Feature Inheritance and Percolation between C and T

Feature Inheritance and Percolation between C and T

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Abstract

The functional category T in a clause undergoes feature inheritance of φ-features from C in the system of complementizer. This feature inheritance bears by-products, and one of them is complementizer agreement observed in many languages, especially in West Germanic languages. The φ-features in T that are inherited from C percolate up from T to C, which is caused by requirements of the principle called "Percolation" applicable in Distributed Morphology, a grammatical level between Narrow Syntax and PF Interface. Some cross-linguistic variations of this complementizer agreement depend on the interaction among the principle Percolation and the hierarchy of the φ-features. Features other than φ-features, i.e. tense feature and mood feature, also undergo feature inheritance from C to T, and feature percolation of the features in T inherited from C occurs due to requirements of the principle Percolation.

Keywords: *feature inheritance, feature percolation, complementizer agreement, Distributed Morphology, Mood*

1. Introduction

Under the analysis of Chomsky (2000, 2008), features such as φ-features are inherited from C to T. The argument that the φ-features of T are inherited from C is mainly based on the fact that some of Germanic languages (especially the West Germanic languages) exhibit complementizer agreement with T as to φ-features.

(1) *West Flemish*
Kpeinzen dan-k (ik) morgen goan.
I-think that-I (I) tomorrow go
'I think that I'll go tomorrow.'
(Haegeman 1992: 49)

Much attention has been paid to these phenomena. The main concern is to analyze these as overt agreement between C as a prober and T as a goal in Narrow Syntax (e.g. Zwart 1993, Carstens 2003, Van Koppen 2005). The phenomena, furthermore, are treated as a post-syntactic process (e.g. Ackema and Neelman 2004 and Fuß 2008). West Flemish, as shown above, has a full, i. e. non-defective, complementizer agreement. However, there are some cross-linguistic variations of this complementizer agreement. Selection as to which feature is determined among person, number, and gender in the complementizer agreement depends on languages. Munemasa (2020, 2021) propose that these phenomena and their language variation is due to the interaction between the principle Percolation which induces feature percolation and the feature hierarchy.

This paper, based on the assumption that the feature inheritance from C to T bears by-products (like a relation between action and reaction) and one of them is complementizer agreement, shows that the complementizer agreement phenomenon is a problem of morphology and is closely related to the feature percolation from T to C caused by requirements of the principle Percolation. Complementizer agreement is treated in the grammatical level concerning morphology. Thus it is a problem of Distributed Morphology, a grammatical level to determine morphological representation between Narrow Syntax and PF Interface proposed by Halle and Maranz (1993) and Harley and Noyer (1998, 1999) (cf. Hoekstra and Marácz's (1989) analysis of complementizer agreement as INFL movement from T to C). Furthermore, based on the analysis of feature inheritance and feature percolation, this paper shows that features other than φ-features, i. e. tense feature and mood feature, also undergo feature inheritance from C to T, and feature percolation of the features in T occurs in Distributed Morphology, which is explained as a consequence of the analysis based on the principle Percolation and their feature hierarchy.

2. Complementizer Agreement and Feature Percolation

As mentioned above, selection as to which feature is determined among person, number, and gender depends on languages which show complementizer agreement. In Najdi Arabic, the complementizer agrees with the embedded subject in person, number, and gender.

(2) a. ta-Qatiqid inna-ha sawwa-t al-akil
2_{SG}-think that-3SG. fem make.perf-3sg.fem the-food
'You think that she made the food.'

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b. ta-Qatiqid inna-hum saww-aw al-akil
2_{SG}-think that-3PLl.MASC make.perf-3pl.masc the-food
'You think that they made the food.'
(Lewis 2013)

In Katwijk Dutch, complementizer agreement occurs concerning number between C and a local subject.

(3) *Katwijk Dutch*
a. ... as ik/jij/hij hoor(t) ...
when I/you/he hear(s)
'...when I/you/he hear(s) ...'
b. ... as-e we/jollie/ze hore ...
when-PL we/you/they hear
'...when we/you/they hear ...'
(Van Koppen 2017)

In Limburgian, complementizer agrees with an embedded 2SG-subject.

(4) a. Ich denk de-s doow Marie ontmoet-s
I think that-2SG you.SG Marie meet-2SG
'I think that you will meet Marie.'
b. Ich dink de-s [toow en Marie] kump.
I think that-2SG you.SG and Marie come-PL.
'I think that you and Marie will come.'

