13. The short-*a* and short-*o* configurations

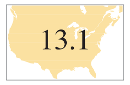
Chapter 11 established a typology of North American dialects that is based on the phonological status of the two low short vowels /o/ and /æ/. The chain shifts in progress are to a large extent governed, or even triggered, by the merger and/or split of /o/ and /oh/, /æ/ and /æh/. Chapter 9 traced the ongoing merger of /o/ and /oh/. This chapter will present a brief account of the phonetic realizations of short-*o* and then proceed to the more complex topic of short-*a* configurations across the continent.

13.1. Short-*o* configurations

The historical short-*o* class of words is preserved in spelling as *got*, *God*, *hop*, *cob*, *hock*, *hod*, etc. To this must be added the class of words that are spelled with *a* and preceded by /w/ or /wh/. If these words end with velar consonants, they are realized as /æ/ along with other short-*a* words: *whack*, *whacky*, *wack*, *wag*, *waggle*, *wagon*, *wax*, *waxy*, etc. If the spelling shows that the syllable was closed historically with a liquid, the vowel is realized as /oh/: *wall*, *tall*, *call*, *talk*, *balk*, *caulk*, *stalk*, *wart*, *warm*, *wharf*, *warp*. In the case of /r/, the coda can be simply /r/, as in *war*. Otherwise, words spelled historically with *a* and preceded by /w/ join the /o/ class: *wasp*, *wander*, *Watson*, *wad*, *waddle*, *wadding*, *wan*, and (variably) *want*, *watch*, *wallet*. Some of these, like *watch* and *wallet*, appear variably with /oh/ in dialects that maintain the /o/ ~ /oh distinction. *Water* commonly occurs with /oh/, but the alternation with /o/ is frequent and a matter of much social comment.

The formation of the /oh/ class and the opposition of /o/ and /oh/ was discussed in Chapter 9, along with the migration of a large number of /o/ words into the /oh/ class in North America. For dialects where /o/ merged with /oh/, there is no further history of /o/ to be discussed, since it then forms a part of a long and ingliding vowel that occurs in final as well as checked position. For those that do not merge /o/ with /oh/, the most common sequence is for /o/ to merge with /ah/. The /ah/ class has a small nucleus of native words: *father*, *pa*, *ma*, to which are added a large and variable class of loan words, the “foreign a” class (Boberg 1997): *pasta*, *llama*, *macho*, *taco*, *Mazda*, *teriyaki*, *pajamas*, etc. When /o/ is unrounded it normally merges with the /ah/ class, and becomes a low central peripheral vowel. Among the dialects where /o/ and /oh/ are distinguished, it is only in the South that this combined class remains a low back rounded short vowel in opposition to the long and ingliding vowel /oh/. As Chapter 18 will show, the differentiation of these two vowels is developed further as /oh/ shifts from a long and ingliding vowel to the back upgliding subsystem as /aw/.

The realization of the short-*o* class

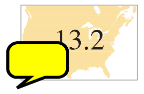


Map 13.1 displays the realization of /o/ in both phonetic and phonemic terms. As in Chapter 11, the green-oriented isogloss defines the region in which /o/ and /oh/ are merged. The red isogloss outlines the region in which /æ/ is raised as a whole, with a mean value for non-nasal environments of less than 700 Hz. These red symbols denote speakers for whom the /o/ ~ /oh/ distinction is preserved by the fronting of /o/, with an F2 greater than 1400 Hz. The red symbols fill the /æ/-raising area, but extend beyond it westward to an area of eastern South Dakota and western Iowa, and also are heavily concentrated in western New England. Very few red symbols are found outside of these areas.

The blue symbols are speakers with back (and usually rounded) /o/, with F2 values of less than 1200 Hz, while the yellow symbols are the residual, or unmarked case of F2 greater than 1200 Hz but less than 1400 Hz. It is the distribution of the blue symbols that is noteworthy here. There are none in the Inland North. The heaviest concentrations are to be found in the low back merger region, especially in western Pennsylvania and Canada, where the merger is realized in low back rounded position. Table 1 shows the extent to which the back position of /o/ is associated either with the low back merger, or the diphthongization of /oh/. Only six blue tokens are found in other regions.

Table 13.1. Distribution of low back rounded forms of /o/

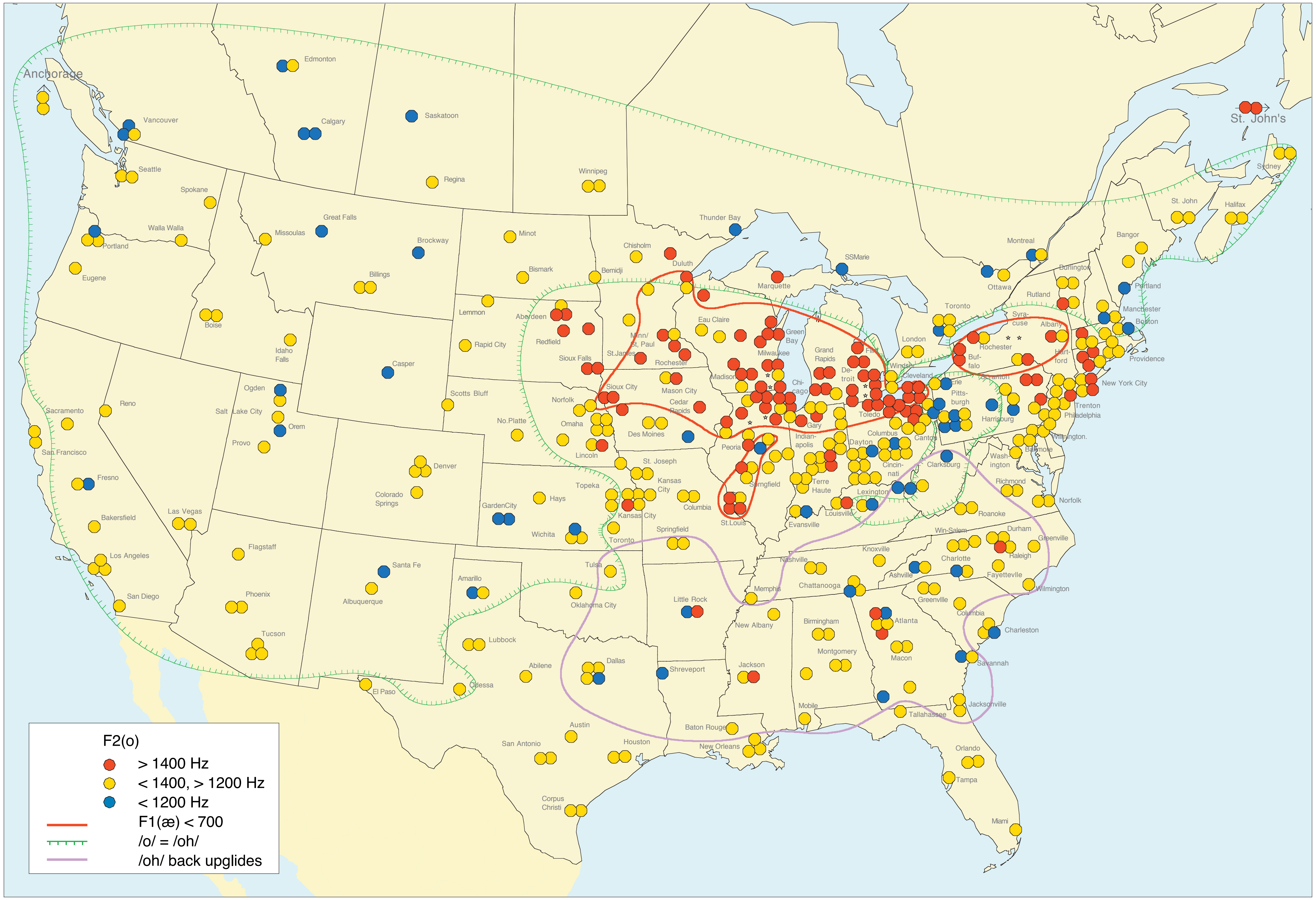
	No. speakers rounded vowel	Low back	Percent
Area of low back merger	136	37	27%
Area of back upglide chain shift /oh/ → /aw/ →	62	12	19%
Other	242	6	2%



In the initial position of Chapter 2, the /ah/ class of *father*, *spa*, *pa*, *garage*, *Bahamas*, etc. is presented as distinct from /o/, although for the great majority of speakers, these two classes are firmly merged. Map 13.2 identifies those areas in which the two classes are distinct. The data here are somewhat sparse; /ah/ is not frequent in spontaneous speech, and no minimal pairs were elicited in the Telsur interview. Such pairs are rare and marginal (e.g. *bomb* ~ *balm* for the diminishing number who do not pronounce the /l/ in *balm*). We therefore have data on /ah/ and its relation to /o/ for only 310 of the 439 Telsur speakers who were analyzed acoustically.[1]

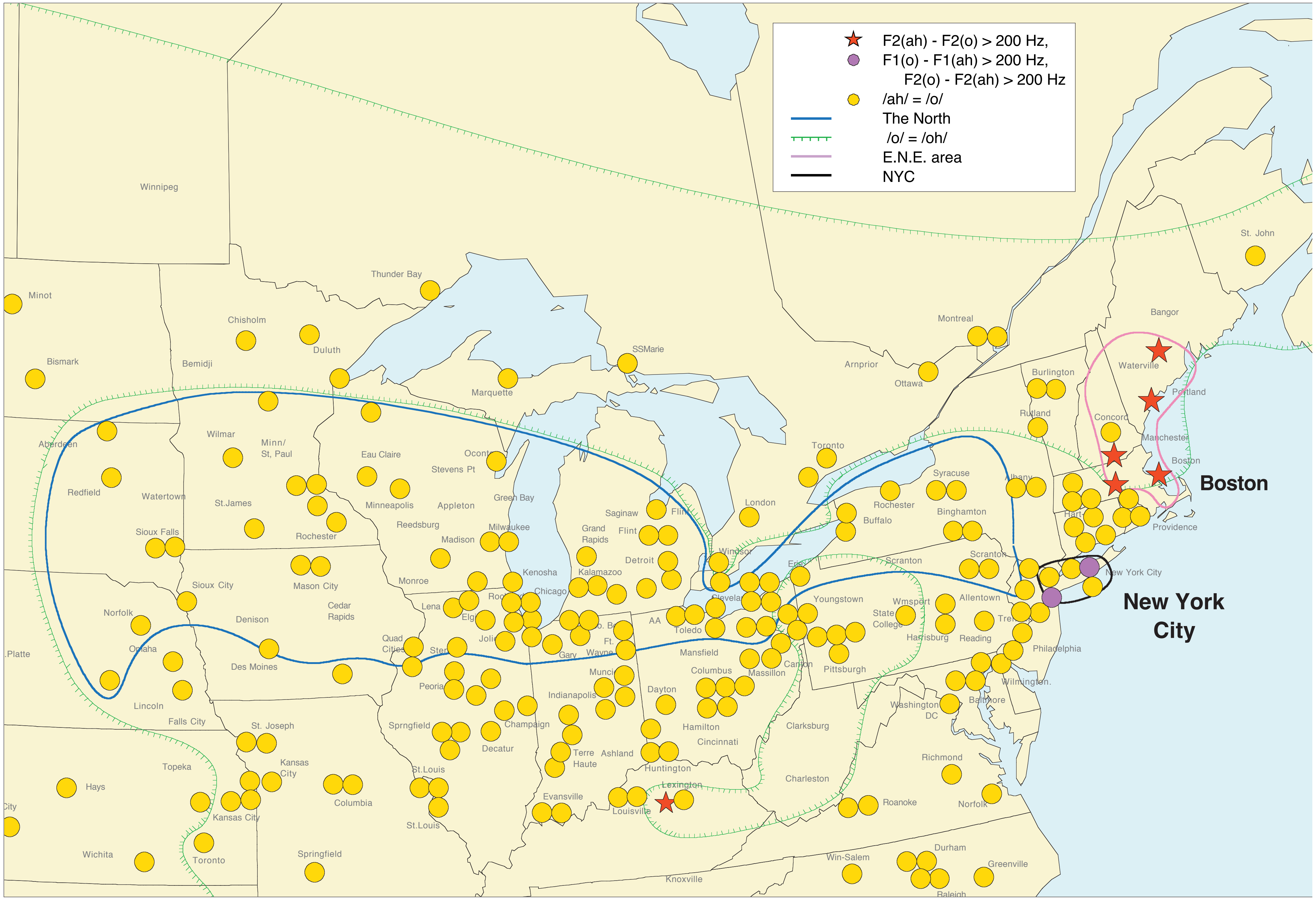
For the great majority of the speakers – shown as yellow symbols on Map 13.2 – there is no evidence of a phonemic difference between /o/ and /ah/. For those within the green-oriented isogloss, /ah/ forms part of the low back merger, so that the vowels of *pa*, *paw*, *pot*, *pod*, *pawed*, *taught*, form a single phoneme. For those outside that isogloss, where /o/ is generally distinct from /oh/, /o/ is unrounded as a rule and merges with /ah/, so that *pa*, *pot*, *pod* is opposed to *paw*, *pawed*, *taught*. The distinction between /ah/ and /o/ is maintained in only two narrowly circumscribed areas on Map 13.2: the area of Eastern New England centered on Boston, and some speakers in New York City. Though these areas are small geographically, they include large populations.

