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The geochemical signature of Neogene Eastern Mediterranean sediment: evidence for temporal and spatial variations in provenance

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Subducted sediment is one of the main geochemical components in arc magmas. Although an east-west gradient in Eastern Mediterranean Sea (EMS) sediment composition has been evoked to explain the along-arc geochemical variations in Aegean arc magmas [1], solid evidence for E-W changes in EMS sediment composition is lacking. The EMS sediment dataset is limited to Holocene samples, while the sediment currently underneath the volcanic arc has an age of at least 6 Ma. In order to characterise EMS sediment, we have used a combination of thermo-gravimetric and geochemical analyses of 45 Neogene DSDP and ODP drill core samples.
Thermogravimetric dissociation curves provide a rapid way to determine carbonate-content and relative abundance of clay mineral groups in mixed sediment samples. Clear clay mineral distribution patterns are observed in the EMS: smectite is dominant in Nile sediment, aeolian dust consist mainly of kaolinite while illite is present in coarser (shelf) sediment. Four distinct provenance areas can be recognised on the basis of radiogenic isotope and trace element ratios of the EMS sediment samples. In line with previous studies [e.g. 2], we conclude that Sahara dust and Nile sediment are main constituents of EMS sediment. However, we recognize two additional source areas. Sediment derived from Cyprus and/or SW Turkey, characterised by high Ni/Nb ratios, is an important component in Quaternary EMS sediment. Sediment from the Aegean region has an arc signature (e.g. high La/Nb) and is distinguishable only in the Hellenic Trench. During the Neogene, an increase in aeolian dust input to the EMS is observed, which is consistent with the progressive aridification of the Sahara region.
The geochemical characterisation of Neogene EMS sediment and the recognition of distinct provenance areas can be used to assess the contribution of subducted sediment to magmas in the Aeolian and Aegean volcanic arcs. In addition, it allows further high-resolution investigation of climate-induced variations in sediment supply by the Nile river [2] and sapropel formation.

[1] Elburg et al. (2013) Geol. Soc. London spec. pub. 385. [2] Revel et al. (2010), Quat. Sci. Rev. 29, 1342-1362.