Refining the approach for volcanic CO2 output estimation at San Cristobal volcano

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The estimation of carbon budget for an entire convergent margin depends on the approach for each single volcano across a targeted volcanic arc segment. We attempt to improve the method for quantifying the CO_2 output at San Cristobal volcano (Nicaragua) with crater plume gas measurements combined with preliminary melt inclusion records of pre-eruptive dissolved volatile abundances. Samples were taken from olivines collected from fine ashes and scoria deposits of explosive eruptions from Holocene to the 1971-present eruptive cycle at San Cristobal volcano (VEI= 1-3). During a stage of quiescent degassing, the H_2O-CO_2-SO_2 volcanic gas plume composition of San Cristobal has been measured with an electrochemical/NDIR(Multi-GAS) and UV-DOAS instruments in the field, showing a degassing mechanism dominated by H_2O (85-97 mol%; mean of 92%), and by CO_2 (2-12 mol%; mean of 6%; 523 +/- 263 t/d fluxes) and SO_2 (3-5 mol%; mean of 3.8%; 181 +/- 35 fluxes). The actual volatile content measured by mFTIR and NanoSIMS on melt inclusion are quite low and represent the initial gas mixture environment with 0.04 % CO_2 and 2.1% H_2O. Based on a detailed textural melt inclusion assemblage description with optic microscopy, SEM and Raman spectroscopy, we were able to determine the occurrence of chemical changes inside melt inclusions and thus, the existing approaches for re-adding/correcting CO_2 content in melt inclusions cannot be applied in a simple way because of various complexities linked to post-crystallization effects. Such effects on the melt inclusion environment should be taken into account during the CO_2 output mass estimation.