

## Velar palatalization and affrication in Rhodian Greek

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### Περίληψη

Η εργασία αυτή εξετάζει ένα φωνητικό/φωνολογικό φαινόμενο της ροδιακής ελληνικής και συγκεκριμένα την ουρανικοποίηση και προστριβοποίηση του άηχου υπερωικού κλειστού /k/ σε περιβάλλον πρόσθιων φωνηέντων. Τα ερευνητικά δεδομένα προέρχονται από ελεύθερες συνεντεύξεις τεσσάρων φυσικών ομιλητών/τριών της διαλέκτου που ηχογραφήθηκαν κατά τη διάρκεια έρευνας πεδίου σε τρία χωριά της Ρόδου (Ιαλυσό, Δαματριά, Μεσσαναγρό). Τα αποτελέσματα καταδεικνύουν την ύπαρξη τριών αλλοφωνικών πραγματώσεων του υπερωικού κλειστού /k/: μίας στάνταρντ ουρανικής πραγμάτωσης [c] και δύο διαλεκτικών προστριβόμενων πραγματώσεων [cz] και [tʃ], οι οποίες προσομοιάζουν με τις αλλοφωνικές πραγματώσεις του /k/ στη διάλεκτο της (Δυτικής) Κρήτης ως αποτέλεσμα της ουρανικοποίησης και προστριβοποίησης.

Λέξεις κλειδιά: ροδιακή ελληνική, Δωδεκάνησα, ουρανικοποίηση, προστριβοποίηση, υπερωικό κλειστό

### 1 Introduction

Rhodian Greek (RhoGr) is a Dodecanese variety spoken in the island of Rhodes, the largest of the Dodecanese islands located in the south-east Aegean Sea. RhoGr exhibits the typical phonological and morphosyntactic features found in other south-eastern Greek varieties (Pantelidis 1929, Tsopanakis 1940, Browning 1969, Newton 1972, Kontossopoulos 2000, Trudgill 2003), among which are the deletion of intervocalic voiced fricatives, the presence of geminate consonants, the aspiration of voiceless stops, and the retention of the final –n in nouns, adjectives and verb forms. In this paper, we examine another interesting feature of the dialect, namely the palatalization and affrication of the velar stop /k/ before the front vowels /i/ and /e/, a feature also found in other southern Greek dialects (Trudgill 2003, Manolesou and Pantelidis 2013).

Palatalization of velars is obligatory in all Greek varieties, including Standard Modern Greek (Newton 1972, Holton et al. 1997, Trudgill 2003, Arvaniti 2007). Velars /k, g, x, ɣ/ turn into palatals [c ɟ ç j], respectively, before the front vowels /i/ and /e/ and the high front glide /j/. More specifically, Baltazani and Topintzi (2012), and Baltazani et al. (2016) distinguish two types of phonological palatalization, which affect velar obstruents (and [n, l]) in Modern Greek: (i) *simple palatalization*, which occurs before a front vowel preserving the trigger in the output (1) and (ii) *extreme palatalization*, which occurs before a glide followed by a back vowel /a, o, u/ in the same syllable, whereby the glide is absorbed by the newly created palatal (2) (Baltazani et al. 2016: 11).

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<sup>1</sup>Baltazani et al. (2016) point out that the glide /j/ is crucially involved in processes of palatalization and glide hardening, with the latter to be attested in all Greek varieties as well. Revithiadou et al. (2014) report that south-eastern dialects (Dodekanese, Cypriot) are a case of extreme hardening across Greek dialects, since the glide displays further fortition.

(1)	kima	['cima]
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'wave'

(2)	/kjal-i/	['cali]
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'binoculars'

As mentioned above, in southern Greek dialects, palatalization of velar stops /k, g/ can be followed by affrication (Newton 1972, Trudgill 2003, Manolessou and Pantelidis 2013). The affricated outputs can be palato-alveolars ([tʃ], [dʒ]) or alveolo-palatals ([tɕ], [dʒ]), respectively. The former are said to occur in Cyprus, the latter are said to occur in Crete (Trudgill 2003, Manolessou and Pantelidis 2013). In a recent experimental study, Lengeris and Kappa (2016) reported two possible affricated realizations of the voiceless velar stop /k/ in Western Crete, a palatal affricate [cç] and an alveolo-palatal affricate [tɕ].