In Bavarian as well, complementizer agreement occurs only concerning 2SG-subjects and 2PL-subjects.

(5) a. (I frog' me) ob-sd ned du des mocha kansd
I ask myself whether-2SG not you this make could-2SG
'I ask myself whether you could not make it.'
(Weiss 2005)
b. wei-ts iw t'pruk khumt-Ø sea-ts s'witshaus
when-2PL over the-bridge come see-2PL the-tavern
'When you cross the bridge, you see the tavern.'
(Fuß 2003: 5)

However, Munemasa (2020, 2021) propose that complementizer agreement is not the operation in Narrow Syntax but is derived from feature percolation from T to C in the other grammatical level than Narrow Syntax, based on the observation of many languages that exhibit feature percolation as follows:

(6) *Hindi-Urdu*
Vivek-ne [kitaab parh-nii] chaah-ii
Vivek-Erg book.F read-Inf.F want-Pfv.F.SG
'Vivek wanted to read the book.'
(Bhatt 2005: 760)

(7) *Itelmen*
t'- əntxa- čePn [mił okno-Pn sop-es]
1SG-forger-3PL.OBJ all window-PL close-INF
'I forgot to close all the windows.'
(Bobaljik and Wurmbrand 2003: 1)

As shown above, the objects in the embedded clause are in an agreement relation with the verbs of the same clause and moreover, the verbs in the matrix clause exhibit φ-feature agreement with the objects. This fact suggests that the φ-features of the objects in the embedded clause percolate up through the embedded clause even to the matrix clause.

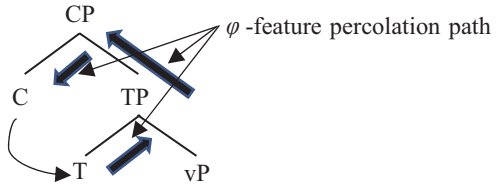
The same feature percolation can be observed in noun phrases.

(8) *German*
a. der große Tisch
the-MASC.SG big-MASC.SG desk-MASC.SG
b. die rotten Dächer
the-NEU.PL red-NEU.PL roof-NEU.PL

(9) *Italian*
a. la mia casa
the-FEM.SG my-FEM.SG house-FEM.SG
b. il mio gatto
the-MASC.SG my- MASC.SG cat- MASC.SG

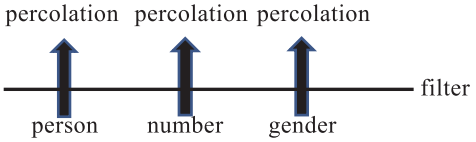
As shown above, in German and Italian, φ-features percolate up to the upper part of the projection in the noun phrases. Therefore, in the case of complementizer agreement, φ-features are directly inherited from C to T and in a reflex manner they percolate up from T to C where complementizers occur as a by-product of the feature inheritance, as shown below.

(10)

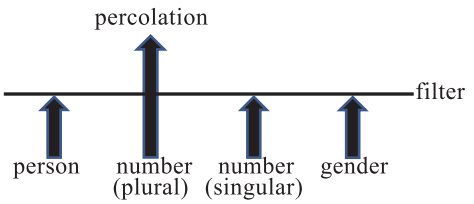


All the examples shown above exhibit φ-feature percolation between T and C in common. However, some features among φ-features are prevented from percolating from T. That is, some φ-features are filtered out as follows:

