP-adjunct use, that we take, as most scholars, to be the primary one. It may be possible to explain the change of contribution of the adverbial between its VP-adjunct use and its IP-adjunct one by some kind of type-lifting corresponding to the syntactic movement, although we will not explore this further here. We will leave the IP-adjunct case for a future paper in which we will tackle, more generally, the discourse effects of locating adverbials. The IP-adjunct position gives rise to several contextual effects, like the spatio-temporal interpretation of *à Cordes*, *10 km plus loin* and *10 mn plus tard* in (2) or the frame role of *le lundi* and *à Toulouse* in (8-9), that can both be fully analyzed in a discursive context only.

3. Internal Syntactic Structure of Locating Adverbials

Although the position and function of locating adverbials has been discussed in the literature, their internal syntactic structure has not been systematically described and analyzed. Here, we take our locating adverbials, be they in VP-adjunct or IP-adjunct position, to have the general syntactic structure shown on Figure 1.
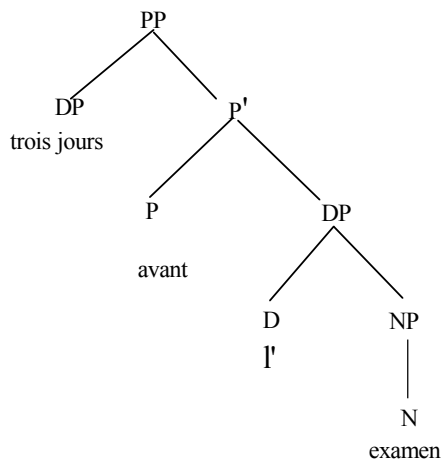

Figure 1: *trois jours avant l'examen*

Two preliminary remarks have to be made concerning this basic structure. First, the head of the prepositional phrase can be a lexically empty element as in *ø hier* (yesterday), *ø la veille* (the day before) or *ø le lundi* (on the Monday). This entails that, although not lexicalized, we consider that an element playing the syntactic and semantic part of a preposition is present in those expressions (such an assumption is corroborated by comparisons with other languages).

Second, we have seen that the NPs in the proposed structure express either an extension (a duration or a spatial span), or a (temporal or spatial) location. The determinant phrases they make up will be called respectively ext-DPs and loc-DPs. Both possibilities occur for the DP-complement position while the DP-specifier position is restricted to ext-DPs.
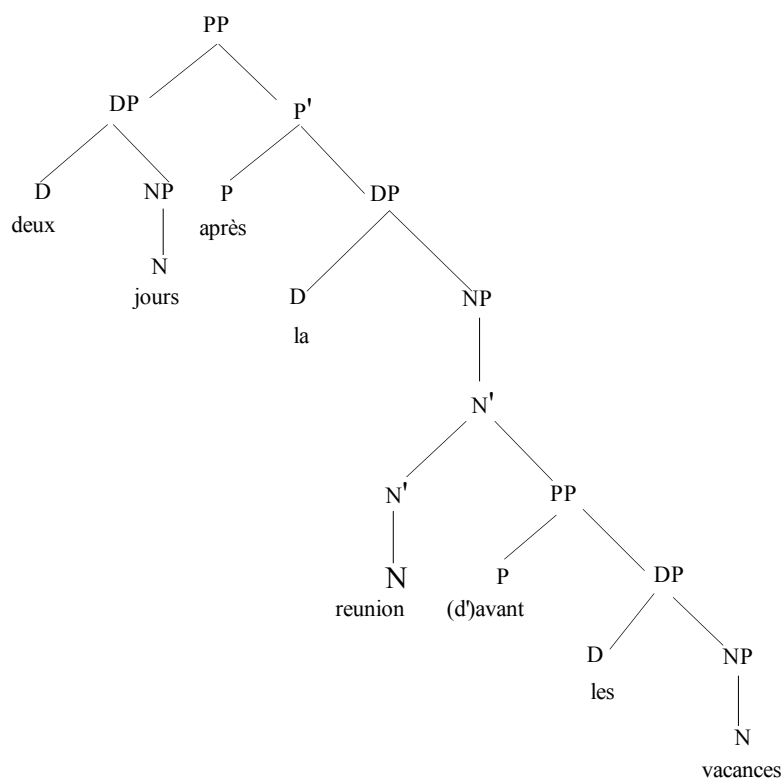

Figure 2: *deux jours après la réunion (d')avant les vacances*

Actually, the SPEC and COMP elements are not confined to the DP category (in a restrictive sense). Besides the noun phrases usually occurring in SPEC, (e.g., *trois kilomètres* in *trois kilomètres avant la station d'essence* (three kilometers before the gas station)), adverbs may fulfill a similar role in

the structure (e.g., *bien* in *bien avant la station d'essence* (well before the gas station) or *juste* in *juste après les vacances* (just after the holidays)). The role of the ext-DP in *trois jours avant l'examen* (three days before the examination) is indeed similar to the role of the adverb in *bien / peu avant l'examen* (well / shortly before the examination). However —and for the sake of simplicity— we will focus this study on syntactic structures in which the SPEC and the COMP positions are represented by means of a DP (with a possibly empty D head).

The complete structure of an adverbial can be more complex than the basic representation in Figure 1 because the NP complement of the DP-COMP can itself incorporate a locating PP (or other kind of adjunct) as in *(deux jours / peu de temps) après la réunion (d')avant les vacances* ((two days / shortly) after the meeting before the holidays), whose structure is shown on Figure 2, or in *(100 mètres / un peu) après la station (d')avant le village* ((100 meters / a bit) after the gas station before the village).

Beyond the uniform character that the general syntactic structure we propose suggests, two categories of adverbials can be distinguished which basically match the opposition between prepositions and adverbs. We have, on the one hand, real prepositions like *depuis* (since), *avant* (before), *derrière* (behind), etc. that usually combine with a lexicalized DP-COMP (*depuis la réunion* (since the meeting), *derrière la mairie* (behind the town hall)) but which also give rise to anaphoric or deictic uses when the DP is empty.[2]

There is, on the other hand, a class of markers —usually called adverbs— that normally do not appear with a lexicalized DP-COMP (*plus tard* (later), *plus loin* (further), *dedans* (inside)) even though the presence of a contextually determined DP-COMP can be postulated. Indeed, several clues reveal the presence of a non lexicalized element, among which the existence of similar structures selecting a complement (e.g., *pas plus tard qu'hier* (only yesterday)) or their re-analysis/re-use as prepositions that is sometimes made in colloquial language (e.g., *dedans la mairie* (inside the town hall)). The characterization of adverbs and, in particular, the properties that distinguish them from prepositions constitute open questions that we will nevertheless not tackle here.[3] We would only like to stress that, beyond the fact that they require a lexicalized DP-COMP or not, real prepositions as well as adverbs can be analyzed by means of the syntactic structure previously introduced.

