Chapter 1

STAMP morphs and non-pronominal STAMP in West Africa: Typology and areal distributions

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This paper presents the results of a typological survey of STAMP (subject, tense, aspect, mood, polarity) portmanteaux morphology across West Africa. 118 languages were surveyed, 91 of which show at least some co-realization of subject and tense/aspect/mood/polarity morphology. We detail which semantic features are expressed through STAMP morphology in West Africa, and by what morphophonological means, highlighting micro-areal patterns as relevant. A key finding of our results is that TAMP co-realized with non-pronominal subjects seems to be a subtype of STAMP morphology, though it is not previously considered in discussions of STAMP. Our results build on typological and comparative work by Anderson (2011, 2015, 2016) and serve as a starting point for future typological, historical, and formal research on STAMP morphology.

1 Introduction

1.1 What is STAMP? Definitions and setting the scene

STAMP morphs simultaneously realize subject features and some combination of tense, aspect, mood, and polarity (TAMP) features (Anderson 2011a,b, 2015, 2016, this volume; Rolle 2022). An example of STAMP morphology in Gã (gaa, Kwa, Ghana)[1] is given in (1), where the third singular pronoun has a Low tone

[1]For each language, upon first mention, we provide the ISO code, language family, and country or countries where the language is spoken in parentheses.

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in its default form (1a), a High tone in the perfect (1b), and a long vowel in the progressive (1c). In this example, there is no separate TAMP-indexing auxiliary or verbal morphology; the alternations on the subject-indexing morpheme are the only realization of these TAMP differences.[2]

(1) Gã STAMP morphology (Russell 2024; Felice 2021, 2022)

a. e=ba
3SG=come
'He came.'

b. é=ba
3SG.PRF=come
'He has come.'

c. ee=ba
3SG.PROG=come
'He is coming.'

d. Kofí ba
Kofi come
'Kofi came.'

In this section we define STAMP and other relevant terminology as it is used throughout this paper. STAMP crucially refers to co-realization of features of the subject and other inflectional categories; see Appendix B for our definitions of other relevant terminology.

A single auxiliary may co-realize multiple clause-level inflectional features. We refer to this as a TAMP morph (2).

(2) TAMP (morph): A morph that co-realizes features of at least two distinct tense, aspect, mood, and/or polarity meanings.

When referring to a morph that expresses only one of the tense, aspect, mood, and/or polarity categories, we refer to those as, for example, aspect morphs.

We now proceed to define STAMP as a phenomenon (3) and STAMP morphs (4).

[2]Throughout the paper, transcriptions are given as in the source, but glosses are translated into Leipzig glossing conventions. Abbreviations used in the paper are defined in the Abbreviations section at the end of the paper.

(3) STAMP (adapted from Anderson 2011b, 2015): The phenomenon wherein features of the subject (person, number, and/or gender) are co-realized with clause-level inflectional features including tense, aspect, mood, and/or polarity.

Note that the definition in (3) does not limit STAMP morphs to closed-class pronominal subjects, but also includes cases where TAMP features are co-realized with non-pronominal subjects. Non-pronominal subjects have not previously been considered in discussions of STAMP, though we argue that they should be. This is an area we explore further throughout this paper.

(4) STAMP morph: A morph that co-realizes features of the subject and tense, aspect, mood, or polarity.

STAMP morphs typically function simultaneously as subjects and auxiliaries. Following Anderson, even when there is co-realization of subject features and only one TAMP category (i.e., subject person and number features with negation), we still refer to this as a STAMP morph. When there is co-realization of multiple inflectional features, we use the term TAMP (as in (2)) or, if the subject is involved, STAMP.

The term STAMP is used as in (3, 4) by Anderson (2011b, 2015, 2016). As Anderson notes, other terms have historically been used to refer to what we call pronominal STAMP morphs, including *tensed pronouns* (Anderson 2011a), *the tense-person complex* (Creissels 2005), *pronominal predicative markers* or *pronominal auxiliaries* (Vydrine 2011, Èrman 2002).

We follow Anderson (2011a,b, 2015, 2016) in a unified treatment of STAMP morphs that are analyzed as separate words and those analyzed as affixal to the verb. As Anderson points out, STAMP morphs that are verbal affixes have likely grammaticalized from non-affixal STAMP but are ultimately serving the same function, and they still meet the definition of STAMP in (3). "Fused subject/auxiliary forms that themselves are further fused into large complex verb forms are characteristic of several languages of the [Macro Sudan Belt] region" (Anderson 2011a:240).

Anderson (2016) defines subtypes of STAMP based on whether inflectional features are only realized on the STAMP morphs versus on STAMP morphs as well as elsewhere in the clause (on the verb, for example). We consider a distinct set of properties in our categorization of STAMP morphs and so do not directly adopt Anderson's (2016) STAMP subtype terminology here, though we encourage readers who are interested in multiple exponence of inflectional features to consult Anderson's (2016) typology.

Other work on areal word order patterns in Sub-Saharan Africa has considered STAMP within the context of another areal feature, namely split predicates of the type S Aux O V, where auxiliaries and verbs are separated by an object and/or other material, and inflectional categories may be split across the auxiliary and verb. STAMP O V orders are a subtype of the split predicate category (cf. Anderson 2011a). Here we treat these two features—split predicates and co-realization of subject + TAMP features—as typologically independent, since a language could have a set of morphs that co-realize subject and TAMP features without having material intervene between the auxiliary and subject, and in fact there are many such languages in West Africa. Relatedly, Güldemann (2008) identifies S (Aux) O V X word order as characteristic of the Macro-Sudan Belt, focusing on the fact that, in many languages of the Macro-Sudan Belt, the direct object surfaces before the verb, but other elements surface after the verb. For Güldemann's S (Aux) O V X feature, the status of TAMP morphs as separate auxiliaries versus those merged with subject features in STAMP morphs is irrelevant, whereas for us the relative position of O, V, and X is irrelevant (except that it is another, independent areal feature of the Macro-Sudan Belt). Here, we focus specifically on languages with STAMP morphs, irrespective of whether they show split predicates (Aux O V order) or O V X order.

While the previous literature on STAMP focuses on STAMP morphs that serve simultaneously as pronominal subjects and TAMP auxiliaries (here referred to specifically as *pronominal STAMP* (5)), we also consider here the phenomenon of TAMP co-realized with non-pronominal subjects, or *non-pronominal STAMP* (6).

(5) Pronominal STAMP: The phenomenon wherein TAMP features are simultaneously co-realized with features of pronominal subjects, or where paradigms of subject and TAMP features simultaneously serve as pronominal subjects and TAMP auxiliaries.

(6) Non-pronominal STAMP: The phenomenon wherein TAMP features are co-realized with non-pronominal subjects.

We believe that non-pronominal STAMP should be considered alongside traditional pronominal STAMP morphs in a typological survey for a number of reasons. First, just like pronominal STAMP, non-pronominal STAMP involves simultaneous co-realization of subject features and TAMP features. Second, non-pronominal STAMP, just like most cases of pronominal STAMP, simultaneously expresses the subject of the sentence and inflectional morphology. Third, as we show here, only languages that have pronominal STAMP also have non-pronominal

STAMP, suggesting that non-pronominal STAMP developed as an extension of pronominal STAMP. Thus, we propose that non-pronominal STAMP is a subtype of STAMP.

For an example of a language with non-pronominal as well as pronominal STAMP, consider the data from Guébie (gie, Kru, Côte d'Ivoire) in (7). In Guébie, negation is co-realized with the subject (Russell 2022, Sande 2022a,b), whether the subject is pronominal or non-pronominal. Negation systematically adds a high tone to the right edge of a non-pronominal subject in Guébie and can be analyzed as having a floating High tone exponent. The only difference between the examples in (7a) and (7b) is the addition of a High tone (tone 4) at the right edge of the underlying tone melody of the subject. (7c, d) show examples with pronominal STAMP, where, like the non-pronominal subject examples in (17a–b), the tone on the subject is the only difference between the affirmative example (7c) and the negative example (7d).

(7) Guébie negative STAMP morphs (field notes, Agodio et al. 2023)[3]

a. guwə$^{3.2}$ gba^{2}
dog.PL bark.PFV
'The dogs barked.'

b. guwə$^{3.24}$ gba^{2}
dog.PL.NEG bark.PFV
'The dogs didn't bark.'

c. ɔ^{3} li^{2} diok^{w}ə$^{1.1.3}$
3SG.NOM eat.IPFV fufu
'He is eating fufu.'

d. ɔ^{24} li^{2} diok^{w}ə$^{1.1.3}$
3SG.NOM.NEG eat.IPFV fufu
'He is not eating fufu.'

