Ultrasound and corpus study of a change from below: vowel rhoticity in Canadian French
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While phonetically-motivated change from below is a fundamental concept in contemporary approaches to phonology and variation, empirical data is sparse (Cedergren, 1973; Trudgill, 1974; Labov 2001), partly because changes usually go unnoticed until long after their inception, and because articulatory data (which can shed light on phonetic motivations) is often unavailable. This paper documents the inception of a change from below using corpus data and ultrasound imaging of the tongue.

The variable under investigation is the rhoticity with which some speakers of Canadian French produce the vowels /ø/, /œ/ and /œ̃/, making them sound like English [ɨ] (i.e., heureux, docteur, and commun sound like [ɥɛ], [dɔkˈtɛʁ] and [komɪ]). When asked, native speakers are completely unaware of the difference between rhotic and non-rhotic pronunciations, suggesting that rhoticity is a change from below. Previous reports of retroflex-sounding variants of Canadian French vowels date back to the early 1970s in Montreal (Dumas 1972, 100, Sankoff, p.c.) and a retroflex-sounding variant of /ö/ has also been observed (Sankoff and Blondeau, 2007), but there has been no previous articulatory study of these sounds. North American English /ô/ can be produced with various tongue shapes, including bouched and retroflex variants (Delattre and Freeman, 1968) raising the question of whether French rhotic vowels are also produced with these categorically different tongue shapes.

Corpus data: The historical development and distribution of rhotic vowels were investigating by acoustic analysis of data from 42 speakers born between 1918 and 1991, from two corpora of Ottawa-Hull French: Corpus du français parlé à Ottawa-Hull (Poplack, 1989) and Corpus du français de l’Outaouais au nouveau millénaire (Poplack and Bourdages, 2010). Reduction in F3 values (i.e., rhoticity) for word-final /ø/ and /œ/ was observed for speakers born after 1950. Rhotic /ø/ appears stable among speakers born after 1970, with /œ̃/ lagging behind. Rhotic /œ/ before /ö/ is mostly limited to speakers born after 1985. The earliest instances of rhoticity are strongest among working class speakers, indicating that rhoticity is not a change from above. Despite the fact that rhotic vowels are phonetically very similar to English [ɵ], rhoticity emerges last in the pre-/ö/ context.

Articulatory data: Ultrasound imaging was used to produce mid-sagittal tongue video for 23 native speakers of Canadian French (including Laurentian and Acadian varieties) as they pronounced words containing /œ/, /œ̃/, and /ø/ in a carrier phrase, resulting in 90-105 tokens of the target vowels for each participant. Most rhotic vowels were articulated with a bunched tongue posture closely resembling Delattre and Freeman’s type 4 English [ɵ] tongue shape, but one subject consistently used a retroflex tongue posture for /ø/ and /œ̃/. Some non-rhotic speakers employed tongue postures for /œ/ and /œ̃/ that were virtually identical to their /ɛ/ (from which they are distinguished by lip rounding and nasalization), while the rhotic speakers’ tongue postures show clearly distinct articulatory targets.