Geophysical Research Abstracts, Vol. 5, 01660, 2003


# OXIDIZED, SULFUR-RICH MAFIC MAGMA AT MOUNT PINATUBO, PHILIPPINES

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Basaltic fragments erupted during the early stages of the 1991 Mount Pinatubo eruption contain small euhedral amphiboles, which grew during mixing of the basalt with dacite in a shallow magma reservoir. The amphiboles contain abundant melt inclusions, the most primitive of which contain high S (>1700 ppm). The basaltic fragments also contain Fo-rich, Cr-spinel-bearing olivine. Spinel-olivine oxybarometry suggests that the mafic magma was intrinsically oxidized (NNO+1.4) and comparable to the oxidation state of the dacitic magma (NNO+1.6). Therefore, mixing between felsic and mafic magmas was not accompanied by a significant change in oxidation states. Instead, the oxidized state of the dacitic magma likely reflects that of parental mafic magma and the source region of the sub-arc mantle. Oxidized mafic melt is an efficient medium in transferring S from the mantle to shallow crustal levels and the atmosphere, as it can effectively scavenge sulfide from the source mantle and will discharge $SO_2$ during ascent. At Pinatubo, the $SO_2$ discharged from mafic magma was incorporated into the felsic magma and immiscible aqueous fluids and was likely the source of S that was discharged to the atmosphere during the cataclysmic eruption. The findings from Mount Pinatubo suggest that the sub-arc mantle is locally oxidized, that basaltic magmas are not necessarily reduced and that oxidized felsic magmas in arcs likely reflect the oxidized state of the sub-arc mantle. Higher than average sulfur fluxes can be expected in these regions.