1 Map 32 of Kurath and McDavid (1961) gives phonetic realizations of the word *father.* Though there is a considerable variety of forms, they correspond quite closely to the vowel of /o/ except for Eastern New England.



Map 13.1. Front–back position and phonemic status of /o/ in North American dialects

The position of the word-class /o/ on the front–back dimension is closely connected with the various chain shifts that differentiate North American dialects. The red circles are the speakers with mean values of /o/ that are clearly in central (or even front) position. Red circles are dominant inside the red isogloss, which marks the general raising of (non-nasal) /æ/; this shows the close connection between these two sound changes. The fronting of /o/ extends to the east and west of the red isogloss, but not north or south of it. It is well dissociated from the area where /o/ and /oh/ merge, within the green oriented isogloss.



Map 13.2. Relations of /o/ and /ah/ in North America

In one region of North America, /o/ in *bother* and /ah/ in *father* are kept apart by the relatively front position of /ah/: in Eastern New England. In New York City, many speakers also retain the distinction between these two word classes, but here *father* is further back and higher than *bother*. In the rest of the country, /o/ of *bother*, *got*, *rock*, *Don*, etc. is not clearly distinct from /ah/ of *father*, *pa*, *spa*, etc. This merged phoneme is best noted as /o/, to retain comparability of word classes across dialects.

The criterion here is a simple acoustic one, based on F2 measurements. It follows that some speakers, /ah/ is front of /o/. It has been found in a number of studies that a minimum of 200 Hz is needed to maintain a stable distinction on the F2 axis (LYS; Labov 1994: Ch. 12). For /o/ and /ah/ to be phonemically distinct in Map 13.2, the difference in the mean values of F2 must be greater than 200 Hz. This condition holds for only seven of the 310 speakers. Five are concentrated in the Boston area, where only one of the Telsur speakers fails to meet the criterion. The sixth is an isolated person in Lexington, Kentucky. The seventh (not shown in Map 13.2) is in Corpus Christi. Discounting these isolated points, it appears clear that /ah/ is maintained front of /o/ only in Eastern New England.

Figure 13.1 shows the distinction between the /ah/ and /o/ classes in the vowel system of Denise L., 21, of Boston. Figure 13.1a displays the clear separation of /ah/ and /o/. The four /ah/ tokens are well to the front of the 18 /o/ tokens, with a mean difference of 304 Hz, and a t-test value that is significant at $p < .001$. Figure 13.1b shows how this distinction is embedded in the larger system of back vowels. The /ah/ tokens (*father*, *father's*, *Bahamas*) are part and parcel of the /ahr/ distribution: /ah/ and /ahr/ are merged in this *r*-less dialect (Chapter 7). The /o/ class is merged with the /oh/ class in low back position.

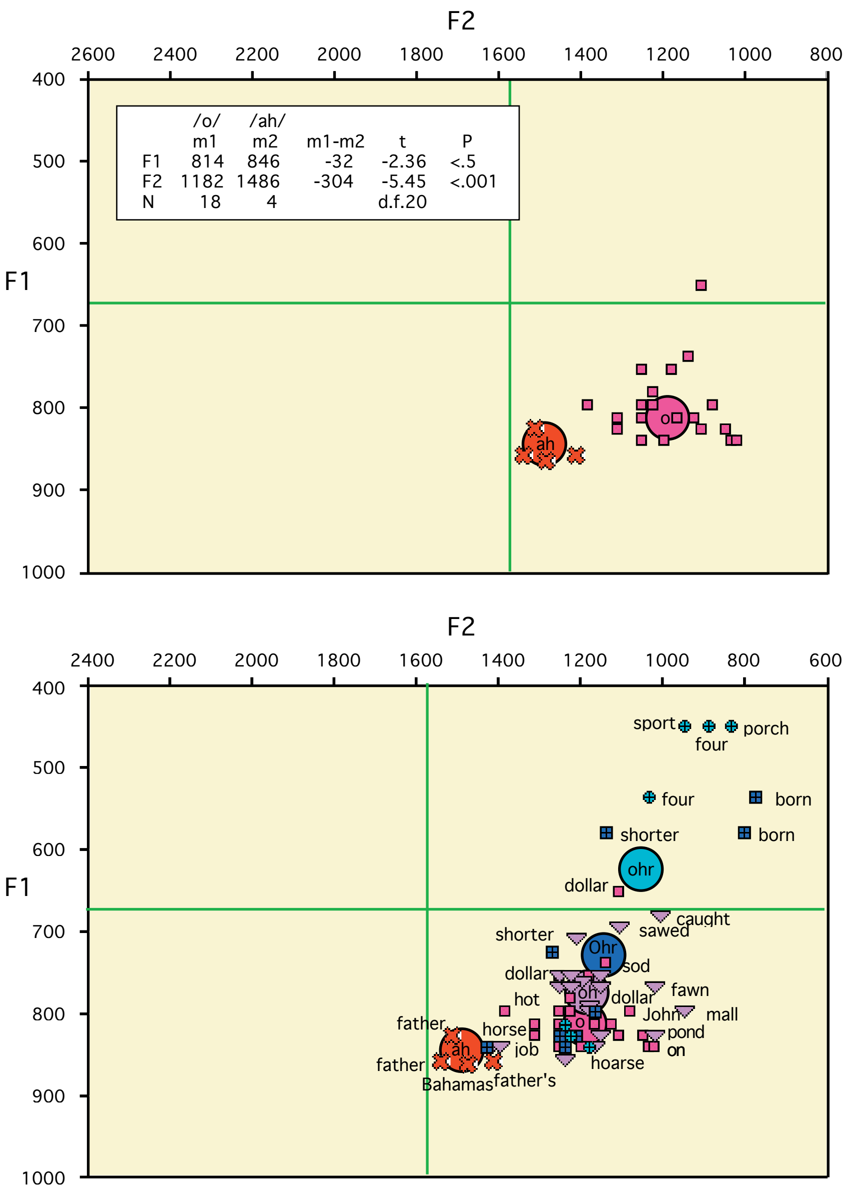


Figure 13.1 a, b The distinction between /ah/ and merged /o,oh/ in the vowel system of Denise L., 21 [1995], Boston, TS 427

The reverse pattern is for /o/ to occupy a back unrounded position, between 1200 and 1400 Hz, while unrounded /ah/ is in far back lower mid position. As Map 13.2 shows, this pattern is characteristic of New York City: the F1 mean of /o/ is more than 200 Hz higher than /ah/ and the F2 mean of /ah/ is more than 200 Hz lower than /o/.[2] In the data from one New York speaker in Figure 13.2, the /ah/ class is represented by three tokens: *father*, *garage*, and *mater* (from *Alma mater*).

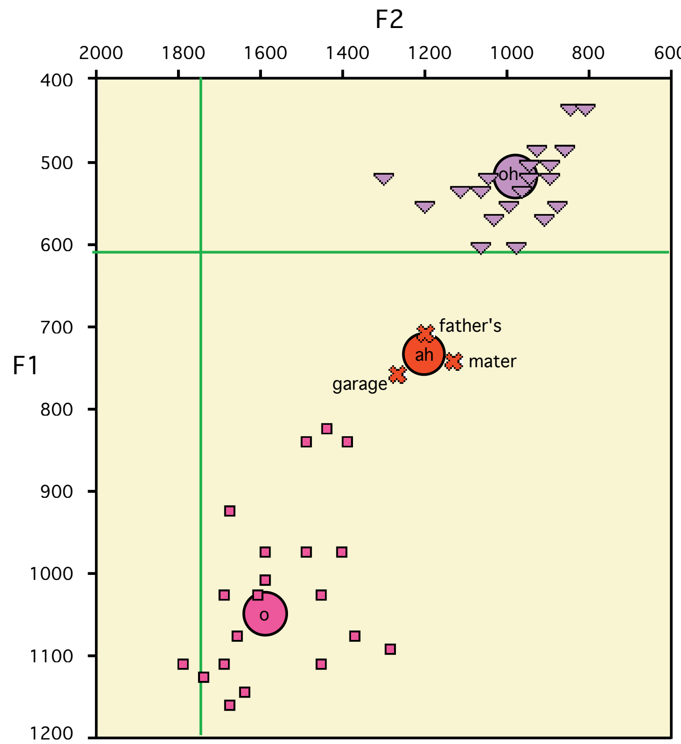


Figure 13.2. Distinction between /o/ and /ah/ in the NYC system of Pat M., 48 [2000], TS 800

Representation of the merged classes

Within the green-oriented isogloss that outlines the low back merger, the great majority of speakers have a single phoneme that combines initial /o, ah, oh/. Since it includes a large word-final vocabulary (*law*, *saw*, *pa*, *spa*), this is clearly a member of the long and ingliding subsystem. This category is best represented then as /oh/. Outside of the low back merger area, two phonemes are usually combined: /ah/ and /o/. The question remains as to whether the more limited merger of /o/ and /ah/ is also a member of this subsystem and would therefore should be represented as /ah/. The merged phoneme occurs in stressed word-final position as *pa*, *ma*, *bra*, *spa*, recent loan words like *shah* and *éclat* and many marginal

2 The /o/ phoneme is actually split in New York, with a set of words before a voiced consonant in far back position along with /ah/: see Chapter 17.

items such as *rahrah*, *blah blah*, *tata*, *hahaha*, *tralala*. To maintain comparability with all dialects, this merged unit will be referred to as /o/.[3]

The general view of low back vowel configurations is shown in Figure 13.3, which displays the number of distinct categories for each dialect.

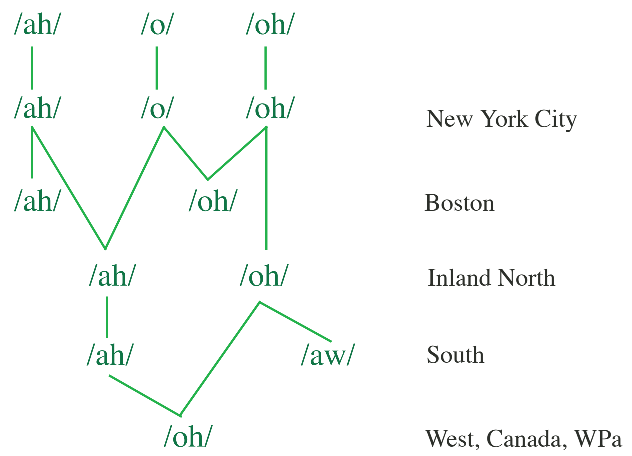


Figure 13.3. Short-*o* configurations

13.2. Short-*a* configurations

The variety and complexity of short-*a* configurations in North America is considerably greater than the short-*o* systems reviewed in the preceding section. There is a wide range of allophonic relations with various degrees of raising along the front diagonal. In NYC and the Mid-Atlantic region, short-*a* is split into a tense and lax class. There is reason to believe that the tense class /æh/ descends from the British /ah/ or "broad a" class.[4] In current-day British dialects, this special class appears as a low back vowel /ah/ in *can't*, *dance*, *half*, *last*, etc., but in the Middle Atlantic States and New York City it is a front tensed vowel /æh/ that ranges from low to upper mid or higher.[5]

In many ways, the North American distinction between /o/ and /oh/ is parallel to the distinction between /æ/ and /æh/. The migration of /o/ words into the /oh/ class (*strong*, *off*, *lost*, *broth*) is governed by phonetic environments similar to those operating in the lexical assignment to /æh/: both involve vowels before nasals clusters and voiceless fricatives.