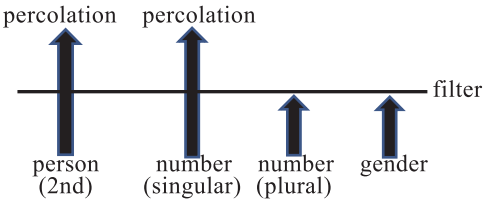
(11) *West Flemish-Najdi Arabic Type*



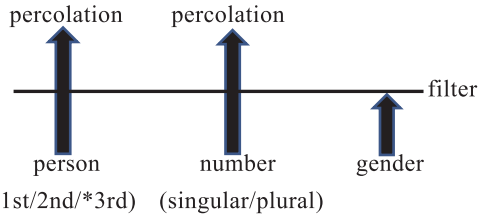
(12) *Katwijk Dutch Type*



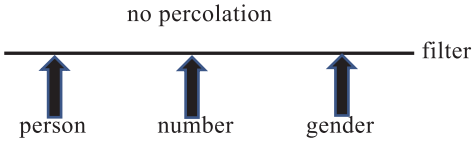
⑬ *Limburgian Type*



⑭ *Bavarian Type*



⑮ *Non Complementizer Agreement Languages*



Generative Grammar introduces features in numeration of syntactic structure. Once features are employed in the numeration of syntactic structure, the numeration follows a law of nature. Regularity such as the Fibonacci sequence is observed in natural phenomena, and some principles are used to explain natural phenomena in physics and quantum mechanics (for example, Hamilton's principle). In a similar way, some principles get involved in the numeration of syntactic structure. In addition, the features used in the numeration of syntactic structure are considered to be hierarchical in the same way that the configuration of a base of genomic DNA is hierarchical. Percolation is observed in the natural phenomena. The filter in question here is also based on interaction between one principle and the hierarchy of features. It is assumed that some principles operate in determining the morphological representation in Distributed Morphology and occurrence of φ-feature percolation depends on a specified hierarchy and interaction among them. Systematic variation concerning φ-feature percolation is derived from differences between the feature rankings. The principle that induces feature percolation is called here as follows:

⑯ Percolation: features percolate up.

Munemasa (2020, 2021) argued that domination of φ-feature hierarchy by this principle induces φ-feature percolation, while dominance of this principle by φ-feature hierarchy induces no φ-feature percolation as in the case of languages like English (cf. Greenberg (1963)). The principle operates not in Narrow Syntax but in Distributed Morphology, since feature percolation in Narrow Syntax induces a No Tampering Condition (NTC) violation due to addition of new features to a projection via feature percolation.

Now let's take a look at language variation of φ-feature percolation. West Flemish-Najdi Arabic Type languages have a hierarchy as follows:

⑰ West Flemish-Najdi Arabic Type:
Percolation > {Number, Person, Gender}

This hierarchy exhibits percolation of all kinds of φ-feature.

Katwijk Dutch Type languages have the feature hierarchy as follows:

⑱ Katwijk Dutch Type:
Percolation > Number [PL > SG] > {Person, Gender}

Features develop sub-hierarchies. In light of this, I posit that φ-features bear sub-hierarchies. That is, it consists of sub-features and a stratified hierarchy of them is formed. The above feature hierarchy allows only percolation of plural number feature, since the number feature PL dominates the number feature SG.

Limburgian Type languages have the hierarchy as follows:

⑲ Limburgian Type:
Percolation > {Person [2nd > {1st, 3rd}], Number [SG > PL]} > Gender

The person feature 2nd dominates 1st and 3rd person and the number feature SG dominates the number feature PL. This hierarchy induces percolation of 2nd person and singular number features.

Bavarian Type languages have the hierarchy as follows:

⑳ Bavarian Type:
Percolation > {Person [2nd > {1st, 3rd}], Number} > Gender

The person feature 2nd dominates 1st and 3rd person. This hierarchy induces percolation of 2nd person and number features.

No Complementizer Agreement languages have the hierarchy as follows:

㉑ No Complementizer Agreement Languages:
{Person, Number, Gender} > Percolation

This hierarchy induces no percolation of φ-features, hence no complementizer agreement between C and T. All the feature rankings shown above are in order below:

(22)

Language	Feature Hierarchy
West Flemish	Percolation > {Number, Person, Gender}
Najdi Arabic	Percolation > {Number, Person, Gender}
Katwijk Dutch	Percolation > Number [PL > SG] > {Person, Gender}
Limburgian	Percolation > {Person [2nd > {1st, 3rd}], Number [SG > PL]} > Gender
Bavarian	Percolation > {Person [2nd > {1st, 3rd}], Number} > Gender
English	{Person, Number, Gender} > Percolation

However, languages that exhibit φ-feature percolation optionally induce it. Lapscheure Dutch does not always induce φ-feature percolation as follows:

(23) *Lapscheure Dutch*

a. Kpeinzen **{dat zelfs Valère}** zukken boeken niet leest.
I think that even Valère such books not reads

b. Kpeinzen **{*da-n/??dat zukken boeken}** zelfs Valère niet leest.
I think that-3P.PL/that such books even Valère not reads
'I think that even Valère would not read such books.'
(Haegeman and Van Koppen 2012: 446)

In (23b), the object intervenes between C and the local subject, and φ-feature percolation from T to C does not occur.

On the other hand, Gmunden dialect, a variant of Bavarian, induces φ-feature percolation despite the existence of an intervenor between C and the local subject.