STAMP morphs sometimes function as the subject of the sentence themselves, as in Guébie in (7). In other languages, STAMP morphs can co-occur with overt subjects, as in Ebira (igb, Nupoid, Nigeria) in (8) (Adive 1989, Rolle 2022). We remain agnostic as to whether the STAMP morphs in languages like Ebira (8) should themselves be considered as 'true' subjects versus agreement morphemes, since sufficient diagnostic data is not available for most such languages in the

[3]For Guébie, tone marking is as follows: tone is indicated using superscripts, 1 being the lowest and 4 the highest. A dot between tones separates syllables, and two numbers within a syllable signifies a contour tone.

sample. Instead, if a set of morphemes co-realizes subject features and TAMP features, we consider that set to be STAMP morphs.

(8) Ebira co-occurrence of STAMP with independent subjects

a. ẹ̀mī mâ rí̤ ī̤sá
1SG 1SG.COMPL eat food
'I ate the food.' (Adive 1989:118)

b. ẹ̀wṳ̄ wâ rí̤ ī̤sá
2SG 2SG.COMPL eat food
'You ate the food.' (Adive 1989:118)

When a language displays multiple STAMP or TAMP paradigms, we sometimes refer to one of those paradigms as the *default*, defined in (9).

(9) Default (paradigm): In languages where there are multiple pronominal paradigms, if one paradigm is used in a general set of cases, seems to be monomorphemic, and/or serves as the morphophonological base of other inflected pronominal paradigms, we refer to it as the default STAMP paradigm. Where one pronominal paradigm distinguishes subject features but is not co-realized with TAMP features while other paradigms in the same morphosyntactic slot are, we refer to this paradigm as the default subject paradigm.

In previous work, STAMP morphs are described as portmanteaux, or portmanteau morphs (Anderson 2011a,b, 2015, 2016; Rolle 2022). We follow this tradition, defining portmanteau morphs as in (10).

(10) Portmanteau (morph): A single morph that co-realizes multiple grammatical features.

Note that we are using the term portmanteau in its descriptive, typological sense. In the formal literature, the term *portmanteau* can be used to refer to a particular formal analysis where a single suppletive morpheme is the simultaneous exponent of multiple grammatical features, as opposed to two underlyingly distinct morphemes that undergo regular affixation and phonological alternations to surface simultaneously, the latter of which would not be considered a formal portmanteau. In our use of the term portmanteau here, we remain agnostic regarding claims about the best formal analysis of a morph.

STAMP morphs may be straightforwardly a surface combination of two or more distinct underlying morphs, one that realizes subject features and one (or

more) that realizes TAMP features. Alternatively, they may not be decomposable into separable subject- and TAMP-realizing pieces, in which case they may be best analyzed as suppletive portmanteau morphs in the formal sense. This is discussed further in Section 4. We define suppletion as in (11).

(11) Suppletion: When a portmanteau morph cannot (due to phonological unpredictability) be analyzed as the concatenation of two or more distinct underlying morphs where each is independently the exponent of a single grammatical feature, that morph must be analyzed as *suppletive*, or separately listed in the lexicon. We refer to this phenomenon as suppletion.

As an example of a pronominal STAMP paradigm that can be decomposed into separate subject and TAMP pieces (i.e., a non-suppletive paradigm), consider the data from Lobi (lob, Gur, Côte d'Ivoire/Burkina Faso) in Table 1 (Hien et al. 2024). Lobi shows a consistent realization of each subject person/number combination and a consistent realization of each distinct tense/aspect/mood/polarity feature in its STAMP paradigms. The past paradigm (also used for non-past stative verbs) can be considered the default form of each person and number combination, while the irrealis, imperfective and progressive can be analyzed as derived from the concatenation of default phonological forms expressing subject features and forms expressing grammatical features, as well as predictable phonological interactions between the two forms.

Table 1: Lobi STAMP paradigm

	PST/DEFAULT		IRR		IPFV		PROG	
	SG	PL	SG	PL	SG	PL	SG	PL
1	mɪ	sɪ	ma	sa	mĩː	sĩː	mãː	sãː
2	fɪ	nɪ	fa	na	fĩː	nĩː	fãː	nãː
3	á	wʊ	á	wa	ấː	wʊ̃ː	ấː	wãː

The pronominal paradigms in Table 1 are decomposable into separate subject exponents (i.e., the 1sg subject features always correspond with [m] 2SG subject features with [f], etc.), shown in the SG and PL columns under 'DEFAULT'. The TAMP exponents are also decomposable: from left to right, past/default -∅, irrealis /-a/, imperfective vowel length and nasality, progressive /-ã:/. Despite their decomposability, the subject and TAMP features are co-realized in Lobi, so

they fall into our class of STAMP morphs, in line with previous work on STAMP morphs (Anderson 2011a,b, 2015, 2016; Rolle 2022).

An example of clearly suppletive STAMP morphs is given in (12) from Guro (goa, Mande, Côte d'Ivoire) (Vydrine 2009:239). In Guro, pronouns express both subject and object person and number features. The forms of the 2SG>3SG pronouns in imperfective positive and negative contexts are phonologically unrelated. There is no clear phonological exponent of the negative morpheme that is decomposable from the rest of the STAMP morph; rather, we take these pronominal STAMP morphs to be best analyzed as suppletive.

(12) Guro suppletive negative STAMP morphs (Vydrine 2009:239)

a. ɓe zuru-o
2SG>3SG.IPFV wash-IPFV
'(You) wash him/her/it.'

b. yaa zùrù-ò ɗo
2SG>3SG.IPFV.NEG wash-IPFV NEG
'(You) don't wash him/her/it.'

In the previous literature on STAMP morphs, Anderson (2015, 2016) considers the grammaticalization path from independent subjects and auxiliaries to STAMP morphs. While we do not explicitly focus on the historical pathways that lead to STAMP here, our results generally corroborate Anderson's findings. This is briefly discussed in Section 6.

To summarize, we consider STAMP morphs to be any phonologically simultaneous realization of the exponents of subject features with tense, aspect, mood, or polarity features. These may be suppletive or derivable from multiple underlying morphemes, only pronominal or co-realized with non-pronominal subjects, they may serve as the subject of a sentence or co-occur with a separate subject, they may appear in languages with split predicates or not, and they may be analyzed as separate words or as affixes in individual languages. The primary criterion for being categorized as a STAMP morph is whether subject features and TAMP features are co-realized.

1.2 STAMP in West Africa

The Macro-Sudan Belt is a linguistic area of sub-Saharan Africa that stretches east-to-west from the Atlantic Ocean to the Ethiopic Plateau and north-to-south from the southern Sahara and Sahel to the Atlantic Ocean and Congo Basin (Güldemann 2008). The Macro-Sudan Belt forms a linguistic area with respect

to several features, including many discussed throughout this volume. STAMP morphs are found to be common in the Macro-Sudan Belt (Anderson 2011a, 2015, 2016); however, they are particularly common in the western part of the areal core of the Macro-Sudan Belt (Güldemann 2011), comprising the geographic region from present-day Senegal to the west, Niger/Chad to the east, and Cameroon to the south.

While STAMP morphs are common in West Africa, they are also found elsewhere in the world. For example, Anderson (2006, 2015) mentions northern South America and eastern and insular Papua New Guinea as areas outside of Africa with many languages that display STAMP. He also mentions English contracted subjects plus auxiliaries as another example.

Here we focus on West African languages within the Macro-Sudan Belt, due to the density of STAMP in this sub-area. We investigate sub-properties of STAMP morphs and how they pattern together. We begin with the premise that STAMP morphs are common in West Africa, as previously reported by Anderson (2011a, 2016) and Konoshenko (2020), and we consider the distribution of properties of STAMP morphs in this area based on a typological survey, with the goal of a better understanding of the sub-properties of STAMP systems within this region. We address which morphosyntactic categories are marked by STAMP morphs in this area, how STAMP is phonologically realized (tone, length, segmental alternations, etc.), and how non-pronominal STAMP compares with pronominal STAMP. We then consider the implications of our findings for the typological and historical nature of STAMP.

2 Methodology

We investigated STAMP patterns in a typological survey of 118 languages across 22 countries in Africa, focusing on West Africa. See Appendix A for a list of language families and subgroups represented in the sample, where language classification information is taken from Glottolog (Hammarström et al. 2023). While we attempted to balance the survey by language family and country, the data is based on a convenience sample; not all language descriptions contain enough information to determine how TAMP morphology is realized, or whether it is co-realized with subjects, so the languages in our sample represent those for which we were able to find enough information to answer a set of predetermined questions about TAMP morphology.

