

# On the peculiar distribution of the Japanese epistemic adverb *masaka*<sup>1</sup>

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**Abstract.** This study addresses the distribution of the Japanese epistemic adverb *masaka*. In declaratives, it must co-occur with a negated epistemic modal. It can occur in polar questions but not in *wh*-questions. We propose that *masaka* differs from ordinary epistemic adverbs in that it expresses the modal claim that the prejacent is certainly at the not-at-issue level, while leaving the at-issue content intact. This semantics predicts that the at-issue and not-at-issue contents contradict each other in cases where *masaka* is not licensed. Furthermore, several remaining issues are discussed. First, negated epistemic attitude verbs such as *omow* ‘believe’ also license *masaka*. Second, the Japanese exclamative markers *nante/towa* also license *masaka*. Herein we present tentative ideas for accommodating these cases. Finally, we demonstrate that the projection properties of *masaka*’s semantic contribution as not-at-issue content is complicated.

**Keywords:** modality, epistemic adverbs, epistemic modals, two-dimensional semantics,

## 1. Introduction

The primary aim of this study is to capture a peculiar distribution of the Japanese epistemic adverb *masaka* (approximately, ‘by any chance’ in English), whose semantic properties have never been analyzed intensively in the formal literature. Typically, as we will see in Section 2, *masaka* is used in combination with the epistemic modal *hazu* ‘should’ and the negation *nai*:

- (1) *Masaka ame-ga huttei-ru hazu-nai.*  
masaka rain-NOM falling-PRES should-NEG.PRES  
(Approx.) ‘It should NOT be raining.’

Intuitively, the presence of *masaka* indicates that the probability of rain is even lower than expressed without *masaka* (we call this the strengthening effect). Below, we show that this epistemic adverb can only be licensed by a limited number of expressions, of which our primary focus is on epistemic modals and questions. Specifically, *masaka* is licensed not by negation alone or an epistemic modal alone but by a combination of the two, and *masaka* is licensed in polar questions, but not in *wh*-questions.

Several previous studies have addressed *masaka* in the descriptive Japanese linguistics. Morita (1989) states that *masaka* expresses the speaker’s desire to deny the possibility that a proposition that might or will be true actually becomes true. Hida and Asada (1994) mention that *masaka* conveys that the probability is remarkably low. Makino and Tsutsui (1995) state that *masaka* expresses the speaker’s strong belief that what is unexpected actually happened. Sug-

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imura (2000) argues that *masaka* expresses the speaker’s unexpectedness, not a low possibility or denial of possibilities. These previous studies have discussed what kind of expression can be used with *masaka* but have never tackled the issue of why *masaka* shows such restrictions. Therefore, this study is the first attempt to provide a formal analysis of *masaka* within the theoretical framework.

However, note in advance that the proposed analysis does not capture the whole picture of *masaka*; our analysis is intended to explain how *masaka* interacts with (negated) modals and questions. As we will see in Section 5, other linguistic expressions also license *masaka*. It is a task for future research to cover these cases, although we will discuss tentative ideas on how our analysis can be revised to accommodate them. In this sense, the secondary purpose of this study is to establish a stage for a more comprehensive formal analysis of *masaka* by showing what has been explained and what remains to be explored in future research.

The remainder of this paper is organized as follows. Section 2 provides the data set and claims that *masaka* can be licensed by negated epistemic modals and that it is also licensed in polar questions, but not in *wh*-questions. Section 3 proposes an analysis of *masaka*, where [*masaka-p*] asserts that *p* is true as at-issue content and implies that *p* is almost certainly false as not-at-issue content. Section 4 demonstrates how our analysis captures the data set. Section 5 presents the implications and remaining issues. Finally, Section 6 concludes the paper.

## 2. Data

### 2.1. Negated modals as licensors

First, *masaka* differs from ordinary Japanese epistemic adverbs such as *zettaini* ‘definitely’ and *matigainaku* ‘certainly’ in that it cannot occur in simple declaratives, regardless of their polarity:

- (2) a. #*Masaka ame-ga futtei-[ru/nai]*.  
           *masaka rain-NOM falling-[PRES/NEG.PRES]*  
           (Approx.) ‘It could/couldn’t be raining.’  
       b. *Zettaini/Matigainaku ame-ga huttei-[ru/nai]*.  
           *definitely/certainly rain-NOM falling-[PRES/NEG.PRES]*.  
           ‘Definitely/Certainly, it is/isn’t raining.’

In declaratives, *masaka* can only be licensed by a co-occurring epistemic modal when the modal is negated:

- (3) *Masaka ame-ga huttei-ru hazu-nai.* (= (1))  
       *masaka rain-NOM falling-PRES should-NEG.PRES*  
       ‘It should NOT be raining.’

Japanese has an inherently-negative modal *mai* ‘will not’. This modal also licenses *masaka*:

- (4) *Masaka ame-ga huttei mai.*  
       *masaka rain-NOM falling will.not*  
       ‘It must NOT be raining.’

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If there is no negation or if what is negated is the prejacent rather than the modal, *masaka* is not licensed:<sup>2,3</sup>

- (5) a. #*Masaka ame-ga huttei-ru hazu-da.*  
 masaka rain-NOM falling-PRES should-COP  
 ‘(Approx.) Possibly, it should be raining.’  
 b. #*Masaka ame-ga huttei-nai hazu-da.*  
 masaka rain-NOM falling-NEG.PRES should-COP  
 ‘(Approx.) Possibly, it should not be raining.’

Thus, we conclude that *masaka* can be licensed by a co-occurring negated modal.

However, *daroo* ‘will’ might seem to be an exception. See (6), where the negation *nai* comes to the left of *daroo* but nevertheless *masaka* is licensed:<sup>4</sup>

- (6) *Masaka ame-ga huttei-nai-daroo.*  
 masaka rain-NOM falling-NEG.PRES-will  
 ‘It must NOT be raining.’

