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Geochemistry of the Arc-Adjacent Loicas Trough Plumbing System, Argentina.

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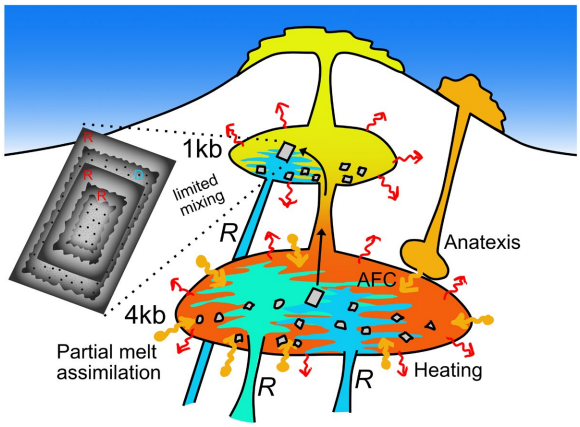

We present a comprehensive geochemical and petrological approach to understand the origin of magmatism, magmatic evolution and plumbing system of the Loicas Trough, Argentina. We utilise whole rock major and trace elements, Sr, Hf, Nd and Pb isotopes, thermodynamically constrained Magma Chamber Simulator models, *in situ* Sr-isotopes and compositional profiles of plagioclase phenocrysts, and state of the art geothermobarometry and hygrometry. The Loicas Trough is a graben located between the main and back arc of the Southern Volcanic Zone (~37°S), that crosses the fold and thrust belt of the Andean mountains. The abundant volcanism of the Loicas Trough is of interest in relation to recent unrest, uplift and geothermal resources, its arc-adjacent setting and its wide range of magma compositions from alkali basalts to abundant silicic rhyolites. The results show that the Loicas Trough lavas originate from a mixed mantle source with variable slab input, are moderately oxidized and have moderately hydrous primitive melt compositions. The differentiation is dominated by assimilation and fractional crystallization; recharge episodes occurred but had a limited impact on the compositional evolution of the magmas. Abundant assimilation of the wallrock produces pseudo-arc trace element signatures and largely obscures the source variations present in primitive samples. This assimilation occurs through incongruent melting of wallrock with residual plagioclase, which controls the evolution of both trace elements and Sr-isotopes. Geothermobarometry results are consistent with the modelled melt evolution trends and show the Loicas Trough magmas predominantly evolved in a polybaric but shallow plumbing system. The magmas reside at two statistically significant main levels in the crust, namely at ~4 and ~16 km depth, with most assimilation occurring in the middle crust. Volcanic provinces with similar features to the Loicas Trough are found in other arc-adjacent localities that experience oblique plate motion and extension, rather than compressional deep-seated arc volcanism or extensional back arc intra-plate volcanism. The Loicas Trough model provides a framework for understanding lava compositions in these continental arc-adjacent settings by highlighting the importance of assimilation and shallow magma differentiation.