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Titanium isotopic insights into partial melting versus magma mixing in the Aleutian arc

EMMA G. LING[1], SARAH M. AARONS[1], ZHE JAMES ZHANG[2], LINQING HUANG[1], ALEISHA JOHNSON[3], NICOLAS DAUPHAS[2], GENE YOGODZINSKI[4] AND PETER B KELEMEN[5]

[1]Scripps Institution of Oceanography, University of California San Diego
[2]The University of Chicago
[3]University of Arizona
[4]University of South Carolina
[5]LDEO, Columbia University

Presenting Author: eling@ucsd.edu

Titanium (Ti) isotopes are a well-established tracer of magmatic differentiation, [1] capable of providing useful insight into the magma series (e.g., calc-alkaline versus tholeiitic) and geodynamic setting [2,3]. In this study, we use a suite of samples from two relatively modern, well-characterized sites from the Aleutian arc thought to have little to no influence from subducted sediment in the source of the arc magmas [4,5,6] to probe how formation processes (e.g., partial melting versus fractional crystallization/magma mixing) impacts the measured Ti isotope compositions. We present Ti isotopic compositions for 18 volcanic samples from two Aleutian arc sites; Western Aleutian Seafloor Lavas from the Ingenstrem Depression, thought to have formed through partial melting of Mid-Ocean Ridge Basalt (MORB) in eclogite facies, and lavas from Korovin volcano on Atka Island, formed from fractional crystallization and/or magma mixing. Samples from the Ingenstrem Depression span a narrow range in Ti isotopic composition (δ^{49}Ti = +0.031 to +0.147‰) with a relatively muted trend in isotope fractionation with respect to increasing silica content (50.41 to 66.30 wt%) whereas the samples from Korovin volcano span a larger range (δ^{49}Ti = -0.021 to +0.355‰) and more pronounced Ti isotopic fractionation with increasing silica content (50.38 to 64.09 wt%). We use thermodynamic isotopic modeling (using THERMOCALC software 3.53c [7]) following previously established methods [8] to demonstrate that the rocks from Ingenstrem Depression were formed through partial melting of MORB in eclogite facies and rocks from Korovin Volcano are likely formed by magma mixing of a mafic and andesitic endmember.

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