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Time-related variation of volatile contents of Western Ghats volcanic formations, Deccan, India

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Deccan volcanism in India covered more than 1 million square km and reached a maximum thickness of about 3 km, as presently preserved in the Western Ghats volcanic lava piles. Volcanic activity started at about 66.4 Ma (Jawhar formation) and ended at about 65.5 Ma (Mahabaleshwar unit; Renne et al., 2015). Deccan volcanism straddled the Cretaceous-Paleogene boundary (ca. 66.0 Ma) and possibly contributed to the end-Cretaceous mass extinction event through emission of gases such as SO₂, CO₂, Cl, F that may have triggered global climate changes. Severe pollution by volcanic gases is supported by the high S and Cl contents (up to 1400 and up to 900 ppm, respectively; Self et al., 2008) measured in a few olivine- and plagioclase-hosted melt inclusions from the Jawhar, Neral, and Thakurvadi Formations (early lava flows, ca. 66.3-66.4 ± 0.1 Ma; Renne et al., 2015) and by magmatic S contents (up to 1800 ppm; Callegaro et al., 2014) calculated from S measurements in clinopyroxenes from the Mahabaleshwar unit (ca. 65.5 ± 0.1; Schoene et al., 2015). Here, we present new analyses of S, Cl, and F, obtained by ion-probe and synchrotron light micro-fluorescence analyses on clinopyroxenes and plagioclase phenocrysts from lava flow units of the Western Ghats. The volatile contents of the host magmas have been calculated from recently published clinopyroxene/basalt partition coefficients. These new data will describe the time-related variation of volatile elements hosted and eventually emitted by Deccan lavas and shed light on their environmental impact.

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