Figure 1 provides a map of the languages examined, where each letter or dot represents a language. Letters represent language family, dots represent languages

for which there is no larger family affiliation (specifically, in our sample, the creole language Pichi). For a list of language families and the corresponding representative letter in the maps in this paper, see Appendix A. Green letters represent languages that are described as having STAMP morphs in at least one context, while blue letters or dots represent those that are not described, according to the sources consulted, as having any STAMP morphs.

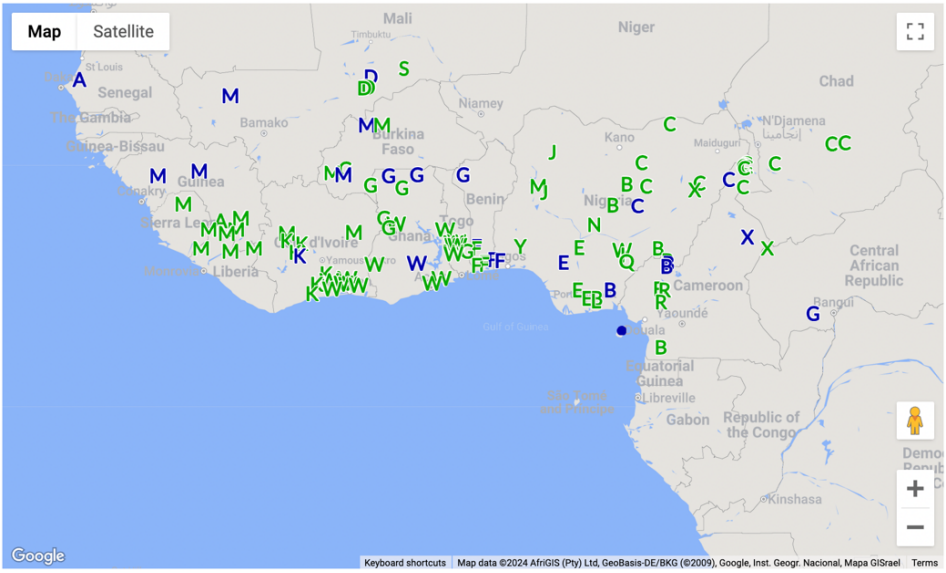

Figure 1: Map of languages in our sample and whether they are described as having STAMP morphs (green = yes; blue = no)

The data was entered by the authors into a Google form, which asked for metadata on the language and source of data, as well as data-oriented questions about how various combinations of subject, tense, aspect, mood, and polarity are expressed. The data came from a combination of descriptive grammars and language experts. For the full set of survey responses, see Felice et al. (2024).

Of the 118 languages examined, at least one cell of the tense/aspect/mood/polarity paradigm is co-realized with the subject in 91 languages. Here and throughout this paper, we take a language to show a particular property if that property is reported in descriptive materials about the language. It is therefore possible that the true count is higher than the figures we present, due to a lack of description in those languages where the property is not reported. We may be underreporting, but are likely not overreporting, the presence of various STAMP patterns. We acknowledge that this is a reality of any typological survey of this kind and discuss the implications of this factor when relevant.

The following sections of this paper describe the semantic features realized by STAMP morphs in languages of our survey, including subject features (person and number, Section 3.1) and TAMP features (Section 3.2), and the morphophonological means of STAMP morph realization in languages in our survey (Section 4). STAMP co-realized with non-pronominal subjects is discussed in Section 5. We then consider the areal and analytical implications of our findings in Section 6.

3 Semantics of STAMP morphs

3.1 Person and number

3.1.1 Number

Of the 91 languages in our sample that co-realize subject and TAMP features, most languages (n = 73) contrast exactly three person distinctions (1^{st}, 2^{nd}, 3^{rd}) and two number distinctions (singular and plural). Ten languages in the sample additionally make at least one gender distinction (masculine versus feminine) in the pronoun inventory.[4] 18 languages in the sample make a clusivity distinction.[5]

Most languages in the sample distinguish all subject person and number features via STAMP morphs in at least one context. Of the 91 languages with STAMP morphology, 81 languages are described in enough detail to determine whether all subject person/number combinations in the inventory are realized in STAMP morphs. Of these 81 languages, 69 exhibit STAMP marking distinguishing all subject person/number combinations in at least one TAMP context. For 12 languages, however, only a subset of the subject features are realized via STAMP in any context.

In our sample, there is a tendency for languages to realize singular person more often than plural person (SG>PL) via STAMP morphs. In 4 languages in our sample (Ajagbe, Gengbe, Igbo, and Tiéfo), only singular persons (1SG, 2SG, 3SG) are realized via STAMP morphs while plural pronouns never alternate with TAMP. Consider the imperfective and perfective paradigms for Tiéfo (tiq, Gur, Burkina

[4] One language (Pa'anci) distinguishes masculine versus feminine for 1SG and 2SG pronouns. One language (Kouya) distinguishes masculine versus feminine only for 2SG. Three languages (Gidar, Nyabwa and Mbara) distinguish masculine versus feminine only for 3SG. Five languages (Bidiya, Gashua Bade, Kanakuru, Mokilko and Wobé) distinguish masculine versus feminine for 2SG and 3SG.

[5] In our sample, 4 languages (Gemzek, Merey, Nda'nda', and Zialo) make a three-way distinction between 1PL dual, inclusive and exclusive. 14 languages (Bandi, Bidiya, C'Lela, Dan, Dukawa, Gashua Bade, Loko, Longuda, Looma, Mada, Mbara, Mbuko, Mokilko, and Moloko) make a two-way distinction between 1PL inclusive and exclusive.

Faso) (Hantgan 2014:20) (Table 2). The singular forms are STAMP morphs, simultaneously expressing both subject person and aspect. In contrast, the plural forms, in bold, do not vary with aspect (or tense, mood, or polarity), and therefore are not considered STAMP morphs by our definition. There is no morphological distinction between imperfective and perfective for plural subjects in Tiéfo.

Table 2: Tiéfo plural does not alternate with aspect

	IPFV		PFV	
	SG	PL	SG	PL
1	ŋí	é	ān	é
2	mì	nā	m	nā
3	kā	ō	n	ō

At least in our sample, the tendency for singular subjects over plural subjects (SG > PL) to be realized via STAMP is a universal; there are no examples of languages in the sample that distinguish plural but not singular subjects via STAMP. This is similarly true for gaps within paradigms, where a gap is a cell in a paradigm that does not display STAMP while the other cells do. For example, for progressive and imperfective aspect, Nafaanra (nfr, Senufo, Ghana) realizes STAMP for all subjects except 1PL and 2PL, for which aspect is realized as a separate auxiliary (Garvin 2017). In our survey, there were 28 languages with gaps in a STAMP paradigm (excluding languages where STAMP is absent for all plural subjects) and in 19 of those 28 languages, gaps occurred only within plural subjects. There were no definitive examples of languages with gaps in singular but not plural subjects.[6] Thus, our survey supports an implicational hierarchy of singular subjects being more likely than plural ones to be realized via STAMP: SG > PL. In other words, if a language has plural STAMP morphs, it also has singular ones.

A map of the languages in the sample that show STAMP morphs for singular but not plural subjects in at least one TAMP context is given in Figure 2. Interestingly, the languages with only singular STAMP in at least one context seem to be areally concentrated around Ghana, Togo, and Benin. Most of these languages are Kwa (W) or Gbe (F) languages, so it is difficult to tease apart from the current sample whether this is a language family effect or a contact effect; this is an area

[6]There is one possible exception to the implicational hierarchy of SG>PL in our sample. Vai is reported to have Low tone marking negation on 1PL and 2PL subject pronouns, without alternations reported for 1SG and 2SG; however, there are too few examples provided to make conclusions about the full paradigm (Welmers 1976:84).

for future work. We will see in following sections that the languages spoken in Ghana, Togo, and Benin tend to pattern together (and differently from languages further east or west) across STAMP-related linguistic variables. This region has also been identified as a relevant sub-area with respect to other areal linguistic features (cf. Rolle et al.'s (2020) *West African ATR zone*).

