

RENDICONTI *Online* della *Società Geologica Italiana*

Volume 31, Supplemento n. 1 - Settembre 2014

The Future of the Italian Geosciences - The Italian Geosciences of the Future

87° Congresso della Società Geologica Italiana e
90° Congresso della Società Italiana di Mineralogia e Petrologia



Abstract Book

Milan, Italy, September 10-12, 2014

edited by: B. Cesare, E. Erba, B. Carmina,
L. Fascio, F.M. Petti, A. Zuccari.



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SOCIETÀ GEOLOGICA ITALIANA
2014

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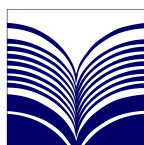
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Mo and stable U isotopes as tracers for subduction components in the Quaternary West-Mediterranean potassic and ultrapotassic magmatism

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Keywords: Mo and U stable-isotopes, geochemical tracers, Italian potassic magmatism.

The central-western Mediterranean is one of the most important areas on Earth for studying subduction-related potassic and ultrapotassic magmatism. In a very restricted area, leucite-free (lamproite) and leucite-bearing (kamafugite, leucitite, and plagioleucitite) ultrapotassic rocks have been emplaced and are associated with shoshonites and high-K calc-alkaline volcanic rocks.

Despite their alkaline characteristics, the least evolved Italian ultrapotassic rocks associated with destructive plate margins invariably show a strong depletion of Nb and Ta along with the highest levels of incompatible trace elements ever seen in any volcanic arc. These characteristics are thought to be derived through the recycling of sediments via subduction within the mantle wedge, and their extreme trace element enrichments make them unique for understanding the roles of different subduction-related metasomatic agents (e.g. silico-clastic vs carbonate). In fact, the variable compositions of the sedimentary materials, subducted along the Adriatic slab and transported into the overlying mantle forming a vein network, could explain the distinct geochemical signature of each Italian magmatic region (Avanzinelli et al., 2009).

We propose to investigate this issue considering two stable isotopic systematics that are perceptive to redox condition-related isotopic fractionation. We measured Mo and stable U isotopes with the high-resolution MC-ICP-MS (Neptune), using a double-spike technique, on selected volcanic rocks from three Italian magmatic provinces and representative samples of subducting sediments.

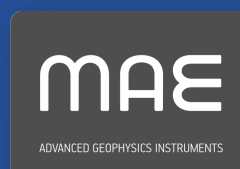
Molybdenum has seven stable isotopes, which have been shown to fractionate during the incorporation into oceanic sediments. Under oxic conditions, Mo adsorbs to particles into the sediment, particularly when Fe-Mn oxides are present, producing lighter isotopic composition ($\delta^{98}\text{Mo}/^{95}\text{Mo}$), whilst is quantitatively removed in anoxic conditions, leaving sediments with a heavier isotopic signature. The recently observed variability in natural $^{238}\text{U}/^{235}\text{U}$ values (different from the widely used “consensus” value of 137.88) due to isotopic fractionation during the redox transition between the U(IV) and U(VI) oxidation states, produces as well as Mo isotopes, a lighter isotopic composition ($\delta^{238}\text{U}/^{235}\text{U}$) in oxic sediments compared to a heavier composition in anoxic sediments. We interpret those results in order to recognize the U and Mo isotopic signature of sediments, with different lithology and chemical composition, recorded into the selected volcanic rocks, and to set new constraints on the metasomatic agents responsible for the transition from silica oversaturated lamproite-like to strongly silica undersaturated HKS magmas.

Avanzinelli R., Lustrino M., Mattei M., Melluso L., Conticelli S. 2009. Potassic and ultrapotassic magmatism in the circum-Tyrrhenian region: Significance of carbonated pelitic vs. pelitic sediment recycling at destructive plate margins. *Lithos*, 113, 213–227.

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