Mantle-Crust interactions and genesis of the high K-Mg lamprophyric stocks, dykes, and enclaves in I type Las Chacras batholith, Sierras Pampeanas (Argentina)

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Middle to late Devonian (393-377 Ma) I to A-type batholiths of the Sierras Pampeanas (López de Luchi et al. 2017, Dahlquist et al. 2021) are characterized by high-K calc-alkaline monzonite (MS) and granite suites (GS) and associated with minor intrusive vaugnerite stocks, syen-plutonic dykes and enclaves (monzonites and quartz monzonites). In Las Chacras batholith, the stocks and dykes contain ±Hb+Bio+Pl+Kfs+Ap+Qtz+Ttn+Op±Alln. They are metaluminous, with moderate SiO₂ (49–62%), MgO (2-5%) and K₂O (3.5-7%), low Cr and Ni (<20 ppm), high LILE (Sr>500, Ba>900 ppm), LREE and Sr/Y, variably low Th and Zr, (La/Yb)N and (Tb/Yb)N, little or no europium anomaly (Eu/Eu*>0.9), and negative Nb and Ta anomalies suggesting a subduction-related enriched lithospheric mantle source. Enclaves are coarse grained and contain Bio±Hb+Kfs+Pl+Qtz+Ap+Ttn+Op. They are present in every GS facies. Nd and Sr isotope ratios of mafic microgranular enclaves (50<SiO₂<62%, 2.1<MgO<4.7% and K₂O>3%; Eu/Eu* >0.73, -1.9<εNd<0.7, δSr<0.704) and MS suite (57<SiO₂<65%, MgO<2.6%; 4<K₂O<6%, high Cr (50-140 ppm); εNd ≈1.5, δSr <0.704) suggest a common source compatible with an enriched mantle. Moreover, Nd-TDM ages of 1.36-1.38 Ga are considerably younger than the mean 1.8-1.6 Ga Eastern Sierras Pampeanas basement crustal residence age. The host GS granites (SiO₂>68% MgO<1%, 4<K₂O<5.6%) are slightly peraluminous and show variably high LILE contents (100<Sr<900, 30<Ba>1600 ppm and negative Eu anomalies (Eu/Eu* 0.2 - 0.7). Whole-rock Sr and Nd isotope ratios for the stocks GS-hosting facies indicate a mafic source (δSr<0.705; εNd>-2.7). Conversely, data from the rest of the GS facies point towards a metasedimentary crustal source (0.706<δSr<0.709; εNd ≈ -3). The isotopic evidence suggests a Devonian episode of crustal growth by enriched mantle derived magmas with variable degrees of partial melting of crustal material. The heat source for this magmatism could have been upwelling due to foundering of a detached slab after collision of the Chilenia terrane (390 Ma) in the waning stages of the Achalian orogeny.