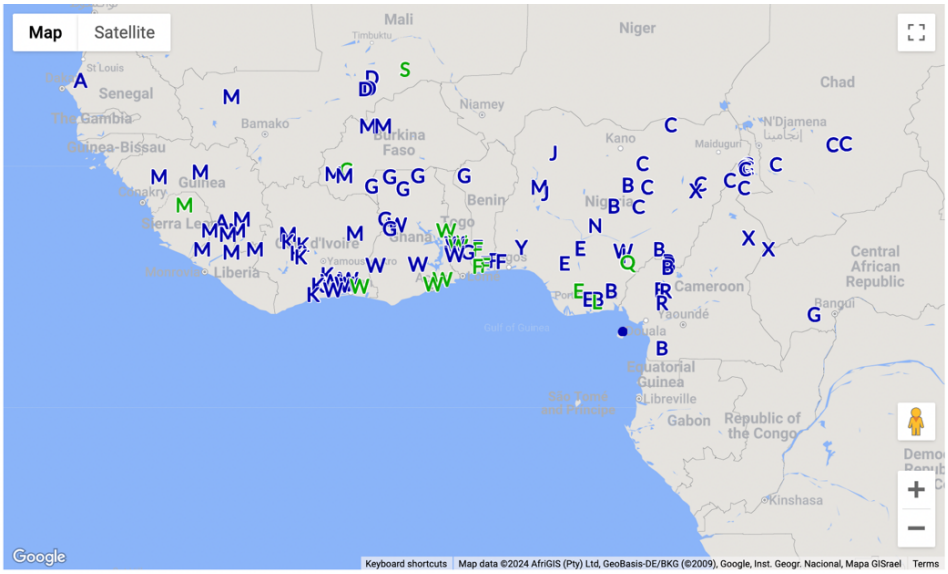

Figure 2: Map of languages with singular but not plural STAMP morphs in at least one context. (green = yes; blue = no)

3.1.2 Person

The majority of languages surveyed that have pronominal STAMP morphs show STAMP for all person distinctions (n=61) in at least one context. Nevertheless, there are exceptional patterns or gaps in several paradigms in our sample. Languages may be counted twice here if all persons are distinguished via STAMP in one paradigm but there is a gap in a different paradigm.

Table 3 provides the counts and example languages for the 26 person-related gaps within STAMP paradigms in our sample. These gaps reveal that 3rd person is particularly likely to be exceptional: there are 13 languages where 3rd person patterns separately from 1st and 2nd person. Gaps in the first person are relatively uncommon. There are no STAMP paradigms in our sample that only apply to second person subjects, with gaps in 1st and 3rd persons

Table 3: Number of languages with each pronominal STAMP system

Person gaps in STAMP paradigm	Example language(s)	# Count
1 gap (2, 3 only)	Dukawa	1
2, 3 gap (1 only)	Gã, Lelemi	7
2 gap (1, 3 only)	Adioukrou, Agni	5
1, 3 gap (2 only)		0
3 gap (1, 2 only)	Avikam, Kouya	7
1, 2 gap (3 only)	Mombo, Nafaanra	6

Because there are so few languages with any particular person gap in our sample, areal patterns are difficult to assess.

3.2 Tense, aspect, mood, and polarity

This section explores which tense, aspect, mood, and polarity (TAMP) features are co-realized with subject features in STAMP paradigms the 91 languages in our sample with STAMP.

For some languages in our survey, there is ambiguity as to whether certain semantic and grammatical distinctions should be categorized as tense, aspect, or mood. For example, in Gã (gaa, Kwa, Ghana), one morpheme is described in some sources as future tense or subjunctive mood (Kropp Dakubu 2002), and the same morpheme in other sources is described as irrealis (Felice 2022). Because grammars differ in their descriptions of TAMP features and STAMP morphology, implicational relationships between TAMP categories realized via STAMP are difficult to assess. Here we report on TAMP patterns as they are described, and our summary of the patterns focuses on the most commonly described TAMP categories.

3.2.1 Tense via STAMP

Tense is described as realized via STAMP in 41 languages in our sample. Specifically, 18 languages are reported to have STAMP morphs realizing past tense, 9 present tense, and 37 future tense. Table 4 provides an example of past, present, and future STAMP morphs from Sɛkpɛlé (lip, Kwa, Ghana) (Delalorm 2016:188).

As shown in Table 4, past and present tense STAMP morphs in Sɛkpɛlé differ in tone, where past tense bears a high tone and present tense bears a low tone. Singular and 3PL pronouns also show a distinction in the future paradigm, where

Table 4: Tense morphs in Sɛkpɛlé

	PST		PRS		FUT	
	SG	PL	SG	PL	SG	PL
1	ń	bó	ǹ	bò	mò	bò
2	á	bé	à	bè	è / fò	bè
3	ó	bá	ò	bà	wò	bò

they differ in segmental content (all beginning with a labial consonant followed by the vowel [o]) from their form in other paradigms. There is no distinction between present and future STAMP morphs for 1PL or 2PL.

3.2.2 Aspect via STAMP

Aspect morphs marked via STAMP, drawing on the distinctions proposed by Comrie (1976), are particularly common across languages in our survey, with 69 languages displaying STAMP morphology to distinguish at least some aspect category. The most common aspect categories realized via STAMP are imperfective (25 languages), perfective (13), progressive (26), and habitual (21). If we combine incompletive, progressive, continuative, and habitual as subtypes of imperfective aspect, 65 languages in our sample display imperfective STAMP.

As an example of aspect marked via STAMP, in Nyankpa (yes, Benue-Congo, Nigeria), progressive STAMP morphs differ from default ones in tone and, in some places in the paradigm, length (Blench 2009:6), as shown in Table 5.

Table 5: Default and progressive morphs in Nyankpa

	DEFAULT		PROG	
	SG	PL	SG	PL
1	mā	mbī	máá	mbí
2	mū	mī	múú	mmí
3	nī	mbɛ̄	nní	mbɛ́

3.2.3 Mood via STAMP

Mood categories are expressed via STAMP for 40 languages in our sample. For example, in Izi (izz, Benue-Congo, Nigeria) (Meier et al. 1975:236), the non-future

indicative mood is realized as a low tone in contrast with a high tone in the default paradigm (Table 6).

Table 6: Non-future indicative mood in Izi[7]

	DEFAULT		IND	
	SG	PL	SG	PL
1	mú	anyí	mù	ànyì
2	í	unú	ì	
3	ó	ephé	ò	

The most common mood to be described as realized via STAMP is the subjunctive, with 22 languages exhibiting subjunctive STAMP, followed by imperative STAMP, attested in 5 languages. Table 7 demonstrates the difference between indicative and subjunctive in Loko (lok, Mande, Sierra Leone) (Innes 1964:129, 133), where the vowel quality of the pronoun differs between the past tense indicative and subjunctive mood.

Table 7: Past tense indicative and subjunctive mood in Loko

	PST		SUBJ	
	SG	PL	SG	PL
1	ngɔ	mɔ (INCL) nɔ (EXCL)	ngi	mu (INCL) ni (EXCL)
2	bɔ	wɔ	bi	wu
3	ɔ	tɔ	i	ti

3.2.4 Polarity via STAMP

Polarity is also commonly expressed via STAMP: 42 languages in our sample display negative STAMP morphs. Table 8 provides an example from Dan (ndj,

[7]Meier et al. (1975) give the default forms of Izi subject pronouns on p. 236. They state that "the distinctive features of [the indicative] are the tones of the subject: low tones on all the pronouns and the pronominals" (p. 205), and while there are concrete examples of the singular and 1PL pronouns in the grammar in both the default and non-future indicative, there are no examples of the 2PL and 3PL non-future indicative pronouns. We assume from Meier et al.'s (1975) description that they would have the form [ùnù] and [èphè], respectively, though we conservatively leave these forms out of the table due to a lack of positive evidence.

Southeastern Mande, Côte d'Ivoire), where negation is realized via a difference in vowel length on the subject pronoun (Doneux 1968:46). The table contrasts the perfective and the negative perfective, where the only difference is the vowel length of the subject pronoun. The tonal pattern is determined by aspect, where the negative perfective and negative habitual differ only in tone.

Table 8: Polarity and aspect STAMP paradigms in Dan

	PFV		NEG.PFV		NEG.HAB	
	SG	PL	SG	PL	SG	PL
1	má	yǿ (EXCL)	māá	yœ̄ǿ	máá	yǿǿ
2	ɓá	ká	ɓāá	kāá	ɓáá	káá
3	yà	wà	yāá	wāá	yáá	wáá

3.2.5 Summary and areal distribution of TAMP features realized via STAMP morphs

The number of languages that mark tense, aspect, mood, and polarity via STAMP is summarized in Table 9. Aspect distinctions are the most commonly realized via STAMP, whereas each of tense, mood, and polarity are distinguished via STAMP in about half of the languages in our sample.

