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Emission of trace halogens (Br, I) from a basaltic volcano: Mount Etna

A. Aiuppa (1), C. Federico (2), A. Franco (1), G. Giudice (2), S. Guerrieri (2), M. Liuzzo (2), and M. Valenza (1)

(1) CFTA, Università di Palermo, Palermo, Italy

(2) INGV, Sezione di Palermo, Palermo, Italy

aiuppa@unipa.it / Fax : 39 091 6168376

The volcanogenic contribution to the global atmospheric budget of bromine and iodine is poorly constrained (Cadle, 1980; Bureau et al., 2000; Halmer et al., 2002; Bobrowski et al., 2003). The few reliable determinations of bromine and iodine abundance in volcanic gases (Sugiura et al., 1963; Honda et al., 1966; Honda, 1970; Snyder et al., 2002; Snyder and Fehn, 2002; Bobrowski et al., 2003; Gerlach, 2004) suggest that volcanic degassing may play a determining role in the atmospheric cycling of these environmentally-important species. Bureau et al. (2000), based on their experimental investigation of fluid/melt partition coefficient in albitic melts, estimated bromine yield of volcanic eruptions ranging from $\sim$0.1 to $>$33,000 kt. The Br contribution from passive degassing by quiescent volcanoes is, on the other hand, poorly constrained. Determinations of iodine fluxes from volcanoes are even more scanty, and limited to arc tectonic settings (i.e., White Island, New Zeland, 7 t/yr, Tedesco and Toutain, 1991; Satsuma-Iwojima, Japan; 12 t/yr, Snyder et al., 2002; Poas, Costarica, Central America, 7.6 t/yr, Snyder and Fehn, 2002).

In this note, we present a very first systematic record of bromine and iodine content in the quiescent volcanic plume of Mount Etna, periodically monitored over 2004 by in-situ filter-pack sampling. The contemporaneous determination of major halogens (HCl, HF) and SO_2 provides evidence for the typical Etna's plume signature (e.g., S/Br $\sim$ 0.5-6$\cdot 10^3$; S/I 0.6-2.3$\cdot 10^5$ on molar basis), and offers important clues on bromine and iodine behaviour upon shallow-depth magmatic degassing at a basaltic volcano. The acquired compositional data, combined with spectroscopic measurement of SO_2

emission rates, allows an assessment of bromine and iodine fluxes from Etna volcano.