The split system

As early as 1896, Babbitt noted that the environments for British broad *a* are fronted and raised in New York City. The system that has been described in some detail from 1930 on is shown in Figure 13.4. The main phonetic factor involved in the split is the place and manner of the following consonant. The tensing environments for New York City comprise all following voiced stops, front nasals and voiceless fricatives. The remaining environments (voiceless stops, voiced fricatives, and liquids) retain lax, low-front vowels. While the distribution is phonetically governed, there are many other phonological, grammatical and lexical conditions. It must be specified that tensing occurs only in closed syllables; that syllables are closed by inflectional boundaries (tense *planning* vs. lax *planet*); that all auxiliaries and other weak words[6] are lax (*can*, *have*, *had*); that short-*a* is frequently tense before voiced fricatives (*magic*, *imagine*); that learned words are lax (*alas*); that tense vowels appear in word-initial position in common words (*ask*, *after*) but lax vowels in less common ones (*asterisk*, *Afghan*); that tense *avenue* is a common lexical exception (Cohen 1970; Labov 1994: 335). Further, it should be noted that raising of /æh/ is overtly stigmatized in New York City, and with any attention given to speech is apt to show correction of raised /æh/ to low front [æ:].

Figure 13.5 shows the NYC split-*a* system of a 62-year-old New Yorker, Nina B. The tense /æh/ tokens are concentrated in upper-mid position, discretely separated from lax /æ/, except for three corrected tokens (with bold labels): *bad*, *Babs*, *bag*. One can note the contrast with tense *bad2* and *bad3*, along with other words ending in voiced stops. The tense group includes syllables closed by voiceless fricatives, including palatals (*calf*, *half*, *glass*, *flash*) and nasals (*ham*, *panties*, *lamb*). Open syllables have lax vowels (*manatee*, *animals*). Words with velar nasal codas are consistently lax (*frank*, *Sanka*), as with voiced fricatives and liquids (*asthma*, *locality*). Auxiliaries are lax even when they end in consonants that are normally in the tense class (*am*, *had*).

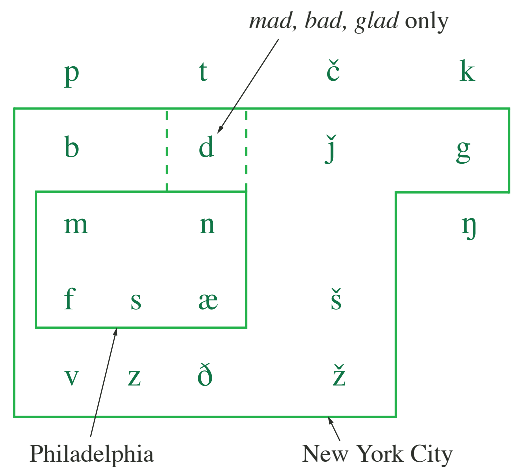


Figure 13.4. Following environments for /æh/ class in New York City and Philadelphia

Figure 13.4 also shows the tensing environments for the Philadelphia short-*a* system, a subset of those in the New York City system. In Philadelphia, tensing is confined to syllables closed with front nasals, voiceless fricatives, and (as indicated by dotted lines) three common affective adjectives ending in /d/: *mad*, *bad*, *glad* (but not *sad*, or any other word ending in /d/) (for further details see Ferguson 1975, Payne 1976, and Labov 1989, 1994: 340). Figure 13.6 shows a realization of the Philadelphia pattern in the vowel system of a 30-year-old Telsur subject, Rosanne V. Again, there is a clear separation of the phonetic distribution of /æ/ and /æh/ in acoustic space. The Philadelphia /æh/ class includes vowels

3 The measurements for the merged class will continue to be taken from the tokens of the initial /o/ class, since the number of initial /ah/ tokens is much smaller in comparison.

4 In Britain, pre-nasal environments are limited to clusters, but in the U.S. this was expanded to vowels before single nasal consonants. For the relation between Middle Atlantic short-*a* pattern and British broad-*a* see Ferguson (1975) and Labov (1994: 535-356). Jespersen (1949: 10,5) provides a detailed account of the history of broad-*a*, and traces its origin to open syllable lengthening.

5 It appears that in Britain, this broad-*a* class was strongly fronted during the period of early colonization of America.

6 A weak word is one in which the only vowel can be schwa. It is not equivalent to "function word" since the function word *can't* cannot be reduced to schwa.

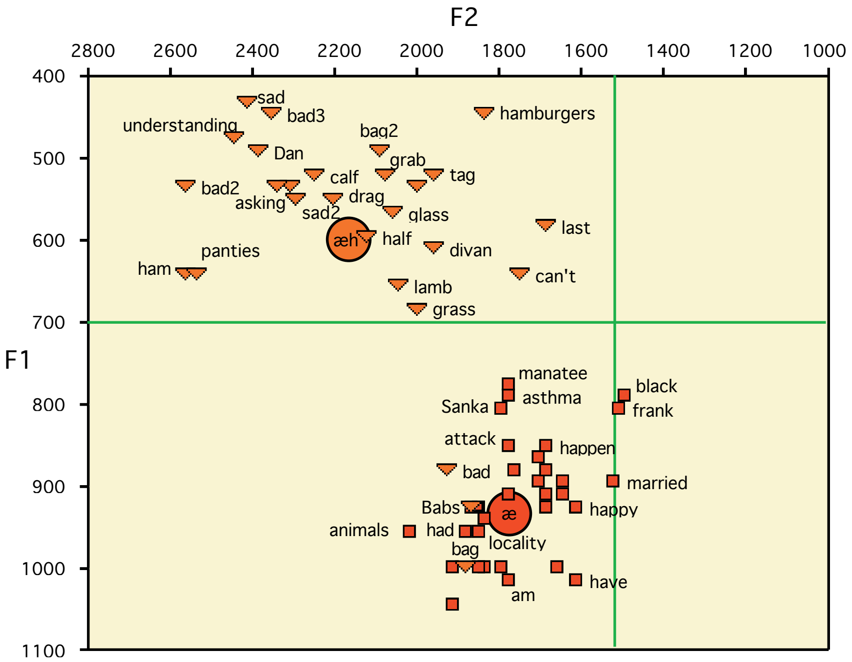


Figure 13.5. Split /æ/–/æh/ system of Nina B., 62 [1996], New York City, TS 495

before nasals (*Dan*, *pants*, *handy*, *rancher*, *aunt*, *lamb*, *fan*, *understand*), voiceless fricatives (*bathroom*, *fasten*, *asked*, *grass*, *plastic*) and the limited set before /d/ (three tokens of *bad*). The lax class includes the other voiced stops (*tag*, *bag*, *sad*), and vowels before nasals in open syllables, as in New York City (*Spanish*, *ceramic*, *Montana*), along with the remainder of the historical short-*a* class (*cap*, *hat*, *sack*).

There are three exceptions to the clear separation of tense and lax nuclei: *grandfather*, *glass*, and *last* (shown with bold labels). These three cases are not the result of the correction process that operated in Figure 13.5, but of consonantal conditioning. They represent the least advanced of the tense class, under the influence of a stop–liquid onset (*grandfather*, *glass*), initial /l/, and complex codas (*grandfather*, *last*). Directly above them, *grass* and *plastic* show a weaker form of the same coarticulatory effects. The corresponding conditioning in the lax class is shown by the word *language*, where an initial liquid, a velar nasal coda, and a following syllable all contribute to make it the most retracted of the lax tokens.

The broad-*a* system

A remnant of the British broad-*a* system is found in Eastern New England, where several common words of the British class are preserved with a low vowel back of center: *half*, *aunt*, *laugh*. The broad-*a* distribution has not been given a full sociolinguistic study, but the Telsur interviews do indicate the general pattern, as shown in Figure 13.7, the low vowel system of a 21-year-old Bostonian. It shows the clear separation of /o/ and /ah/ that is indicated in Map 13.2. Short-*o* remains in low back (rounded) position, merged with /oh/ and quite distinct from /ah/. The /ah/ class is represented by three tokens of *father*, by the foreign-*a* word *Bahamas*, and by the broad-*a* item *half*. Though *half* is close to the most retracted members of the /æ/ class, it is quite distant from most /æ/ before voiceless fricatives (*hashbrowns*, *Mass*, *fasten*).

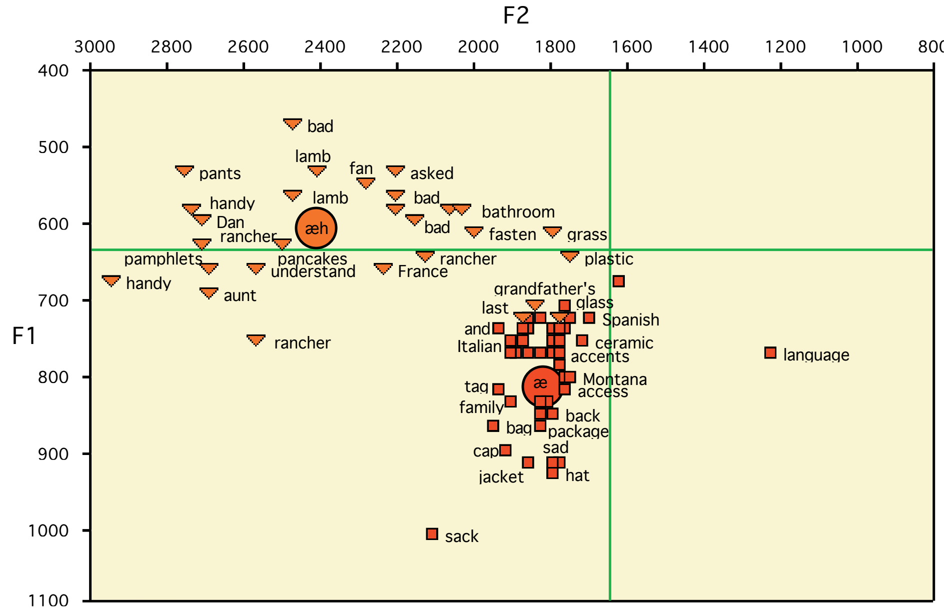


Figure 13.6. Split /æ/-/æh/ system of Rosanne V., 30 [1996], Philadelphia TS 587

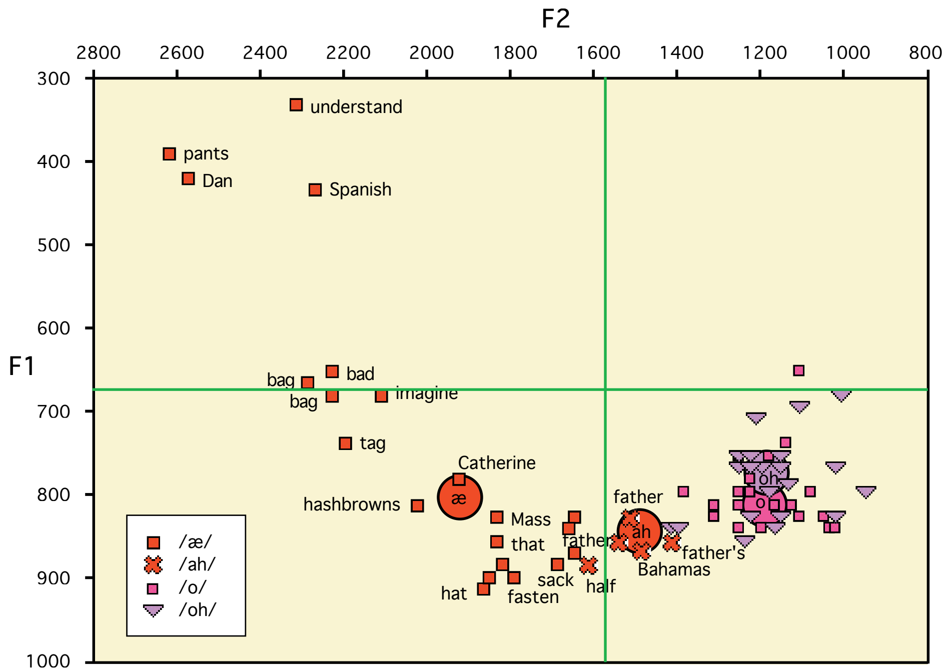
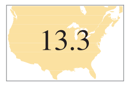


Figure 13.7. Low vowels of Dana L., 21 [1995], Boston, TS 427

The nasal system

A striking feature of the ENE system is the wide separation between the vowels before nasals and others shown in Figure 13.7, where the nuclei before nasals are in high front position. /æ/ before voiced stops forms a separate sub-group in front-mid position, as compared to the major set of /æ/ tokens in low front position. The /æ/ allophone before nasals includes both open and closed syllables (*Spanish*, *Dan*). This separation of vowels before nasals from those before oral consonants is the nasal short-*a* system, found in many regions of North America.