Table 9: Number of languages with each TAMP category realized via STAMP

TAMP category	Example languages	Count
Tense	Sɛkpɛlé, Mano	41
Aspect	Nyankpa, Gã	69
Mood	Baoulé, Kulango	40
Polarity	Dan, Godié	42

The distribution of languages that realize certain TAMP features via STAMP does not seem to be random. Specifically, languages that mark imperfective aspect via STAMP are very common in Côte d'Ivoire and the immediately surrounding area, as well as at the border of Nigeria, Cameroon, and Chad. There seems to be a gap in languages that mark imperfective aspect via STAMP to the northwest of Côte d'Ivoire, and in between the two areas where imperfective STAMP

morphs are commonly found (Figure 3). Notably, the area from Ghana to Benin and into western Nigeria, where imperfective STAMP is not common, is precisely the area where we saw an asymmetry between singular and plural STAMP morphs in Figure 2. These sub-areas correspond with previously identified sub-areas of the Macro-Sudan Belt (cf. Hyman et al. (2019); Sande et al. (2019); Rolle et al. (2020)), discussed further in Section 6.

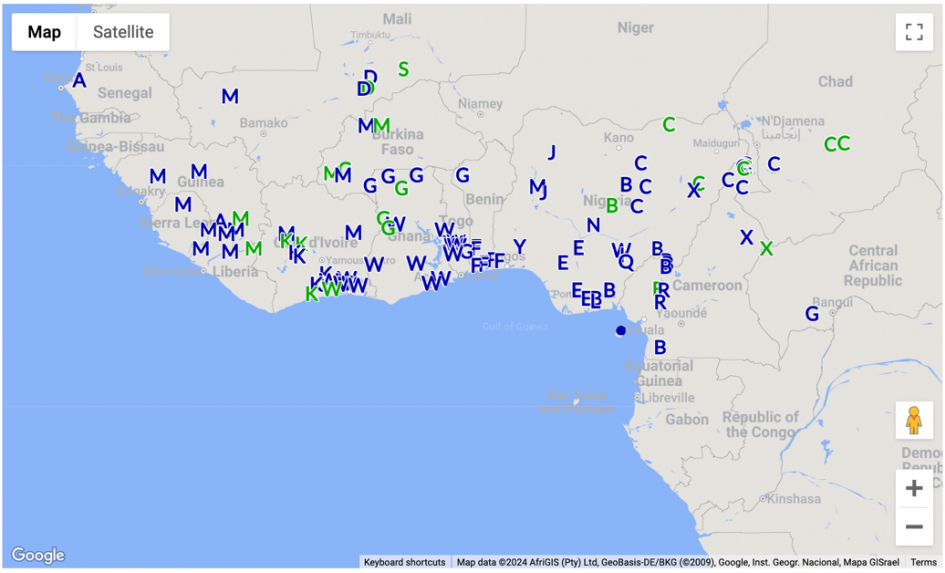

Figure 3: Map of languages that mark imperfective aspect via STAMP in our sample (green = yes; blue = no)

For other TAMP features, though, the distribution of languages that mark them via STAMP does not seem concentrated within particular micro-areas of West Africa. For example, there seems to be a rather even distribution of languages that mark negation via STAMP across West Africa (Figure 4).

4 Phonological form of STAMP morphs

STAMP is realized in a variety of ways across languages. The morphophonological means of encoding TAMP features on subjects can be sorted into several general categories: tone, nasality, vowel length, and segmental changes, the latter including the addition of segmental material as well as suppletive effects.[8]

[8]The STAMP typology proposed by Anderson (2015, 2016) considers tonal versus segmental differences across STAMP paradigms. We break down these distinctions further here.

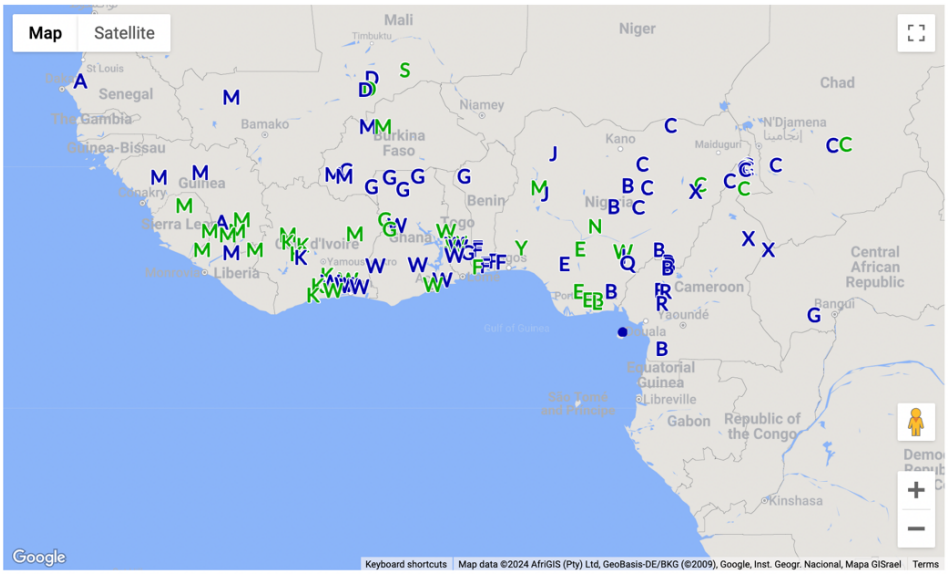

Figure 4: Map of languages that mark negation via STAMP in our sample (green = yes; blue = no, black = unknown)

4.1 STAMP via tone

In our sample, 66 languages make use of tone in STAMP paradigms to realize TAMP features. In many cases, a particular tone or tone melody is associated with a specific grammatical meaning. For instance, in Ndemli (nml, Grassfields, Cameroon), subject pronouns surface with a Mid tone on the final tone-bearing unit of the STAMP morph in present contexts, but with a High-Low contour in future contexts, shown in Table 10 (Lenaka 1999: 71, 80). The segmental content of the pronouns across contexts is identical; the distinction is solely tonal.

Table 10: Ndemli tonal STAMP

	PRS		FUT	
	SG	PL	SG	PL
1	mī	hábɛ̄	mî	hábɛ̂
2	wɔ̄	hɨ́ŋbɛ̄	wɔ̂	hɨ́ŋbɛ̂
3	bɛ̄	bī	bɛ̂	bî

Sometimes, tonal differences on STAMP morphs differentiate TAMP mean-

ings, but their specific surface realization depends on the underlying tone of the subject. The present habitual in Nda'nda' (nnz, Grassfields Bantu, Cameroon) is realized by the addition of a tone polar to that of the subject, resulting in an underlying Low tone surfacing as a rising contour tone and an underlying High tone surfacing as a falling contour tone, shown in (13) (Nguendjio 1989:241).

(13) Nda'nda' tonal STAMP

a. pɔ̌ ŋ-kwé
1PL.HAB IPFV-eat
'We eat habitually.' (cf. pɔ̀ '1PL')

b. ŋáŋû ŋ-kwé
cow.HAB IPFV-eat
'The cow eats habitually.' (cf. ŋáŋú 'cow')

In some languages in the sample, a change in the tone of the subject marks a grammatical specification, but the exact change is phonologically unpredictable. For example, in Lakota Dida (dic, Kru, Côte d'Ivoire) (Table 11), negation is realized as a change in the tone of the subject (Guéhoun 1993:249–252). It is not the case that a grammatical specification is associated with a particular tone melody on the subject in this language, because there is no consistent realization of tone across the paradigms: for instance, although the 1SG, 3SG, 2PL and 3PL pronouns all carry a Mid tone in default contexts, the 3rd person morphs in the negative context are realized with a MH contour, while the 1SG and 2PL morphs in the negative are realized with a LH contour. The negative STAMP morphs are likely best analyzed as suppletive since their phonological content is unpredictable.

Table 11: Lakota Dida STAMP realized via tone and length alternations

	DEFAULT		NEG	
	SG	PL	SG	PL
1	ī	à	ì́	àā
2	ì	ā	ì̄	àá
3	ɔ̄	wā	ɔ̄́	wāá

4.2 STAMP via nasality

In one language in our sample, a grammatical category is realized through a change in nasality of the vowel of the STAMP morph. In Lobi (lob, Gur, Côte

d'Ivoire/Burkina Faso, Hien et al. 2024), the default (past/stative) form of each pronoun includes an oral vowel. However, the morph for the progressive includes a long, nasal vowel (see Table 1).