We claim that in (6), *nai* negates *daroo* rather than the prejacent. More specifically, we assume that the configuration [*p-nai-daroo*] can have two different internal structures:

- (7) a. [[*p nai*] *daroo*]  
 b. [*p* [*nai daroo*]]

*Masaka* can be licensed in structure (7b), where the modal *daroo*, rather than the prejacent *p*, is negated because *daroo* is in a sister relation with *nai*.<sup>5</sup> If this assumption is correct, *masaka* will not be licensed when some other element intervenes between *nai* and *daroo* to break up their constituency. This prediction is borne out:

<sup>2</sup>Other epistemic modals such as *nitigainai* ‘must’ and *kamosirenai* ‘might’ cannot license *masaka*:

- (i) #*Masaka ame-ga huttei-ru [nitigainai / kamosirenai].*  
 masaka rain-NOM falling-PRES [must / might]  
 ‘(Approx.) Possibly, it [must/might] be raining.’

Unlike the cases of *hazu* (i.e., (3) and (5a)), adding negation to the right of these modals cannot rescue (i) because they cannot be negated, probably for morpho-syntactic reasons regardless of the presence/absence of *masaka* :

- (ii) \*(*Masaka*) *ame-ga huttei-ru [nitigainaku-nai / kamosirenaku-nai].*  
 (masaka) rain-NOM falling-PRES [must-NEG.PRES / might-NEG.PRES]  
 ‘(Intended) It must/might not be raining.’

<sup>3</sup>See Appendix for why we ignore the possibility that the negation *nai* in (5b) is associated with *hazu* rather than with the prejacent.

<sup>4</sup>Without negation, *daroo* cannot license *masaka*:

- (i) #*Masaka ame-ga huttei-ru-daroo.*  
 masaka rain-NOM falling-PRES-will  
 ‘It must NOT be raining.’

<sup>5</sup>The current claim that *nai* and *daroo* can form a constituency is corroborated by the fact that the configuration *nai-daroo* can be contracted as *nakaroo* ‘will.not’. This contracted form also licenses *masaka*:

- (i) *Masaka ame-ga huttei-nakaroo.*  
 masaka rain-NOM falling-will.not.  
 ‘It must NOT be raining.’

- (8) #*Masaka ame-ga huttei-nai-no daroo.*  
 masaka rain-NOM falling-NEG.PRES-NMLZ will  
 ‘(Intended) It must [have been / be] raining.’

In (8), *daroo* and *nai* do not form constituency because of the intervening element, that is, the nominalizer *no*. The infelicity of this sentence underpins the claim that *masaka* is licensed only when the co-occurring modal is negated.

## 2.2. In questions

*Masaka* is licensed in polar questions, with the strong implication that the speaker expects the negation of the prejacent to be true:

- (9) a. *Masaka ame-ga huttei-ru no?*  
 masaka rain-NOM falling-PRES Q  
 ‘Is it raining, by any chance?’  
 Implication: The speaker expects that it is not raining.  
 b. *Masaka ame-ga huttei-nai no?*  
 masaka rain-NOM falling-NEG.PRES Q  
 ‘Isn’t it raining, by any chance?’  
 Implication: The speaker expects that it is raining.

However, *masaka* cannot appear in *wh*-questions:

- (10) #*Masaka nani-ga huttei-ru no?*  
 masaka what-NOM falling-PRES Q  
 ‘(Intended) What is falling, by any chance?’

Thus, the current study attempts to capture (i) why negated modals can be licensors of *masaka* in declaratives and (ii) why *masaka* can appear in polar questions but not in *wh*-questions.

## 3. Proposal

We follow the traditional assumption that epistemic modals quantify the set of the most ideal epistemically-accessible worlds (Kratzer, 1981):<sup>6</sup>

- (11) a.  $\llbracket hazu \rrbracket = \llbracket daroo \rrbracket = \lambda p. \lambda w. \forall w' [w' \in \text{BEST}(f, g, w) \rightarrow p(w')]$ .  
 b.  $\text{BEST}(f, g, w)$  is the set of the most ideal worlds in  $\bigcap f(w)$  in terms of  $g(w)$ , where  $f$  is the epistemic modal base and  $g$  is the stereotypical ordering source.

The sentence in (12) indicates that it is highly probable that it is not raining. This suggests that, when *hazu* and *daroo* are negated, these modals take scope over negation, as in the English *mustn’t* (*must* >  $\neg$ ) and *shouldn’t* (*should* >  $\neg$ ), as in (13).<sup>7</sup>

<sup>6</sup>We abstract away the semantic differences between *hazu-da*, *nitigainai*, and *daroo*, but see Okano and Mori (2015) for the detailed analysis of *hazu* and Hara (2018) for that of *daroo*.

<sup>7</sup>It is an issue for future research why these Japanese modals show the same scopal pattern as English ones.

- (12) *Ame-ga huttei [ru-hazu-nai / mai / nai-daroo]*  
 rain-NOM falling [PRES-should-NEG / will.not / NEG-will]  
 ‘It [shouldn’t/mustn’t] be raining.’

(13)  $\llbracket \text{hazu-nai} \rrbracket = \llbracket \text{mai} \rrbracket = \llbracket \text{nai-daroo} \rrbracket = \lambda p.\lambda w. \forall w' [w' \in \text{BEST}(f, g, w) \rightarrow \neg p(w')]$

Let us turn to the semantics of *masaka*. Ordinarily, epistemic adverbs are analyzed as functions that take a proposition and return a modalized statement (e.g.,  $\llbracket \text{certainly} \rrbracket = \lambda p.\lambda w. \mathbf{certain}(p)(w)$ ).<sup>8</sup> We depart from this tradition and propose that *masaka* takes a proposition but expresses the modalized claim as *not-at-issue* content (Potts, 2003, Gutzmann, 2015, among others):

(14)  $\llbracket \text{masaka} \rrbracket = \lambda p.\lambda w. p(w) \bullet \exists S[\text{BEST}(f, g, w) \subseteq S \wedge \forall w' [w' \in S \rightarrow \neg p(w')]]$ .

The elements following  $\bullet$  are not-at-issue content, which do not participate in the rest of the sentence’s composition. When *masaka* takes a proposition  $p$ , *masaka* leaves  $p$  intact at the at-issue level, while expressing at the *not-at-issue* level that  $p$  is false in all the worlds in  $S$ , which is a superset of  $\text{BEST}(f, g, w)$ . The superset relation between  $S$  and  $\text{BEST}(f, g, w)$  means that the number of worlds quantified by *masaka* is larger than that quantified by *hazu*, *mai*, and *daroo*, which ensures that the presence of *masaka* leads to the strengthening effect seen in Section 1.

