Aerosol modifications observed at Mt. Cimone (Italy) during the Eyjafjallajokull eruption in 2010

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Measurements of physical and chemical properties at the Mt. Cimone GAW-WMO Global Station (2165 m a.s.l.) allowed the detection of two volcanic transports occurred during the Eyjafjallajökull Icelandic volcano eruption in Spring 2010. Both episodes were characterized by an abrupt increase of fine and especially coarse mode particles number, with a consistent ash mode at an optical diameter of about 2.5 μm and an accumulation mode peaking at 0.2 - 0.3 μm. To figure out whether and to what extent the local aerosol mass was influenced by the transported volcanic ash the chemical composition of filter samples was derived from different analytical techniques (Ionic Chromatography, PIXE-PIGE and ICP-OES) showing a fine fraction dominated by sulphates and a coarse fraction of mainly crustal origin with a composition in good agreement with that of volcanic ash collected at the eruption site. The concentrations of selected elements (Ti, Al, Fe, Mn) allowed to estimate a volcanic plume contribution of about 10 $\mu g\ m^{-3}$, corresponding to about 40% of the total PM10 mass on 18 May, the most intense of the two events. A comparison with contributions observed in other parts of Europe is presented.

Characteristics and genesis of ion-adsorption type REE ores

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Ion-adsorption type REE deposits are the predominant source of HREE and Y in the world, and they have been economically mined only in South China. In order to elucidate the genesis of the deposits, we review petrochemistry of parent granites of ion-adsorption ores, and geochemical and mineralogical characteristics of the ores.

The REE deposits in China consist of weathered granites called ion-adsorption ores which have over 50 % of ion-exchangeable REY relative to whole-rock REY [1, 2]. The parent granites of the deposits are generally characterized by metaluminous to weakly peraluminous (ASI < ~1.1) compositions and low P_2O_5 contents (< 0.08 %). The granites contain allanite, titanite and REE fluorocarbonates (e.g., synchysite), which are degraded by chemical weathering, and they are poor in insoluble REE phosphates (monazite and xenotime). The HREE-rich granites are particularly fractionated and underwent deuteric alteration associated with mineralization of REE fluorocarbonates. The LREE/HREE ratios of ion-adsorption ores are constrained by nature and occurrences of these REE-bearing minerals in the granites.

The REE-bearing minerals in granites are degraded by low-pH soil water near the surface, and REE are transported downward in a weathering profile. REE are transported by complexing with humic substances and (bi)carbonate ions or as free ions in soil and ground water at low to near-nuetral pH. REE are immobilized by adsorption or incorporation into secondary minerals due to pH increase resulting from the contact of the soil water with rock-forming minerals or higher-pH ground water. Ce is mostly immobilized as CeO_2 by oxidizing from Ce^{3+} to Ce^{4+} near the surface. The other REE^{3+} are most likely to be adsorbed on the surfaces of kaolinite, halloysite and illite because of their points of zero charge and abundances in the ores. As a result, the weathering profile of the deposits is divided into a REE-leached zone of the upper part of the profile with positive Ce anomaly and a REE-accumulation zone (ion-adsorption ores) in the lower part with negative Ce anomaly. The occurrence of ion-adsorption ore is estimated by the negative Ce anomaly which is positively correlated with ion-exchangeable REE [2].

[1] Bao & Zhao (2008) *Ore Geol. Rev.* **33**, 519-535. [2] Sanematsu et al. (2013) *Miner. Deposita* **48**, 437-451.

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