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Isotopic signature of mature slab recycled materials in volcanic rocks from the Caviahue-Copahue Volcanic Complex (Chile-Argentina)

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Most active Andean Volcanoes in Chile lie along the N-S trending volcanic front, generated by the subduction of Nazca Plate under the South American Plate. One exception is Caviahue-Copahue Volcanic Complex (CCVC), which is located 30 km to the east of the current volcanic front. There, volcanic activity results from crustal attenuation, asthenospheric influx and the steepening of the slab. Here we investigate the link between the geochemical and isotopic composition of CCVC magmas and the subduction regime evolution since 5 Ma. Our approach focuses on volcano geochemical evolution over time, using trace elements and Sr, Nd, Hf, Pb and Li isotopes of bulk rocks, and He and N isotopes from olivine and pyroxene phenocryst. Minerals from andesitic to trachy-andesitic samples are characterized by high mantle-like $^{3}He/^{4}He$ (6.85-8Ra) and high crustal $\delta^{15}N$ (~5.8‰) suggesting their parents magmas are derived from mantle wegde inflitrated by slab-derived crustal materials. Trace element - isotope modelling indicates a strongest influence of sediments in magma formation from Copahue area, while mantle wedge contribution is strongest in Caviahue and Ante-Caviahue. The LREE enriched nature of Copahue rocks compare to Caviahue and Ante-Caviahue products, is more likely due to the incorporation of sediments from the slab. Remarkably, the $\delta^{7}Li$ values from CCVC rocks (-0.44‰ to +1.42‰) are significantly lower than that of Ante-Caviahue ones (+2.63‰). Based on the $\delta^{7}Li$ versus Li contents, Rayleigh distillation has been used to model the degree of Li isotopic fractionation due to the progressive and successive dehydration of the slab in the mantle source of the CCVC magmas. A possible explanation is the progressive change in the slab regime in response to the Mocha fault zone subduction (2.5-5Ma). The expected consequences of this event are steepening of the slab, migration of the volcanic front westward, and contribution of more mature slab to the volcano mantle source.