High-Mg# andesites and basalts from the Kamchatka-Kurile subduction system: Implications for primitive arc magma genesis and mantle wedge processes

Details

Meeting	2007 Fall Meeting
Section	Volcanology, Geochemistry, Petrology
Session	From the Arc to the Back-Arc: Linking Geochemical and Geophysical Observations With Geodynamic Models of the Mantle Wedge I Posters
Identifier	V43D-1628
Authors	Bryant, J A*, Department of Geological Sciences, University of South Carolina, 700 Sumter Street, Columbia, SC 29208, United States Bryant, J A*, Electron Microscopy Center, University of South Carolina, 715 Sumter Street, Columbia, SC 29208, United States Yogodzinski, G M, Department of Geological Sciences, University of South Carolina, 700 Sumter Street, Columbia, SC 29208, United States Churikova, T G, Institute of Volcanology and Seismology Far East Division, Russian Academy of Sciences, 9 Piip Avenue, Petropavlovsk, 683006, Russian Federation Volynets, O N, Institute of Volcanology and Seismology Far East Division, Russian Academy of Sciences, 9 Piip Avenue, Petropavlovsk, 683006, Russian Federation
Index Terms	Subduction zone processes [3060] Subduction zone processes [8170] Subduction zone processes [8413]

Abstract

Primitive arc magmatism and mantle wedge processes are investigated through a petrologic and geochemical study of high Mg# (Mg/Mg Fe>0.65) basalts and andesites from the Kurile-Kamchatka subduction system. The primitive andesites are from the Shisheisky complex (Portnyagin et al., AGU Monograph 172, 2007), a field of Quaternary-age, monogenetic cones located in the Aleutian-Kamchatka junction, north of Shiveluch Volcano, the northernmost active composite cone in Kamchatka. The Shisheisky lavas are similar to primitive andesites from Mt. Shasta, Piip Volcano, and Setouchi, Japan. They have Mg# of 0.66-0.73 at intermediate SiO2 (54-58 wt%), low CaO/Al2O3 (<0.54), and high Ni (184-243 ppm) and Cr (418-880 ppm). Olivine phenocryst core compositions of ~FO90 appear to be in equilibrium with whole-rock `melts', consistent with the aphyric to sparsely phyric nature of these lavas. Compared to the Shishiesky andesites, primitive basalts from the region (Alaid, Tolbachik, Kharchinsky) have higher CaO/Al2O3 (0.69-0.86), and lower whole-rock Ni (105-182 ppm), Cr (395-531 ppm), and Ni/MgO (10-17) at similar Mg# (0.66-.70). Olivine phenocrysts in the basalts have similarly higher CaO, lower Ni, and lower Ni/MgO at ~FO88 compared to the andesites. The absence of plagioclase phenocrysts from the primitive andesites strongly contrasts petrographic observations of the plagioclase-phyric basalts, indicating relatively high pre-eruptive water contents for the andesites compared to the basalts. Petrographic and mineral composition data suggest that the Shisheisky primitive andesites were liquids in equilibrium with mantle peridotite,

and were not produced by mixing between primitive basalts and evolved felsic magmas or from contamination by xenocrystic olivine. The key features of the Shisheisky primitive andesites (e.g., low CaO/Al2O3 and high Ni/MgO at high Mg#) appear to have been acquired at sub-moho depths, by processes and under physical conditions in the mantle wedge (lower temperatures, higher water contents), which were distinct from those that produced primitive basalts in the region.

Cite as: Author(s) (2007), Title, *Eos Trans. AGU, 88*(52), Fall Meet. Suppl., Abstract V43D-1628