Hf mobility and immobility in subduction zones

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The combination of shallow Nd-Hf isotope trends above the Terrestrial Array and negative Hf concentration anomalies (i.e., Hf/Sm < 0.66) is common in many Western Pacific arcs but not yet understood. Nd-Hf isotope ratios for these arcs overlap those of Indian Ocean MORB, and often do not require Nd or Hf from a subduction component. Sometimes they are consistent with the addition of a sediment-sourced subduction component with a high Nd/Hf ratio such as a fluid or a sediment partial melt with residual trace accessory phases. The latter is favored when the negative Hf concentration anomalies are large but the isotope displacement from the Terrestrial Array is small. New Nd and Hf isotope and trace element data will be presented for basalts from the Kurile, Izu, Mariana, and Kermadec arcs. Most show positive correlations between eHf, eNd, and Hf/Sm ratios. Rear-arc volcanoes generally usually have lower eNd and eHf and sometimes by smaller Hf/Sm ratios than arc-front volcanoes. Within the Mariana arc-front volcanoes, samples from fluid-dominated volcanoes (Guguan and Maug) have higher ratios, whereas samples from sediment-melt dominated volcanoes (Sarigan and Anatahan) have lower ones. These data are consistent with mixing between a fluid-enriched depleted mantle and a partial melt of subducted sediment that is saturated with trace accessory phases including zircon, monazite, and rutile. The sediment contribution to the source of NW Pacific arcs is greatest in the Marianas which is consistent with its steeper angle of subducting slab. The sediment contribution within the Kermadecs increases north to south and extends into the Havre Trough. Regardless of whether sediment is contributed to arcs as a silicate melt or supercritical fluid, residual trace accessory phases are required to significantly fractionate HFSE from REE.