The most general conditioning factor in the raising of /æ/ is the effect of a following nasal consonant (Labov, Yæger, and Steiner 1972; Labov 1994: Table 18.1). This effect can be accounted for in part by the acoustic effects of opening the nasal cavity. It can be shown that the location of formant positions reflected in Figure 13.7 are systematically shifted to higher F2 and lower F1 positions by the presence of nasal formants and nasal zeroes (Plichta and Rakerd 2002). This does not necessarily mean that such measurements are artifacts of the methods used, since the positions of the vowels in Figure 13.7 conform quite closely to what trained phoneticians hear, and presumably to what languages learners hear and reproduce. In the course of sound change, /æ/ or /æh/ tokens before nasals move more quickly towards the high front target than other tokens for all dialects. Nevertheless, the degree of separation between nasal allophones and others varies widely across dialects. Although the initial effect of nasallity may be triggered by such acoustic interaction, there is no doubt that nasal allophony has been translated to the phonological level, and the wide variation in the degree of pre-nasal raising across dialects is a linguistic fact of considerable consequence.



Map 13.3 shows the differences in mean F1 values between the pre-nasal allophones of /æ/ and the conservative allophone before /t/. The brown symbols within the black isogloss are the split systems discussed above, including New York City and Philadelphia, where nasal allophones are divided between /æ/ in open and /æh/ in closed syllables. The magenta circles represent the most extreme differences: greater than 300 Hz. These 30 speakers represent the nasal system in its most extreme form. They are heavily concentrated in Eastern New England and Nova Scotia, with a scattering of points through the southern half of the Midland area, extending into Kansas. No such points appear in the Inland North, where the raising of all /æ/ in the Northern Cities Shift greatly reduces the distance between pre-nasal allophones and others, nor in most of Canada, where raising before nasals is quite limited, nor in the South. Most short-*a* systems show moderate differences between the two sub-classes of 200–300 Hz [orange symbols, N = 73], and more moderate differences of 100–200 Hz [green symbols, N = 139].

The nasal short-*a* system is the simplest of the short-*a* patterns. The /æ/ class is raised and fronted before any nasal consonant, in closed or open syllables; otherwise the nucleus remains in low front position. Figure 13.8 shows a typical example in the vowel system of Cynthia G., a 36-year-old woman from Columbus, Ohio. The separation is not as extreme as in Figure 13.7, but all /æ/ before nasals are raised and fronted in a set disjunct from the main body of /æ/ words. The raised group includes such open syllable words as *family* and *Spanish*. The lax /æ/ class shows considerable range, with the most advanced tokens before voiced stops (*sad*, *had*, *tag*), but there is no overlap between the two sets. Words with /æ/ before velar nasals (*banking*) are among the lowest of the raised class, but still distinct from the unraised vowels.

Many short-*a* systems show small variations from the pattern of Figure 13.8. Words with velar nasal codas (*bank*, *bang*) may be lax; some words with open syllables may be lax, while all other vowels before nasals are tense. Nasal systems grade into continuous systems (see below) where there is no clear separation of allophones.

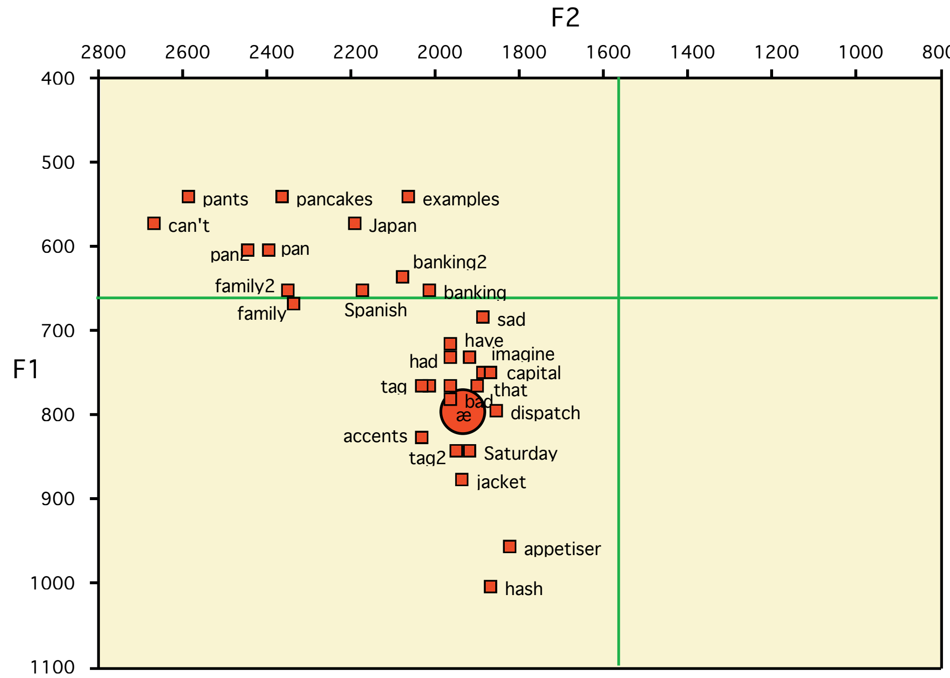


Figure 13.8. The nasal short-*a* configuration in the vowel system of Danica L., 35 [1999], Columbus, Ohio TS 757

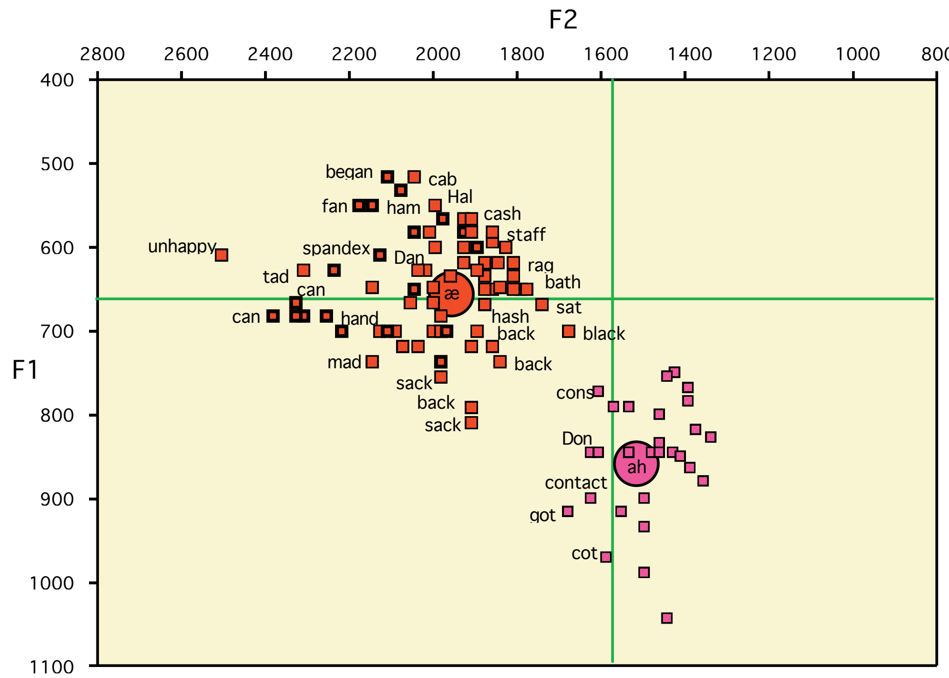
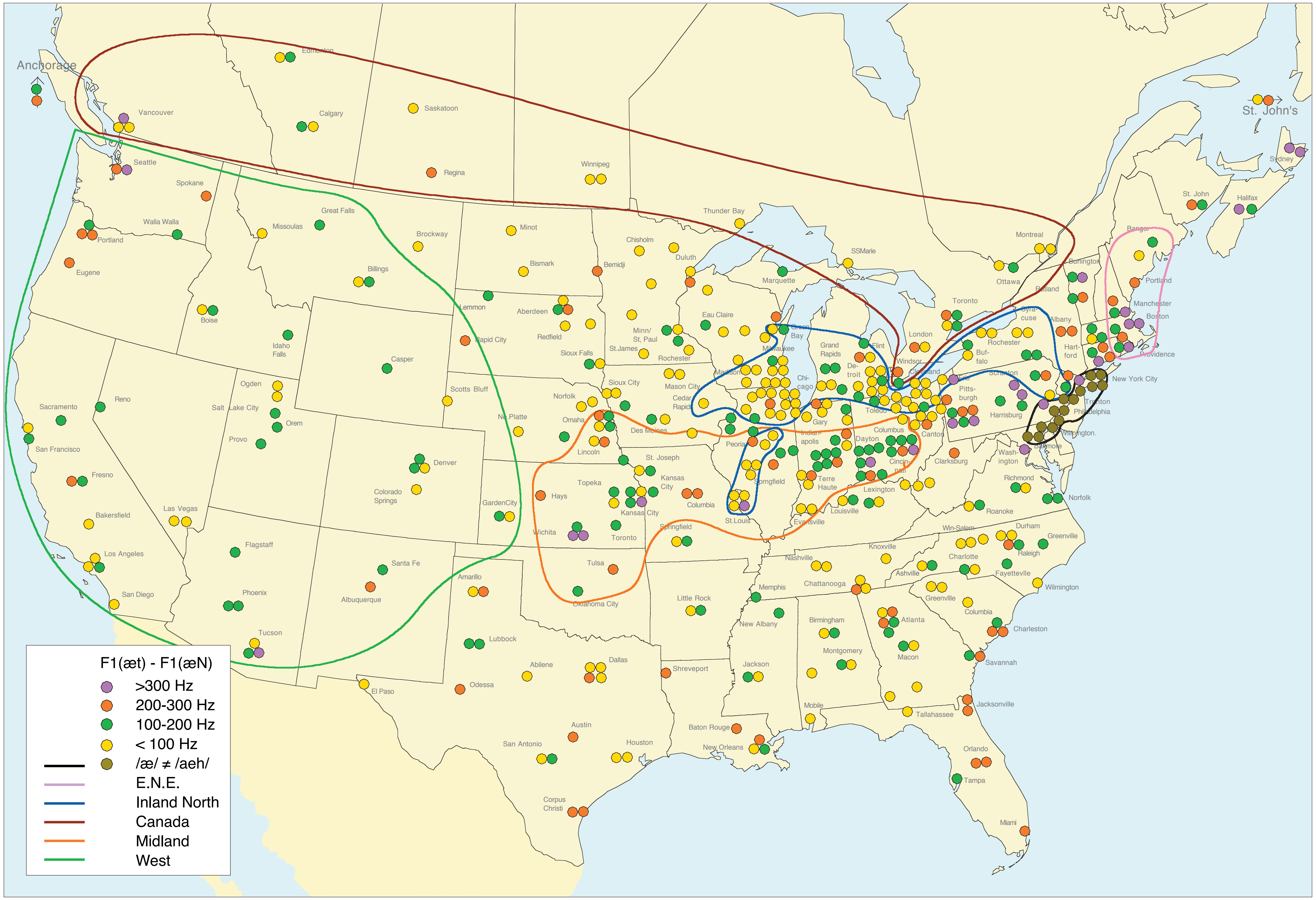


Figure 13.9. Raised /æ/ system of Randall R., 24 [1993], Chicago IL TS67 [nasal coda highlighted]

The raised /æh/ system[7]

Chapter 11 introduced the Northern Cities Shift [NCS] as the defining feature of the Inland North dialect. The triggering event for the NCS is the general tensing, raising, and fronting of all short-*a* in all words in which this vowel occurs. This

7 The generally tensed, lengthened and raised class discussed in this section might well be described as /æh/, a member of the long and ingliding system. There is reason to think that it is accompanied by a parallel shift of /o/ to /ah/. However, the notation /æh/ in this volume is reserved for cases of clear phonemic opposition in the Mid-Atlantic states, where /æh/ is opposed to /æ/. Until further evidence is assembled to show that /æ/ has shifted its phonemic identification in the North, we will continue to refer to it by the original class label /æ/.



