Chemical and mineralogical profile of the local wind-blown surface soil contribution to respirable airborne PM in Rome (Italy)

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We present the chemical and mineralogical profile of the respirable fraction of resuspended surface soil contributing to airborne particulate matter (PM) in the southern area of Rome. Mineral dust either from rocks and soil or from human activities share an exchangeable fate in the PBL [1] and result often not separable by receptor modelling. Nevertheless, discriminating among dust contributions is critical both for legislative purposes and for modelling improvement. In this work 12 bulk samples of surface rocks were collected at locations where the various geological lithosomes of the southern area of Rome emerge from soil [2]. From these samples the PM10 fraction was extracted. The PM_{10} soil fraction was analysed by ED-XRF and for single–particle microanalysis by SEM–EDX. The mineralogical content of samples was obtained by XRD. Analytical performances of single-particle microanalysis were evaluated against ED-XRF and XRD results. Single particles were classified for mineralogy, by matching the EDS spectra with the database of the RRUFF and/or of the GEOROC projects [3, 4]. Estimated aerodynamic diameter and size-segregation of the mineralogical classes identified in the PM_{10} soil fraction are discussed.

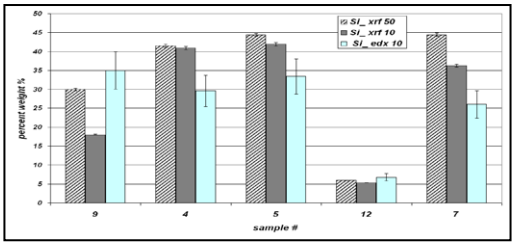

Figure 1: Performance evaluation for the Si determination by field and single-particle SEM-EDX microanalysis.

[1] Korcz *et al*. (2009) *Atm Env* **43**, 1410-. [2] Giordano *et al*. (2006) *J. Volcanol Geotherm Res* **155**, 49–80. [3] Downs (2006) http://rruff.info. [4] Sarbas & Nohl (2006) http://georoc.mpch-mainz.gwdg.de/georoc/Entry.html

Slow mantle upwelling on the margin of the Hawaiian plume based on ^{230}Th-^{238}U disequilibria at Lōih‘i Seamount

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The shield stage of a Hawaiian volcano is dominated by the eruption of tholeiitic basalts, whereas alkalic lavas are commonly erupted during the submarine pre-shield stage. Geochemical studies (e.g. [1]) relate this difference in lava chemistry to an increase in the degree of partial melting as the volcano drifts onto the Hawaiian mantle plume. We present high-precision U-series isotopic measurements for sixteen volcanic glasses from Lōih‘i Seamount to examine the time scale of the melt generation process during the pre-shield stage of a Hawaiian volcano. All of the samples have small amounts of excess ^{234}U (~0.2-1.0%) due to contamination with seawater-derived U (with ~14.6% excess ^{234}U). These signatures cannot be explained by syn- or post-eruptive interaction between lava and seawater. Instead, mantle-derived magmas at Lōih‘i are probably contaminated by hydrothermally altered rocks within the volcanic edifice. These altered rocks were likely enriched in U that was precipitated from seawater-derived hydrothermal fluids in the region above the volcano’s magmatic plumbing system. The Lōih‘i glasses display a wide measured range in the amount of excess ^{230}Th from ~1-7% (due to the addition of seawater-derived U) that overlaps with lavas from the nearby shield-stage volcano, Kīlauea (~2% excess ^{230}Th [2]). We correct the ^{230}Th-^{238}U disequilibria of the Lōih‘i glasses back to their pre-contamination values using their ^{234}U-^{238}U disequilibria and a simple mass-balance calculation. This correction suggests that mantle-derived magmas at Lōih‘i have a narrow range of ~6-9% excess ^{230}Th, which is significantly larger than observed at Kīlauea. This difference is consistent with the idea that Lōih‘i is tapping mantle that is upwelling slowly (~5-6 cm/yr) on the margin of the Hawaiian plume. This rate is at least an order of magnitude slower than the 50-1000 cm/yr range inferred for the mantle beneath Kīlauea [2].

[1] Garcia *et al*. (1995) *J. Petrol*. **36**, 1647–1674. [2] Pietruszka *et al*. (2001) *EPSL* **186**, 15–31.