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Melt Production And Types In Mantle Drip Mechanism

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The removal/foundering of the continental lithosphere has been put forward to explain varying volumes of melt production derived from sublithospheric/asthenospheric mantle (e.g mafic magmatism) on Earth, and potentially on other planets. Based on the distribution of OIB-type (Ocean Island Basalts, non-subduction related) volcanics, delamination or convective removal mechanisms have been suggested to occur below the Puna-Altiplano plateau (central Andes back-arc). Recently, pyroxenite and peridodite melts, were used to approximate the amount of melting and the temperature constraints in relation to the mantle drip magmatism under the Puna region. In accord with geological-petrological interpretations, seismic tomography images, re in favour of lithospheric removal/drip/delamination (although the style is not agreed upon). In this work, we explore magma/melt types and amounts by using petrological-thermomechanical numerical models of mantle drip/convective removal. In the experiments, we calculate the volumetric melt production of dry and wet (hydrous) melting in the models. The dry (decompression) melting is an approximation of the mafic magmatism following the removal of the lithospheric drip migrating under the crust, whereas the hydrous melting is an approximation to the devolatilize melt produced by pinching off of the dripping viscous lithosphere.
We conduct two series of experiments, with delamination, and with convective removal. We analyze melting temperature increase and melt production in these series, to compare with the short timescale signals from the Puna plateau. Our first of models use the small-scale removal (50 km diameter) and the second set of models consider larger volumes of melt production due to the convective removal. We specifically compare our results to see if the melting temperature increase over relatively short timescale (1 - 2 myrs) as suggested for the Puna plateau.