(24) *Bavarian, Gmunden dialect*

a. **Warum-st** sein Friend uns **DU** net vorgstöht ho-st, vasteh i a net.
Why-2P.SG his friend us you not introduced have-2P.SG understand I too not
'Why you didn't introduce his friend to us, I don't understand either.'

b. Wos hot da Hannes gsogt, **wo-st** morgn **DU** mitbringasoid-st?
What has the Hannes said, that-2P.SG tomorrow you with-bring should-2P.SG
'What did Hannes say that you should bring along tomorrow?'
(Gruber 2008: 54)

The examples shown above suggest that language variations have optionality concerning percolation of φ-features. Optionality of grammatical operation is derived from the notion of feature ranking tie and thus languages exhibiting optionality of φ-feature percolation have the following ranking, where Percolation and φ-features are in a tie relation.

(25) {[Person, Number, Gender], Percolation}

Complementizer agreement sometimes shows sensitivity concerning linear adjacency. Tegelen Dutch exhibits agreement between C and the first conjunct of the coordinated local subject.

(26) *Tegelen Dutch*

... de-s doow en ich ôs treff-e.
that-2P.SG [you$_{SG}$ and I]$_{1P.PL}$ each other$_{1P.PL}$ meet-1P.PL
'... that you and I meet each other.'
(Van Koppen 2005: 174)

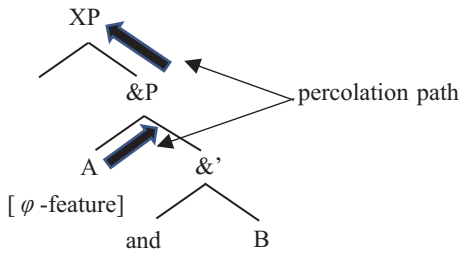
On the other hand, Lapscheure Dutch exhibits complementizer agreement between C and the external possessor in the local subject.

(27) *Lapscheure Dutch*

... omda-n **die venten** toen juste **underen computer** kapot was.
because-3P.PL those guys then just their computer broken was
'... because those guys' computer broke just then.'
(Haegeman and Van Koppen 2012: 444)

In these examples, complementizer agreement occurs between C and the upper nominal element in the local subject. This suggests that the φ-features of the upper element in the structure preferentially percolate up.

(28)



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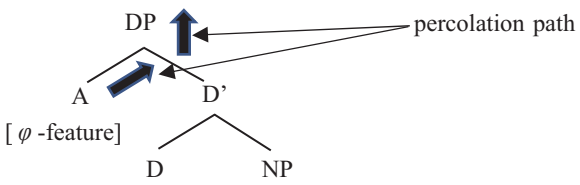


This kind of feature percolation suggests that feature percolation prioritizes percolation of the upper feature in hierarchy.

For stratification of feature, possible permutations and combinations of layers are derived by mathematical formulas

such as (30), (31), and (32).

(30) Number of permutations and combinations of feature hierarchy

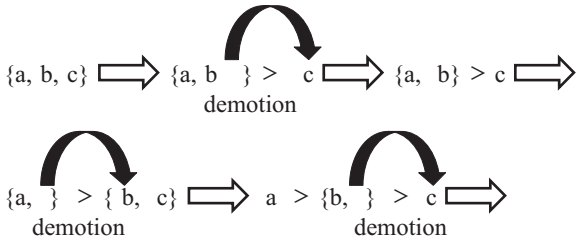
a. $\mathrm{nPr} = \frac{n!}{(n-r)!}$

b. $\mathrm{nCr} = \frac{nPr}{r!}$

(31) Sum of permutations and combinations of feature hierarchy

$\mathrm{Sn} = \sum_{k=1}^{n} x_k$

(32) Procedure of feature demotion



a > b > c

P(S) = {1, 2, 3}, {1, 2} > 3, 1 > {2, 3}, 1 > 2 > 3,
2 > {1, 3}, 3 > {1, 2}, 1 > 3 > 2, 2 > 1 > 3,
2 > 3 > 1, 3 > 1 > 2, 3 > 2 > 1