These remarks on adverbials calling for prepositions or adverbs also show that, when an element (here the DP-COMP) of the syntactic structure is not lexicalized, the interpretation of the whole expression has to rely on other referential information. Indeed, an important property of locating adverbials is their dependence on or their independence from the preceding discourse (anaphora) or the context of utterance (deixis). The adverbials involved in

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[2] But some prepositions (*jusqu'à, dans, à, il y a, de*) require a lexicalized DP-COMP.
[3] For detailed analyses of French adverbs see (Gross 1990, Molinier & Lévrier 2000).

narratives typically are dependent on the linguistic context, i.e., they are anaphoric —e.g., *deux heures plus tard* (two hours later), *trois kilomètres plus loin* (three kilometers further)— or deictic, although the latter case will be set aside in this study.[4] Of course, in addition to anaphoric ones, we will analyze locating adverbials which are context independent —e.g., *le 23 mars 2002* (on March 23rd 2002), *à Toulouse* (at/in Toulouse).

Further remarks have to be made concerning the syntactic structure of two kinds of complex adverbials. Adverbials like *au coin de la rue* (at the corner of the street), *au milieu de la réunion* (in the middle of the meeting) involve two locating nouns. According to descriptive studies on internal localization (Borillo 1992, Aurnague 1996), they are rather made up of a complex preposition (such as *au coin de* or *au milieu de*) combined with a simple DP-COMP (*la rue, la réunion*) than of the simple preposition *à* associated with a complex DP (*le coin de la rue, le milieu de la réunion*).

For adverbials of the form *jusqu'à / après Noël* (till Christmas / till after Christmas), *jusque sur le toit* (up onto the roof) —and even though this kind of construction will not be studied as much as the simpler ones—, it will be assumed that a few prepositions (e.g., *jusque, depuis*) can take other PPs as complements (e.g., *à Noël, après Noël, sur le toit*).[5] The final structure of such expressions can be even more complex as the complement can sometimes take a specifier, as in *jusque bien après Noël* (till long after Christmas). So, the syntax of these complex adverbials can be accounted for by adding a structure involving embedded PPs to the basic one seen above.

4.   Semantic Description of Locating Adverbials

4.1. Relational semantics

The semantic analysis of temporal and spatial locating adverbials can give rise to two distinct approaches (at least). In the first approach that we call 'referential', the preposition —applied to its complement—, introduces a time or a place at which the eventuality described by the VP is located (in (16), for instance, the event of Marie joining Luc would be located in a time defined by the adverbial *après la réunion*). In the second approach —called 'relational'—, the prepositional phrase does not introduce any new referent on top of that of its complement but rather indicates that the eventuality and the complement of the adverbial have to stand in the relation denoted by the

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[4] For more on French spatial deictic expressions, see (Kleiber 1992, Borillo 1993).

[5] Another point of view consists in stating that, even if a combination of embedded PPs is diachronically or synchronically possible for such expressions, the final syntactic structure could be also grasped by a complex preposition (e.g., *jusqu'à, jusqu'après, jusque bien après, jusque sur*) simply associated with a DP-COMP, even though this lessens the compositional character of the analysis.

preposition (that is, the preposition *après* in (16) would only compel the joining event to be later than the meeting).

> *(16)   Marie rejoignit Luc après la réunion.* (Marie joined Luc after the meeting.)

As it could be foreseen in the previous remarks, the referential approach —which is also the most widespread—, implies that all the locating adverbials call for a unique locating relation, inclusion: the preposition operates as a function on the complement and provides the time or place in which the eventuality will be located via the inclusion. This choice presents the inconvenient to treat the prepositions in a non-homogeneous way. When a preposition —in all or part of its uses— already denotes some notion of inclusion in the entity designated by the complement (e.g., *à* (at), *dans* (in)), the systematic use of the relation of inclusion in the resulting semantics leads to consider that this preposition has a null contribution or to assume that all other prepositions are virtually preceded by such an 'inclusion' marker. The drawbacks of the referential approach are even more evident in the spatial or spatio-temporal domain than in the pure temporal one which is unidimensional and calls for a limited number of (temporal) relations. Indeed, the analysis of spatial markers showed that the semantics of prepositions like *sur* (on) or *dans* (in) cannot be reduced to a 'geometrical' inclusion in a space portion (defined by applying the preposition to the complement (landmark entity)) because it involves 'functional' relations (e.g., support, containment) based on a real interaction between the located entity and the landmark ('subject' and complement of the preposition, respectively) (Vandeloise 1986, Aurnague *et al*. 1997). Prepositions like *avant* (before)/*après* (after) related to the domain of orientation and motion provide similar arguments against a 'referential' approach. In (17), the simple application of the preposition to the complement/landmark does not suffice to determine a location; we need to take into account the direction of motion of the located eventuality as well as other elements of the context (e.g., the course of a possible itinerary). This behavior of spatial markers would therefore be better accounted for by stating that the eventuality and the landmark stand in a relation fulfilling the different constraints we mentioned (based on the interaction of these entities as well as other possible factors from the context).

> *(17)   Luc s'arrêta 10 mètres avant le grand chêne* (Luc stopped 10 meters before the big oak)

Besides the difficulties related to the exclusive role assigned to the complement of the preposition, the referential approach seems to give rise to ontological problems. For instance, in a description like (18) involving several plural entities moving around, are we going to introduce a unique complex place (something like a ring?, how large?) or several places situated a few hundred of meters from the presidential house? Have these locations to be stable or moving (following the moving groups of workers)? and, in the

latter case (if it makes any ontological sense at all), how are these changing elements to be determined?

> *(18)   Des groupes d'ouvriers en colère parcouraient la ville à quelques centaines de mètres du palais présidentiel* (Groups of angry workers were marching up and down the city a few hundred of meters from the presidential house)

These issues would not arise with a relational approach that avoids any 'proliferation' of entities and stands as close as possible to the ontological granularity underlying the linguistic description (ontological parsimony). To sum up, the relational processing of locating adverbials is more likely than the referential approach to take into account the complex 'functional' interactions between entities that these markers call for. It also appears to imply a more cautious ontological commitment.

In spite of our claim that the semantics of locating adverbials is primarily relational, in particular circumstances, they behave in a more referential manner and may actually introduce a time or place different from that denoted by their complement.

For instance, adverbials like *après Noël* (after Christmas) or *sur le toit* (on the roof) acquire a referential behavior when used as complement of another preposition as in *jusqu'après Noël* (till after Christmas) or *jusque sur le toit* (up onto the roof). Indeed, the preposition *jusque* heading the complex PP calls for a complement referring to a time or a place (as a loc-DP does) and, consequently, the embedded adverbial (*après Noël*, *sur le toit*) has to be able to introduce such a referent for the overall computation to be possible.[6] So, the syntactic structure of the PP is able to coerce the referential interpretation of an adverbial.