According to early impressionistic descriptions in the 40s and 50s, affrication of the voiceless stop /k/ is active in RhoGr. Tsopanakis (1940:111) reports that the RhoGr affricate resembles the Cretan one, although it seems to be articulated at a more front position in the oral cavity. On the other hand, Papachristodoulou (1959–60: 259) mentions that the RhoGr affricate is phonetically closer to the post-alveolar affricate [tʃ] found in Italian. More recently, two fieldwork studies have documented the application of the phenomenon in contemporary RhoGr (Nikolou et al. 2018, Nikolou and Frantzi 2019), but neither study nor older studies have examined the acoustics of the RhoGr affricate allophone. The current study aims to (a) investigate the acoustics of the RhoGr affricate and (b) compare it to the Cretan affricate as discussed in Lengeris and Kappa (2016).

## 2 Method

### 2.1 Dialectal speakers and speech elicitation

Four speakers of the dialect (two female and two male) with a mean age of 76 years (range 67-85 years) were recorded conversing freely with a native speaker of the dialect<sup>2</sup>. Two speakers were from the village of Ialyssos (or Trianda) (north-west Rhodes), one from Damatria (northwest Rhodes), and one from Messanagros (south-west Rhodes, see Figure 1). All speakers were permanent inhabitants of the above-mentioned villages and had received basic education. Each conversation lasted approximately twenty minutes and revolved around informants' childhood, everyday life, family, work, memories of the World War II, the Italian occupation of the island etc. The recordings were made at the informants' house.

<sup>2</sup>The conversational speech data used in this study are part of the Corpus of Rhodian Language Varieties (CRhoLaV), currently being developed by the Laboratory of Informatics, Department of Mediterranean Studies, School of Humanities, University of the Aegean. CRhoLaV is a dynamic corpus of spoken language material from various villages in Rhodes. It currently contains material from eleven villages (Afandou, Damatria, Fanes, Ialyssos, Kalavarda, Kalythies, Koskinou, Maritsa, Messanagros, Paradeisi, Soroni) and is constantly being updated (for more details, see Frantzi 2016).



**Figure 1 | Map of the island of Rhodes. The markers show the location of the three villages (Ialyssos, Damatria, Messanagros) where the data were collected**

## 2.2 Acoustic measurements

The acoustic analysis was performed using the PRAAT speech analysis software (Boersma and Weenink 2015). We identified and measured the acoustic characteristics of the allophonic realizations of /k/ followed by front and back vowels in approximately ten minutes of speech uttered by each dialectal speaker. Three acoustic measurements were taken using the waveform and widebank spectrogram: (a) release intensity (stop/affricate release intensity relative to the intensity of the following vowel), (b) duration (stop/affricate release duration), (c) and burst spectral peak (spectral peak frequency of the stop/affricate burst).

## 3 Results

### 3.1 Descriptives

Speaker	Number of tokens
1 (Damatria)	144
2 (Ialyssos)	66
3 (Ialyssos)	70
4 (Messanagros)	122
	<b>402</b>

**Table 1 | Number of tokens analyzed per speaker**

Overall, 402 tokens were analyzed (see Table 1), with the number of tokens being relatively balanced across villages (range = 122-144 tokens).

Speaker	Allophonic realization of underlying /k/		
Speaker	Velar [k]	Palatal [c]	Affricate [cç, tɕ]
1 (Damatria)	64	30	50
2 (Ialyssos)	22	30	14
3 (Ialyssos)	26	32	12
4 (Messanagros)	60	30	32
	<b>172</b>	<b>122</b>	<b>108</b>

**Table 2 | Allophonic realization of underlying /k/ analyzed per speaker**

The allophonic realization of underlying /k/ tokens per speaker is shown in Table 2. There were 172 instances where /k/ was followed by a back vowel and was thus realized as [k] (see 3) and 230 instances where /k/ was followed by a front vowel. In those 230 instances, we identified 122 palatal stops [c] (see 4) and 108 palatal and alveolo-palatal affricates [cç] and [tɕ] (see 5 and 6). The dialectal allophones [cç] and [tɕ] were thus quite common in the dialect, but not as common as the standard ones (47% vs. 53% respectively).

