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Pre–eruption conditions of Minopoli2 shoshonitic magma from melt inclusions and experimental studies

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Minopoli_2 eruption occurred in the first epoch of Campi Flegrei Caldera (Italy) activity (10.3-9.5 ka). The products of this eruption are shoshonite and represent the less evolved magma composition erupted in the caldera. New constraints on magma pre-eruption conditions and dynamics are provided by geochemical investigation on melt inclusions (MIs) and experimental studies. Measurements of dissolved H_2O and CO_2 in phenocrysts-hosted MIs were performed using FTIR spectroscopy. Water contents vary from 0.3 to 3.5 wt% and CO_2 contents range from 40 to 910 ppm. Minimum pressures of entrapment calculated from MIs data ranges from 140 to 245 MPa, corresponding to depths of 5 – 9 Km. Low pressure trapping ranges from 37 to 50 MPa, corresponding to depths of 1.5 – 2 Km. Thus, the pre-eruption magma is interpreted to be water and CO_2-rich and to have equilibrated in a shallow magma chamber prior to eruption. The sulphur speciation in glassy MIs is determined as $\geq$ 79% sulphate which is equivalent to a log $fO_2 \geq$ NNO + 1.5. The low end of the fO_2 range is interpreted to represent the pre-eruption magma at depth. Phase equilibrium experiments dry and with 3.5wt% H_2O have been done guided by the dissolved H_2O in MIs. The phase equilibria of this shoshonite shows that the observed phenocryst assemblage (olivine, Ca-pyroxene, plagioclase and biotite) is stable at a temperature 1020$\pm$15 ˚C over the pressures range of 40 to 150 MPa and to higher pressures. Based on the MIs data for volatiles and the experiments, it is concluded that the shoshonite cristallised the phenocryst assemblage (15 vol%) at a depth of 9 Km and 1025 ˚C; only small degrees of additional crystallization occurred as the magma ascended to a depth of 2 Km with degassing of some MIs. These results can contribute to the understanding of magma chamber processes and conduit dynamics, relevant parameters for hazard assessment.