# Evolution and Genesis of Volcanic Rocks from Mutnovsky Volcano, Kamchatka

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We will present new geochemical data for Mutnovsky Volcano, located along the volcanic front of the southern portion of the Kamchatka arc, which elucidate the roles for fractional crystallization (FC), assimilation fractional crystallization (AFC) and dehydration partial melting of amphibole-bearing basaltic rock in controlling the compositional evolution of lavas and mass transfer of slab-sediment-fluid and/or slab-sediment-melt into the Mutnovsky magma plumbing system. Mutnovsky is comprised of four stratocones and each had major caldera-forming eruptions, beginning ~80 ka. The youngest center, Mutnovsky IV, erupted basalts and basaltic andesites. The older three centers (Mutnovsky I, II, III) are dominated volumetrically (60 to 80%) by basalt and basaltic andesite; however, each of these centers also erupted small volumes of andesite and dacite. Sr, Nd and Pb isotope data span a narrow compositional range for samples from all four eruptive centers, and indicate that all erupted lavas share a common source. AFC model results for major and rare-earth elements indicate that 1) basaltic andesites were produced by 20% FC of 40% clinopyroxene and 60% olivine, combined with assimilation of dacite (R=0.67); and 2) andesites were produced by 50% FC of 60% clinopyroxene, 30% olivine and 10% magnetite. The large amount of FC required to produce andesite may explain why this rock type is so rare at Mutnovsky. The model results indicate that dacites from Mutnovsky I and II cannot be related to mafic rock compositions from those centers by FC and AFC processes. These dacites have lower abundances of rare earth elements (REE) relative to more mafic rocks from the same eruptive center. The dacites are interpreted as the product of dehydration partial melting at mid-crustal levels of (garnet-absent) underplated amphibole-bearing basaltic rock, which itself formed in the mid-crust by emplacement and crystallization of basaltic magma that originated from the same source reservoir as all Mutnovsky magmas. The data from this study corroborate the important role for partial melting of underplated basalt to produce compositionally evolved (e.g., dacitic) magmas in arc volcanoes.