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Geochemical variation of the Central El Negrillar volcanic cluster: in the midst of one of the largest monogenetic fields in the Central Andes, Chile.

DANIELA PARRA[1,2], DR. PATRICIA LARREA, PHD[2,3], BENIGNO GODOY[2] AND PETRUS LE ROUX[4]

[1]Department of Geology, Facultad de Ciencias Físicas y Matemáticas, Universidad de Chile

[2]Centro de Excelencia en Geotermia de los Andes (CEGA), Universidad de Chile

[3]Departamento de Geología, Facultad de Ciencias Físicas y Matemáticas, Universidad de Chile

[4]University of Cape Town

Presenting Author: danielaparraencalada@gmail.com

El Negrillar is one of the largest monogenetic volcanic fields of the Central Volcanic Zone (CVZ) located at the southern limit of the Altiplano Puna Volcanic Complex, Chile. This volcanic field is comprised of more than 25 eruptive centers distributed over ~168 km^2, and it is spatially divided into three clusters: Northern El Negrillar, Central El Negrillar (CEN) and Southern El Negrillar.

The present study focuses on the geochemical variation of the 10 volcanoes comprising the CEN cluster. Their lava flows mainly range from andesites to dacites with a few trachydacites, with 57.05-65.43 wt.% SiO_2 and 5.60-7.28 wt.% Na_2O+K_2O contents. Major element bivariate plots exhibit a decrease in FeO^T (3.7-7.0 wt.%), MgO (1.9-5.8 wt.%), TiO_2 (0.71-1.27 wt.%), CaO (4.08-7.34 wt.%) and P_2O_5 (0.25-0.49 wt.%) as SiO_2 increases. Al_2O_3 (16.34-17.01 wt.%) and Na_2O (4.15-4.55 wt.%) contents do not show a well-defined trend with increasing SiO_2, whereas K_2O (1.43-2.82 wt.%) shows an increase with increasing SiO_2. Remarkably, Negro volcano, with the largest number of lava flows emitted (6), shows a MgO variation of less than 2 wt.% and it is not possible to establish a pattern in the P_2O_5 content.

Trace element abundances also correlate with SiO_2 content, however, these volcanic centers exhibit relatively lower Ni (18-60 ppm), Sc (6-18 ppm) and Cr (20-120 ppm) concentrations than other mafic monogenetic eruptive centers from the CVZ (e.g., Cerro Overo [1], Cerro Tujle, El País, and North & South Tilocar [2]). The only exception is the oldest volcano of the CEN cluster (Cola de Caballo), which shows the lowest SiO_2 (57.05 wt.%) and highest Ni (121 ppm) contents. Incompatible elements such as Ba, La, Sr and Rb show positive correlations with the increase of SiO_2 and their high concentrations stand out with respect to the other mafic centers named above. A multi-elemental diagram normalized to N-MORB shows LREE enrichment and HREE depletion, which are in any case significantly lower than similar patterns in the other mafic volcanoes of the CVZ.

[1] González-Maurel, Godoy, le Roux, Rodríguez, Marín, Menzies, Bertín, Morata & Vargas (2019). Lithos, 338-339:128-140.

[2] Van Alderwerelt (2017). PhD Thesis, University of Iowa.