

Contrasting volatile contents in the lunar mantle and anorthosites

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The enrichment of lunar basalts in heavy Zn isotopes has been used to support large-scale evaporation of lunar volatiles in the aftermath of the Moon-forming event [1]. A remarkable property of Zn is that the Zn/Fe ratio does not significantly fractionate during magmatic processes [2], which reflects the very similar ionic radii of the two elements. We measured trace and major elements by LA-ICP-MS in individual mineral grains and basaltic fragments from 17 lunar samples, among which high-Ti and low-Ti basalts, pyroclastics, the Mg-suite, ferroan anorthosites (FAN), breccias and soils. Among the volatile elements, some of them are siderophile (Ge, $T_{50} = 883$ K), some other lithophile (Zn, $T_{50} = 726$ K) or chalcophile (Cu, $T_{50} = 1037$ K)[3]. Here we show that the Zn/Fe ratios in the source of mare basalts is about two orders of magnitude less than in the terrestrial mantle, which demonstrates that the interior of the Moon is very depleted in volatiles. On the other hand, the Zn/Fe ratios of FAN plagioclase are 1-2 orders of magnitude higher than in lunar basalts. Mineral and melt data indicate that plagioclase preferentially incorporates Zn and Cu relative to Fe by more than an order of magnitude. The nearly constant Ge/Si ratios observed for all samples argue against variable Zn/Fe fractionation upon core segregation. A first possibility is that the higher contents of volatile elements in anorthosites relative to the source of mare basalts reflects the preferential uptake of these elements from the magma ocean by crystallizing anorthite. Alternatively FAN may have been derived from a magma ocean distinctly enriched in volatile elements relative to the deep lunar mantle. The non-chondritic Th/U ratio of FAN inferred from their Pb isotopes [4] is representative of their parent melts and suggests that the latter interpretation should probably be preferred.

[1] Paniello R *et al* (2012) *GCA* **42**, 1075-1090. [2] Le Roux V. *et al et al* (2010) *GCA* **74**, 2779-2796. [3] Lodders (2003) *Astrophys. J.* **591**, 1220-1247. [4] Premo *et al* (1999) *Internatinal Geology Review* **41:2**, 95-128.

The URGE project in Italy: The Acerra–Pomigliano-Marigliano conurbation

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The URGE project has as the main objective the production of the geochemical maps of 12 european urban areas using a shared sampling and analytical procedures.

In the framework of the URGE (Urban Geochemistry) project, aiming at the production of the geochemical maps of 12 european urban areas, the north-eastern sector of the Napoli metropolitan area (Italy), namely the Acerra-Pomigliano-Marigliano area has undergone a geochemical characterization based on 145 soil samples collected over an area of 90 sqkm.

This area has been selected on the basis of previous regional studies [1, 2, 3] and because of both the presence of an historical industrial settlement on it (mainly devoted to plastic materials and synthetic fibres production) and of an incinerator which came into operation in March 2009.

The main objective of the study was to define the local geochemical baselines both for 53 elements (among which the toxic ones) and for some organic compounds, including PAHs and OCPs. Furthermore, the study aimed at supporting epidemiological researches and at establishing a record of the actual environmental conditions to evaluate the future impact of the incinerator on both the territory and the public health.

Preliminary results showed that 1) the most urbanized areas of the conurbation are characterized by concentrations of Pb, Zn and V exceeding the trigger limits established by the Italian Environmental law (D.Lgs. 152/2006); 2) agricultural soils, in the surroundings of the urbanized areas, are enriched in Cu, Co, Cd, Be and Ni, 3) in the incinerator area Se, Hg, Cu, Cd and Sb baselines are generally higher than in the rest of the territory.

Furthermore, the PAHs distribution pattern and their diagnostic ratios suggested that the agricultural waste burning in the rural sector of the study area could be a relevant source of pollution.

[1] Albanese *et al* (2007) *JGE* **93**, 21-34. [2] Cicchella *et al* (2008) *GEEA* **8** (1), 19-29. [3] De Vivo *et al* (2006) *Aracne* Editrice, Roma. 324 pp.