The Number of permutations and combinations of feature hierarchy is determined by (30) and (31). However, the number of features always induces a problem as to the correlation between feature ranking and data complexity. The amount of data that needs to be supplied to learn feature rankings yields the data complexity. Given that any target grammar a person is learning is consistent with at least one total ranking of the features, the number of possible grammars is the number of possible total rankings. The number of distinct total rankings is a factorial function of the number of features. For example, a set of 8 features has 8! = 40,320 distinct rankings. If the amount of data was required to determine the correct ranking as the number of possible rankings, a grammar having many features would require a large amount of data, leading to data complexity. To resolve the problem, it would be required to design mechanisms to determine the correct feature ranking efficiently by the minimum necessary data. Therefore, hierarchy of features, based on the language data when learning an individual language, is determined by the procedure of feature demotion, which is easier to be operated than feature promotion in determining feature hierarchy efficiently as in (32). In determining feature rankings by the feature demotion procedure, the target grammar can have equally ranked features, that is, formation of a feature ranking tie. Two features are not ranked with respect to each other. In this case, they belong to the same stratum as in the following representation: $\{F_1, F_2\}$. As mentioned above, when the principle Percolation dominates the stratified features, the highly ranked feature must take priority and thus percolates up. A series of the computation such as (30)-(32) is called the Feature Percolation Algorithm here.

3. Percolation of Other Features

Now let us consider a consequence of the Feature Percolation Algorithm. There seems to be some languages undergoing inheritance of other features than φ-features from C to T. Much attention has been paid to the relation between C and tense. In modern Irish, types of finite clauses (e.g. subordinate, relative, interrogative, negative clauses, and such) show up in complementizers. According to Chung and McCloskey (1987), the complementizers have two forms, past and non-past, as follows:

(33)

	Non-past	Past
Subordinating	go /gə/	gur /gər/
"Direct" relative	a /ə/	a /əí/
"Indirect" relative	a /ə/	ar /ɛr^{y}/
Interrogative	an /ən/	ar /ɛr^{y}/
Matrix negative	ní /n^{y}i:/	níor /n^{y}i:r/
Embedded negative	nach /nax/	nír /na:r/

(Chung and McCloskey 1987: 218)

(34) a. Dúirt sé go dtiocfadh sé.
say(Past) he Comp come(Condit) he
'He said that he would come.'

b. an fear al abhrann tú leis.
the man Comp speak(Pres) you with-him
'the man that you speak to'

c. Dúirt sé nár chuir sé isteach air.
say(Past) he Neg put(Past) he in on-it
'He said that he did not apply for it.'

ibid.

This is one of the cases to suggest that tense feature can be inherited from C to T.

Another case of feature inheritance from C to T would be mood feature inheritance from C to T. In English, the complement of verbs expressing demand, proposal, request, hope, desire, and so on is associated with subjunctive mood, and the verb in it is required to be bare infinitives in American English and is required to introduce *should* in British English. This *should* in British English is so-called emotional *should*.

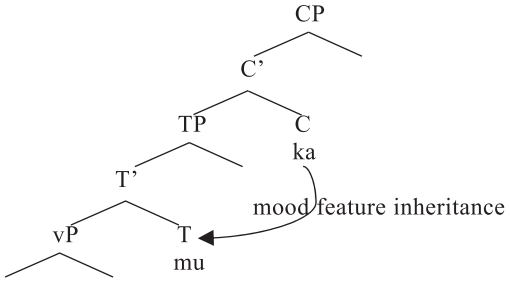
(35) a. We desire that they (should) visit us more often.
b. They proposed that the hospital (should) be built.
c. We want that they (should) come to the party.

In Early Middle Japanese where the same pattern as in British English was exhibited, an auxiliary, *mu*, occurred in T in tandem

with the mood marker *ka*. The marker *ka* exhibits uncertainty.

(36) Toriidete-mo　　sama　asikara mu　ka.
take something out Part.　manner bad　Aux. Part.
'The manner of his / hers will be bad.'
(*Ochikubo Monogatari* (*The Tale of Ochikubo*))

(37)



The particle *ka* as mood marker occurs in C in the above example (note that Japanese is a head-final language).

Many other languages fill in a piece of the argument justifying the direct relationship between sentence complementation and typological difference of complementizers. Romanian also distinguishes indicative and subjunctive complements by using different complementizers.

(38) *Romanian*

a. El spune ca　　citeste　　o carte
he says　COMP read(3SG INDIC)　a book
'He says that he's reading a book.'

b. El vrea　sa　　citesca　　o carte
he wants COMP　read(3SG SUBJUN)　a book
'He wants to read a book.'

(Noonan 1985)

In Bulgarian, the indicative and subjunctive have distinct complementizers, *ce* and *da* respectively. And they differ in inflectional possibilities; the indicative is inflected for tense while the subjunctive is invariable and uses the same person-number inflections as the indicative present.