As discussed in Section 2, the position of the locating adverbial in the sentence (VP- or IP-adjunct) is closely related to its functioning as a predicate or sentence modifier. This factor too conditions the relational or referential behavior of these markers. In particular, the 'lifting' of the adverbial from a postponed position (16) to an initial separated position (19) appears, very often, to entail an IP-adjunct attachment and a concomitant shift to a referential meaning. Indeed, a temporal adverbial in IP-adjunct position, like *après la réunion* in (19), cannot 'locate' a sentence after some event (*la réunion*). Rather, it introduces a temporal index at which the main proposition (*Marie rejoignit Luc*) is said to be true, and therefore has a referential meaning.[7] The need, for the IP-adjunct, to introduce a location is also clear when the interpretation of the IP itself implies the presence of a specific time as in (20).

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[6] With 'inclusion' embedded adverbials like *à Noël* (in, e.g., *jusqu'à Noël* (until Christmas)), whose semantics doesn't really differ from a relational or a referential point of view, the contribution of the preposition *à* simply disappears.

[7] For *à Noël* or *à huit heures* (at 8), the point is that the contribution of the preposition changes from a simple predicate locating an eventuality to an intensional operator.

With the anaphoric value of the *imparfait* tense, the sentence has to be anchored at a specific time or event to be interpretable. Here, this anchoring is clearly provided by the adverbial. These examples indicate that, contrarily to the VP-adjunct position which calls for a relational interpretation, the 'lifting' of locating adverbials to an IP-adjunct position leads to a referential processing of these markers.

> *(19)   Après la réunion, Marie rejoignit Luc* (After the meeting, Marie joined Luc)

> *(20)   Deux heures plus tard, Marie dormait* (Two hours later, Marie was sleeping)

We take thus the referential meaning to be a derived one (possibly obtained through some kind of type mismatch resolution) whose full analysis is left for a forthcoming paper.

4.2. Locating Temporal Adverbials (LTAs)

The semantic description of LTAs that we give here relies on previous work on French temporal adverbials (Vet 1980, Borillo 1983, Molinès 1989, Bras 1990, Bras & Molinès 1993). These approaches were adopting a referential analysis, and were not fully aimed at a compositional analysis as we do in this paper (see also (Borillo 1999) for a referential view). Here we want to account for the way anaphoric LTAs[8] locate the eventuality denoted by the VP, adopting a relational analysis. This description will then be formalized in a compositional semantic fashion in Section 5.

A first distinction among the LTAs at stake can be made by comparing the kind of relation the preposition establishes between the temporal referent introduced by the DP in COMP position and the eventuality. In an LTA such as *jusqu'à huit heures*, the DP describes a temporal location —namely a particular area of the time axis specified by the clock time— that is used to give a (final) boundary to the eventuality, as in (21). A similar behavior occurs with LTAs such as *depuis la veille, à partir de ce moment-là,* that focus on the initial boundary of the eventuality as in (22-23).

> *(21)   Max dormit jusqu'à huit heures.* (Max slept till eight o'clock.)

> *(22)   Max était absent depuis la veille.* (Max had not been there since the day before.)

> *(23)   Max dormit tranquille à partir de ce moment-là.* (Max slept soundly from that time on.)

Since the way these LTAs locate the eventuality relies on its temporal continuity between the DP-COMP and some other salient temporal referent

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[8] We will not go into the details of the way the anaphoric antecedent is to be resolved. This will be seen in a forthcoming paper discussing discourse issues. Let us simply mention that LTAs like *à huit heures* (at eight) may make implicit anaphoric reference to a larger unit of time —e.g., *à huit heures* has to be located in a particular day.

(the initial boundary of the eventuality for 'final' PPs and an anaphoric or deictic element for 'initial' ones), we call them continuous LTAs.

On the other hand, in LTAs such as *à huit heures* (at eight), *à ce moment-là* (at that time), *la veille* (the day before), the DP-COMP gives a temporal location that is used in a more direct way to locate the eventuality by means of the relation denoted by the preposition (in these cases, an inclusion relation). Similarly, in *après Noël* (after Christmas) and *auparavant* (beforehand), the preposition will introduce respectively a posteriority and a precedence temporal relation. This type of localization will be called the direct localization case as opposed to the continuous one.

As far as the interaction between the LTA and the sentence aspect is concerned, direct LTAS like *à huit heures* only combine with events[9], cf. (24-25), but for continuous LTAs, things vary. Those headed by the preposition *depuis* (since/for) only combine with states, cf. (22) and (26), while those headed by *jusque* (until) and *à partir de* (from) require events, cf. (21) and (23). But lexical aspect matters too: terminative verbs or VPs like *arriver* (to arrive) cannot be modified by continuous LTAs (27) whereas non-terminative VPs like *dormir (to sleep)* or *rester* (to stay) can (28). This distinction is not relevant for direct ones, cf. (24).

> *(24)   Max arriva/dormit à 8 h.* (Max arrived/slept at 8.)[10]

> *(25)   Max arrivait/dormait à 8h.* (Max arrived/slept at 8.): acceptable only with an habitual or a narrative reading of the *imparfait* tense.[11]

> *(26)   *Max arriva/dormit depuis 8h.* (Max arrived/slept since 8.)

> *(27)   *Max arriva jusqu'à 8h.* (Max arrived until 8.)

> *(28)   Max dormit/resta jusqu'à 8 h.* (Max slept/stayed until 8.)

A second distinction comes from the possible or impossible presence of an ext-DP in the LTA. Ext-DPs, usually in SPEC position as in *trois jours avant (Noël)* (three days before (Christmas)) or *une heure plus tard* (an hour later) give an information that helps specify the relation by quantifying the distance associated to it. In (29), the eventuality is simply located before a time associated to Christmas while in (30), the distance between the eventuality and this time is specified. Adverbials like *à huit heures* (at eight) or *le lendemain* (the day after), headed by a (possibly empty) preposition denoting an inclusion, i.e., a temporal relation implying a null distance, cannot be specified further by an ext-DP.

> *(29)   Max arriva avant Noël.* (Max arrived before Chritsmas.)

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[9] We adopt the simple, event / state ontology for eventualities, as done in DRT (Kamp & Reyle 1993) and SDRT (Asher 1993).

[10] *Dormir* yields an inchoative reading because of the inclusion meaning of the preposition and the punctual nature of the NP *8 heures*. Note also that inclusion boils down to coincidence with punctual NPs.

[11] In *à huit heures, Marie dormait*, we do have a stative *imparfait*, but just as in (20), the adverbial is in IP-adjunct position.

> *(30)   Max arriva trois jours avant Noël.* (Max arrived three days before Christmas.)

In direct locating adverbials, ext-DPs may also appear in COMP position, as in *au bout de trois jours* (after three days) and *après/avant trois jours* (after/within three days). Since the semantics of *après/avant trois jours* differs from that of *trois jours après/avant*, we have chosen to consider these prepositions as being polysemous. The only case in which an ext-DP shows up in a continuous adverbial is in a COMP position as well, with the preposition *depuis* as in *depuis trois jours* in (31) —although we are faced again with a case of polysemy (*depuis* means here *for*, not *since*).

> *(31)   Max était malade depuis 3 jours.* (Max had been sick for 3 days.)