#### 4. Deriving facts

Let us begin with simple declaratives without modals, that is, (2a), repeated here as (15):

- (15) a. #*Masaka ame-ga huttei-ru.*  
           *masaka rain-NOM falling-PRES*  
           ‘(Approx.) It could be raining.’  
 b. #*Masaka ame-ga huttei-nai.*  
           *masaka rain-NOM falling-NEG.PRES*  
           ‘(Approx.) It couldn’t be raining.’

The meaning of (15a) is obtained as in the following (henceforth, **rain** is the abbreviation for  $\lambda w. \text{it is raining in } w$ ):

(16)  $\llbracket (15a) \rrbracket = \llbracket \text{masaka} \rrbracket(\mathbf{rain})$   
 $= \lambda w. \mathbf{rain}(w) \bullet \exists S[\text{BEST}(f, g, w) \subseteq S \wedge \forall w' [w' \in S \rightarrow \neg \mathbf{rain}(w')]]$ .

This is contradictory: the speaker asserts that **rain** is true but at the same time implicates that it is absolutely certain that **rain** is false (just as it is odd to say ‘ $p$  is true but  $p$  must certainly be false’).<sup>9</sup>

<sup>8</sup>Some authors such as Anand and Brasoveanu (2009) treat modal adverbs as modal modifiers that take the co-occurring modal as one of their arguments.

<sup>9</sup>This explanation might seem insufficient in theoretical terms. The not-at-issue content of (16) just says that all worlds in  $S$  (i.e., the superset of the most *ideal* accessible worlds,  $\text{BEST}(f, g, w)$ ) are **rain**-worlds. The actual world can be a non-ideal world, so it does not have to be contained in  $S$ . Therefore, the formula in (16) can be non-contradictory in itself.

However, we can still maintain that (16) is infelicitous when we take pragmatic factors into consideration. Generally, when one asserts a proposition in  $w$ , she is required to know in  $w$  that it is true (a felicity condition for assertion), which means that it is true in all worlds in her epistemically-accessible worlds, i.e.,  $f(w)$ . The at-issue

(15b) is composed as follows:

$$(17) \quad \llbracket (15b) \rrbracket = \llbracket masaka \rrbracket(\llbracket \text{NEG} \rrbracket(\mathbf{rain})) \\ = \lambda w. \neg \mathbf{rain}(w) \bullet \exists S[\text{BEST}(f, g, w) \subseteq S \wedge \forall w'[w' \in S \rightarrow \mathbf{rain}(w')]].$$

This is also contradictory for the same reason as (16).

Next, consider the case where there is a co-occurring modal that is not negated; that is, (5a), repeated here as (18a). Its composition is provided in (18b) (we assume that the copula *-da* is semantically vacuous):

$$(18) \quad \text{a. } \#Masaka \text{ ame-ga } huttei\text{-ru } hazu\text{-da.} \\ \text{masaka rain-NOM falling-PRES should-COP} \\ \text{'(Approx.) Possibly, it should be raining.'} \\ \text{b. } \llbracket (18a) \rrbracket = \llbracket hazu \rrbracket(\llbracket masaka \rrbracket(\mathbf{rain})) \\ \llbracket masaka \rrbracket(\mathbf{rain}) = \lambda w. \mathbf{rain}(w) \bullet \exists S[\text{BEST}(f, g, w) \subseteq S \wedge \forall w'[w' \in S \rightarrow \neg \mathbf{rain}(w')]]. \\ \llbracket hazu \rrbracket(\llbracket masaka \rrbracket(\mathbf{rain})) = \lambda w. \forall w'[w' \in \text{BEST}(f, g, w) \rightarrow \mathbf{rain}(w')] \\ \bullet \exists S[\text{BEST}(f, g, w) \subseteq S \wedge \forall w'[w'' \in S \rightarrow \neg \mathbf{rain}(w'')]]$$

This formula is also contradictory: all worlds in  $\text{BEST}(f, g, w)$  are required to be **rain**-worlds and  $\neg \mathbf{rain}$ -worlds at the same time, since  $\text{BEST}(f, g, w) \subseteq S$ .<sup>10</sup> The same result is obtained even when the prejacent is negated (i.e., (5b)).

Let us now turn to the cases where the co-occurring modal is negated. We repeat (3) here as (19a). Its meaning is provided in (19b).

$$(19) \quad \text{a. } Masaka \text{ ame-ga } huttei\text{-ru } hazu\text{-nai.} \\ \text{masaka rain-NOM falling-PRES should-NEG.PRES} \\ \text{'It should NOT be raining.'} \\ \text{b. } \llbracket (19a) \rrbracket = \llbracket hazu\text{-nai} \rrbracket(\llbracket masaka \rrbracket(\mathbf{rain})) \\ = \lambda w. \forall w'[w' \in \text{BEST}(f, g, w) \rightarrow \neg \mathbf{rain}(w')] \bullet \exists S[\text{BEST}(f, g, w) \subseteq S \wedge \forall w'[w'' \in S \rightarrow \neg \mathbf{rain}(w'')]].$$

There is no contradiction in (19b): both the at-issue and not-at-issue contents require all relevant worlds to be  $\neg \mathbf{rain}$ -worlds (the strengthening effect is obtained since  $\text{BEST}(f, g, w) \subseteq S$ , as described in Section 3.<sup>11</sup>

Next, consider (9), in which *masaka* is licensed in polar questions. We repeat (36) here as (20):

content of (16) is **rain**(*w*). Therefore, the speaker asserts **rain**(*w*). Thus, the at-issue content of (16) implicates that all worlds in  $f(w)$  are **rain**-worlds while the not-at-issue content says that all worlds in  $S$  are non-**rain**-worlds. This is contradiction because  $S$  overlaps with  $f(w)$  given that  $\text{BEST}(f, g, w)$  is a subset of  $f(w)$ .

<sup>10</sup>Note that contradiction also occurs if *masaka* takes the modalized proposition as its argument:

$$(i) \quad \llbracket masaka \rrbracket(\llbracket hazu \rrbracket(\llbracket \mathbf{rain} \rrbracket)) \\ = \lambda w. \llbracket hazu \rrbracket(\mathbf{rain})(w) \bullet \exists S[\text{BEST}(f, g, w) \subseteq S \wedge \forall w'[w'' \in S \rightarrow \neg \llbracket hazu \rrbracket(\mathbf{rain})(w'')]].$$

In this case, the speaker asserts that  $\llbracket hazu \rrbracket(\llbracket \mathbf{rain} \rrbracket)$  is true in  $w$ , but simultaneously implies that  $\llbracket hazu \rrbracket(\llbracket \mathbf{rain} \rrbracket)$  is certainly false. Therefore, changing the order of composition in (18b) does not rescue the sentence.