Map 13.3. Differences in height between allophones of /æ/ before nasals and elsewhere in North American dialects

In all North American dialects, the short-*a* class is further front and higher before nasal consonants, as in *man*, *ham*, *hang*, etc. This tendency is most extreme for the speakers shown with magenta and orange circles: heavily concentrated in Eastern New England, the Atlantic Provinces, and scattered throughout the Midland. The yellow circles, showing the minimum differentiation, are dominant in the Inland North, where all short *a* is raised as /æ/. In the Mid-Atlantic States and New York City, vowels before /m/ and /n/ (but not /ŋ/) are in a separate phonemic category, as part of the lexical split that defines that area.

raised vowel then develops an inglide (or a second mora – see below). Its structural relation to the long and ingliding system is evident in that it is involved in a chain shift with the /o/ that resulted from the merger of /o/ and /ah/, and /oh/.

Figure 13.9 shows the /æ/ system of Randall R., 24, of Chicago. The /æ/ group forms a continuous series from lower high to lower mid. The vowels with nasal codas are concentrated in the upper left of the distribution, but they are interspersed with /æ/ before voiced stops (*tad*, *bag*, *mad*), and after palatals (*jacket*). The most conservative tokens are those with velar codas and obstruent/liquid onsets (*back*, *black*, *haggling*), but even these have vacated the low front area and are established in lower mid position.

As in the nasal systems, the mean values of /æ/ before nasals show the lowest F1 and highest F2, but in the raised /æ/ system the pre-nasal allophones are not distinctly separated from the rest of the class. The raised /æ/ system contrasts with the nasal system in that the effect of following nasals is not a simple categorical constraint, but rather one of many independent influences on the raising and fronting of the vowel. The factors responsible for the high F2 and low F1 before nasal consonants cannot then be entirely due to the distortion of formant positions by nasal formants and zeroes, since the magnitude of the effect varies widely across dialects.

Northern breaking

The formant pattern of lax /æ/ shows a simple trajectory where measurement at the relative maximum of F1 can be used as an indicator of the central tendency of the vowel, and corresponds to its overall auditory impression. Figure 13.10 shows the formant trajectories for a typical lax vowel, *sack*, produced by a Philadelphia speaker. The overall duration of the vowel is 173 msec. Approximately halfway through this trajectory, F1 reaches a maximum value of 862 Hz.

The general raising and fronting of /æh/ in the Inland North creates a more complex phonetic pattern. When /æh/ is tensed and raised to mid position and higher, it develops an F2 maximum before a final inglide. Figure 13.11 shows the word *pants* pronounced by an Inland North speaker from Rochester. F1 is low and steady, while F2 begins at 2264 Hz, then rises to 2477 Hz halfway through the 190 msec resonant portion of the vowel before declining again as the tongue moves into the inglide. Measurement at the F2 peak corresponds to the auditory impression of a fronted, upper mid, ingliding vowel.

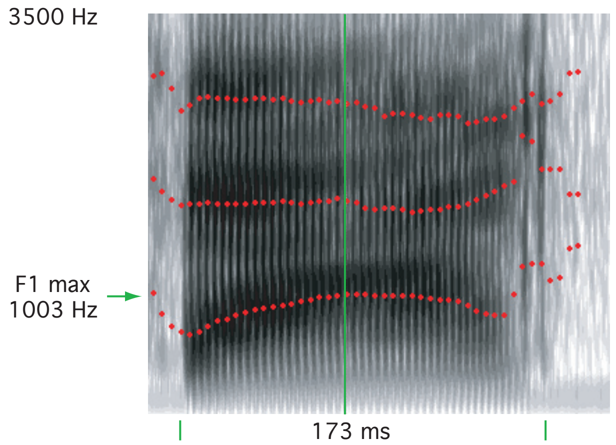


Figure 13.10. Formant trajectories for lax *sack* of Rosanne V., 30 [1996], Philadelphia PA, TS 587, Duration = 173 msec.

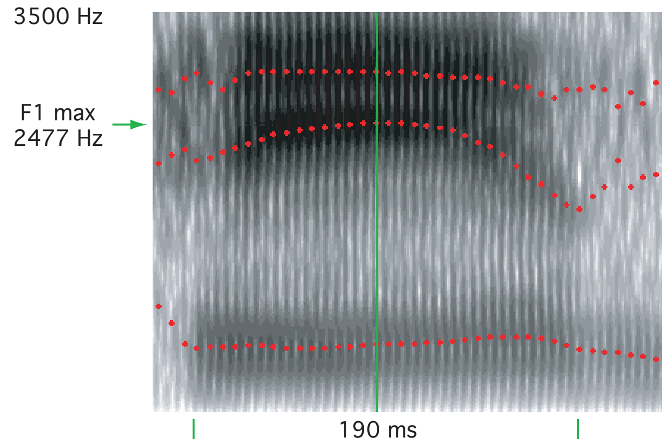


Figure 13.11. Formant trajectories for ingliding tense vowel in *pants* of Sharon K., 35 [1995], Rochester NY, TS 359, Duration = 190 msec.

Ingliding vowels of this type have been extensively studied as sociolinguistic variables in New York City (Labov 1966), Philadelphia (Labov 2001), Boston (Laferriere 1977), northern Illinois (Callary 1975), and elsewhere. In the pilot studies for ANAE in the North Central states, it was discovered that a great many tokens of short-*a* followed a different trajectory,[8] in which the nucleus of these of raised and fronted /æh/ is followed, not by an inglide to mid central position, but by a second steady state. These tokens break abruptly into two moræ of equal length: one in mid front position, the other in low front or central position. Both moræ are of sufficient length to be heard as individual short vowels when isolated, and have distinctly different quality from that of an off-glide.

Figure 13.12 shows a broken /æh/ pronounced by the speaker of Figure 13.11. The first half of the vowel is an upper mid tense nucleus with F2 at a relative maximum of 2261 Hz and a corresponding F1 value of 669 Hz. The second half is a lax vowel with F1 at a maximum of 901 Hz and F2 at 1756 Hz. The duration of each half of this complex vowel is that of a simple, short nucleus, about 130 msec. Figure 13.13 shows an even longer broken vowel, where each half is 180 msec. The first half is an upper mid fronted vowel with an F2 maximum of 2146 Hz and a corresponding F1 of 516 Hz, while the second half is a lax vowel with an F1 maximum of 720 Hz and a corresponding F2 of 1624 Hz.

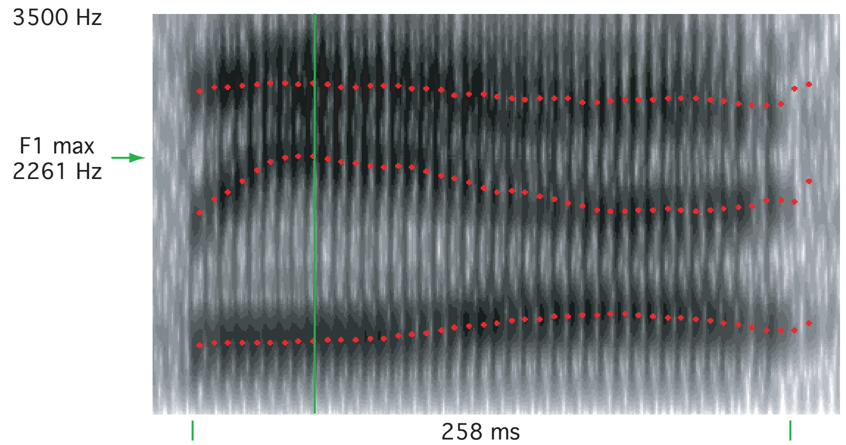


Figure 13.12. Formant trajectories for broken /æ/ in *that* of Sharon K., 35 [1995], Rochester, NY TS 359. Duration 258 msec

8 S. Ash and C. Boberg are the observers here.

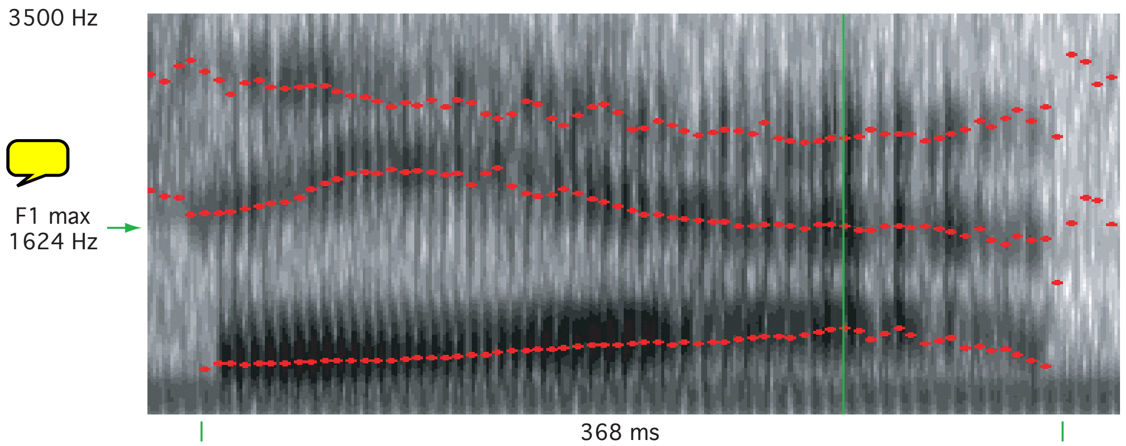


Figure 13.13. Formant trajectories for broken /æ/ in *sad* of Joseph K., 53 [1994], Youngstown OH, TS 93. Duration 368 msec

The geographic distribution of Northern breaking by regional dialects is shown in Figure 13.14. The North has a sizable number of speakers with 2 to 15 broken short-a vowels. The Midland follows weakly behind the North, and the West with several speakers with more than one broken vowel. Breaking of short-*a* is a Northern phenomenon: even those Midland and Western speakers who use broken short-*a* are located near the Northern border.

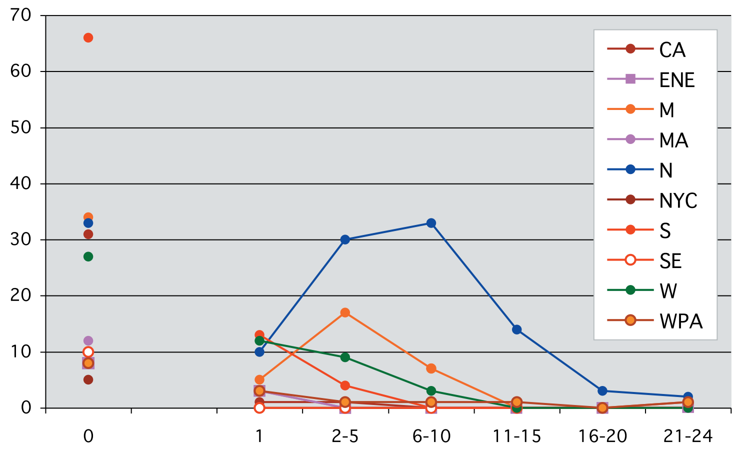


Figure 13.14. Distribution of broken short-*a* vowels by region

Southern breaking and the Southern drawl

Only a very few examples of Northern breaking are to be found in the South. There is however another form of short-*a* breaking centered in that region which is even more prominent phonetically. In Southern breaking, the vowel nucleus begins in low front position, is followed by a [j] transition, and then returns to a phonetic position not far from the origin. Figure 13.15 shows the characteristic Southern breaking for *pants*, the word that appeared with Northern breaking in Figure 13.11. The second formant begins at 1839 Hz and rises rapidly to 2477 Hz, then falls to 1400 Hz. This extreme breaking is characteristic of the "Southern drawl" (Feagin 1987). Although the South shows some raising of /æ/ before nasals, Southern breaking of /æ/ usually begins with a nucleus in low front position, with the auditory impression of [æʲə]