4.3. Locating Spatial Adverbials (LSAs)

Besides their relational nature, Locating Spatial Adverbials (LSAs) show several other properties that have to be taken into account for the analysis and formalization of their semantic content.

As for LTAs, a first distinction concerns the continuous/direct aspect of the spatial relation expressed by the LSA: whereas some adverbials call for a continuous localization partially bounded by the spatial entity their complement refers to —as in *à partir de la maison* (from the house), *depuis trois kilomètres* (for three kilometers) —, other ones locate the eventuality in a direct and more limited way with respect to that spatial entity —as in *devant la bibliothèque* (in front of the library) or *à gauche de la mairie* (at the left of the town-hall). The continuous LSAs —but not the direct ones— presuppose the identification of a second spatial entity given by the context and imply the located entity to 'continuously' occupy the area thus bounded.

Here again, a second distinction concerns the possibility or not for LSAs to be modified by an ext-DP specifier. The continuous LSAs previously mentioned (e.g., *depuis/jusqu'à la maison* (from/up to the house)) as well as the non-continuous LSAs that denote an 'internal' localization (e.g., *sur la place* (on the square), *dans la rue* (in the street), *à la mairie* (at the town hall), *au coin de la rue* (at the corner of the street)) reject the association with an ext-DP-SPEC: **cent mètres depuis/jusqu'à la maison* (one hundred meters from/up to the house), **dix mètres sur la place* (ten meters on the square), **cent mètres à la mairie* (one hundred meters at the town hall), **dix mètres au coin de la rue* (ten meters at the corner of the street). On the contrary, the direct LSAs that call for an 'external' localization and as a result imply a non-null distance between the located entity and the complement (e.g., *avant/après la mairie* (before/after the town hall), *à gauche/droite de la mairie* (at the left/right of the town hall), *au-dessus/au-dessous du refuge* (above/below the refuge)) usually admit the combination with a specifier: *cent mètres après la mairie* (one hundred meters after the town hall), *dix mètres à gauche de la mairie* (ten meters at the left of the town hall), *cent mètres au-dessous du refuge* (one hundred meters below the refuge). Many of

these LSAs are based on orientational notions and the direction they define, together with the external character of the localization process —which, thus, operates outside the landmark (the loc-DP-COMP) and along the mentioned direction—, make possible the calculation of a distance between the landmark and the located entity (the eventuality, and through it, usually its participants). However, note that an external LSA integrating distance in its semantic content can take a specifier only if the value or magnitude of this distance parameter is not already expressed by the Prep itself (e.g., *dix mètres près de la mairie* (ten meters near the town hall), ??*dix mètres à côté de la mairie* (ten meters next to the town hall)). In short, the possibility to take an ext-DP-SPEC means that the Prep presupposes a distance component in its semantics, the value of which is left unspecified.

Although measure nouns (ext-DPs) mainly appear in SPEC position, they can sometimes appear in COMP position as in *au bout de trois kilomètres* (after three kilometers; direct) or *depuis trois kilomètres* (for three kilometers; continuous). For continuous LSAs, the resulting possible alternation between loc-DPs (*depuis le haut de la colline* (from the top of the hill)) and ext-DPs (*depuis trois kilomètres*) in COMP has to be taken into account. With an ext-DP, we systematically get a spatio-temporal interpretation as in (32) while with a loc-DP, the spatio-temporal interpretation is possible but doesn't seem mandatory because of examples like (33) and (34).[12] However, those latter cases appear to be limited to VPs involving either a perception verb or a motion verb.[13] Continuous LSAs with spatio-temporal interpretation display the same pattern of aspectual constraints as their temporal counterparts (see Section 4.2), e.g., *depuis trois kilomètres* can only apply to a state (32); but *depuis* without spatio-temporal interpretation (necessarily with a loc-DP in COMP) behaves differently and doesn't present this constraint (33):

> *(32)   Luc inspectait/*inspecta le ciel depuis trois kilomètres* (Luc was inspecting/inspected the sky for three kilometers)
>
> *(33)   Luc inspectait/inspecta le ciel depuis le haut de la colline* (Luc was inspecting/inspected the sky from the top of the hill)
>
> *(34)   Le chat atteignit le bol de lait depuis la chaise* (The cat reached the bowl of milk from the chair)

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[12] With a state, (33) is ambiguous between the spatial (The top of the hill was Luc's viewpoint while he was inspecting) and spatio-temporal (Luc started inspecting when he left the top of the hill) interpretations, while with an event only the spatial interpretation is available. Similarly, (34) only has a spatial reading.

[13] Further studies are needed to clarify whether the PPs in such examples with a purely spatial reading are really VP-adjuncts or rather interact more closely with the verb in a lower syntactic position. In the latter hypothesis, one would thus conclude that all prepositions heading continuous LSAs are primarily temporal ones and take up a spatio-temporal reading through some kind of coercion when combined with spatial DP-COMP, just as direct ones like *3 km après* (3 km further) do.

Apart from the case of continuous adverbials just described, the semantics of LSAs does not involve aspectual constraints and allows these markers to combine with states as well as with events.

5. Formalization

We will now model the contribution of LTAs and LSAs to the sentence semantics, when they are in VP-adjunct position. We will show in details on a few examples how this contribution is compositionally computed.

With our general discourse perspective, if we were to choose a dynamic representational framework like DRT (Kamp & Reyle 1993) or SDRT (Asher 1993), this semantics would have to contribute to the construction of DRSs, and thus should be written in a λ-DRT formalism (e.g., that of (Asher 1993) or (Muskens 1996)). Since the discourse dimension is actually not focussed on in this paper, we instead chose the standard formal semantics expression —the translation between the two formalisms being quite straightforward. We will nevertheless need to introduce certain underspecified elements, to be resolved further on by the discourse context. We follow the underspecification method already present in various versions of DRT that take seriously the underspecified semantics of pronouns and in which pronouns introduce conditions of the form x=?. But because the resolution of underspecified conditions may come in several steps, we will introduce a relation of "resolves", written ⇝, which is transitive and anti-symmetric. The one complication consists in the resolution of these underspecified elements during the application of the preposition meaning to the meanings of its arguments. We will handle this by writing constraints on what the application yields with :=. Such constraints exploit a categorization that implements previous observations: Ns —and as a result, NPs and DPs— are categorized in the lexicon as expressing a location (loc) or an extension (ext) and as being temporal (temp) or spatial (sp). We similarly assume a temp/sp categorization of those Preps that are not ambiguous. Some other constraints on composition will be handled using an ontological typing of individual variables: E for events, S for states, T for times and P for places.

The semantics of our locating adverbials are all appropriate to their syntactic position as VP-adjuncts; they take a property P as argument —itself with at least an eventuality[14] as argument ($P = \lambda e^{E \cup S} P'(e)$)— and yield a new formula taking an eventuality as argument representing the combination of the adverbial semantics with the content of P. They thus have the following general form: $[\![PP]\!] = \lambda P \lambda x (P(x) \wedge Q(x))$, where $Q(x)$ is the actual semantic contribution of the adverbial.[15]

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[14] The eventuality, an event or a state, is to be given by the IP head.