4.3 STAMP via vowel length

Across the languages in our sample, lengthening of a vowel or sonorant consonant in the subject is a common exponent of a grammatical category in STAMP paradigms, found in 32 languages in our survey. For instance, in Chakali (cli, Gur, Ghana), the vowel of the STAMP morph is short with a Low tone in default contexts, but long with a Low tone in imperfective contexts (Brindle 2017:417–419), as shown in Table 12.

Table 12: Chakali STAMP expressed by length[9]

	DEFAULT	IPFV
	SG	SG
1	ǹ	ǹǹ
2	ì	ìì
3	ɔ̀	ɔ̀ɔ̀

4.4 STAMP via additional segmental material

The realization of some STAMP category through the addition of segmental material appears in 61 languages in our survey. Such segmental alternations may be interpreted in a variety of ways. For instance, segmental phenomena within individual languages may be best analyzed as affixation of a segmental morpheme to the subject, phonological fusion of the subject and auxiliary, or suppletion. One instance of realizing grammatical meaning through a segmental alternation comes from imperfective STAMP in Avikam (avi, Kwa, Côte d'Ivoire), where imperfective STAMP morphs appear to be derived through the concatenation of

[9]While Brindle (2017:368–369) says "All weak [default] forms may be lengthened in the imperfective", no examples of the plural pronouns in their long imperfective forms are given, so we only include the singulars here, for which we have positive evidence that there are long/short alternations; see Brindle (2017:368) for the default forms, and Brindle (2017:308, 334, 404, 418, 419) for lengthened imperfective forms of singular pronouns.

the perfective (default) STAMP morph with the vowel *á* as well as the application of regular phonological processes within the language such as gliding in vowel hiatus contexts (Schang 1995:24, 30) (Table 13).

Table 13: Avikam imperfective adds á to the subject pronoun

	PFV (DEFAULT)		IPFV	
	SG	PL	SG	PL
1	m̀	ɔ̀	mă	wă
2	à	ɔ̃̀	ă	ŋwā́ā́
3	è	ɲɔ̃́	jă	ɲɔ̃́ à

In some languages, a certain grammatical category is realized by a change in segmental material that appears to be unpredictable, or inconsistent throughout the paradigm. We analyze these cases as suppletive. As shown in Table 14, in Zoʔi (dot, Chadic, Nigeria), the future is expressed by the addition of *-n* to the aorist forms of the plural subject pronouns (Caron 2002:7). However, for the first- and second-person singular pronouns, the alternation in segmental material between aorist and future forms are not predictable and is therefore best analyzed as suppletive.

Table 14: Zoʔi suppletion in 1SG and 2SG future contexts

	AOR		FUT	
	SG	PL	SG	PL
1	a	ma	máá	man
2	ú	ko	kíí	kon
3	∅	ti	∅	tin

4.5 STAMP via multiple phonological alternations

Many languages in our sample make use of multiple simultaneous phonological alternations to realize a single grammatical category. As shown in Table 15, in Busa (bib, Mande, Burkina Faso), the tone of the subject pronoun — L or H — distinguishes between different grammatical categories (Wedekind 1972:22–23). The future, though, is realized by both a tonal alternation and a change in segmental material.

Table 15: Tonal and segmental STAMP alternations in Busa

	DEFAULT		PRF & STAT		FUT	
	SG	PL	SG	PL	SG	PL
1	mà	wà	má	wá	mɛ́	wé
2	ǹ	à	ń	á	nɛ́	é
3	à	ànɔ́	á	ánɔ̄	èé	ànɔ̄é

In other languages, different STAMP realizational strategies are used in different contexts. In Lɛlɛmi (lef, Kwa, Ghana), for instance, the past is realized through the presence of a High tone on the subject pronoun (14b), which is not present in default contexts (14a). The present, on the other hand, is realized as a change in vowel length (14c).

(14) Tonal and vowel length STAMP alternations in Lɛlɛmi

a. ɔ̀-dìa
3SG-be.good
'He/she/it is good.' (Allan 1973:239)

b. ɔ́-nì-nà ubi ntu
3SG.PST-drink-CAUS baby water
'She made the baby drink water.' (Allan 1973:248)

c. àbla ɔ̀ɔ-ŋwù-nà lècami
Abla 3SG.PRES-be.dirty-CAUS plate
'Abla is making the plate dirty.' (Allan 1973:248)

4.6 Summary and distribution of STAMP phonological realization

STAMP distinctions across the Macro-Sudan Belt exhibit a variety of morphophonological patterns, summarized in Table 16. Tone is the most common phonological means of distinguishing STAMP paradigms among languages in our sample. These numbers in Table 16 add up to more than 91 languages, since it is common for a single language to make use of multiple phonological strategies for expressing STAMP within and across paradigms, as demonstrated in Section 4.5.

STAMP distinctions realized suprasegmentally are the most common in our sample, and distributionally they are found throughout all of West Africa as

Table 16: Number of languages with each type of phonological distinction between STAMP paradigms

Phonological realization	Example languages	Count
Tone	Ndemli, Nda'nda'	66
Segmental alternation/addition	Avikam, Etsako	61
Vowel length	Nyankpa, Dan	32
Nasality	Lobi	1

shown in Figure 5. Similarly, none of the other types of morphophonological alternations seems to show evidence for meaningful areal patterning within West Africa. See Section 6.2 for discussion of the frequency of suprasegmental STAMP.

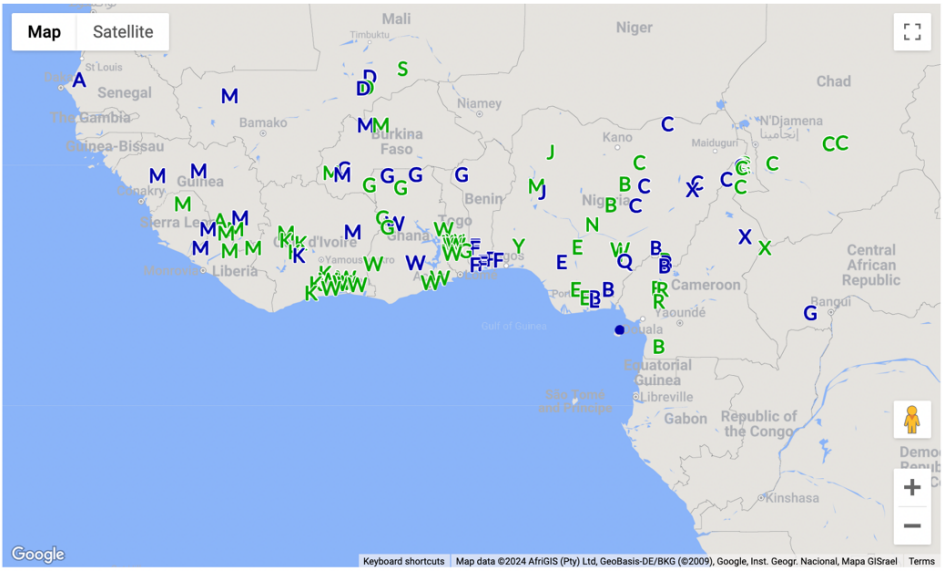

Figure 5: Map of languages that mark STAMP distinctions suprasegmentally in our sample (green = yes; blue = no)

5 STAMP on non-pronominal subjects

5.1 Number and distribution of languages with non-pronominal STAMP

To this point we have focused on the co-realization of TAMP features with pronominal or inflectional subject features. Here we turn to non-pronominal subjects. Of the languages in the survey, 22 are described as involving co-realization of TAMP features with non-pronominal subjects in at least one context. All 22 of these languages also show pronominal STAMP. That is, there are no languages in our sample that display non-pronominal STAMP without also showing pronominal STAMP: Pronominal>Non-pronominal. A map of the distribution of these 22 languages is given in Figure 6. The languages with at least one TAMP morph co-realized with non-pronominal subjects are in green; these tend to cluster around Côte d'Ivoire and Nigeria, with a gap in between, aligning with the previously identified micro-areas mentioned in Sections 3.1 and 3.2. See Section 6 for additional discussion of this and other micro-areal STAMP patterns.

