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An experimental study to determine the solubility of C-H-O-S volatiles in basaltic melts.

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Arc volcanism is known for his dangerousness, because of his high content of volatiles. Major volatiles present in magmatic liquids are C, H, O, S, forming the major gases emitted by volcanoes: H_2O, CO_2, and SO_2 and/or H_2S, depending on f_{O2}. A significant amount of work has been done to define the solubility laws of H_2O, CO_2 and S in silicic melts. However, such data are still scarce for basaltic liquids. To remedy this gap, we are conducting experiments on basaltic liquids at 1050˚C and 1200˚C, at pressures varying between 250 and 2000 bar in oxidized (NNO+2) or reduced (NNO-1) conditions, using an IHPV equipped with a system of rapid quench. Basaltic compositions from Vesuvius, Etna and Stromboli are equilibrated with an H_2O, H_2O+ CO_2, H_2O+S or H_2O+CO_2+S rich fluid phase. After a rapid quench, H_2O and CO_2 dissolved in the glasses are analyzed using both KFT and FTIR. Major elements and sulphur contents are determined by electron microprobe analyses. The comparison of our results with studies carried out on MORBs (Dixon et al. 1995) or on other basaltic compositions (Berndt et al., 2002), shows that there is no significant effect of composition on water solubilities under these experimental conditions. In contrast, the CO_2 content of basaltic melts is strongly dependent on its composition, and this dependence increases with pressure (at 2kbar basalt from Vesuvius (7,39% Na_2O+K_2O) dissolves 3900 ppm of total carbon whereas a basalt from Etna (5.38% Na_2O+K_2O) or from Stromboli (4.20% Na_2O+K_2O) dissolves less than 2000 ppm). Microprobe analyses show that, at near H_2O saturation, sulphur contents increase strongly with pressure (from 2500 ppm at 250 bar, to 6700 ppm at 2000 bar for Etna and Stromboli compositions at NNO+2). Basaltic melts dissolve more S under oxidized conditions than under reduced conditions. First results obtained on basaltic liquids equilibrated with an H_2O+CO_2+S rich fluid phase show that the C/S ratio in-

creases strongly with pressure and alkalies content of the melt.