<sup>11</sup>Some readers might find it problematic that in (19b), the not-at-issue content entails the at-issue one, because it is pragmatically odd if the presupposition of a sentence (one kind of not-at-issue meanings) entails the assertion. The not-at-issue content encoded by *masaka* should be understood as use-conditional meaning (Gutzmann, 2015), which represents the conditions that an utterance must satisfy to be felicitous. That is, (19a) becomes true iff the at-issue content in (19b) holds, and becomes a felicitous utterance iff the not-at-issue content of (19b) holds.

- (20) *Masaka ame-ga huttei-ru no?*  
 masaka rain-NOM falling-PRES Q  
 ‘Is it raining, by any chance?’

Implication: The speaker expects that it is not raining.

Following the traditional assumption that questions denote a set of propositions (Hamblin, 1973; see Dayal, 2016 for an overview), we assume that the operator  $Q_{pol}$ , as in (21a), forms polar questions by being appended to the end of the sentence composition. The semantics of (20) is obtained as in (21b)

- (21) a.  $\llbracket Q_{pol} \rrbracket = \lambda p. \{p, \neg p\}$ .  
 b.  $\llbracket (20) \rrbracket = \llbracket Q_{pol} \rrbracket(\llbracket masaka \rrbracket(\mathbf{rain}))$   
 $= \{\mathbf{rain}, \neg\mathbf{rain}\} \bullet \exists S[\text{BEST}(f, g, w) \subseteq S \wedge \forall w' [w' \in S \rightarrow \neg\mathbf{rain}(w')]]$ .

The at-issue content of (21b) is a set of polar opposites, which guarantees that (20) is a polar question. The not-at-issue content expresses the speaker’s strong bias toward  $\neg\mathbf{rain}$ , as desired. Example (9b), where the preadjacent of *masaka* involves negation, provides the same result, except that the speaker’s bias is oriented towards **rain**.

Finally, *masaka* cannot occur in *wh*-questions ((10), repeated here as (22)):

- (22) #*Masaka nani-ga huttei-ru no?*  
 masaka what-NOM falling-PRES Q  
 ‘(Intended) What is falling, by any chance?’

For the treatment of *whs* in Japanese, we follow Kratzer and Shimoyama (2002) and Shimoyama (2006); Japanese *wh*-phrases such as *nani* ‘what’ denote (the intension of) a set of individuals as in (23a). In this system, regular predicates denote (the intension of) a singleton set whose only element is their ordinary denotation, as in (23b). For the composition rule, we employ a variant of the pointwise functional application relativized to world arguments, as in (23c). (23d) is the result of combining (23a) and (23b) (we ignore the contribution of the case particle *-ga* for the sake of simplicity).

- (23) a.  $\llbracket nani \rrbracket = \lambda w. \{x: \mathbf{thing}(x)(w)\}$ .  
 b.  $\llbracket huttei-ru \rrbracket = \lambda w. \{\lambda x. \lambda w'. \mathbf{falling}(x)(w')\}$ .  
 c. If  $\alpha$  is a branching node with daughters  $\beta$  and  $\gamma$ , and for any world  $w$ ,  $\llbracket \beta \rrbracket(w) \subseteq D_{(\delta, \tau)}$  and  $\llbracket \gamma \rrbracket(w) \subseteq D_{\delta}$ , then  $\llbracket \alpha \rrbracket = \lambda w. \{f(x): f \in \llbracket \beta \rrbracket(w) \wedge x \in \llbracket \gamma \rrbracket(w)\}$ .  
 d.  $\llbracket nani-ga huttei-ru \rrbracket = \lambda w. \{f(x): f \in \llbracket huttei-ru \rrbracket(w) \wedge x \in \llbracket nani \rrbracket(w)\}$ .  
 $= \lambda w. \{\lambda w'. \mathbf{falling}(a)(w'), \lambda w'. \mathbf{falling}(b)(w'), \lambda w'. \mathbf{falling}(c)(w'), \dots\}$  such that  $a, b, c, \dots \in \{x: \mathbf{thing}(x)(w)\}$ .

(24a) is the denotation of *masaka* modified to fit into this system. Combining this with (23d) yields (25):

- (24)  $\llbracket masaka \rrbracket$   
 $= \lambda w. \{\lambda p. \lambda w'. p(w') \bullet \exists S[\text{BEST}(f, g, w') \subseteq S \wedge \forall w'' [w'' \in S \rightarrow \neg p(w'')]]\}$ .
- (25)  $\llbracket masaka nani-ga huttei-ru \rrbracket$   
 $= \lambda w. \{\lambda w' \mathbf{falling}(a)(w') \bullet \exists S[\text{BEST}(f, g, w') \subseteq S \wedge \forall w'' [w'' \in S \rightarrow \neg\mathbf{falling}(a)(w'')]]$ ,  
 $\lambda w' \mathbf{falling}(b)(w') \bullet \exists S[\text{BEST}(f, g, w') \subseteq S \wedge \forall w'' [w'' \in S \rightarrow \neg\mathbf{falling}(b)(w'')]]$ ,  
 $\lambda w' \mathbf{falling}(c)(w') \bullet \exists S[\text{BEST}(f, g, w') \subseteq S \wedge \forall w'' [w'' \in S \rightarrow \neg\mathbf{falling}(c)(w'')]]$ , ... $\}$ ,  
 such that  $a, b, c, \dots \in \{x: \mathbf{thing}(x)(w)\}$ .

(25b) denotes the set of possible answers, but all of them are contradictory statements (for the same reason as in (16)). Therefore, question (22) ends up having no appropriate answer, leading to its infelicity.

Thus, *masaka*'s peculiar distribution presented in Section 2 is accounted for by positing that *masaka* expresses a negative modality at the not-at-issue level. The next section discusses the implications of our findings and remaining issues.

