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Short scale heterogeneity of the sub-arc mantle beneath the Christina-Santorini-Kolumbo volcanic field (Greece).

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The Christiana-Santorini-Kolumbo volcanic field in the central part of the South Aegean volcanic arc (Greece) results from the northward subduction of the oceanic crust remnant of the African plate beneath Eurasia (continental Aegean microplate) since the Late Cretaceous [1]. The thick sedimentary cover at Hellenic Trench (~8 km) leads to the highest rate of sediment subduction on Earth [2] (10^9 km^3/million years). The geochemistry of volcanic rocks along the arc has highlighted the importance of the subducted sediments in the generation of primitive melts in the highly depleted Aegean mantle wedge [2]. The He isotope signature of the sub-arc mantle and its geographical variations are poorly constrained and a common MORB-type mantle with a $^3He/^4He$ of 7 R_a has been suggested, based on submarine seeps sampled at Kolumbo [3]. Significantly lower $^3He/^4He$ are recorded for Santorini fumaroles and olivines (3 to 4 R_a) 7 km south of Kolumbo that are interpreted as a mix of magmatic and crustal He in the shallow crust [4]. Olivine phenocrysts in arc basalts tend to crystallize in the mantle so the volatiles in melt inclusions record the sub-arc mantle [5]. The low $^3He/^4He$ of olivines from the latest M12 interplinian deposits of the Santorini volcano (3.1 R_a) indicate that the mantle wedge beneath Santorini is polluted by radiogenic He. Using the Sr isotope composition of these olivines ($^{87}Sr/^{86}Sr$ = 0.705785; [6]) it plots on the trend established for Italian arc magmatism [5] . As radiogenic He cannot be derived from the subducted oceanic crust these results are compatible with ^4He ingrowth in the mantle wedge by the sediment melts containing U and Th [5]. This implies strong heterogeneity of the sub-Aegean arc mantle, which had not previously been recognised by He isotopes.

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