[15] The variable x is not typed here as being $E \cup S$, since we will see that the same formula is also appropriate to PPs in a N'-adjunct position.

The semantics we give below is compositional and based on our previous syntactical analysis. The exact calculation depends on the nature of the preposition. If it accepts two (lexicalized or not) DPs in SPEC and COMP positions, like *avant* in *(trois jours) avant (l'examen)* ((three days) before (the examination)), we apply the Sem1 schema that requires the DP-SPEC to be an ext-DP and the DP-COMP to be a loc-DP. When the adverbial is headed by a preposition that does not accept a DP-SPEC —like *à*, *depuis*, *devant*, in *à/depuis midi* (at/since 12), *devant (la mairie)* (in front (of the town hall))— patterns Sem2 and Sem3 differentiate between the two kinds of possible DP-COMP, loc-DP and ext-DP. In case a given preposition accepts both loc-DPs and ext-DPs in COMP position, as *depuis* does, we have a case of polysemy.

Sem1 $(\llbracket\text{Prep}\rrbracket(\llbracket\text{DP}_{\text{COMP}}\rrbracket_{\text{loc}}))(\llbracket\text{DP}_{\text{SPEC}}\rrbracket_{\text{ext}})$

Sem2 $\llbracket\text{Prep}\rrbracket(\llbracket\text{DP}_{\text{COMP}}\rrbracket_{\text{loc}})$

Sem3 $\llbracket\text{Prep}\rrbracket(\llbracket\text{DP}_{\text{COMP}}\rrbracket_{\text{ext}})$

Note that if the preposition does accept a DP-SPEC modification, when used without it, the composition still follows the first pattern and an $\llbracket\text{empty-DP}\rrbracket$ is used. Similarly, when there is an anaphor and the DP-COMP is missing, we will use an $\llbracket\text{empty-DP}\rrbracket$ argument in the schemata.

As explained in Section 3, the complexity of the overall semantic computation varies according to the internal structure of the NP introduced in the DP (most of the time it is the DP in COMP which gives rise to this phenomenon). Simple DPs ($\llbracket\text{DP}\rrbracket = \llbracket\text{Det}\rrbracket(\llbracket\text{NP}\rrbracket)$) contrast with structures integrating a PP as N'-adjunct, as *ø la semaine d'avant les vacances* (on the week before the holidays), for which a more complex calculus is necessary: $\llbracket\text{DP}\rrbracket = \llbracket\text{Det}\rrbracket (\llbracket\text{PP}\rrbracket(\llbracket\text{NP}\rrbracket))$ (see Figure 2).

5.1. Locating Time Adverbials

We start with direct locating adverbials. The simplest cases are those with prepositions that do not take specifiers and follow the Sem2 schema, as with *à midi* (at 12).

$\llbracket\text{à}\rrbracket = \llbracket\text{null prep}\rrbracket = \lambda C\ \lambda P\ \lambda e\ (P(e) \wedge C(\lambda x\ (R_{à}(e, x) \wedge R_{à} \rightarrowtail ?)))$

$\llbracket\text{le}\rrbracket = \llbracket\text{la}\rrbracket = \llbracket\text{null det}\rrbracket = \lambda P\ \lambda R\ \exists y\ (P(y) \wedge R(y))$

$\llbracket\text{midi}\rrbracket_{\text{loc-temp}} = \lambda u^{T}\ \exists v^{T}\ (\text{Day}(v) \wedge v=? \wedge \text{Hour}(u) \wedge u\subset v \wedge \text{Calendar}(u,\text{'12h'}))$

$\llbracket\text{à ø midi}\rrbracket = \llbracket\text{à}\rrbracket(\llbracket\text{null det}\rrbracket(\llbracket\text{midi}\rrbracket_{\text{loc-temp}})) = \lambda P\ \lambda e\ \exists y^{T}\ \exists v^{T}\ (P(e) \wedge \text{Day}(v) \wedge v=? \wedge \text{Hour}(y) \wedge y\subset v \wedge \text{Calendar}(y,\text{'12h'}) \wedge R_{à}(e, y) \wedge R_{à} \rightarrowtail ?)$

Let's explain a few points. Where we have a phonologically non realized determiner in the DP, as with *midi*, we suppose that it has the force of a definite, introducing an existential quantifier. This first example illustrates also how we deal with underdetermination. The preposition *à* (at) could either be spatial or temporal and so the meaning of the preposition itself contains an underspecified relation $R_{à}$ between the eventuality the VP predicates over and the place or time introduced by the loc-DP-COMP. It will be specified further when the preposition combines with a particular DP. We assume

that when *à* combines with a temporal DP, $R_{à}$ is specified to some temporal relation, namely temporal inclusion. We specify these constraints as follows:

$[\![à]\!] ([\![DP]\!]_{\text{loc-temp}}) := ([\![à]\!] [\subseteq/R_{à}])([\![DP]\!]_{\text{loc-temp}})$

Therefore, since we assume $[\![ø\ midi]\!]_{\text{loc-temp}}$ to be recognized as a temporal loc-DP (inherited from the lexical entry *midi*), we rather have:

$[\![à\ ø\ midi]\!] = \lambda P\ \lambda e\ \exists y^T\ \exists v^T\ (P(e) \wedge Day(v) \wedge v=? \wedge Hour(y) \wedge y \subset v \wedge Calendar(y,'12h') \wedge e \subseteq y)$

Prepositions that admit a specifier follow the pattern Sem1. Let's take as example *deux jours avant Noël* (two days before Christmas):

$[\![avant_1]\!]_{\text{temp}} = \lambda C\ \lambda S\ \lambda P\ \lambda e^{E \cup T}\ C(\lambda x\ (P(e) \wedge e<x \wedge S(\lambda y\ Dist(e,x,y))))$

$[\![Noël]\!]_{\text{loc-temp}} = \lambda Q\ \exists t^T\ (Noël(t) \wedge Q(t))$[16]

$[\![deux\ jours]\!]_{\text{ext}} = \lambda R\ \exists u\ (Length(u,'2days') \wedge R(u))$[17]

$[\![deux\ jours\ avant\ Noël]\!] = ([\![avant_1]\!]_{\text{temp}}([\![Noël]\!]_{\text{loc-temp}}))([\![deux\ jours]\!]_{\text{ext}})$
$= \lambda P\ \lambda e^{E \cup T}\ \exists t^T\ \exists u\ (P(e) \wedge Noël(t) \wedge e<t \wedge Length(u,'2days') \wedge Dist(e,t,u))$

As explained in Section 4.2, the preposition determines how the specifier modifies it. In the case of *avant*, a DP-SPEC specifies the distance[18] between the entity modified by the whole PP and the DP-COMP.