## 5. Implications and remaining issues

### 5.1. Implications

The first implication of our findings is *masaka*'s complicated licensing conditions. In declaratives, modality is required in addition to negation, which means that *masaka* differs from ordinary NPIs such as *any*. Furthermore, *masaka* can be embedded in polar questions but not in *wh*-questions. To our knowledge, no other lexical items have been reported to have the same properties as *masaka*.

The second implication is that several recent studies have analyzed certain modal particles in the same manner as the current study. Zimmermann (2018) addresses the German modal particle *schon*, and claims that [*schon p*] presupposes that *p* is more valid than  $\neg p$  in terms of the circumstantial modal base, and it is true iff *p* is true. Davis and Matthewson (2022) address the St'át'imcets frustrative marker *-séna7*, arguing that [*-séna7 p*] conveys that *p* is true as at-issue content and implicates at the not-at-issue level that there is another true proposition *q* such that the speaker believes that both *p* and *q* cannot be true at the same time. What these two analyses and ours have in common is that *schon*, *-séna7*, and *masaka* all encode some kind of modality at the not-at-issue level while leaving the prejacent at the at-issue level intact. This suggests that there may be a natural category of the lexical items that possess this semantic structure.

### 5.2. Remaining issues

#### 5.2.1. How to extend to attitude verbs

The first remaining issue is that epistemic attitude verbs such as *omow* 'think' license *masaka* when they are negated:

- (26) a. #*John-wa masaka ame-ga huttei-ru to omot-ta.*  
           John-TOP masaka rain-NOM falling-PRES COMP think-PAST  
           (Approx.) 'John thought at all that it was raining.'  
       b. *John-wa masaka ame-ga huttei-ru to omowa-nakatta.*  
           John-TOP masaka rain-NOM falling-PRES COMP think-NEG.PAST  
           (Approx.) 'John didn't think at all that it was raining.'

In the current analysis, *masaka*'s modality is associated with the speaker's epistemic state (i.e., *f(w)*). Therefore, the current analysis predicts that (26a)/(26b) assert that John thought/didn't



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think that it was raining while the speaker is certain that it is not raining. This does not match the intuitive meaning, nor does it capture the contrast between (26a) and (26b).

If *masaka*'s modality is relativized to John's doxastic state (i.e., the set of worlds compatible with John's belief in  $w$ ; henceforth,  $\text{DOX}_{J,w}$ ), as in (27), the contrast in (26) can be derived.

$$(27) \quad \llbracket \textit{masaka} \rrbracket = \lambda p. \lambda w. p(w) \bullet \exists S[\text{DOX}_{J,w} \subseteq S \wedge \forall w'[w' \in S \rightarrow \neg p(w')]].$$

(27) and the traditional semantics of attitude verbs in (28a) give rise to (28b) and (28c):

$$(28) \quad \begin{array}{l} \text{a. } \llbracket \textit{omotta} \rrbracket = \lambda p. \lambda x. \lambda w. \forall w'[w' \in \text{DOX}_{x,w} \rightarrow p(w')]. \text{ (past tense is ignored)} \\ \text{b. } \llbracket (26a) \rrbracket = \llbracket \textit{omotta} \rrbracket(\llbracket \textit{masaka} \rrbracket(\llbracket \textit{rain} \rrbracket))(\llbracket \textit{John} \rrbracket) \\ \quad = \lambda w \forall w'[w' \in \text{DOX}_{J,w} \rightarrow \textit{rain}(w')] \bullet \exists S[\text{DOX}_{J,w} \subseteq S \wedge \forall w'[w' \in S \rightarrow \neg \textit{rain}(w')]]. \\ \text{c. } \llbracket (26b) \rrbracket = \llbracket \text{NEG} \rrbracket(\llbracket \textit{omotta} \rrbracket(\llbracket \textit{masaka} \rrbracket(\llbracket \textit{rain} \rrbracket))(\llbracket \textit{John} \rrbracket)) \\ \quad = \lambda w \neg \forall w'[w' \in \text{DOX}_{J,w} \rightarrow \textit{rain}(w')] \bullet \exists S[\text{DOX}_{J,w} \subseteq S \wedge \forall w'[w' \in S \rightarrow \neg \textit{rain}(w')]]. \end{array}$$

The at-issue content of (28c) is consistent with its not-at-issue content (the latter entails the former), where as a contradiction occurs in (28b) (for the same reason as in (16)). Thus, one avenue for future research is explore how to implement the idea that *masaka*'s modality can refer either to the subject of the attitude verb or to the speaker's epistemic state, depending on the environment.

### 5.2.2. On the exclamative markers

The second remaining issue is the interaction between *masaka* and the Japanese exclamative markers *nante/towa* (cf. Sawada and Sawada, 2021). These markers can occur in sentence-final position and express the speaker's surprise:

$$(29) \quad \textit{Ame-ga huttei-ru nante/towa!}$$

rain-NOM falling nante/towa  
'It is raining!'

Crucially, *nante/towa* seem to entail that their prejacent is true, as with exclamatives in general (Rett, 2011). This is evidenced by the fact that sentences marked with *nante/towa* cannot tolerate the following denial:

$$(30) \quad \textit{Ame-ga huttei-ru nante/towa! \#Zissaiwa huttei-nai kedo.}$$

rain-NOM falling-PRES nante/towa in.fact falling-NEG.PRES though  
'It is raining! In fact, it is not, though.'

*Nante/towa* licenses *masaka* (as in (31a)), and their combination still seems to entail the truth of the prejacent because it is incompatible with the following denial as in (31b):

$$(31) \quad \begin{array}{l} \text{a. } \textit{Masaka ame-ga huttei-ru nante/towa!} \\ \quad \textit{masaka rain-NOM falling-PRES nante/towa} \\ \quad \text{'Unexpectedly, it is raining!'} \\ \text{b. } \textit{Masaka ame-ga huttei-ru nante/towa! \#Zissaiwa huttei-nai} \\ \quad \textit{masaka rain-NOM falling-PRES nante/towa in.fact falling-NEG.PRES} \\ \quad \textit{kedo.} \\ \quad \textit{though} \\ \quad \text{'(Approx.) Unexpectedly, it is raining! In fact, it is not, though.'} \end{array}$$

A reviewer points out that if (31a) entails that it is raining, it should contradict its not-at-issue content, which states that it is certainly not raining (as discussed in Section 4). This may be a limitation in this study.<sup>12</sup>