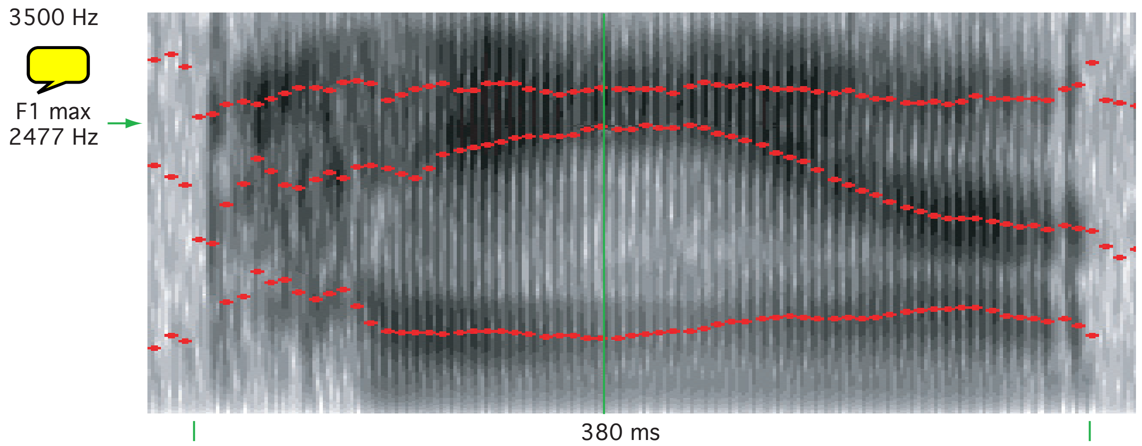


Figure 13.15. Spectrogram and formant trajectory for Southern breaking of nucleus of *pants*, spoken by Thelma M., 31[1992], Birmingham AL, TS 341, Duration = 380 msec

The Southern drawl is shown in a non-nasal context in Figure 13.16: the word *past* as spoken by Thelma M., with a smoother set of formant contours than in Figure 13.15. The formant trajectories are almost symmetrical, starting in low central position, proceeding to a low energy transition state in high front position, and returning to low central before the final fricative. Figure 13.17 displays four /æ/ tokens measured for Thelma M., with nuclei shown in red, /j/ transitions in yellow, and endpoints of the nuclei in orange, including the trajectories of *pants* and *past*, the tokens in Figures 13.15 and 13.16. It can be seen that various realizations of the vowel start at different positions, and reach different points of inflection and endpoints, but all maintain the same general pattern. The inglides shown in Figures 13.15 and 13.16 are quite different from the steady-state second morae of Northern breaking: they are typical glides which move continuously toward the center without reaching such a steady state.

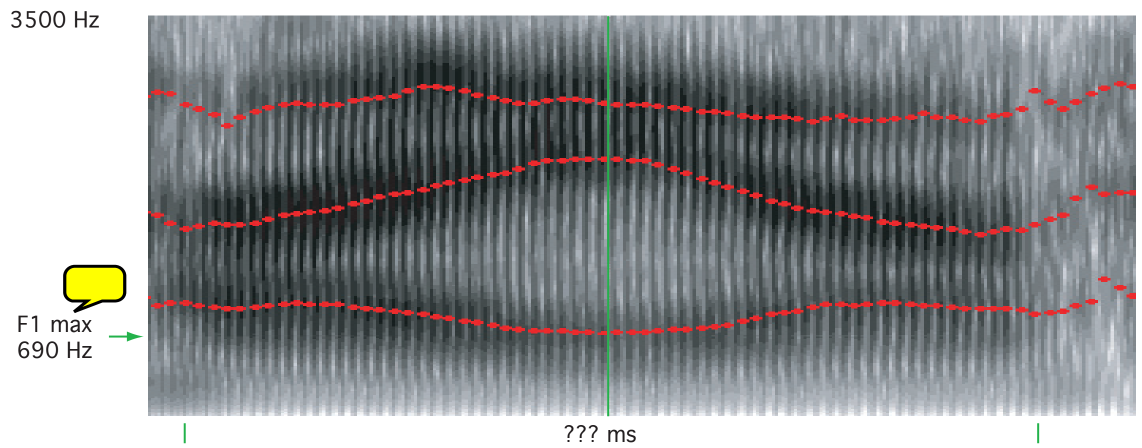
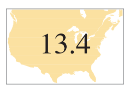
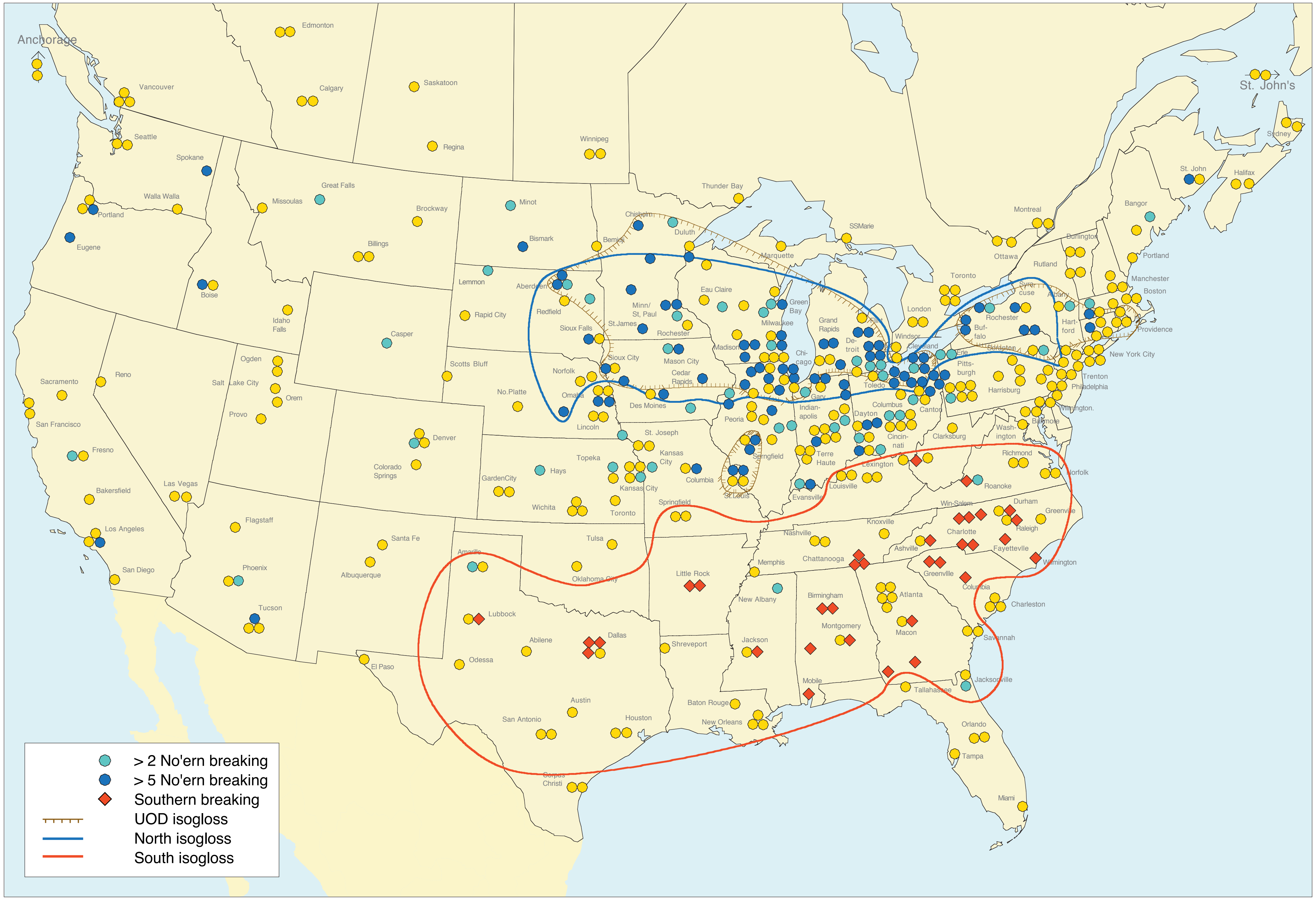


Figure 13.16. Southern breaking of /æ/ in spectrogram and formant trajectories for *past*, Thelma M., Birmingham



The geography of breaking is displayed in Map 13.4. Northern breaking is indicated by the blue circles, with the heaviest concentration of breaking tokens in dark blue (more than five examples), and a lesser frequency (2–5 tokens) in light blue. The blue isogloss is the outer definition of the North from Chapter 11: it is evident that Northern breaking is heavily concentrated in the Northern region.



Map 13.4. Geographic distribution of Northern and Southern breaking

As part of the general raising and fronting of /æ/, there is a strong tendency for the vowel to break into two parts. The blue circles show the distribution of "Northern" breaking, where instead of a single nucleus and inglide, the vowel appears as two sharply separated steady states of equal length. Within the red isogloss that defines the South (by glide deletion of /ay/), the dominant tendency is to break into three parts: a relatively low nucleus, a high front glide, and a following inglide. This is frequently described as the "Southern drawl".

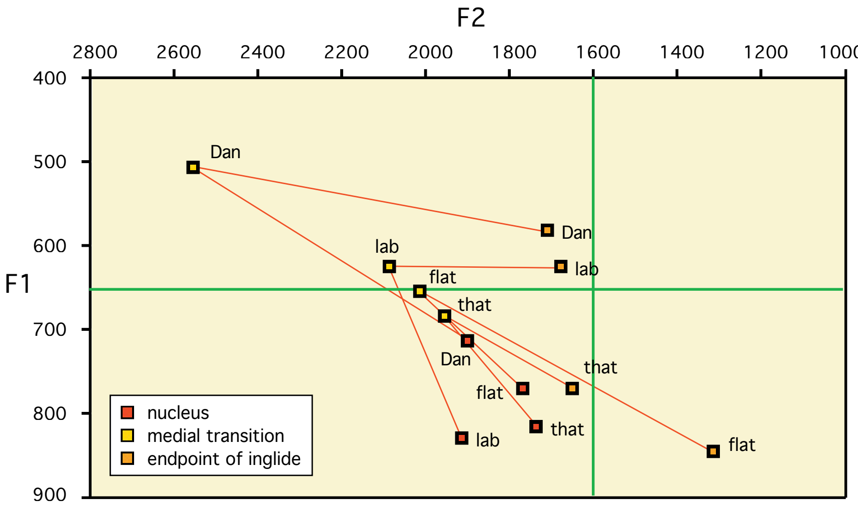


Figure 13.17. Four short-*a* tokens for Thelma M. with Southern breaking

This is not the Inland North defined by the EOD isogloss, but a somewhat broader area that extends well into the North Central area in a manner coincident with the UOD isogloss of Chapter 11 (the oriented blue line of Map 13.4; see Map 11.14). As already indicated by Figure 13.14, there are a small number of dark blue symbols in the West, mostly in the areas bordering the North, and in the Midland, again not far from the North. Four of these outliers are found in the St. Louis corridor, matching again with the pattern of the UOD isogloss. A smaller concentration of speakers exhibiting Northern breaking appears in the Pacific Northwest, well separated from the main concentration in the Inland North.

The phonetic conditioning factors for breaking are quite different in the North and the South. Northern breaking occurs before all oral obstruents except /k/, and is especially favored before apicals /t/ and /s/. It is not found before nasals. On the other hand, Southern breaking is strongly favored by nasal codas, with apical /n/ showing by far the highest percent breaking and lower frequency before /m/ and /ŋ/. It occurs with moderate frequency before other apical consonants /s, d, t/ and occasionally before other stops /b, g, t, c/. Neither type of breaking is found in the Telsur data before /k/ or /l/.

Continuous short-*a* systems

The most common short-*a* configuration in the West and the Midland is a more or less continuous range of allophones from low front to mid position, with no marked break. A typical continuous system is that of Lorraine K., 35, of Spokane, Washington, shown in Figure 13.18. The most conservative environments, with /æ/ before voiceless velars (*sack*) are in low front position with an F1 as high as 900 Hz. The most advanced tokens are in high front or mid front position. The highest and frontest tokens are with nasal codas, but interspersed with the nasals are vowels before other favoring environments, such as /d/ (*bad*, *dad*).

