The phonetic motivation of stop assibilation

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The present study is concerned with stop assibilation — a process whereby stops become sibilant affricates or sibilant fricatives before high vocoids. Two examples are presented in (1a, b) from Finnish and Korean respectively. Similar examples of assibilations can be found in Romanian, Cheyene, Efik, Japanese and Quebec French (see Bhat 1978 and Kim 2001).

(1) a. $t \rightarrow s / \_ i$
   b. $t t^h \rightarrow t s t s^h / \_ i$

Stop assibilations are defined here as processes with the following four properties (see also Clements 1999 and Kim 2001): (a) the input segments are stops, which are usually alveolar or dental, (b) the trigger is (typically) some subset of the high front vocoids (e.g. /i j/), (c) the output is always a sibilant (either an affricate or a fricative) and (d) the trigger is always to the right of the target.

Kim (2001) offers a phonetic explanation for these properties: The creation of sibilants from stops has its phonetic origin in the brief period of turbulence which occurs at the release of a stop into a high vocoid.

In the present study we present phonetic evidence supporting the two implications in (2), neither of which is discussed by Clements (1999) or Kim (2001):

(2) a. Assibilation of /t/ in /tj/ implies assibilation of /t/ in /ti/
   b. Assibilation of /d/ implies the assibilation of /t/

Both (2a) and (2b) can be confirmed by examining the cross-linguistic evidence for stop assibilations (see Hall & Hamann 2005). For example, there are languages like Quebec French and Plains Cree, in which /t/ assibilates before /i/ and /j/ and Latin, in which /t/ assibilates only before /j/ but not before /i/. No language assibilates /t/ only before /i/ but not before /j/.

In our talk we will present the results of an acoustic study of /ti tj di dj/ sequences in German (a Germanic language with assibilation) and Polish (a non-Germanic language without assibilation). In our study we measured the frication phase after the /t d/ release (until the onset of a following vocoid) for three speakers of these two languages in each of these four sequences. We found that the friction phase for /ti/ was significantly longer than that of /tj/, supporting the implication in (2a). Furthermore, we found that the friction phase of /t/ is significantly greater than /d/, thereby lending support to the implication in (2b).

Our results are significant because they show that the universals in (2) (which are not discussed in the literature cited above on stop assibilations) can be confirmed by phonetics. By contrast, there is no clear phonological reason for why (2a, b) should hold. Thus, our study provides an example of a phonological process whose explanation can only be made clear by appealing to phonetics.
References