Although we do not have a clear solution to this problem, we suggest the possibility that *nante/towa* operate on temporal information involved in *masaka*'s modality. (31a) intuitively conveys that the speaker believed that it was not raining until she learned that it was (which is compatible with the exclamative meaning of *nante/towa*). If *masaka*'s modality in (31a) expresses the epistemic state that the speaker possesses before learning that the prejacent is true, then the modality does not contradict the truth of the prejacent at the utterance time. Specifically, assume the following denotation of *masaka*, where temporal arguments are added to the original version:

- (32) a.  $\llbracket \textit{masaka} \rrbracket = \lambda p.\lambda w.\lambda t. p(w)(t) \bullet \exists S[\text{BEST}(f, g, w, t) \subseteq S \wedge \forall w' [w' \in S \rightarrow \neg p(w')(t)]]$ .  
 b.  $\text{BEST}(f, g, w, t)$  is the set of the most ideal worlds in  $\bigcap f(w)(t)$  in terms of  $g(w)$ , where  $f(w)(t)$  is the set of propositions that the speaker knows at  $t$  in  $w$ , and  $g$  is the stereotypical ordering source.

*Nante/towa* modify the temporal information on *masaka* as follows:<sup>13</sup>

- (33)  $\llbracket (31a) \rrbracket = \lambda w.\lambda t. \mathbf{rain}(w)(t) \bullet \exists S, t' [t' < \text{UT} \wedge sp \text{ learns } \mathbf{rain}(w)(t) \text{ at } t' \wedge \text{BEST}(f, g, w, t') \subseteq S \wedge \forall w', t'' [[w' \in S \wedge t'' < t'] \rightarrow \neg \mathbf{rain}(w')(t)]]$ .

(33a) is true iff it is raining at the evaluation time  $t$  in the evaluation world  $w$ , and it implicates i) that the speaker learns at some time  $t'$  (which is prior to  $t$ ) that it is raining at  $t$ , and ii) that before the learning event, the speaker is certain that it is not raining at  $t$ . In this formula, *masaka* expresses the speaker's epistemic attitude prior to  $t$ ; therefore, it is compatible with the truth of the prejacent at  $t$  expressed at the at-issue level. This enables us to maintain the essence of our original idea that *masaka* encodes a negative modality at the not-at-issue level. What remains is how to achieve the semantics (33) in a compositional fashion.<sup>14</sup>

<sup>12</sup>*Nante/towa* can also be used as a complementizer. Their actuality entailment seems to be alleviated when *p-nante/towa* accompanies *omow* 'think' and negation, independent of the presence/absence of *masaka*:

(i) *John-wa (masaka) ame-ga huttei-ru nante/towa omottei-nai-si zissaini*  
 John-TOP (masaka) rain-NOM falling-PRES nante/towa thinking-NEG.PRES-and in.fact  
*huttei-nai.*  
 falling-NEG.PRES  
 'John is not thinking that it is raining, and in fact it is not raining.'

<sup>13</sup>Here, we omit the semantic component of *nante/towa* that expresses the speaker's surprise for the sake of simplicity. See Sawada and Sawada (2021) for the detailed analysis.

<sup>14</sup>The current claim that *nante/towa* operates on the modality encoded by *masaka* is also motivated by the following contrast:

(i) Context: the speaker knows that it is not raining.  
 a. #*Masaka ame-ga huttei-ru hazu-nai.*  
 masaka rain-NOM falling-PRES should-NEG  
 'It couldn't be raining.'  
 b. *Masaka ame-ga huttei-nai nante/towa.*  
 masaka rain-NOM falling-NEG.PRES nante/towa  
 '(Approx.) Unexpectedly, it is not raining!'

This contrast shows that [*masaka p hazu-nai*] is incompatible with the speaker's knowledge that  $p$  (this is so-called

5.2.3. On the projection property of *masaka*

It is widely agreed that the semantic contribution of not-at-issue contents projects to the global level, as they are so-designed (Potts, 2003, Simons et al., 2010, among others). For example, Zimmermann (2018) tests the projection property of the German aspectual particle *schon*, which expresses at the not-at-issue level that the prejacent is false before  $t_0$ . (the utterance time). By employing Simons et al.'s (2010) test forms, he demonstrates that this contribution of *schon* projects over negation, questions, and conditionals:

- (34) a. *Es ist nicht der Fall, dass es schon regnet.*  
 it is not the case that it already rains  
 'It's not the case that it's already raining.'  
 At-issue: It's not raining at  $t_0$   
 Not-at-issue: It wasn't raining before  $t_0$ .
- b. *Regnet es schon?*  
 rains it already  
 'Is it raining already?'  
 At-issue: {It's raining at  $t_0$ , It's not raining at  $t_0$ }  
 Not-at-issue: It wasn't raining before  $t_0$ .
- c. *Falls es schon regnet, müssen wir uns beeilen.*  
 if it already rains must we us hurry  
 'If it is already raining, we have to hurry up.'  
 At-issue: If it's raining at  $t_0$ , we have to hurry up.  
 Not-at-issue: It wasn't raining before  $t_0$ .

The projection status of *masaka* is not as clear as *schon*. First, it is difficult to test whether *masaka*'s contribution projects over negation because *masaka* seems unembeddable under *koto* 'that'-clause:

- (35) (\**Masaka*) *ame-ga huttei-ru hazu-nai koto-wa*  
 (masaka) rain-NOM falling-PRES should-NEG.PRES fact-TOP  
*zizitu-de-wa-nai.*  
 fact-COP-TOP-NEG.PRES  
 '(Intended) It is not the case that it should NOT be raining.'

As seen in Sections 3 and 4, the questions of the form [*masaka p?*] implies the speaker's strong bias for  $\neg p$  as in (9):

- (36) *Masaka ame-ga huttei-ru no?* (= (36))  
 masaka rain-NOM falling-PRES Q  
 'Is it raining, by any chance?'  
 Implication: The speaker expects that it is not raining.

Therefore, *masaka*'s contribution (i.e., the prejacent is certainly false) projects over the question

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indirectness requirement of epistemic modals; see von Stechow and Gillies, 2010), while [*masaka p nante/towa*] is not. This suggests that the epistemic state of the speaker of (ia) at the utterance time differs from that of the speaker of (ib). The current approach captures this by postulating that the temporal argument involved in the modal base refers to different times.

operators. What is puzzling, however, is the following case, in which *hazu-nai* is embedded under a polar question in addition to *masaka*:

- (37) *Masaka ame-ga huttei-ru hazu-nai no?*  
 masaka rain-NOM falling-PRES should-NEG.PRES Q  
 ‘Shouldn’t it be raining, by any chance?’