It is evident that a continuous system of this sort differs from the nasal system only in the degree of differentiation of the vowels before nasal consonants. In both cases, the effect of the nasal consonant is independent of syllable construction: open syllables like *Canada* are raised as much as closed syllables like *demand*. Given the great range of realizations of /æ/, the question remains as to whether the environmental constraints are ordered in the same way across and within systems. In general, this is true: the effects of following nasals, following voiceless velars, complex codas, and obstruent/liquid onsets are the same for almost all North American speakers. However, following voiced stops show a remarkable differentiation.

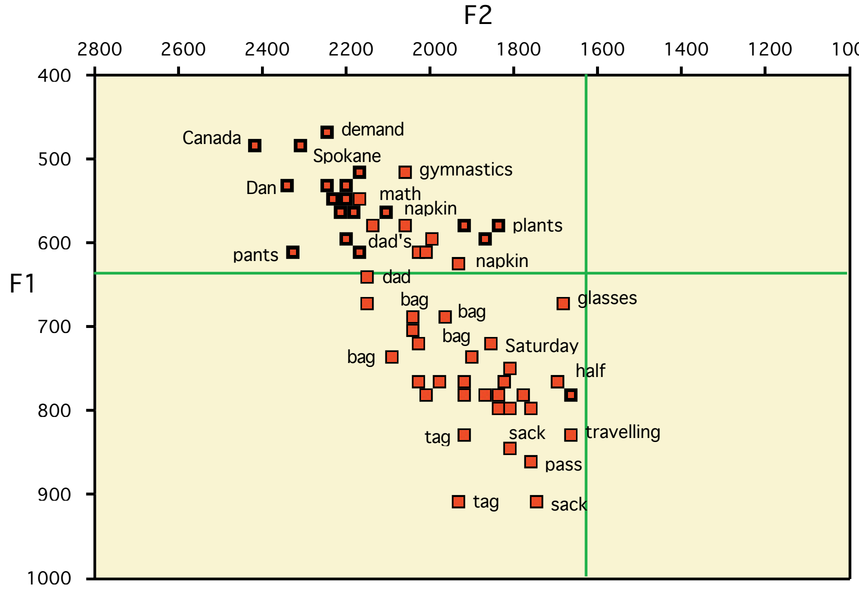


Figure 13.18. Continuous short-*a* system of Lorraine K., 35 [1995], Spokane, WA, TS 318. Highlighted tokens: /æ/ before nasal consonants

Differentiation of the voiced stops

In Figure 13.18, a following /d/ produces higher and fronter /æ/ nuclei than a following /g/ (compare *dad*, *dad's*, *bad* with the three examples of *bag* and the two tokens of *tag*). This is the most common configuration. However, there are speakers who show the reverse ordering of these voiced stops. Figure 13.19 is

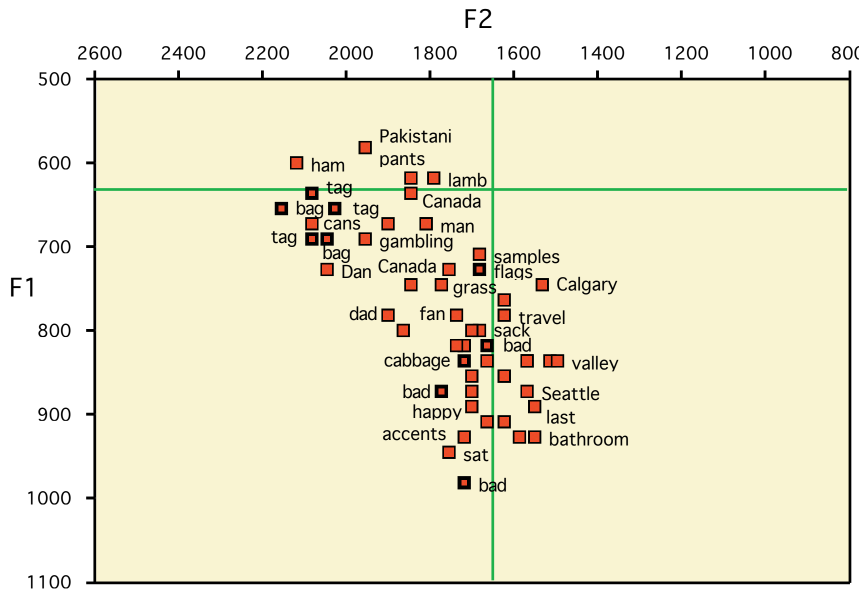


Figure 13.19. Relative advance of /g/ over /d/ in the short-*a* system of Duncan D., 29 [1997], Edmonton, Alberta, TS 655. Highlighted tokens: /æ/ before voiced stops

the short-*a* pattern from the vowel system of a 29-year-old man from Edmonton, Alberta, with a continuous short-*a* pattern. Vowels before voiced stops are highlighted. Vowels before nasals are in upper mid position, but along with them are vowels before /g/ (*tag*, *bag*). The word *flags* is somewhat lower and backer, under the influence of the *fl*- onset. Words with /æ/ before /d/ are considerably lower (*dad*, *bad*) along with /æ/ before /b/ (*cabbage*). This reversal of the ordering of /d/ and /g/ environments is not an accident, but is distributed over broad areas in a geographically coherent pattern, as shown on Map 13.5.

The merger of /æg/ and /eyg/

In the early 1990s, Zeller (1997) reported a merger of /æ/ and /ey/ before /g/ in Wisconsin, in which *haggle* and *Hegel* are homonyms and *bag* rhymes with *vague*. Like most mergers, it was not noticed by members of the speech community affected.[9] Although the opposition has a low functional load, with very few words in the /eyg/ category, the raising of /æg/ to [e^{i}g] is sometimes noted by outsiders. Speakers who have this merger report that when they are traveling in other regions they are often not understood when they ask for a *bag*.

A merger of this type is shown in Figure 13.20. The five tokens of /æ/ before /g/ are clearly closer to the /ey/ distribution than to the remainder of /æ/ before oral consonants, significantly higher than even the most raised tokens of /æ/ before nasals, e.g. *hand*. The token of /æ/ before /d/ (*bad*) is much lower, in the main body of /æ/ words. In this case, the /æg/ syllables are monophthongal, matching the tendency of /ey/ in this region, but in other cases, the shift of /æg/ to /eyg/ is shown by the development of a front upglide.

In the common vocabulary, no minimal pairs differentiate /æ/ and /ey/ before /g/.[10] The words *bag*, *tag*, *rag*, *drag*, *flag* are common enough to show the relation of this allophone of /æ/ to the checked /ey/ distribution for most speakers. The status of /æg/ for each speaker was determined by examining the degree of overlap between /æg/ and /eyC/ in the completed chart of the vowel system, combined with a search for any evidence of a front upglide with /æg/.[11] Merged /æg/ ~ / eyC/ is found in Wisconsin and Minnesota, the general area in which it was first reported by Zeller, though not in Milwaukee, the city she studied most closely (see the light blue stars in Map 13.15). Figure 13.20 shows a vowel system from Green Bay, Wisconsin, where the allophone of /æ/ before /g/ is detached from the main body of /æ/ words and is fully merged with /ey/. In this case the analyst noted that both the /ey/ tokens and the /æg/ tokens are monophthongs, as in [de:] for *day*.

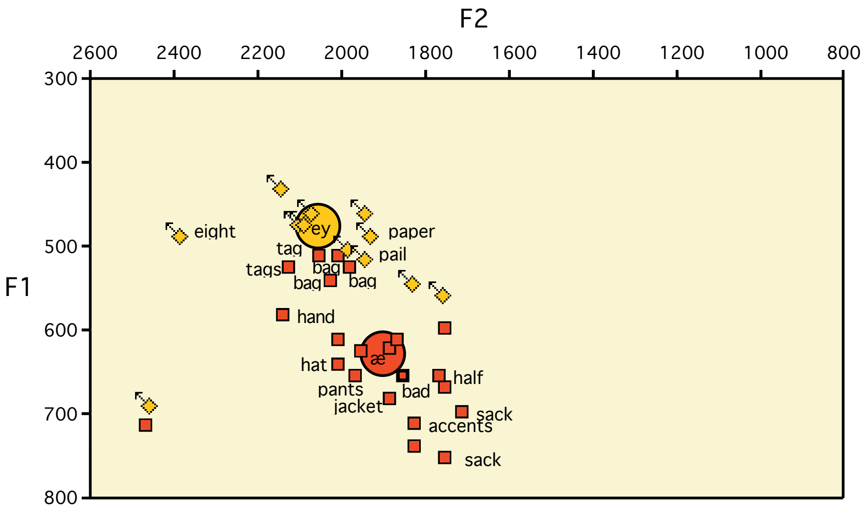


Figure 13.20. Merger of /æg/ and /ey/ in vowel system of Jan X., 14, Green Bay WI, TS 219

It might seem at first glance that the predominance of /g/ in the raising of /æ/ in Figure 13.19 is simply a reflection of this underlying merger. But the study of the geography of short-*a* configurations indicates the opposite. The merger represents only a small subset of the dialect areas where the normal relations of /g/ and /d/ are reversed, and may well be a consequence of whatever factors have led to this reversal.

The over-all geographic distribution of short-*a* systems is displayed in Map 13.5, along with the relationship between them and the dialect regions defined in Chapter 11. 13.5

The *split /æ/ ~ /æh/ systems*, indicated by brown circles, are confined to New York City and the Mid-Atlantic States, as shown in a number of other maps.

The *nasal system*, in which /æ/ is raised and fronted before any nasal consonant in a separate distribution from other /æ/, is designated by magenta circles. These predominate in New England, with a further concentration in northern New Jersey outside of the New York City area. A second striking area of concentration of nasal systems is found across the Midland, especially in the large cities of Pittsburgh, Columbus and Indianapolis (but not Cincinnati).

The Inland North is dominated by the *raised /æh/* system, with blue symbols indicating the well defined ordering of influence of the following consonant: n > d > g (Northern breaking is not shown).

The light green and dark green circles represent the parallel situation for the *continuous* short-*a* systems: these alternate with nasal systems throughout the Midland and predominate in the West. The light green circles show speakers who follow the n > d > g pattern, raising /æ/ considerably more before /d/ than before /g/; the dark green circles are speakers who show no clear difference between /d/ and /g/.

Southern breaking is indicated by red diamonds, entirely confined to the Southern area as originally defined by the AYM line. As always, Atlanta appears as an island of non-Southern speech. For four of the five Atlanta speakers, magenta circles show the nasal system. This is also the case for the peripheral areas of the Southeastern region: Charleston, Florida, Corpus Christi. The nasal system appears to be the default short-*a* pattern for the eastern half of North America.

A geographic pattern of great interest is the distribution of the star symbols, which indicate the speakers for whom /æ/ is raised before /g/ more than before /d/. The magenta isogloss is the outer limit of these symbols (the GD line). It includes the entire Canadian dialect region except Montreal. It extends well beyond Canada to include most of the north central and northwestern United States. The homogeneity of the magenta isogloss is .80; consistency is .86, and leakage is only .02.

The two red stars located in Sydney, Nova Scotia indicate a special case of a nasal system, with extreme separation of vowels before nasal consonants, combined with a merger of /æg/ with /eyg/.

