Influence of regional tectonics on crustal petrogenesis & eruption style

I. SMET[1]* AND M. ELBURG[2]

[1]Department of Geology and Soil Science, Ghent University, Gent, Belgium (*correspondence: ingrid.smet@ugent.be)

[2]Department of Geology, University of Johannesburg, South Africa (marlina@flintsource.net)

Long-lived subduction of Africa beneath Eurasia led to the complex tectonic setting of Greece and to volcanic activity in the Saronic Gulf. The main centres of this westernmost part of the South Aegean arc, Aegina and Methana, are only 20 km apart and located on similar continental crust. Their dominantly effusive deposits erupted during two distinct periods of volcanic activity: a change in regional tectonics coincided with renewal of volcanism on both Aegina and Methana [1].

The petrography and geochemistry of Methana's effusive deposits suggest that magma mixing between more felsic crystal mushes and mafic injections play a key role in remobilisation and eruption of its magmas. Study of the pyroclastic deposits, however, suggests that a larger mafic replenishment led to partial melting and resorption of hydrous minerals, which in turn triggered a Plinian eruption. (Re-) activation of crustal-scale fault systems seems to have caused this explosive eruption by providing pathways for large volumes of replenishing magmas. The last eruption created a sub-marine volcano NW of Methana on the boundary of a Holocene graben [2] – indicating that regional tectonics are still guiding magmas to the earth's surface. The longevity of Methana's volcanism, the importance of magma mixing and the explosive eruption are thought to reflect a nearby NW-SE oriented (sub)crustal extensional fault system that facilitates and controls magmatic intrusions [3].

Aegina lacks pyroclastic deposits and this centre's volcanic activity ceased shortly after initiation of the area's second volcanic phase. Petrography and geochemistry of its lavas also reveal mafic replenishment of more felsic magmas as a common process, but their petrogenesis is dominated by crystal fractionation. Only during renewal of volcanism, again by partial melting of a more evolved magma due to mafic injection, did magma mixing play a significant role. The volcanic quiescence on Aegina since ca. 2.1Ma, the importance of crystal fractionation and the absence of explosive eruptions reflect a tectonically less active location.

[1] Pe-Piper & Piper (2013) *J Volcanol Geoth Res* **260**, 146-163. [2] Nomikou *et al* (2013) *Tectonophysics* **597-598**, 123-146. [3] Efstathiou *et al* (2013) *EGU General Assembly*, Vienna, Austria, 7-12 April.