	SMG	RhoGr
(3) /karvuno/	[ˈkarvuno]	[ˈkarvuno]

‘coal’

(4) /ekina/	[eˈcina]	[eˈcina]
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‘those-NEUT’

(5) /ke/	[ce]	[cçe]
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‘and’

(6) /faki/	[faˈci]	[faˈtɕi]
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‘lentil’

### 3.2 Acoustic analysis

Mean relative intensity (dB) of the palatal stop [c] and the palatal and alveolo-palatal affricates [cç] and [tɕ] are shown in Figure 2. A one-way Analysis of Variance (ANOVA) with Allophone (palatal stop, palatal affricate, alveolo-palatal affricate) as factor indicated that there was a significant effect of Allophone on mean relative intensity,  $F(2, 399) = 47.4, p < .001$ . Post-hoc tests (Bonferroni adjusted) showed that the dialectal, affricate allophones had higher release intensity ( $M = -10.6$  dB and  $M = -10.4$  dB) than the standard, palatal allophone ( $M = -14.7$  dB), confirming that affricates have higher intensity compared to stops.

Mean release duration (ms) of the palatal stop [c] and the palatal and alveolo-palatal affricates [cç] and [tɕ] are shown in Figure 3. A one-way ANOVA with Allophone (palatal stop, palatal affricate, alveolo-palatal affricate) as factor indicated that there was a significant effect of Allophone on mean release duration,  $F(2, 399) = 87.4, p < .001$ . Post-hoc tests (Bonferroni adjusted) showed that the dialectal, affricate allophones had longer release duration ( $M = 52$ ms and  $M = 54$ ms) than the standard, palatal allophone ( $M = 29$ ms), confirming that affricates have longer release duration compared to stops.

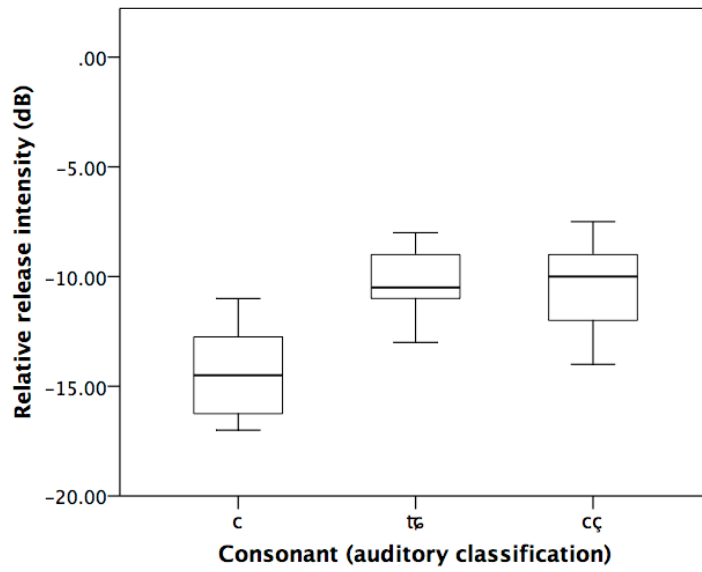


Figure 2 | Mean relative intensity (dB) of the standard allophone [c] and the dialectal affricates [cç] and [tɕ]

