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First volcanic CO_2 budget estimate for three actively degassing volcanoes in the Central American Volcanic Arc

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CO_2 is a key chemical tracer for exploring volcanic degassing mechanisms of basaltic magmatic systems (1). The rate of CO_2 release from sub-aerial volcanism is monitored via studies on volcanic plumes and fumaroles, but information is still sparse and incomplete for many regions of the globe, including the majority of the volcanoes in the Central American Volcanic Arc (2). Here, we use a combination of remote sensing techniques and in-situ measurements of volcanic gas plumes to provide a first estimate of the CO_2 output from three degassing volcanoes in Central America: Turrialba, in Costa Rica, and Telica and San Cristobal, in Nicaragua. During a field campaign in March-April 2013, we obtained (for the three volcanoes) a simultaneous record of SO_2 fluxes (from the NOVAC network (3)) and CO_2 vs. SO_2 concentrations in the near-vent plumes (obtained via a temporary installed fully-automated Multi-GAS instrument (4)). The Multi-GAS time-series allowed to calculate the plume CO_2/SO_2 ratios for different intervals of time, showing relatively stable gas compositions. Distinct CO_2 - SO_2 - H_2O proportions were observed at the three volcanoes, but still within the range of volcanic arc gas (5). The CO_2/SO_2 ratios were then multiplied by the SO_2 flux in order to derive the CO_2 output. At Turrialba, CO_2/SO_2 ratios fluctuated, between March 12 and 19, between 1.1 and 5.7, and the CO_2flux was evaluated at $\sim$1000-1350 t/d (6). At Telica, between March 23 and April 8, a somewhat higher CO_2/SO_2 ratio was observed (3.3 $\pm$ 1.0), although the CO_2 flux was evaluated at only $\sim$100-500 t/d (6). At San Cristobal, where observations were taken between April 11 and 15, the CO_2/SO_2 ratio ranged between 1.8 and 7.4, with a mean CO_2 flux of 753 t/d. These measurements contribute refining the current estimates of the total CO_2 output from the Central American Volcanic Arc (7).

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