(39) *Bulgarian Indicative*

a. Misli,　　ce　　vie　ste umoren
think(3SG) COMP　ou　tired
'He thinks that you are tired.'

b. Dobre, ce　　te　sreštnax
good　COMP you met(1SG)

c. Cux,　　ce　　toj　mu　　dal　　parite
heard(1SG) COMP he　to him　gave(3SG) money
'I heard that he gave him the money.'

(Noonan 1985)

(40) *Bulgarian Subjunctive*

a. Mislja　　da　　ida
think(1SG)　COMP go(1SG SJNCT)
'I intend to go.'

b. Iskam　　da　　kupja
want(1SG) COMP　buy(1SG SJNCT)
'I want to buy.'

c. Moga　　da　　vidja
be able(1SG) COMP see(1SG SJNCT)
'I can see.'

d. Vece　zapocnaxa　da　　minavat
already　began(3PL)　COMP　pass by(3PL SJNCT)
'They've already begun to pass by.'

ibid.

In Russian, the indicative and subjunctive have distinct complementizers, *cto* and *ctoby* respectively.

(41) *Russian Indicative*

a. Ja govorju, cto　Boris pridët
I　say　COMP Boris will come
'I say that Boris will come.'

b. Ja dumaju, cto　　Boris pridët
he said　COMP　Boris will come
'I think that Boris will come.'

(Noonan 1985)

(42) *Russian Subjunctive*

a. Ja somnebajus,　ctoby　Boris prišël
I　doubt　　COMP　Boris come (SJNCT)
'I doubt that Boris will come/came.'

b. Ja xocu, ctoby　Boris prišël
I　want COMP Boris come (SJNCT)
'I want Boris to come.'

ibid.

The complementation system in Greek also differentiates factives and non-factives (non-subjunctives) overtly. In this language, non-factive sentences are introduced by the complementizer *oti* and factive sentences by the specialized complementizer *pu*. These facts suggest that mood feature is inherited from C to T.

As mentioned above, Japanese exhibits feature inheritance of mood feature from C to T. There seems to be a case where Japanese underwent feature percolation of mood feature from T to C. In Old Japanese, the particle *shika*, which expresses wish, occurred in C and the modal auxiliary *te* (an auxiliary verb denoting the perfect tense) occurred in T in tandem with *shika*. Furthermore, Old Japanese exhibited cooccurrence of the particle *shik*a and the particle *mo* in C (the following Japanese data are from *The Corpus of Historical Japanese* (CHJ), National Institute for Japanese Language and Linguistics).

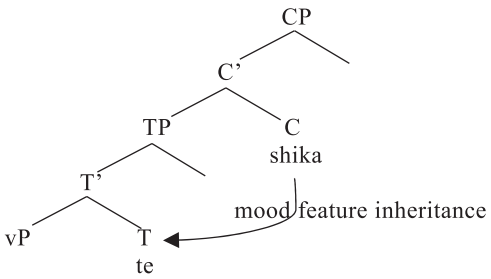
(43) *Old Japanese*

a. nemui　mosa　　ne　　**te**　　**shika**.
sleep　at least　sleep　Aux.　Part.
'I want to sleep.'

b. tukuyomino　　moteru ochimizui　　torikite
the God of the moon having rejuvenating water　take
kimi-ni maturite ochie　　**te**　**shika**　**mo**.

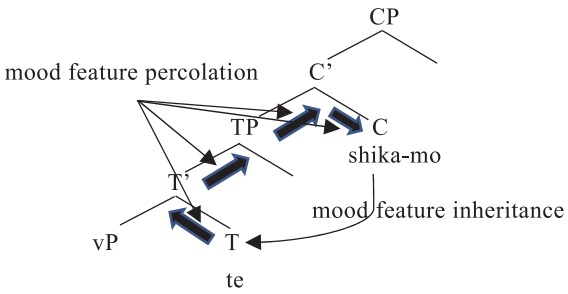
to you give rejuvenated Aux. Part. Part.
'I want to bring to you the rejuvenating water of the God of the moon and make you younger.'
(*Man'yoshu* (*The Ten Thousand Leaves*))

(44)



The occurrence of *mo* in C suggests that the mood feature in T inherited from C can percolate up from T to C and is realized as *mo*.