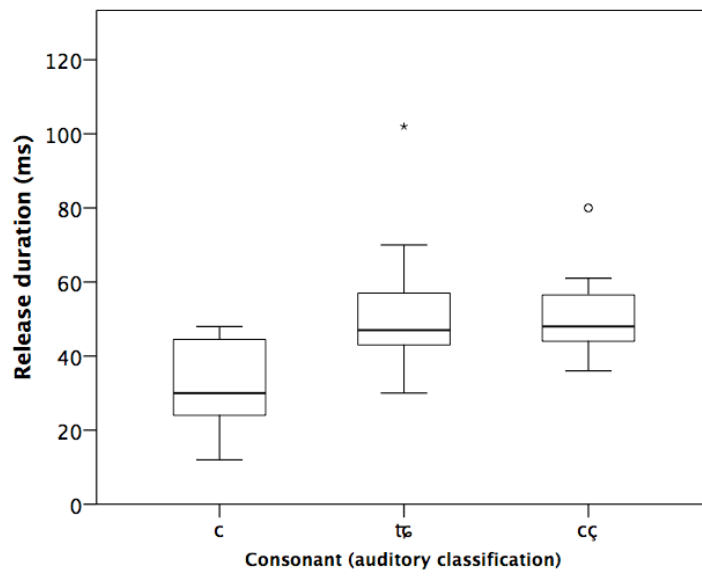
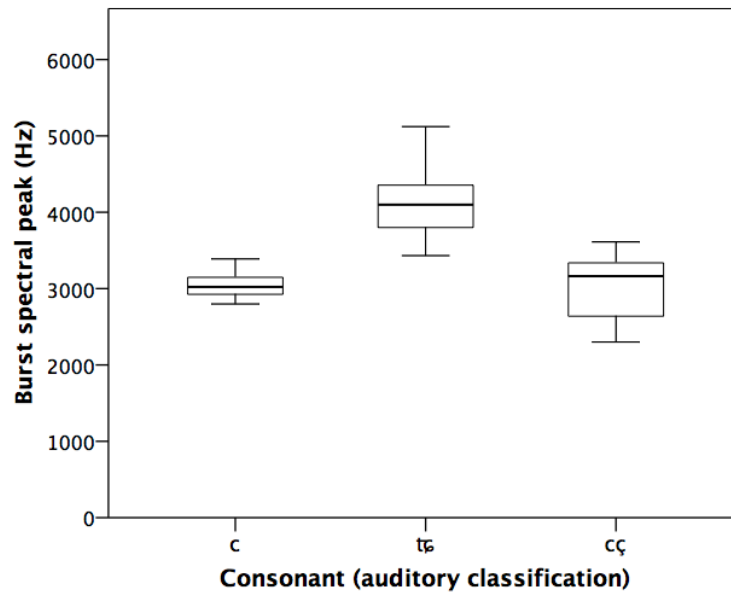


Figure 3 | Mean release duration (ms) of the standard allophone [c] and the dialectal affricates [cç] and [tɕ]



**Figure 4 | Mean burst spectral peak (Hz) of the standard allophone [c] and the dialectal affricates [cç] and [tɕ]**

Mean burst spectral peak of the palatal stop [c] and the palatal and alveolo-palatal affricates [cç] and [tɕ] are shown in Figure 4. A one-way ANOVA with Allophone (palatal stop, palatal affricate, alveolo-palatal affricate) as factor indicated that there was a significant effect of Allophone on burst spectral peak,  $F(2, 399) = 47.4, p < .001$ . Post-hoc tests (Bonferroni adjusted) showed that the standard palatal stop and the dialectal palatal affricate had lower spectral peaks ( $M = 3031\text{Hz}$  and  $M = 2888\text{Hz}$ ) than the alveolo-palatal affricate ( $M = 4124\text{Hz}$ ). This confirms that (a) the standard palatal stop and the dialectal palatal affricate are articulated at around the same place in the mouth and (b) that the alveolo-palatal affricate is articulated at a more front position in the mouth.