The light blue stars are the vowel systems in which there is evidence for the merger of /æg/ and /eyg/. Though Zeller first discovered this merger in Milwau-

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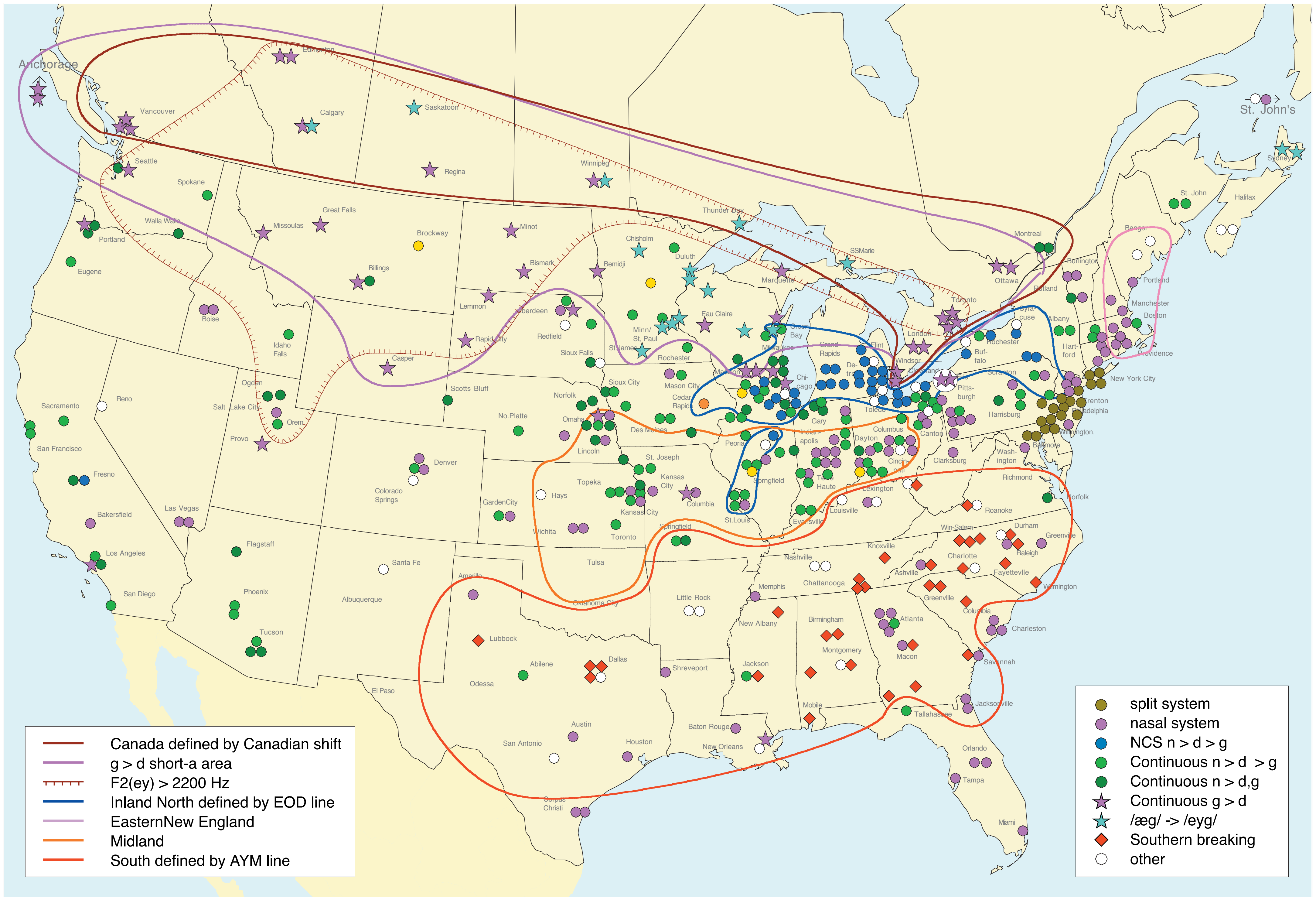
9 Zeller reports that she first became aware of the merger when she went to college in Toronto.

10 The surnames *Jagger* and *Jaeger* offer one possibility for a minimal pair elicitation. Other comparisons with proper nouns are *Craig* and *crag*, *Hague* and *hag*.

11 As noted in the previous section on Southern breaking, glides of this type are not uncommon in the South. However, such Southern /æ/ systems are excluded from any possibility of such a merger by the relatively low position of the /æ/ nucleus.



Map 13.5. Short-*a* systems in North America

This map shows the geographic distribution of the various types of short-*a* system described in this chapter. The main focus is on the relative height of /æ/ before /n/, /d/, and /g/. The magenta isogloss surrounds the region where the usual order /n, d, g/ is altered or reversed: the region where /g/ leads to extreme raising of /æ/ includes most of the Canadian dialect region but also a large section of the North-west and North Central U.S. The blue stars indicate the speakers from whom /æ/ and /ey/ are merged before /g/, so that *bagel* rhymes with *Hegel*.

kee, it is not the predominant pattern among the Telsur Milwaukee speakers, but appears strongly in the rest of Wisconsin, Minnesota, and in neighboring regions of northwestern Ontario and the Canadian prairies.

The GD isogloss cuts across the West and North as defined in Chapter 11 and forms a distinct area of its own. It is mutually exclusive with the Inland North, except for four speakers at the northwestern edge of that dialect area: two in Madison, one in Milwaukee and one in Chicago. The GD area also includes the city of Erie, which as we have seen has shifted its allegiance from North to Midland: it is not clear why Erie has now developed this feature.

The dark red-oriented isogloss on Map 13.5 outlines an area similar to that of the GD isogloss: the region of tense, sometimes monophthongal /ey/, defined by an advanced second formant greater than 2200 Hz. It includes the Prairie provinces of Canada, along with a large area of the North Central States in U.S. It does not extend as far west in Canada as Vancouver, or as far east as Ottawa, and it does not include that region of Wisconsin and Minnesota where the merger of /æ/ and /ey/ before /g/ is most concentrated. In many respects, this is one of the most conservative regions of North America: the front tense /ey/ is matched by /ow/ in a mid back, sometimes monophthongal position.

The reversal of the phonetic effects of /d/ and /g/ on the raising of /æ/ is unusual and unexpected, since most environmental effects are the products of the action of a uniform articulatory apparatus and operate in the same way across dialects. Figure 13.21 shows the degree of uniformity of phonetic effects across dialects. It is based on a regression analysis of the following stop effects on the F1 of /æ/ for the regions defined in Chapter 11.[12] Instead of the features of manner, place and voice, the individual consonants are given as three separate series by place (labial–apical–velar): one series for nasals, one for voiced stops, and one for voiceless stops. The height of any given point on the vertical axis reflects the contribution of the following consonant to the lowering of F1 – that is, raising of the vowel

The nasal series shows similar patterns across dialects, with least raising for the velar nasal.[13] Labial and apical nasals are at about the same level; only the Midland shows a significant advantage of /n/ over /m/. The Inland North, the Midland, the South, the Mid-Atlantic States, and western Pennsylvania show that the vowels before the velar nasal are significantly lower than before the apical nasal.

In general, nasal codas produce greater raising than either of the oral stops. Within the nasal series, Eastern New England has by far the lowest F1 values, reflecting the great distance between the nasal and oral allophones of /æ/ in the nasal systems of that region (Figure 13.5 and Map 13.3). Western Pennsylvania follows closely behind in this respect. The two dialects with split-*a* systems show the least tendency of nasals to raise. This is because the tense /æh/ class (included in this analysis) includes oral voiced stops and voiceless fricatives (Figures 13.5 and 13.6), which equal the nasals in the lowering of F1. The great differentiation of the velar nasals corresponds to the fact that they are excluded from this tense class, thus exaggerating the general effect.

At the right of Figure 13.21 it is evident that the voiceless stops have the smallest effect on the raising of /æ/ (lowering of F1), and the normal ordering is apical > labial > velar. Only Eastern New England and NYC vary slightly from this pattern.

The most striking deviation from the general agreement across dialects of the effects of manner, place and voice appears in the center series of Figure 13.21, for the voiced stops /b, d, g/. Here the general pattern is that /d/ has the greatest effect upon the raising of /æ/, with /b/ and /g/ considerably behind. Canada, however, shows a dramatic reversal of this effect, with a following /g/ by far the most influential of the three stops in the raising of /æ/.

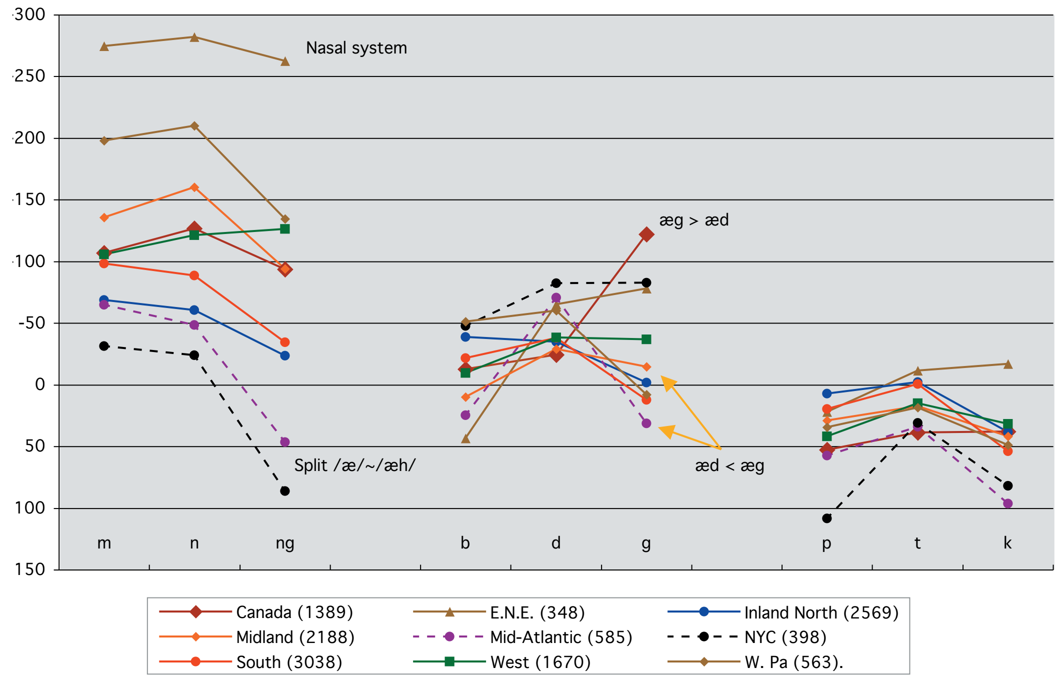


Figure 13.21. F1(æ) Regression coefficients for F1 means of /æ/ by region, place and manner of coda. Numbers of tokens in parentheses. Dashed lines = split short-*a* system

Figure 13.21 does not take into account the fact that the g > d area intersects the West and the North. The figures for Canada reflect the conditioning factors for the GD area accurately, since Canada is wholly contained within that area, but the coefficients for the West are the results of a more heterogeneous mixture of short-*a* patterns. Figure 13.22 clarifies this situation by dividing all Telsur subjects into two groups: those within the GD isogloss of Map 13.5 and those without.

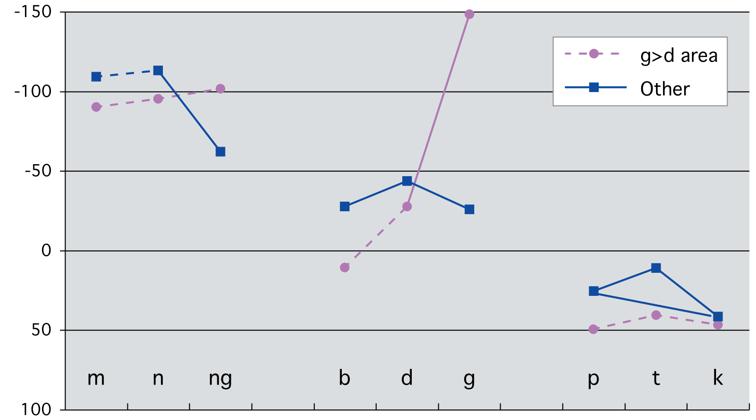


Figure 13.22. Regression coefficients for F1 of /æ/ by place, manner and voice for /g/ > /d/ area of Map 13.4 vs. all others. Dotted lines not significant at $p < .01$. N = 17,826

12 In Figure 13.19, the Inland North is examined rather than the North as a whole, which is split by the GD line.

13 The relatively high values for the velar in the West are exceptional, and reflect the fact that much of the West falls within the area in Map 13.4 where /g/ raises /æ/ more than /d/.

For both areas, the general ordering holds: nasals > voiced > voiceless stops, with the exception of /g/ for the g > d area, which has by far the highest effect on raising of /æ/. As far as relations of place are concerned, the residual area shows a significant advantage of apicals for all three series, except for nasals, where the difference between /m/ and /n/ is not significant. This is not true for the g > d area, where the slight advantage of velar nasals in the raising of /æ/ may reflect the same factors that are operating for /g/. The difference between /ŋ/ and /n/ is not significant for the g > d area, but the difference between /ŋ/ and /m/ is significant at the $p < .05$ level.

A problem for future research is to discover the origins of this sharp differentiation of the effect of /d/ and /g/ on the raising of /æ/ across dialects.