

# **Mantle-like O-Sr isotope values in Holocene lavas of the Villarrica- Quetrupillán-Lanín Volcanic Chain, Southern Andean Volcanic Zone**

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Systematic along-arc variation in magma composition is a common feature of subduction-related volcanism, reflecting variable interactions between mantle-derived parental magmas and crustal components during storage and evolution. Consequently, not all eruptions are representative of sub-arc, mantle wedge-derived parental magma compositions. New and existing [1] laser fluorination  $\delta^{18}\text{O}$  values of olivine (4.7 to 5.1‰; average = 4.9‰,  $n = 10$ ) and plagioclase (5.5‰,  $n = 1$ ) from Holocene lavas from the Villarrica-Quetrupillán-Lanín volcanic chain (~39°S) exhibit a narrow range, overlapping the mantle range. Thus, olivine crystallised from magma having a  $\delta^{18}\text{O}$  value of 5.4 to 5.8‰ (average = 5.6‰), whereas plagioclase would require a magma value of 5.3‰. These magma  $\delta^{18}\text{O}$  values are the same as accepted values for basaltic glasses ( $\delta^{18}\text{O} = 5.4$  to 5.8‰) and lower than previously reported from mantle-derived rocks in subduction zones (up to 6.3‰).

Furthermore, recent thermobarometric calculations [2,3] reveal that at least two distinct magma staging chambers were involved in the evolution of the Villarrica-Quetrupillán-Lanín volcanic chain: 1. a deep-seated chamber (22 to 26 km depth; at  $T > 1140^\circ\text{C}$ ), associated with olivine and bytownite crystallization; and 2. a shallower chamber (15 to 8 km depth; at  $T \sim 1120^\circ\text{C}$ ), associated with pyroxene and labradorite crystallization. Since these two major storage levels are at crustal depth of local pre-Mesozoic basement rocks, some degree of crustal assimilation by these parental magmas would typically be expected. However, the  $\delta^{18}\text{O}$  value show no correlation with  $^{87}\text{Sr}/^{86}\text{Sr}$  ratios and this is consistent with a closed system which experienced fractional crystallization only.

[1] Jacques et al. (2014). Geochemical variations in the Central Southern Volcanic Zone, Chile (38–43 S): the role of fluids in generating arc magmas. *Chemical Geology*, 371, 27-45.

[2] Compayante et al. (2024). Estimación de las condiciones de almacenamiento magmático previas a la erupción de 1984-1985 del Volcán Villarrica (39°25'S, 71°56'W), Región de La Araucanía y de Los Ríos, Chile. II Simposio Chileno de Volcanología, December, Talca, Chile.

[3] Contreras-Higuera et al. (2024). Inyecciones máficas en un mush cristalino: Implicancias para la historia volcánica del Volcán Lanín (39,7°S/ 71,5°W). II Simposio Chileno de Volcanología, December, Talca, Chile.