When the complement DP is missing, as with *deux jours avant* (two days before), we assume the presence of an 'empty DP'. As empty DPs are highly ambiguous, we will use the kind of constraint seen above to obtain the right semantics. In the case at hand, the pattern Sem1 tells us that in COMP position, it is an empty loc-DP, which is always anaphoric; in addition, the nature of the Prep tells us it is temporal:

$[\![empty\ DP]\!]_{\text{loc-temp}} = \lambda Q\ \exists x^{E \cup T}\ (x=? \wedge Q(x))$[19]

$[\![deux\ jours\ avant\ ø]\!] = ([\![avant_1]\!]_{\text{temp}}([\![empty\ DP]\!]_{\text{loc}}))([\![deux\ jours]\!]_{\text{ext}}) = \lambda P\ \lambda e^{E \cup T}\ \exists x^{E \cup T}\ \exists u\ (P(e) \wedge x=? \wedge e<x \wedge Length(u,'2days') \wedge Dist(e,x,u))$

Similarly, for the adverbial *avant (Noël)* (before (Chritsmas)), we have an empty DP-SPEC that, as constrained by the Sem1 schema, is an empty ext-DP. This element is *not* anaphoric, although it vaguely specifies the distance to be 'short', which is of course contextually dependent:

$[\![empty\ DP]\!]_{\text{ext}} = [\![peu]\!] = \lambda R\ \exists u\ (Length(u,'short') \wedge R(u))$

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[16] Noël could be made anaphoric on a year, just as midi is anaphoric on a day.

[17] *Deux jours*, as *une semaine* (one week), is ambiguous between a loc-DP and an ext-DP. This is the ext-DP semantic value. Notice the additional ambiguity (not resolved during composition but only in discourse context) between two kinds of loc-DPs in the case of *une heure* (one hour / one o'clock).

[18] The Dist predicate must take into account the subtle ways humans refer to times. Axioms are needed to explain its interaction with predicates such as Hour, Day, Week, Length, Calendar, Noël. (Gagnon & Bras 1995).

[19] In the temporal case, the antecedent of the anaphor is constrained to be an event or a time, i.e., not a state ; the non-salience of the boundaries of a state prevent it from being a valid anchor point to calculate a distance.

$\llbracket \text{ø avant Noël} \rrbracket = (\llbracket \text{avant}_1 \rrbracket_{\text{temp}}(\llbracket \text{Noël} \rrbracket))(\llbracket \text{empty DP} \rrbracket_{\text{ext}}) = \lambda P \lambda e^{E \cup T} \exists t^T$
$\exists u \ (P(e) \land \text{Noël}(t) \land e<t \land \text{Length}(u,\text{'short'}) \land \text{Dist}(e,t,u))$

$\llbracket \text{ø avant ø} \rrbracket = (\llbracket \text{avant}_1 \rrbracket_{\text{temp}}(\llbracket \text{empty DP} \rrbracket_{\text{loc-temp}}))(\llbracket \text{empty DP} \rrbracket_{\text{ext}}) = \lambda P$
$\lambda e^{E \cup T} \exists x^{E \cup T} \exists u \ (P(e) \land x=? \land e<x \land \text{Length}(u,\text{'short'}) \land \text{Dist}(e,x,u))$

The semantics of our propositional phrases as VP-adjuncts directly applies also to their N'-adjunct use, for instance in the complex adverbial *la semaine avant Noël* (on the week before Christmas):

$\llbracket \text{semaine} \rrbracket_{\text{loc-temp}} = \lambda t^T \ \text{Week}(t)$[20]

$\llbracket \text{ø la semaine ø avant Noël} \rrbracket = \llbracket \text{null prep} \rrbracket(\llbracket \text{la} \rrbracket(\llbracket \text{ø avant Noël} \rrbracket($
$\llbracket \text{semaine} \rrbracket_{\text{loc-temp}}))) = \lambda P \lambda e \ \exists y^T \exists t^T \exists u \ (P(e) \land \text{Noël}(t) \land \text{Week}(y) \land y<t \land$
$\text{Length}(u,\text{'short'}) \land \text{Dist}(y,t,u) \land e \subseteq y)$

Actually, with *avant*, we are faced with polysemy (as with *après* (after), but not with, for instance, *auparavant* (beforehand) nor *plus tard* (later)). The semantics above applies when *avant* combines with a loc-DP in COMP position and (possibly) an ext-DP in SPEC in the Sem1 schema. When it combines with an ext-DP in COMP (and without any DP-SPEC), as in *avant deux jours* (within two days), it has a quite different value, it is anaphoric (it involves a temporal referent (an eventuality or a time) from which the two days are counted), and the Sem3 pattern applies instead:

$\llbracket \text{avant}_2 \rrbracket_{\text{temp}} = \lambda C \lambda P \lambda e^E \exists x^{E \cup T} \exists y^T \ (P(e) \land x=? \land x<y \land x<e \land e<y \land$
$C(\lambda z \ \text{Dist}(x,y,z))))$

$\llbracket \text{avant deux jours} \rrbracket = \llbracket \text{avant}_2 \rrbracket_{\text{temp}}(\llbracket \text{deux jours} \rrbracket_{\text{ext}}) = \lambda P \lambda e^E \exists x^{E \cup T} \exists y^T \exists u$
$(P(e) \land x=? \land x<y \land x<e \land e<y \land \text{Length}(u,\text{'2days'}) \land \text{Dist}(x,y,u))$

We now turn to the continuous temporal locating adverbials, which are all without DP-SPEC and follow either the Sem2 or the Sem3 pattern. They are all anaphoric: those that follow the Sem2 schema involve on top of the boundary DP-COMP another temporal referent at which the state already held/still holds, and those that follow the Sem3 schema, just like *avant₂* above, require a temporal referent from which to calculate either the boundary or this additional referent. Some prepositions have two senses (e.g. *depuis*: since/for) which follow the Sem2 and Sem3 schemata respectively.

$\llbracket \text{depuis}_1 \rrbracket_{\text{temp}} = \lambda C \lambda P \lambda s^S \exists y^{E \cup T} \ (P(s) \land y=? \land C(\lambda x \ (x \supset\!\subset s \land y \subseteq s)))$[21]

$\llbracket \text{depuis ø midi} \rrbracket = \llbracket \text{depuis}_1 \rrbracket_{\text{temp}}(\llbracket \text{null det} \rrbracket(\llbracket \text{midi} \rrbracket_{\text{loc-temp}})) = \lambda P \lambda s^S \exists v^T$
$\exists t^T \exists y^{E \cup T} \ (P(s) \land y=? \land \text{Day}(v) \land v=? \land \text{Hour}(t) \land t \subseteq v \land \text{Calendar}(t,\text{'12h'}) \land$
$t \supset\!\subset s \land y \subseteq s)$

---

[20] This is the loc-DP semantic value of the ambiguous *semaine*.

[21] We have seen in Section 4.2 that *depuis* requires a state. The temporal relation $\supset\!\subset$ is the immediate precedence, also called abutment. Obviously, the locating adverbial semantics described in this paper only makes sense in an appropriate theory of time and space (as e.g., that of (Asher *et al.* 1995a)).