Intuitively, (37) expresses the speaker’s bias for the modalized claim  $\neg$ *hazu-nai*(**rain**), not for **rain**. This interpretation is obtained if *masaka* is interpreted above the co-occurring modal *hazu-nai*:

- (38)  $\llbracket (37) \rrbracket = \llbracket Q \rrbracket(\llbracket masaka \rrbracket(\llbracket hazu-nai \rrbracket(\llbracket \mathbf{rain} \rrbracket)))$ .  
 $\llbracket masaka \rrbracket(\llbracket hazu-nai \rrbracket(\llbracket \mathbf{rain} \rrbracket))$   
 $= \lambda w. hazu-nai(\mathbf{rain})(w) \bullet \exists S[\text{BEST}(f, g, w) \subseteq S \wedge \forall w' [w' \in S \rightarrow \neg hazu-nai(\mathbf{rain})(w')]]$ .  
 $\llbracket Q \rrbracket(\llbracket masaka \rrbracket(\llbracket hazu-nai \rrbracket(\llbracket \mathbf{rain} \rrbracket)))$   
 $= \{\lambda w. hazu-nai(\mathbf{rain})(w), \lambda w. \neg hazu-nai(\mathbf{rain})(w)\} \bullet \exists S[\text{BEST}(f, g, w) \subseteq S \wedge \forall w' [w' \in S \rightarrow \neg hazu-nai(\mathbf{rain})(w')]]$

However, if *masaka* is interpreted under *hazu-nai*, (37) should have the implication that the speaker is biased for  $\neg$ **rain** not for  $\neg$ *hazu-nai*(**rain**):

- (39)  $\llbracket (37) \rrbracket = \llbracket Q \rrbracket(\llbracket hazu-nai \rrbracket(\llbracket masaka \rrbracket(\llbracket \mathbf{rain} \rrbracket)))$   
 $\llbracket hazu-nai \rrbracket(\llbracket masaka \rrbracket(\llbracket \mathbf{rain} \rrbracket))$   
 $= \lambda w. hazu-nai(\mathbf{rain})(w) \bullet \exists S[\text{BEST}(f, g, w) \subseteq S \wedge \forall w'' [w'' \in S \rightarrow \neg \mathbf{rain}(w'')]]$ .  
 $\llbracket Q \rrbracket(\llbracket hazu-nai \rrbracket(\llbracket masaka \rrbracket(\llbracket \mathbf{rain} \rrbracket)))$   
 $= \{\lambda w. hazu-nai(\mathbf{rain})(w), \lambda w. \neg hazu-nai(\mathbf{rain})(w)\} \bullet \exists S[\text{BEST}(f, g, w) \subseteq S \wedge \forall w'' [w'' \in S \rightarrow \neg \mathbf{rain}(w'')]]$ .

Why (37) seems to lack the interpretation in (39) is a remaining issue.

Finally, as with *koto*-clauses, *masaka* is not readily embedded under conditionals (*mosi* is an element that marks the beginning of the conditional clause):

- (40) *Mosi (??masaka) ame-ga huttei-ru hazu-nai nara, ie-ni*  
 mosi (masaka) rain-NOM falling-PRES should-NEG.PRES COND home-to  
*kaeri-tai.*  
 go.back-want  
 ‘(Intended) If by any chance it cannot be raining, I want to go home.’

However, there are (at least marginally) acceptable cases in which *masaka* is embedded under conditionals:<sup>15</sup>

- (41) (?) *Mosi masaka John-ga kuru-to-iu nara, paatii-wa moriagaru daroo.*  
 mosi masaka John-NOM come-COMP-say COND party-TOP get.exciting will.  
 ‘(Approx.) If John were to come, the party would get exciting.’

<sup>15</sup>The configuration *to-iu* does not license *masaka* in the matrix clause. It is to be explored in future research why *to-iu* improves the acceptability of *masaka* only in conditional clauses:

- (i) #*Masaka ame-ga huttei-ru to-iu.*  
 masaka rain-NOM falling-PRES COMP-say  
 ‘(Intended) It could be raining.’

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This sentence implies that the speaker is almost certain that John will not come, which means that *masaka*'s contribution is passed up to the matrix level.

In summary, *masaka*'s projection property is difficult to describe straightforwardly. The bottom line is that it is not unreasonable to posit that *masaka*'s semantics involves certain kinds of not-at-issueness, given that its contribution projects to the global level in cases such as (9), (37), and (41).

### 6. Conclusion

We proposed a tentative analysis of *masaka* that accounts for its peculiar properties: i) *masaka* requires a negated epistemic modal to co-occur in the same clause, and ii) *masaka* is licensed in polar questions, but not in *wh*-questions. In our analysis, *masaka* takes a proposition and encodes a strong modalized claim that the proposition is false at the not-at-issue level, while leaving the proposition intact at the at-issue level.

However, three major issues remain unsolved. First, *masaka* is licensed using negated epistemic attitude verbs. To accommodate this case, *masaka*'s modality must be more flexible in referring to the epistemic/doxastic state of agents other than the speaker. Second, the exclamative markers *nante* and *towa* license *masaka*, and the resulting sentence entails that the prejacent is true, which is incompatible with *masaka*'s modality. We suggested that this problem can be solved by assuming that *nante/towa* operates on the temporal information involved in the modal base of *masaka*. Finally, it was demonstrated that *masaka* shows complicated projection patterns.

### Appendix: [*nai hazu-da*] ≠ [*hazu-nai*]

In Section 3, we analyze the negation *nai* in (5b), repeated here as (42a), as associated with the prejacent *ame-ga huttei-ru* 'It is raining', not with the modal *hazu-da*. Therefore, (42a) is composed as in (42b), resulting in a contradiction between the truth of the prejacent at the at-issue level and the negative modality at the not-at-issue level.