(45)

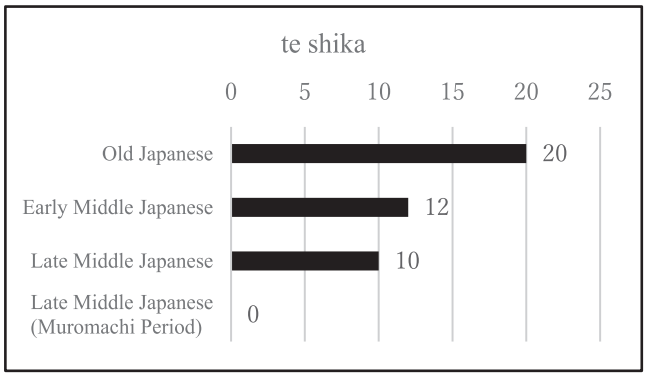


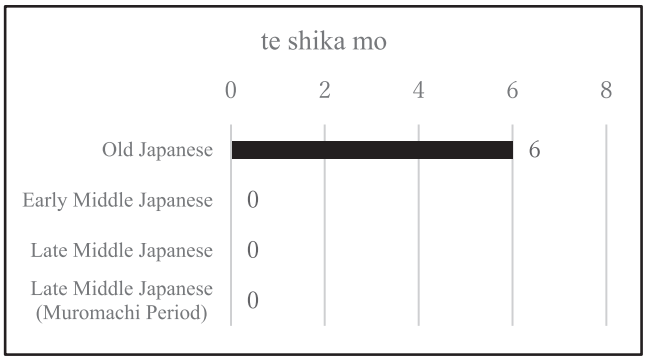
In Early Middle Japanese, the particle *mo* underwent a morphological change into *na* as follows:

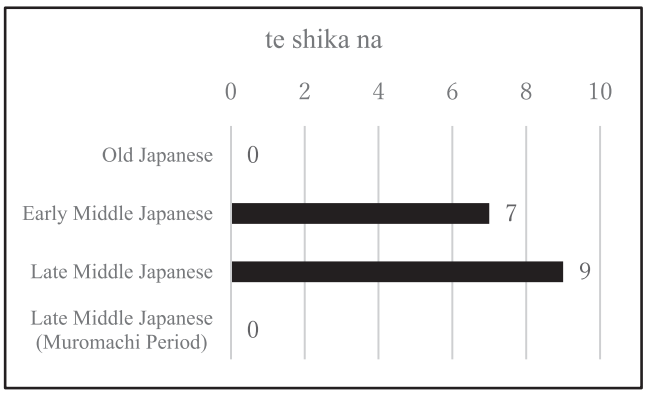
(46) *Early Middle Japanese*
... hako-wo ubaitorite mi **te shika na**.
box take away see Aux. Part. Part.
'I want to take away the box and look into it.'
(*Heichū Monogatari* (*The Tale of Heichū*))

The particle *na* persistently occurred after the particle *shika*, which suggests that the mood feature in T persistently percolated up to C because the principle Percolation dominates the mood feature in Early Middle Japanese.

(47)