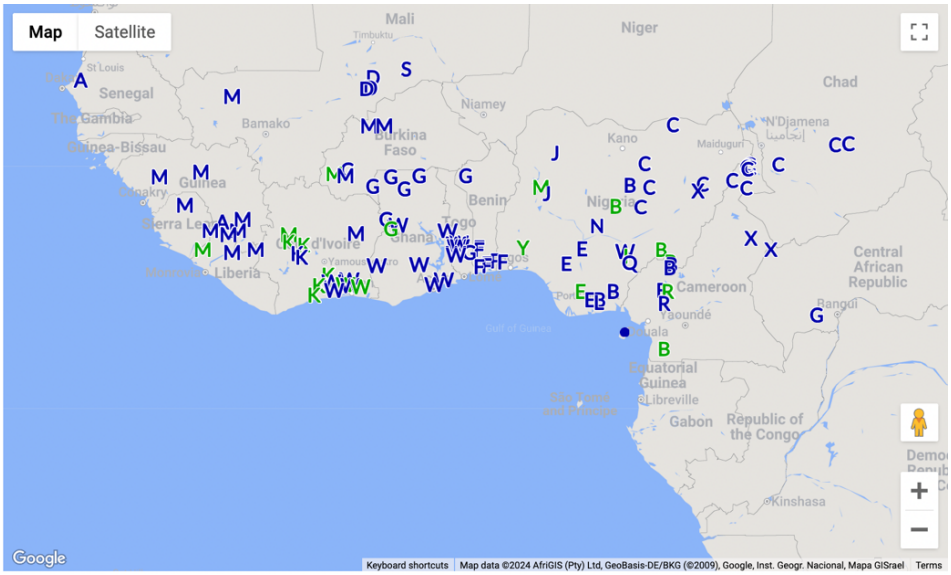

Figure 6: Map of languages described as marking TAMP on non-pronominal subjects (green = yes; blue = no; black = unknown)

5.2 TAMP features expressed on non-pronominal subjects

We find examples where tense, aspect, mood, and polarity are realized on non-pronominal subjects, with aspect and polarity being especially common. Negation is realized on non-pronominal subjects in 9 languages and aspect is realized on non-pronominal subjects in 13 languages.

In Godié (god, Kru, Côte d'Ivoire), for example, negation is realized through the addition of a high tone on the final vowel of either the pronoun (15a–b) or the full subject (15c–d), resulting in vowel lengthening.

(15) Godié negation with pronominal and non-pronominal subjects

a. ɔ̄ mū
3SG go:IPFV
'He goes.' (Marchese 1986:197)

b. ɔ̄ɔ́ mū̀ wɔ̀
3SG:NEG go:IPFV NEG
'He doesn't go.' (Marchese 1986:197)

c. lāāgɔ̄ ɓlá
God kill:IPFV
'God kills.' (Marchese 1986:197)

d. lāāgɔ̄ɔ́ ɓlá wɔ̀
God:NEG kill:IPFV NEG
'God doesn't kill.' (Marchese 1986:197)

Table 17 provides a summary of TAMP features commonly described as co-realized with non-pronominal subjects.

Table 17: Summary of TAMP categories commonly realized on non-pronominal subjects

TAMP Category	Example Languages	Count
IPFV	Guébie, San	8
NEG	Engenni, Godié	11
FUT	Kuteb, Nda'nda'	3

5.3 Phonological realization of TAMP on non-pronominal subjects

In our sample, TAMP distinctions are often realized the same way (via the same phonological mechanism) with pronominal subjects as non-pronominal subjects, as in the Godié length and tone alternations in (15). For an example of pronominal and non-pronominal STAMP realized via segmental alternations, see the Nafaanra data in (16), where negation is realized through the addition of an *-n* on pronominal STAMP morphs (16a–b) and non-pronominal ones (16c–d) (Garvin 2017).

(16) Nafaanra negation on pronominal and non-pronominal subjects

a. Ni màŋà kre tini
1SG.IPFV rope DET pull
'I pull the rope.'

b. Ni-n màŋà kre tini
1SG.IPFV-NEG rope DET pull
'I don't pull the rope.'

c. Kofi màŋà kre tini
Kofi rope DET pull
'Kofi pulls the rope.'

d. Kofi-n màŋà kre tini
Kofi-NEG rope DET pull
'Kofi doesn't pull the rope.'

In 18 of the 22 languages in our sample where TAMP features may be expressed on non-pronominal subjects, tonal alternations express TAMP features. In 11 languages – Baoulé, Lakota Dida, Godié, Gyeli, Guébie, Kouya, Kuteb, Toura, Vata, Wobé, and Ikare Yoruba – vowel length is also reported (in addition to tone) as a strategy by which TAMP features are realized on non-pronominal subjects in at least one TAMP context. Finally, 7 languages — Toura, Wobe, Gyeli, Nafaanra, Kuteb, Vai, and Busa – use the addition or alternation of segmental material on non-pronominal subjects. Table 18 provides a summary.

5.4 What kinds of non-pronominal subjects are co-realized with TAMP?

In this initial exploration of non-pronominal STAMP, one may wonder whether the types of non-pronominal subjects that are co-realized with TAMP features

Table 18: Summary of the phonological realization of TAMP on non-pronominal subjects

Phonological form	Example Languages	Count
Tone	Nda'nda', Yala	18
Vowel length	Baoulé, Dida	11
Segmental alternations	Wobe, Vai	7

are limited. In one language in our sample, TAMP is in fact limited to a subset of subject types – proper names and pronouns in Gyeli in (18) – while in others TAMP is co-realized with all possible subjects, as in Guébie.

The data from Guébie in (7) and (17) (Sande 2017, 2022b) shows that TAMP (in this case, negation marked as a high tone (tone 4) at the end of the subject) may be co-realized with any subject, including a pronoun (7c–d), (modified) noun (7a–b), relative clause (17) (Sande 2022b:26), etc.

(17) Guébie negation on all non-pronominal subjects

a. goji$^{3.1}$ munu$^{3.3}$ jo^{4} ane$^{2.2}$ pa^{1}
dog bite.PFV child REL run.IPFV
'The dog that bit the child is running.'

b. goji$^{3.1}$ munu$^{3.3}$ jo^{4} ane$^{2.24}$ pa^{1}
dog bite.PFV child REL.NEG run.IPFV
'The dog that bit the child is not running.'

In Gyeli, the inchoative, realized via tone and length, is co-realized with proper names and pronouns (18a–d). However, when the subject is neither a proper name nor a pronoun, the inchoative is realized with person features as a separate word (18e–f).

(18) Gyeli STAMP on pronouns and names (Grimm 2021:213-216)

a. mɛ́ dè
1SG.PRS eat
'I eat.'

b. mɛ̀ɛ́ dè
1SG.INCH eat
'I'm beginning to eat.'

c. màmbí kwè
Mambi.PRS fall
'Mambi falls.' (cf. Màmbì)

d. màmbìí kwè
Mambi.INCH fall
'Mambi is beginning to fall.'

e. kálɛ́ (nú) kwè
CL1.sister CL1.PRES fall
'The sister falls.'

f. kálɛ́ nùú kwè
CL1.sister CL1.INCH fall
'The sister is beginning to fall.'

Other than Gyeli, we have found no other languages with non-pronominal STAMP with restrictions on the types of subjects that are co-realized with TAMP features.

6 Implications and conclusions

This paper presents the initial results of a typological survey of STAMP morphology in 91 languages in West Africa. We examine the morphosyntactic and semantic features realized via STAMP and their morphophonological realization. Notably, we make the novel assertion that the co-realization of TAMP features with non-pronominal subjects is a subtype of STAMP morphology. Along the way we have pointed out implicational hierarchies that emerge from our survey, as well as areal distributions of STAMP features within West Africa.

Based on our sample we have evidence for two exceptionless implicational hierarchies: 1) Any language that shows STAMP morphs for plural subjects also shows STAMP for singular subjects, and 2) Any language with non-pronominal STAMP also has pronominal STAMP. These are discussed in more detail in sections Section 6.1 and Section 6.4, respectively.

Distributionally, we find that certain STAMP patterns are found (or are absent) only within certain linguistic micro-areas of West Africa. These align with previously proposed West African micro-areas in work such as Hyman et al. (2019), Sande et al. (2019) and Rolle et al. (2020). This is discussed further in Section 6.3.

6.1 Implicational relationships among semantic features in STAMP paradigms

Our survey results suggest an implicational hierarchy of SG>PL, where singular subjects are more likely to be realized via STAMP than plural ones (see Section 3.1). The majority of languages in our sample express STAMP with all subject persons in at least one context. However, there are four languages that lack plural subject STAMP, and there are no languages in our sample that have STAMP morphs for plural but not singular subjects. Likewise, plural subjects were more likely to exhibit gaps in STAMP paradigms: 19 languages have exceptional STAMP gaps for plural subjects, while there are no languages in the sample with gaps in singular but not plural subject STAMP paradigms.

