Along-strike variability of primitive magmas inferred from olivine-hosted melt inclusions, southernmost Andean Southern Volcanic Zone, Chile

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Glass compositions of melt inclusions in olivine phenocrysts found in tephras derived from explosive eruptions of the four volcanoes along the volcanic front of the southernmost Andean Southern Volcanic Zone (SSVZ) are used to constrain primitive magma compositions and melt generation parameters. Primitive magmas from Hudson, Macá, and Melimoyu have similar compositions and are formed by low degrees (8-18 %) of partial melting. Compared to these other three centers, primitive magmas from Mentolat have higher Al_2O_3 and lower MgO, TiO_2 and other incompatible minor elements, and are generated by somewhat higher degrees (12-20%) of partial melting. The differences in the estimated primitive parental magma compositions between Mentolat and the other three volcanic centers are consistent with difference in the more evolved magmas erupted from these centers, Mentolat magmas having higher Al_2O_3 and lower MgO, TiO_2 and other incompatible minor element contents, suggesting that these differences are controlled by melting processes in the mantle source region above the subducted oceanic plate. The observed along-arc changes in parental magma chemistry may be due to the close proximity below Mentolat of the subducted Guamblin Fracture Zone that could efficiently transport hydrous mineral phases, seawater, and sediment into the mantle, driving enhanced volatile fluxed melting beneath this center compared to the others.

Keywords: Andean volcanism, tephra, olivine melt inclusions, primitive magma

