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Experimental monitoring of iodine degassing from basaltic volcanic systems

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Despite its low abundance in natural magmas, volcanic iodine released to the atmosphere has a strong impact on ozone destruction. To better understand and quantify the iodine contribution of natural volcanic degassing to the atmosphere, we have experimentally studied iodine partitioning between a fluid phase and a natural basaltic melt at high pressure P and temperature T, under hydrous and anhydrous conditions during decompression. Experiments were performed in situ in externally heated and gas membrane driven diamond anvil cells combined with laser heating in order to reach the solidus of the basalt. To study degassing under hydrous conditions, an iodine-bearing basaltic glass was loaded in the DAC together with water as the pressure medium, to study degassing under anhydrous conditions, the same glass was loaded together with pure CO_2 as the pressure medium. For each pressures (0.3 to 1.9 GPa) and temperatures (1300 to 1660°C) iodine was measured in the fluid and in the melt by using synchrotron X-Ray Fluorescence analysis at the Id27 beamline ESRF. From the iodine concentrations (iodine) at each P,T step, partition coefficients between an aqueous fluid (f) and a melt (m) are calculated from the equation: $D_{iodine}^{f/m} = (iodine)_f/(iodine)_m$.

Results will be discussed and compared with previous experimental studies and with volcano degassing monitoring for halogens. An estimation of the outgoing iodine volcanic flux in the atmosphere will be proposed.