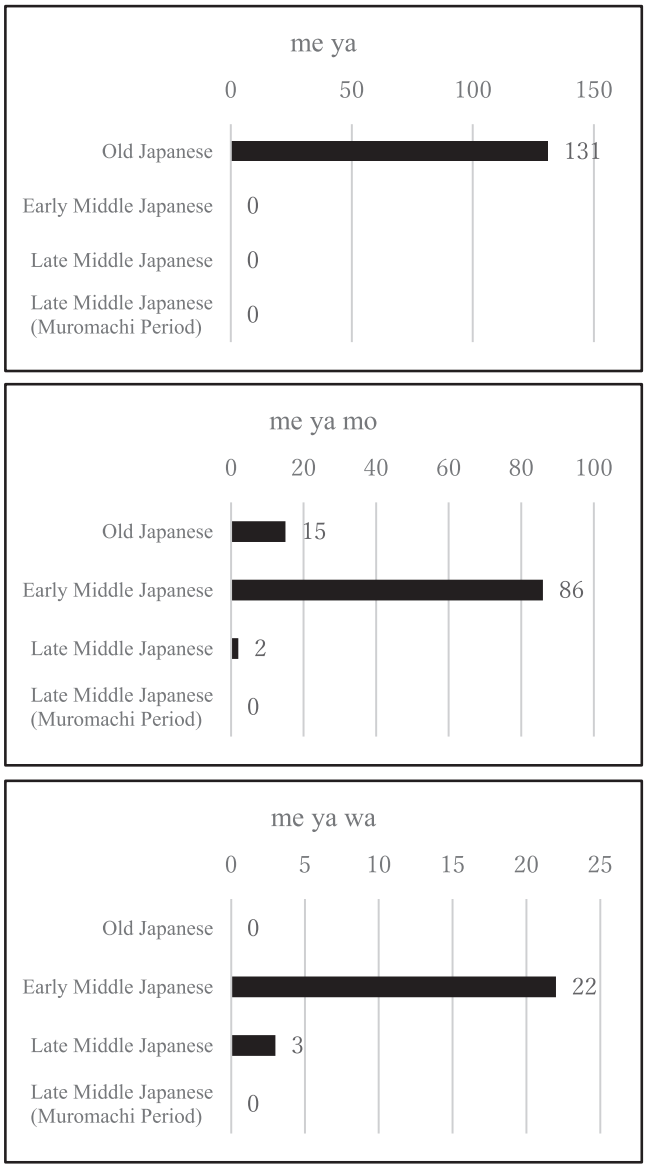


Another case where mood features inherited from C to T can percolate up to C is the chain between an auxiliary and a specialized particle in rhetorical question. Rhetorical question is associated with mood. In Old Japanese, the particle *ya*, which expresses rhetorical question, occurred in C and the modal auxiliary *me* (a conjectural auxiliary verb) occurred in T in tandem with *ya*. Furthermore, Old Japanese exhibited cooccurrence of the particle *ya* and the particle *mo* in C. In Early Middle Japanese, the particle *mo* underwent morphological change into *wa*.

(48) *Old Japanese*
a. tatashishi kimi-no onna wasure **me ya**.
royal prince name forget Aux. Part.
'How can I forget the name of the prince?'
b. ⋯wasurae **me ya mo**.
forget Aux. Part. Part.
'How can I forget it?'
(*Man'yoshu* (*The Ten Thousand Leaves*))

(49) *Early Middle Japanese*
taneshi areba iwanimo matu-wa oini keri koiwoshi
seed exist rock pine tree grow love you
koiba awazara **me ya wa**.
see you not Aux. Part. Part.
'A seed of pine tree will sprout even on a rock. Once I fall in love with you, how can I say I can never see you?'
(*Kokin Wakashu* (*A Collection of Poems Ancient and Modern*))

(50)



From these facts, it follows that the feature concerning rhetorical question percolated up from T to C and was realized as *mo* or *wa*, which is due to the diachronic domination of the feature by the principle Percolation.

In Early Middle Japanese, the particle *ya* exhibited subjunctive mood in tandem with the auxiliary *mashi* in T. The particle *wa* could occur after the particle *ya*.

(51) a. ikanimo ikanimo tozama-ni kokoro-wo wake
how how the other woman heart give
mashi ya.
Aux. Part.
'What if I would give my heart to the other woman?'
(*Genji Monogatari* (*The Tale of Genji*), *Kagerou* (*Dragonfly*))

b. utatane-no yume nakariseba betsunishi mukashi-no
nap dream without separated former
hito-wo mata mi **mashi ya wa**.
person again see Aux. Part. Part.
'Without a dream during a nap, I would not see my ex.'
(*Kin'yō Wakashū* (*A Collection of Golden Leaves*))

This suggests that the feature of subjunctive mood also percolated up from T to C and was realized as the particle *wa*, which is a diachronic domination of the feature by the principle Percolation.

4. Conclusion

This paper has shown that φ-features as agreement feature are inherited from C to T in Narrow Syntax and complementizer agreement observed in many languages is a by-product of φ-feature inheritance from C to T. The inherited φ-features percolate up from T to C in Distributed Morphology. This percolation depends on the interaction between the principle Percolation which causes feature percolation and the hierarchy of φ-features in Distributed Morphology. The difference of feature rankings leads to the language variations of φ-feature percolation. The highest ranked feature can percolate up due to the direct dominance by the principle Percolation. Features of tense and mood are also inherited from C to T, and they can percolate up from T to C if dominated by the principle Percolation in Distributed Morphology. Old Japanese and Middle Japanese exhibit typical examples of feature percolation of mood feature from T to C. The synchronic variation and diachronic variation of percolation of these features depend on the interaction between the principle Percolation and the different rankings of the features. Future research, however, is required to investigate in detail the synchronic and diachronic variation of percolation of features other than the features mentioned here.

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