Petrogenesis of high-Mg andesites, Simbo Volcano, Solomon Islands: evidence for slab melt contributions

S. KÖNIG[1], S. SCHUTH [1,2], C. MÜNKER[2], C. QOPOTO [3]

[1] Institut für Mineralogie Münster, Germany; muchacho@uni-muenster.de [2] Mineralogisch-Petrologisches Institut Bonn, Germany [3] Department of Mines and Energy, Honiara, Solomon Islands

High-Mg andesites are typically confined to regions where (1) shallow refractory mantle is molten or (2) where slab-derived adakitic melts interact with mantle peridotite. We report new major, trace element, and Sr-Nd-Hf-Pb isotope data for high-Mg andesites from Simbo island, in the Solomon island arc, which is located in a unique tectonic setting, directly within the subduction trench.

Volcanism in the Solomon islands was initiated by subduction of the Pacific plate beneath the Indian-Australian plate until a revearsal of subduction polarity occurred ca. 10 Ma ago. Geophysical evidence, however, indicates the presence of a fossil Pacific slab. Currently, the Indian-Australian plate is subducted northeastwards along the San Cristobál trench, forming the younger south-western Solomon island arc. The active volcano Simbo is located on top of a triple junction between the San Cristobàl trench and a strike-slip fault of the adjacent Woodlark spreading center which is subducted [1].

Compositions of volcanic rocks from Simbo are in marked contrast to those of volcanic rocks from islands north of the trench in that they are opx-bearing high-Mg andesites with high SiO_2 compositions (60–62 wt. %), but rather primitive Mg–Ni-Cr characteristics (4–6 wt% MgO, 65 ppm Ni, 264 ppm Cr, Mg# 67–75). Relict olivine phenocrysts with Fo_{88-90} and reaction-rims of opx indicate mixing of a silicic melt with a mafic endmember. Trace element modeling identifies back-arc basalts from the Woodlark ridge as mafic endmember. Elevated Gd_N/Yb_N of up to 2.2 in the silicic endmember are relatively high compared to typical arc rocks, suggesting a slab melt origin.

$^{87}Sr/^{86}Sr$, εNd and εHf values in all analyzed rocks range from 0.7035 to 0.7040, +6.4 to +7.9 and +12 to +14.4, respectively. These values reveal the presence of the Australian-Indian type mantle domain beneath Simbo, similar to all other volcanic islands of the New Georgia group. $^{206}Pb/^{204}Pb$, $^{207}Pb/^{204}Pb$ and $^{208}Pb/^{204}Pb$ values (18.43 to 18.52, 15.49 to 15.55 and 18.13 to 18.34, respectively) that are correlated with $Gd_{(N)}/Yb_{(N)}$ confirm the presence of slab melts originating from the fossil subducted Pacific plate. The influence of the Pacific slab-melts decreases when approaching the active San Cristobál trench in northern Simbo.

References [1] Yoneshima et al. (2005) *Tectonophys.* 3**97,** 225-239. [2] Schuth et al. (2004) *CMP* **148,** 288-304.