$\llbracket \text{depuis}_2 \rrbracket_{\text{temp}} = \lambda C \; \lambda P \; \lambda s^S \; \exists x^{E \cup T} \; \exists y^T \; (P(s) \wedge x=? \wedge y \supset \subset s \wedge x \subset s \wedge C(\lambda z \; \text{Dist}(y,x,z)))$

$\llbracket \text{depuis deux jours} \rrbracket = \llbracket \text{depuis}_2 \rrbracket_{\text{temp}}(\llbracket \text{deux jours} \rrbracket_{\text{ext}}) = \lambda P \; \lambda s^S \; \exists x^{E \cup T} \; \exists y^T \; \exists u \; (P(s) \wedge x=? \wedge y \supset \subset s \wedge x \subset s \wedge \text{Length}(u,\text{'2days'}) \wedge \text{Dist}(y,x,u))$

The preposition *jusque* (until), whose semantics is somewhat symmetric to *depuis*, is only found in complex constructions (e.g., *jusqu'à midi* (until noon), *jusque peu avant Noël* (until shortly before Christmas)) in which it takes as complement another PP instead of a DP (cf. Section 3). In Section 4.1 we hypothesized that this is a case of coercion to a referential value of the PP in COMP. We believe this point, together with the other cases of referential uses like the IP-adjunct positions, requires further investigations. We nevertheless sketch out below what kind of calculation could be appropriate:

$\llbracket \text{jusque} \rrbracket_{\text{temp}} = \lambda C \; \lambda P \; \lambda e \; \exists y^{E \cup T} \; (P(e) \wedge y=? \wedge C(\lambda x \; ((y \supset \subset e \vee y \subset e) \wedge e \supset \subset x)))$

$\llbracket \text{peu avant Noël} \rrbracket = (\llbracket \text{avant}_1 \rrbracket_{\text{temp}}(\llbracket \text{Noël} \rrbracket))(\llbracket \text{peu} \rrbracket_{\text{ext}}) = \lambda P \; \lambda e^{E \cup T} \; \exists t^T \; \exists u \; (P(e) \wedge \text{Noël}(t) \wedge e<t \wedge \text{Length}(u,\text{'short'}) \wedge \text{Dist}(e,t,u))$ which yields, once coerced by a quite simple existential closure:

$\lambda P \; \exists x^T \; \exists t^T \; \exists u \; (P(x) \wedge \text{Noël}(t) \wedge x<t \wedge \text{Length}(u,\text{'short'}) \wedge \text{Dist}(x,t,u))$

$\llbracket \text{jusque peu avant Noël} \rrbracket = \lambda P \; \lambda e \; \exists y^{E \cup T} \; \exists x^T \; \exists t^T \; \exists u \; (P(e) \wedge y=? \wedge (y \supset \subset e \vee y \subset e) \wedge e \supset \subset x \wedge \text{Noël}(t) \wedge x<t \wedge \text{Length}(u,\text{'short'}) \wedge \text{Dist}(x,t,u))$

5.2. Locating Space Adverbials

Spatial locating adverbials are by and large similar to temporal ones. We also find direct adverbials following the Sem2 pattern, as *à Toulouse* (at Toulouse):

$\llbracket \text{Toulouse} \rrbracket_{\text{loc-sp}} = \lambda P \; \exists x^P \; (\text{Toulouse}(x) \wedge P(x))$

$\llbracket \text{à Toulouse} \rrbracket = \llbracket \text{à} \rrbracket(\llbracket \text{Toulouse} \rrbracket_{\text{loc-sp}}) = \lambda C \; \lambda P \; \lambda e \; \exists x^P \; (P(e) \wedge \text{Toulouse}(x) \wedge R_{\grave{a}}^P(e, x) \wedge R_{\grave{a}}^P \text{?})$[22]

Some direct ones follow the Sem1 pattern, like *200 mètres à gauche de la mairie* (200 meters to the left of the town hall):

$\llbracket \text{à gauche de} \rrbracket_{\text{sp}} = \lambda C \; \lambda S \; \lambda P \; \lambda e \; C(\lambda x \; (P(e) \wedge \text{Left-of}(e,x) \wedge S(\lambda y \; \text{Dist}(e,x,y))))$[23]

$\llbracket \text{mairie} \rrbracket_{\text{loc-sp}} = \lambda x^P \; \text{Mairie}(x)$

$\llbracket \text{200 mètres} \rrbracket_{\text{ext}} = \lambda R \; \exists u \; (\text{Length}(u,\text{'200m'}) \wedge R(u))$

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[22] Combining *à* with a spatial DP substitutes $R_{\grave{a}}^P$ for $R_{\grave{a}}$ but underspecification persists. Geometrically speaking, spatial *à* is ambiguous between a spatial inclusion and a simple proximity. For instance in *Marie attendait à la mairie* (Marie was waiting at the town hall), only contextual information can tell us whether the building serves as a 'container' location or as a mere landmark.

[23] We do not discuss here orientational spatial predicates like Left-of, whose interpretation is well-known to be quite complex, with deictic, intrinsic and contextual readings possibly available according to the context and the nature of its arguments. There is a quite large literature on this topic (see, e.g., (Aurnague 1995)).

⟦200 mètres à gauche de la mairie⟧ = (⟦à gauche de⟧$_{sp}$(⟦la⟧(⟦mairie⟧$_{loc\text{-}sp}$))(⟦200 mètres⟧$_{ext}$) = λP λe ∃x^P ∃u (P(e) ∧ Mairie(x) ∧ Left-of(e,x) ∧ Length(u,'200m') ∧ Dist(e,x,u))

The richer nature of the spatial realm gives rise though to a larger variety of anaphoric references, for instance, *plus loin* (further) refers to an implicit direction (in addition to its necessarily empty loc-DP in COMP):

⟦plus loin⟧$_{sp}$ = λC λS λP λe ∃d C(λx (P(e) ∧ d=? ∧ In-direction(x,e,d) ∧ S(λy Dist(x,e,y))))

⟦empty DP⟧$_{loc\text{-}sp}$ = λQ ∃x^P (x=? ∧ Q(x))

⟦200 mètres plus loin ø⟧ = (⟦plus loin⟧$_{sp}$(⟦empty DP⟧$_{loc\text{-}sp}$))(⟦200 mètres⟧$_{ext}$) = λP λe ∃d ∃x^P ∃u (P(e) ∧ d=? ∧ x=? ∧ In-direction(x,e,d) ∧ Length(u,'200m') ∧ Dist(x,e,u))

Other adverbials like *200 mètres avant la mairie* (200m before the town hall) combine a primarily temporal preposition with a spatial loc-DP-COMP, and as result, systematically take up a spatio-temporal interpretation. The same happens with all[24] continuous spatial locating adverbials. As the spatio-temporal interpretation is strongly dependant on the discourse context —it involves an implicit motion event only partially determined by the adverbial (Asher *et al.* 1995b)— and since 'purely' temporal or 'purely' spatial ones can take up a spatio-temporal interpretation too (only if used in IP-adjunct position, though), we will leave their formal analysis for a future paper.

