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Insights into the Oxidation State of Arc Magmas from the Xenolith Suite Sangeang Api Volcano, Eastern Indonesia.

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At ΔlogQFM +2.5 $\pm$ 1 arc magmas are significantly more oxidized than MORB (ΔlogQFM 0 $\pm$ 0.5, Cottrell and Kelley, 2011). The origin of this oxidized state remains controversial, either due to oxidation of the mantle wedge source, or to processes operating as these volatile-rich magmas ascend to upper lithospheric pressures? Sangeang Api is an active volcano in the eastern Sunda Arc in the strait between the islands of Sumbawa and Flores. Its lavas are shoshonitic with silica undersaturated alkalic composition and transport abundant co-genetic, cumulate pyroxenite and gabbroic xenoliths. Lavas and xenoliths all contain pargasite to Mg-hastingite amphibole. Applying the formulations of Ridolfi, et. al. (2012) these yield a continuous range of pressure estimates from 975MPa to 340MPa representing crustal level crystallisation from the Moho at 34km up to 12km. Temperature estimates (1072-976˚C) and water content (6.51 to 3.15wt.%) both decline continuously with depth. fO_2 estimates range from ΔNNO+0.2 to +1.2 and show an initial trend of oxidation from the Moho up to $\sim$ 500MPa and then dominated by lava's phenocrysts revert to a trend of reduction at the shallower depths. Cl in amphibole increases from the Moho up to 500MPa and then abruptly declines. The data imply continuous mixed CO_2-H_2O fluid saturation at all depths from the Moho up with declining CO_2/H_2O from the Moho up to $\sim$500 MPa. Magma bodies emplaced shallower than $\sim$17km exsolve a near pure hydrous fluid to which Cl and S strongly partition. We conclude that in this example arc magmas rise to the crust in a moderately oxidized state and then undergo complex oxidation histories coupled to volatile saturation.