### 3.3 A comparison of affricates in Rhodes and Crete

As mentioned in the Introduction, Lengeris and Kappa (2016)<sup>3</sup> examined the affricate allophones of velar stop /k/ in Western Crete. Given that the two dialects both belong to the southern group of Greek dialects, as well as the impressionistic similarities of the affricated outputs in the two dialects, it is worth comparing the results of the two studies. In both studies, the acoustic analysis allowed distinguishing between a standard allophone [c] and two dialectal allophones, a palatal affricate [cç] and an alveolo-palatal affricate [tɕ]. The use of the dialectal allophones seems to be less extensive in Rhodes (47% of the time) than the use reported for Crete (63% of the time), but given the small number of speakers examined in both studies this should be treated with caution. Irrespective of the exact numbers, the dialectal allophones are still used quite extensively in both dialects (and across speakers). Although a direct comparison of the two studies in terms of the acoustics of the two allophones is not possible, it seems that the affricate allophones are similar in terms of release intensity and burst spectral peak while release duration is slightly longer in the (Western) Cretan dialect.

<sup>3</sup>The dialectal material of this study was drawn from conversational speech uttered by five male speakers of the western Cretan dialect.

## 4 Discussion

This study examined the acoustic characteristics of /k/ palatalization and affrication in the RhoGr dialect, a feature very prominent in southern Greek varieties (e.g. Trudgill 2003, Manolessou and Pantelidis 2013). The results confirmed impressionistic observations that the velar stop /k/ often surfaces as affricate before the front vowels /i e/ (Tsopanakis 1940). This finding was consistent across all RhoGr speakers recorded (from three different villages). Compared to the standard palatal allophone [c], the affricate realization was slightly less preferred (53% vs. 47% respectively). Using three acoustic measures, namely release intensity, release duration and burst spectral peak, apart from the standard palatal allophone [c], we were able to distinguish between two affricate allophones of /k/ in the dialect, a voiceless palatal affricate [çç] and a voiceless alveopalatal affricate [tɕ]. Our results therefore provide the first acoustic evidence of the RhoGr palatalization and affrication. In addition, our results support a close resemblance between the RhoGr and the (Western) Cretan dialect (Lengeris and Kappa 2016), at least as far as the /k/ palatalization and affrication is concerned.

Tsopanakis (1940, 1992) mentions that the Cretan-type affricated sounds are mostly attested in the villages surrounding the city of Rhodes (Northern part of the island) as a result of contact with other Dodecanese varieties (Tilos, Nisyros, Kos) since the inhabitants of these islands settled nearby the city of Rhodes. Tsopanakis argues that the phenomenon is not prototypical of the Rhodian dialect and excludes the possibility that it can be attributed to contact with the Cretan dialect. Our data show that the phenomenon is not only attested in Northern Rhodes, but in the Southern part of the island too (Messanagros). Future work can not only extend the analysis to other parts of Rhodes, but also compare RhoGr to other south-eastern Greek dialects that exhibit velar palatalization and affrication, such as Cypriot Greek.

To summarize, the results of the present study confirm, using acoustic measurements, the application of velar palatalization and affrication in RhoGr adding to existing literature on Modern Greek and other languages (Kochetov 2011, Baltazani et al. 2016).

## References

- Arvaniti, Amalia. 2007. "Greek phonetics: State of the Art." *Journal of Greek Linguistics* 8:97–208.
- Baltazani, Mary, and Nina Topintzi. 2012. "On some phonetic and phonological properties of the Greek glide." In *Selected Papers of the 10th International Conference of Greek Linguistics*, edited by Zoe Gavriilidou, Angeliki Efthymiou, Evangelia Thomadaki, and Penelope Kambakis-Vougiouklis, 153–166. Komotini/Greece: Democritus University of Thrace.
- Baltazani, Mary, Evia Kainada, Anthi Revithiadou, and Nina Topintzi. 2016. "Vocoid-driven processes: Palatalization and glide hardening in Greek and its dialects." *Glossa: A Journal of General Linguistics* 1(1):1–28.
- Boersma, Paul, and David Weenink. 2015. *Praat: doing phonetics by computer*. [Computer program]. Version 5.4.17. Accessed September 1, 2015. <http://www.praat.org/>.

