# Are sediments recycled in the Kamchatkan Arc? Constraints from ODP sediment cores

Annie B. Kersting, Institute of Geophysics and Planetary Physics, Lawrence Livermore National Laboratory

In efforts to improve our understanding of the chemical evolution of our Earth, geochemists have focused on areas where the major chemical fractionation and mass recycling occurs. These areas, called subduction zones, underlie island arc volcanic regions where ocean crust is subducted into the Earth's mantle. Island-arc volcanism is thought to be the major process by which magma and gases are transferred to and form part of the Earth's crust and atmosphere. Understanding the ongoing chemical exchange at the Earth's surface between the crust, mantle and atmosphere help us to define how these fluxes influence crustal growth and climate dynamics. Questions exist regarding the extent to which subducted oceanic sediments are recycled into the arc crust and their impact on long-term chemical budgets.

The objective in this study was to determine the chemical fluxes involved in the recycling in island arcs, by mass balancing the trace-element and isotopic input of the North Pacific sediments and the chemical output from primitive basaltic volcanoes in Kamchatka. In general, the large difference in the concentration and isotopic ratios of Pb between the mantle and oceanic sediments makes it a particularly sensitive tracer to the presence of oceanic sediment in the recycling process. Pb isotopes were measured on basaltic rocks from four Kamchatkan volcanoes and samples selected from sediment cores collected parallel to the arc during ODP Leg 145. The recovery by advanced piston coring of complete, undisturbed sediments make it possible to evaluate their lateral and vertical chemical homogeneity.

The Pb isotopic ratios of the Kamchatkan lavas define a narrow range that overlap with Pacific Mid Ocean Ridge Basalts (MORB) values and are the least-radiogenic island-arc basalts measured to date (see figure) [*Kersting and Arculus,* 1995]. The isotopic composition of the mantle is represented by MORB. In contrast, the Pb isotopic ratios of the Pacific sediments are much more radiogenic (elevated) than the Kamchatkan basalts [*Kersting,* 1995]. Mass-balance calculations, which consider the possible amount of sediment that could have been added to the basalts, limit the contribution of these sediments to less than 1%. These data suggest that the Kamchatkan arc represents an "end-member" whereby little or no sediment is involved in terms of elemental recycling and thus sediments not required for arc magmagenesis.

References:

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