- (42) a. #*Masaka ame-ga huttei-nai hazu-da.*  
           *masaka rain-NOM falling-NEG.PRES should-COP*  
           ' (Approx.) Possibly, it should not be raining.'
- b.  $\llbracket hazu \rrbracket (\llbracket masaka \rrbracket (\llbracket \neg \mathbf{rain} \rrbracket ))$   
        $= \lambda w. \forall w' [w' \in \text{BEST}(f, g, w) \rightarrow \neg \mathbf{rain}(w')] \bullet \exists S [\text{BEST}(f, g, w) \subseteq S \wedge \forall w' [w' \in S \rightarrow \mathbf{rain}(w')]]$ .

However, an anonymous reviewer wonders why we have excluded the possibility that the negation *nai* in (42a) is associated with *hazu*. If this is possible, (42a) will have the same interpretation as (3), repeated below as (43), which is a felicitous example:

- (43) *Masaka ame-ga huttei-ru hazu-nai.*  
       *masaka rain-NOM falling-PRES should-NEG.PRES*  
       'It should NOT be raining.'

We claim that *nai* in (42a) cannot target the higher modal *hazu* for syntactic reasons; therefore,

(42a) cannot be interpreted on a par with (43).

It is well-known that in Japanese, when a universal quantifier marked with the case particle *-ga* is in the subject position, the clause-mate negation cannot scope over the subject:

- (44) *Zen'in-ga kyoositu-ni i-nai.* [ $\forall > \neg / * \neg > \forall$ ]  
 everyone-NOM classroom-in be-NEG.PRES  
 'Everyone is not in the classroom.'

Crucially, [*nai hazu-da*] and [*hazu-nai*] exhibit different scopal patterns with respect to their interactions with a universal quantifier:

- (45) a. *Zen'in-ga kyoositu-ni i-nai hazu-da.* [ $\forall > \neg / * \neg > \forall$ ]  
 everyone-NOM classroom-in be-NEG.PRES should-COP  
 'Everyone should not be in the classroom.'
- b. *Zen'in-ga kyoositu-ni i-ru hazu-nai.* [ $\forall > \neg / \neg > \forall$ ]  
 everyone-NOM classroom-in be-PRES should-NEG.PRES  
 'Not everyone should be in the classroom'

Given these observations, we claim that *hazu* takes a clause containing its prejacent as its complement as follows:

- (46) a. The structure of (45a): [*Zen'in-ga kyoositu-ni i-nai hazu-da*]  
 b. The structure of (45b): [*Zen'in-ga kyoositu-ni i-ru hazu-nai*]

The unavailability of the  $\neg > \forall$  reading in (45a) follows straightforwardly from the fact that the universal quantifier in the subject position and the negation *nai* are clause-mates and the latter cannot scope over the former just as in (44). We further claim that the universal quantifier cannot scope over negation in (45b) because of the Complex NP Constraint (CNPC) violation in Japanese. This is empirically supported by the fact that case particles can be attached to the *hazu*-clause, which is one of the traits of nominal argument-hood in Japanese:<sup>16, 17</sup>

- (47) *Ame-ga huttei-ru hazu-ga-nai.*  
 rain-NOM falling-PRES should-NOM-NEG.PRES  
 'It should not be raining.'

It naturally follows that the negation in (42a) cannot target the higher modal *hazu* because the two items are in different clauses, which leads to the fact that (42a) cannot have the felicitous interpretation that (43) has.<sup>18</sup>

<sup>16</sup>This conjecture is in line with the traditional description of *hazu*, which says that *hazu* is a *keisiki meisi* 'formal noun' that expresses a high probability. This means that the clause preceding *hazu* is some kind of content clause, which blocks extraction.

<sup>17</sup>The availability of the  $\forall > \neg$  reading in (45b) can be attributed to the fact that it is a special case of the  $\neg > \forall$  reading.

<sup>18</sup>The argument here is further supported by the interaction between negation and existential quantifiers. As with universal quantifiers, *ga*-marked subject existential quantifiers obligatorily has wider scope over the clause-mate negation:

- (i) *Dareka-ga kyoositu-ni i-nai.* [ $\exists > \neg / * \neg > \exists$ ]  
 someone-NOM classroom-in be-NEG.PRES  
 'Someone is not in the classroom.'

Here, [*nai hazu-da*] and [*hazu-nai*] show different patterns as to scopal interactions with the existential quantifier:

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This claim is compatible with the interactions between quantifiers and [*nai-daroo*]. Recall that it licenses *masaka*:

- (48) *Masaka ame-ga huttei-nai-daroo.* (=6))  
 masaka rain-NOM falling-NEG.PRES-will  
 ‘It must NOT be raining.’

The felicity of this example suggests that the negation is associated not with the preajcent but with *daroo*, despite of *nai* being located to the left of *daroo*. This means that, unlike the case of *hazu*, there is no clause boundary between *nai* and *daroo*.

Then, it is predicted that when [*nai-daroo*] co-occurs with a universal quantifier in the subject position, the latter scopes over the former because there is no clause boundary between the two. This is borne out:<sup>19</sup>

- (49) *Zen'in-ga kyoositu-ni i-nai-daroo* [ $\forall > \neg / * \neg > \forall$ ]  
 everyone-NOM classroom-in be-NEG.PRES-will  
 ‘Everyone must not be in the classroom.’

In summary, the configuration [*nai hazu-da*] cannot have the same semantics as [*hazu-nai*] because *nai* and *hazu* in [*nai hazu-da*] are contained in different clauses. Meanwhile, *nai* in [*nai-daroo*] can target *daroo* because they are in the same clause.

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- (ii) a. *Dareka-ga kyoositu-ni i-nai hazu-da.* [ $\exists > \neg / * \neg > \exists$ ]  
 someone-NOM classroom-in be-NEG.PRES should-COP  
 ‘Someone should not be in the classroom.’  
 b. *Dareka-ga kyoositu-ni i-ru hazu-nai.* [ $\exists > \neg / \neg > \exists$ ]  
 someone-NOM classroom-in be-PRES should-NEG.PRES  
 ‘No one should be in the classroom’

These patterns can also be explained if we posit the same structures as in (46).

<sup>19</sup>Given f.n. 17, it is also predicted that [*nai-daroo*] scopes under existential quantifiers, which is borne out:

- (i) *Dareka-ga kyoositu-ni i-nai-daroo* [ $\exists > \neg / * \neg > \exists$ ]  
 someone-NOM classroom-in be-NEG.PRES-will  
 ‘Someone must not be in the classroom.’

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