Some TAMP features are more likely to be realized via STAMP morphs than others. In particular, of the 69 languages that realize aspect distinctions via STAMP morphs, 65 mark imperfective (broadly construed, as to include progressive, continuative, and habitual) via STAMP. The reason for the prevalence of imperfective to be marked via STAMP is an area for future research. One hypothesis is that imperfective may be more frequently used than other (non-default) TAMP categories, and thus is more likely to fuse via grammaticalization with subjects (see Anderson 2015, 2016 on grammaticalization pathways of STAMP morphs). Another possibility is that imperfective, when expressed as an independent auxiliary, is cross-linguistically more likely than other TAMP features to be realized adjacent to the subject, thus it is more likely to fuse with the subject during grammaticalization. Whether these hypotheses are borne out is a topic for future investigation.

6.2 STAMP realization: The frequency of suprasegmental STAMP

In Section 4 we present the number and distribution of different phonological realization strategies for differentiating STAMP paradigms. We find that tonal differences are the most common phonological means by which languages distinguish STAMP paradigms. The common occurrence of tone as the sole distinction between STAMP paradigms likely results from the properties of tone itself. Tones (and other suprasegmental features) are prone to spreading and long-distance effects. Additionally, a key characteristic of tone is its stability: when segmental material is lost, tones persist and can float onto other nearby morphemes (Yip 2002, Hyman 2011). Regular, frequent co-occurrence of specific subjects and TAMP morphology over time can result in segmental reduction and tonal overrides, which can lead to grammaticalization of subject-auxiliary sequences into single portmanteau morphs (see Anderson 2015, 2016 for more on

STAMP grammaticalization paths). For example, if a TAMP auxiliary regularly follows pronominal subjects, then loses its segmental content over time, its tonal content may be retained and realized on the nearby subject, resulting in suprasegmentally distinct STAMP morphs. We encourage future work on STAMP patterns within individual language families, such as Anderson (2015) on STAMP in Central Sudanic, Anderson (this volume) on Chadic languages, and Russell (2022) on Eastern Kru, in order to investigate the grammaticalization paths of STAMP morphs in more depth.

6.3 STAMP properties as evidence for linguistic micro-areas

Our results show multiple instances of seemingly non-random areal distributions of STAMP features within West Africa. In particular, the distributions of certain STAMP properties within West Africa seem to align with previously identified micro-areas of West Africa, including the area around Côte d'Ivoire, which Hyman et al. (2019) and Sande et al. (2019) call the *Mandesphere*; the area from Ghana to Benin, which corresponds with Rolle et al.'s (2020) *West African ATR zone*; and eastern Nigeria into Chad, which corresponds with Rolle et al.'s (2020) *Central African ATR-deficient zone*.

Within the Mandesphere, we find a lack of singular-only STAMP (Figure 2), a high concentration of languages that distinguish imperfective aspect via STAMP (Figure 3), and a relatively high concentration of languages that display non-pronominal STAMP (Figure 6). This same set of features is characteristic of eastern Nigeria and the surrounding area.

In between the Mandesphere and eastern Nigeria we find a high density of languages that realize singular but not plural subjects via STAMP (Figure 2), a lack of languages that mark imperfective aspect via STAMP (Figure 3), and a lack of non-pronominal STAMP (Figure 6).

These generalizations cross language families within the relevant micro-areas, but are not generally found within the same language families across areas. These findings support previously identified linguistic micro-areas within West Africa, with evidence from an additional set of linguistic features.

Other common properties of languages with STAMP, such as marking negation via STAMP and using suprasegmental distinctions to differentiate STAMP paradigms, seem to be evenly distributed across West Africa rather than appearing within particular micro-areas and not within others. In general, the morphophonological means of realizing STAMP morphs does not seem to be distributed areally. Future work will seek to explain why some, but not other, STAMP

features are only present in some linguistic areas, while others are evenly areally distributed.

6.4 TAMP on non-pronominal subjects as STAMP

Our survey presents the first investigation of the distribution of TAMP co-occurring with non-pronominal subjects, or *non-pronominal STAMP*. We argue here that non-pronominal STAMP should be considered a sub-type of STAMP. Definitionally, if STAMP is the co-realization of subject features and TAMP features, non-pronominal STAMP fits within this categorization. Additionally, in our sample, all languages (22 in total) that display non-pronominal STAMP in at least one context also display pronominal STAMP. There are no languages with non-pronominal STAMP that lack pronominal STAMP, giving us the implicational hierarchy of Pronominal>Non-pronominal STAMP. For many languages in the sample, the same morphophonological means of realizing a given TAMP feature with pronominal subjects is also found with non-pronominal subjects (see Section 5 for examples). These facts suggest that non-pronominal STAMP is not independent from pronominal STAMP, and in fact, that non-pronominal STAMP can be seen as a sub-type of STAMP, likely an extension of pronominal STAMP. That is, we expect languages to develop pronominal STAMP first, and, in some cases, to extend the co-realization of TAMP with subjects to non-pronominal subjects. Future work will investigate this grammaticalization path in more depth.

6.5 Future directions

In future work we plan to examine why certain morphosyntactic TAMP features are more commonly realized through STAMP morphology than others; whether there are meaningful correlations between which semantic features are realized via STAMP and how they are realized (via tone, length, or other segmental alternations); and whether clausal word order patterns—namely the relative order of various TAMP auxiliaries across languages—correlate with STAMP patterns across languages. We also plan to take a closer look at STAMP patterns within micro-areas of West Africa, and within certain families and subgroups, to better understand the development of STAMP patterns, as Anderson has done with Central Sudanic and Chadic languages (2015, this volume).

Languages in West Africa, the area of focus of this survey, tend to share several relevant typological properties, including analyticity, short (often CV) words, contrastive tone and length, and SAux or SV word order. Future work will also examine whether languages with STAMP morphs in other parts of the world

share these properties in order to determine whether these (or other) linguistic features lend themselves to the development of STAMP morphs.

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Abbreviations

1	1st person	IPFV	imperfective
2	2nd person	IRR	irrealis
3	3rd person	PFV	perfective
AOR	aorist	PL	plural
CL	noun class	PRS	present
COMPL	completive	PRF	perfect
EXCL	exclusive	PROG	progressive
FUT	future	PST	past
HAB	habitual	NOM	nominative
INCL	inclusive	NEG	negative
INCH	inchoative	SG	singular
IND	indicative		

Appendix A Language families and map symbols

Below is a list of language families and subgroups included in our sample, and the corresponding letter symbol used to mark each one on the maps throughout this paper. The language family and subgroup terminology, as well as the longitude and latitude for each language, was taken from Glottolog (Hammarström et al. 2023). Where Glottolog does not list a larger subgroup or family, we have taken subgroup names from the sources consulted for each language. Languages

marked with a dot, as opposed to a letter, in the maps do not have a larger language family classification in Glottolog; this only pertains to Pichi in our sample, a creole language.

Atlantic	A	Igboid	L
Benue-Congo	B	Mande	M
Chadic	C	Nupoid	N
Dogon	D	Edoid	Q
Edoid	E	Grassfields	R
Gbe	F	Songhay	S
Gur	G	Kwa	W
Idomoid	I	Adamawa	X
Kainji	J	Yoruboid	Y
Kru	K		

Appendix B Additional definitions

This appendix presents additional definitions relevant for understanding the definitions of TAMP and STAMP provided in the paper.

- *Subject*: The argument that appears in the grammatical subject position of the sentence. Canonically, in nominative/accusative languages (like all of the languages in our sample), this includes the only argument of an intransitive verb and the external argument of a transitive verb (S and A arguments in Comrie's 1978 categorization).

Throughout, we often distinguish between pronominal and non-pronominal subjects.

- *Pronominal subject*: A morph that appears in the grammatical subject position and realizes inflectional features of the subject but is part of a closed class of pronouns and not an open, lexical class.
- *Non-pronominal subject*: A morph (or word or phrase) that appears in the grammatical subject position and is part of an open, lexical class, as opposed to the closed class of pronouns.

Categories expressed by STAMP morphs may also, or instead, be realized as auxiliaries or verbal morphology. We define auxiliaries and verbs below. These definitions are adapted from Anderson (2011a).

- *Auxiliary (verb):* A functional morpheme from a closed class that expresses inflection having to do with tense, aspect, mood, and/or polarity but does not denote the main event of the clause.
- *Verb*: The lexical item that denotes the main event of the clause. It may or may not be the locus of inflectional morphology.

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