

## Some geochemical constraints on hot fingers in the mantle wedge in NE Japan

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Mantle melting and the production of magmas along the northeast Japan arc may be controlled by hot regions in the mantle wedge (hot fingers) that move toward the volcanic front along upward-sloping trajectories. I propose that hot fingers in the mantle wedge play a role in producing across arc variation of basalt type from low-alkali tholeiite (LAT) through high-alumina basalt (HAB) to alkali olivine basalt (AOB) in the NE Japan arc. At depths equivalent to 1-2 GPa, where magmas are expected to segregate from mantle diapirs, the hot-finger structures result in a decreasing thermal gradient away from volcanic front. LAT is therefore formed by the greater degree of diapiric melting near the volcanic front; HAB and AOB are produced by lesser degrees of diapiric melting to the west.

There is evidence that the isotopic variation in NE Japan mantle predates the formation of the Quaternary volcanic arc. I suggest that a MORB-like mantle source ( $^{87}\text{Sr}/^{86}\text{Sr} \sim 0.703$ ) in the mantle wedge is replenished by fertile mantle materials ( $^{87}\text{Sr}/^{86}\text{Sr} \sim 0.705$ ) through convection induced by the subducting lithosphere. These fertile mantle materials would be the result of mixing between partial melts of sediments and depleted mantle, and would be produced just above the subducting slab and down-dragged mantle layer, the region from which upward convecting masses (mantle fingers) originate.

I suggest that the hot fingers represent the irregular advancing front of hot and fertile mantle material in the mantle wedge. After reaching the volcanic front, this material turns over, cools, and spreads laterally to form continuous sheet moving downward along the top of subducting slab. Mantle diapirs formed in the lower part of the mantle wedge would incorporate greater amounts of fertile material below the volcanic front and lesser amounts of fertile material away from the volcanic front, which could explain the observed map-view variations of  $^{87}\text{Sr}/^{86}\text{Sr}$  in volcanoes in NE Japan.