

Degassing pathways through the shallow magmatic-hydrothermal system of Poás Volcano (Costa Rica)

Spampinato L.^{1,2}, Salerno G.G.^{1,2}, Martin R.S.³, Sawyer G.M.⁴, Ramírez C.⁵, Ilyinskaya E.², and
Oppenheimer C.²

1. *Istituto Nazionale di Geofisica e Vulcanologia, sezione di Catania, piazza Roma, 2, 95123, Catania, Italy.*
2. *Department of Geography, University of Cambridge, Downing Place, Cambridge, CB2 3EN, United Kingdom.*
3. *Department of Earth Sciences, University of Cambridge, Downing Place, Cambridge, CB2 3EQ, United Kingdom.*
4. *Laboratoire Pierre Süe, CNRS-CEA, CE-Saclay, 91191 Gif/Yvette, France.*
5. *Centro de Investigaciones Geofísicas, University of Costa Rica (UCR), 1000 San Jose', Costa Rica.*

We report results from a multidisciplinary campaign carried out at Poás crater-lake (Costa Rica) on 17-18 March 2009. Thermal imagery of fumaroles on the north side of the dome and the lake surface revealed mean apparent temperatures of 25-40°C (maximum of 80°C), and 30-35°C (maximum of 48°C), respectively. Mean radiative heat output of the lake, uncorrected for downwelling flux, was estimated as ~230 MW. The mean SO₂ flux emitted by the crater measured by walking-traverses was 76 tonnes day⁻¹, with approximately equal contributions from both the dome and the lake and fumarole plumes. Gas measurements by active open-path FTIR spectroscopy indicated molar ratios of H₂O/SO₂ = 151 and CO₂/SO₂ = 1.56. HCl and HF were not detected in measured spectra but based on the detection limits of these species, we calculate SO₂/HCl > 40, and SO₂/HF > 200. Particles were sampled from the plume by air filtration. The filters were analysed using ion chromatography, which revealed an abundance of K⁺ and SO₄²⁻, with smaller amounts of Ca²⁺, Mg²⁺ and Cl⁻. We discuss here the implications of the results for degassing pathways through the shallow magmatic-hydrothermal system.

Keywords: Thermal imagery, SO₂ flux traverses, FTIR measurements, Particle composition, Poás volcano