6. Conclusion

In this paper we have described quite in details the syntactic structure of locating adverbials and their compositional semantics in their VP-adjunct use. In particular, we have shown that a relational approach seems more appropriate than the referential one that is commonly adopted.

Of course, we have left quite a number of questions unresolved. But we have tried to argue why we believe that these open issues need to be tackled at another level, namely the discourse level. The semantic contribution of locating adverbials in an IP-adjunct position needs to be investigated further, as well as the quite important phenomenon of spatio-temporal interpretation of locating adverbials in a trajectory context.

7. Références bibliographiques

Asher, N. (1993), *Reference to Abstract Objects in Discourse*. Dordrecht, Kluwer.

Asher, N., Aurnague, M., Bras, M., Sablayrolles, P. & Vieu, L. (1995a), «!De l'espace-temps dans l'analyse du discours!», *Sémiotiques*, 9, pp. 11-62.

Asher, N., Aurnague, M., Bras, M., & Vieu, L. (1995b), «!Spatial, temporal and spatio-temporal locating adverbials in discourse!», in Amsili, P., Borillo, M. & Vieu,

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[24] For a discussion on seamingly exceptions like examples (33-34) see Section 4.3.

L. (eds), *Time, Space and Movement. Meaning and Knowledge in the Sensible World*, TSM'95, Toulouse, pp. A107-119.

Asher, N. & Sablayrolles, P. (1995), «!A typology and discourse semantics for motion verbs and spatial pps in French!», *Journal of Semantics*, 12 (2), pp. 163-209.

Aurnague, M. (1995), «!Orientations in French spatial expressions: formal representations and inferences!», Journal of Semantics, 12 (3), pp. 239-267.

Aurnague, M. (1996), «!Les noms de localisation interne : tentative de caractérisation sémantique à partir de données du basque et du français!», *Cahiers de Lexicologie*, 690 (2), pp. 159-192.

Aurnague, M., Vieu, L. & Borillo, A. (1997). «!Représentation formelle des concepts spatiaux dans la langue!»., in Denis, M. (ed), *Langage et cognition spatiale*, Paris, Masson (Collection Sciences Cognitives), pp. 69-102.

Bellert, I. (1977), «!On Semantics and Distributional Properties of Sentential Adverbs!», *Linguistic Inquiry*, 8(2).

Boons, J.P. (1987), "La notion sémantique de déplacement dans une classification syntaxique des verbes locatifs", *Langue Française,* 76, pp. 5-44.

Borillo, A. (1983), «!Les adverbes de référence temporelle dans la phrase et dans le texte!», DRALV 29.

Borillo, A. (1992), «!Le lexique de l'espace : prépositions et locutions prépositionnelles de lieu en français!», in Tasmowski, L. & Zribi-Hertz, A. (eds), *Hommage à Nicolas Ruwet*, Ghent, Communication & Cognition, pp. 176-190.

Borillo, A. (1993), «!Prépositions de lieu et anaphores!». *Langages*, 110, pp. 27-46.

Borillo, A. (1999), «!Les adverbes de référence temporelle comme connecteurs temporels de discours!», *Bibliothèque des Cahiers de l'Institut de Linguistique de Louvain 99!: Temps et Discours*, pp. 131-145, Louvain La Neuve, Peeters.

Bras, M. (1990), *Calcul des structures temporelles du discours.* Ph.D. dissertation, Université Paul Sabatier, Toulouse.

Bras, M., Le Draoulec, A. & Vieu L. (2001), «!French adverbial *puis* between temporal structure and discourse structure!», in Bras, M. & Vieu, L. (eds), *Semantic and Pragmatic Issues in Discourse and Dialogue: Experimenting with Current Theories*, Oxford, CRiSPI. Elsevier, pp. 109-146.

Bras, M. & Molinès, F. (1993), «!Adverbials of Temporal Location : Linguistic Description and Automatic Processing!», *Proceedings of the 26th Colloquium of linguistics, Linguistische Arbeiten*, pp. 137-146, Tübingen, Niemeyer.

Gagnon, M. & Bras, M. (1995), «!Toward a Representation of Time to Process Temporal Location Adverbials!», Montreal, Proceedings of the IJCAI'95 Worshop on Spatial and Temporal Reasoning.

Gross, M. (1990), *Grammaire transformationnelle du français. 3- Syntaxe de l'adverbe.* Paris, ASSTRIL.

Johnston, M. (1994), *The syntax and semantics of adverbial adjuncts.* Ph.D. dissertation, University of California at Santa Cruz.

Kamp, H. & Reyle, U. (1993), *From Discourse to Logic.* Dordrecht, Kluwer.

Kleiber, G. (1992), *La Deixis.* Paris, PUF.

Le Draoulec, A. (1997), *Etude présupositionnelle des subordonnées temporelles*. Ph.D. dissertation, Université de Toulouse-Le Mirail.

Leech, G. & Svartvik, J. (1975), *A Communicative Grammar of English*. London, Longman.

McKercher, D.A. (1996), *On the Syntax and Semantics of English Adverbials*, Master of Art Thesis, University of Victoria.

Maienborn, C. (1995), «!Toward a Compositional Semantics for Locative Modifiers!», in *Proceedings from Semantics and Linguistic Theory V*, Ithaca New York, Cornell University Linguistic Publications, pp. 237-254.

Melis, L. (1983), *Les circonstants et la phrase*, Louvain, Presses Universitaires de Louvain.

Molinès, F. (1989), *Acceptabilité et acceptation des adverbiaux de localization temporelle : grammaire ou distionnaire*, Mémoire de DEA en Sciences du Langage, Université Toulouse Le Mirail.

Molinier, C. & Lévrier, F. (2000), *Grammaire des adverbes : description des formes en -ment*. Genève-Paris, Droz.

Muskens, R. (1996), «!Combining Montague Semantics and Discourse Representation!», *Linguistics and Philosophy,* 19, pp. 143-196.

Nølke, H. (ed) (1990), «!Classification des adverbes!», *Langue Française*, 88, Paris, Larousse.

Parsons, T. (1990), *Events in the Semantics of English: A Study in Subatomic Semantics*, Cambridge, MA, MIT Press.

Pratt, I. & Francez, N. (2001), «!Temporal Prepositions and Temporal Generalized Quantifiers!», *Linguistics and Philosophy*, 24(2), pp. 187-222.

Quirk, R. & Greenbaum, S. (1973), *A University Grammar of English*. London, Longman.

de Swart, H. (1991), *Adverbs of Quantification: a Generalized Quantifier Approach*, Ph. D. dissertation, University of Groningen, published by Garland, New-York, 1993.

Vandeloise, C. (1986). *L'espace en français : sémantique des prépositions spatiales*, Paris, Seuil (Travaux en Linguistique).

Vet, C. (1980), *Temps, aspects et adverbes de temps en français contemporain*, Genèveve, Droz.