- Browning, Robert. 1969. *Medieval and Modern Greek*. Cambridge: Cambridge University Press.
- Frantzi, Katerina T. 2016. “CRhoLaV: The Corpus of Rhodian Language Varieties”. *Journal of Foreign Languages, Cultures and Civilizations* 4:8–15.
- Holton, David, Peter Mackridge, and Irene Philippaki-Warbuton 1997. *A Comprehensive Grammar of the Modern Greek Language*. London: Routledge.
- Kochetov, Alexei. 2011. “Palatalisation.” In *The Blackwell Companion to Phonology*, edited by Marc van Oostendorp, Colin Ewen, Elizabeth Hume, and Keren Rice, 1666–1690. Oxford: Wiley Blackwell.
- Kontossopoulos, Nikolaos. 2001. *Διάλεκτοι και Ιδιώματα της Νέας Ελληνικής* [Dialects and Idioms of Modern Greek]. Third Edition. Athens: Gregoris Publications.
- Lengeris, Angelos, and Ioanna Kappa. 2016. “Extreme palatalization and (af)frication of velar consonants in the (western) Cretan dialect.” In *Selected Papers of the 21th International Symposium on Theoretical and Applied Linguistics*, edited by Marina Mattheoudakis and Katerina Nicolaidis, 211–223. Thessaloniki: Aristotle University of Thessaloniki.
- Manolessou, Io, and Nikolaos Pantelidis. 2013. “Velar fronting in Modern Greek dialects.” In *Proceedings of the 5th International Conference on Modern Greek Dialects and Linguistic Theory*, edited by Mark Janse, Angela Ralli, Brian Joseph, and Metin Bagriacik, 272–286. Patras: University of Patras.
- Newton, Brian. 1972. *The Generative Interpretation of Dialect: A Study of Modern Greek Phonology*. Cambridge: Cambridge University Press.
- Nikolou, Kalomoira, Katerina T. Frantzi, and Sevasti Logotheti. 2018. “Παρατηρήσεις στα τοπικά ιδιώματα των Απολλώνων και Σαλάκου Ρόδου [Remarks on the Rhodian varieties of Apollona and Salakos].” In *Proceedings of the 8th International Conference on Modern Greek Dialects and Linguistic Theory*, edited by Angela Ralli, Panajot Barka, Brian Joseph, and Stavros Bompolas, 189–201. University of Gjirokastër and University of Patras.
- Nikolou, Kalomoira, and Katerina T. Frantzi. 2019. “Phonological and morphological aspects of Rhodian Greek: A corpus-based study.” In *Proceedings of the 7th International Conference on Modern Greek Dialects and Linguistic Theory*, edited by Ioanna Kappa and Marina Tzakosta, 156–165. Patras: University of Patras.
- Pantelidis, Christos. 1929. *Η Φωνητική των Νεοελληνικών Ιδιομάτων Κύπρου, Δωδεκανήσου και Ικαρίας* [The Phonetics of the Dialects of Cyprus, Dodecanese and Icaria]. Αθήναι. Reprinted in 1991, *Ελληνική Διαλεκτολογία* [Greek dialectology], τομ. 2 (1990-1991), 137-172. Θεσσαλονίκη: Εκδοτικός Οίκος Αδελφών Κυριακίδη.
- Papachristodoulou, Christodoulos. 1959-1960. *Δημοτικά Τραγούδια της Ρόδου* [Folk Songs of Rhodes]. Ανάτυπον εκ της «Λαογραφίας», Τόμος ΙΗ΄ και ΙΘ΄.
- Revithiadou, Anthi, Giorgos Markopoulos, and Polina Messinioti. 2014. “Derived glides and turbid stress.” Paper presented at the Manchester Phonology Meeting 22, Manchester, May 29-31.
- Trudgill, Peter. 2003. “Modern Greek dialects: A preliminary classification.” *Journal of Greek Linguistics* 4:45–64.
- Tsopanakis, Agapitos. 1940. *Essai sur la Phonetique des Parlers de Rhodes*. Athen: Verlag der Byzantinisch - Neugriechischen Jahrbücher.
- Tsopanakis, Agapitos. 1992. *Ροδιακά Γλωσσοϊστορικά Μελετήματα* [Linguistic and Historical Issues of Rhodes]. Public Library of Rhodes Publications.