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Petrogenesis and emplacement depths of the Petite Pluton during the closure of the Rocas Verdes basin, southern Patagonia - preliminary results

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The Petite Pluton is a Cretaceous intrusion covering an area of nearly 136 km^2 located in Isla Capitán Aracena, southernmost Patagonia, Chile. This pluton and other stocks are located outside of the margins the Early Cretaceous-Paleogene Fuegian Batholith. The Petite Pluton intrudes the Capitán Aracena ophiolitic complex, interpreted as supracrustal remnants generated during the rifting stage of the Rocas Verdes marginal basin (Late Jurassic- Early Cretaceous; cf. Calderón et al., 2013, Geochem. J.) overlain by hemi-pelagic sedimentary basin infill (Yahgan Formation). These units are locally deformed and exposed in the southern limit of the NW-SE-trending Magallanes fold-and-thrust belt. The satellite plutons consist of amphibole-bearing diorites and quartzdiorites (48-55 wt.% SiO_2) with calc-alkaline compositional trends consistent with their generation in a subduction environment. On N-MORB normalized incompatible elements pattern, the rocks show peaks in LILE (Rb, Ba, Sr) and subtle throughs in Ti, Zr, Nb, Ta and Y. Chondrite-normalized REE pattern is concave upwards with enrichment of LREE relative to HREE without Eu anomaly. The mineral compositions of diorites of Petite pluton consist of amphibole (magnesio-hornblende and tschermakitic hornblende), plagioclase is labradorite and andesine (An_{44-59}), with Ca-rich composition in small grains included within poikilitic amphibole, biotite (annite), quartz, minor contents of K-feldspar, titanite, magnetite-ilmenite pairs and traces of apatite and zircon. Amphibole composition can be used as a proxy of the amount of H_2O-rich fluids involved in magma evolution and could potentially be used to constrain the crustal depths of pluton emplacement in magmatic plumbing systems (Yavuz & Döner, 2017, P. di Mineralogia; Torres García et al., 2020, Lithos). The calculated pressure and temperature of 3 kbar and 800-850°C, indicate the emplacement and crystallization of magma batches in the upper crust. Oxygen fugacity [log ($ƒO_2$)] varies between -9.9 and -10.7 (NNO), indicating amphibole crystallization from basaltic-andesitic melts under moderately oxidizing conditions. The moderately Mg# (60-72) of amphibole is consistent with their crystallization from mafic-intermediate melt-dominated crystal mushes with residual melts generated after the fractionational crystallization of olivine and clinopyroxene at deeper crustal depths. The amphibole composition constraint an amount of 6

wt% of H_2O in the residual melts. The subtle negative Eu anomaly in amphibole indicates its partially simultaneous fractionation with plagioclase, suggesting rapid undercooling. The emplacement of the Petite Pluton at ~10 km depth occurred during and/or lately after the tectonic emplacement of ophiolitic complexes within an accretionary wedge, governed by a NE tectonic transport (Muller et al., 2021, Tectonophysics). Late Cretaceous satellite plutons suggest a continentward migration of the magmatic arc, related to the flattening of the subducted oceanic lithosphere of the proto-Pacific Ocean.

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