



## **Degassing of different magma batches as the main controlling factor for fumarolic fluid chemistry at the Planchón-Peteroa-Azufre Volcanic Complex (Argentina-Chile) in 2010-2015**

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This study presents the first geochemical data of gas discharges collected during five sampling campaigns (February 2010 to March 2015), from the NNE-oriented Planchón-Peteroa-Azufre Volcanic Complex (PPAVC), located in the Transitional Southern Volcanic Zone (TSVZ) at the border between Argentina and Chile. In 2012, the acidic gas species of the low temperature (up to 102 °C) fumaroles from the Peteroa summit showed a huge increase ( $\text{SO}_2 > \text{CO}_2$ ) with respect to the 2010-2011 period, whereas the typical hydrothermal compounds ( $\text{CH}_4$  and light hydrocarbons) decreased. Such a dramatic compositional change was apparently indicating a pulse of magmatic fluids. By contrast, the temporal evolution of the  $\delta^{18}\text{O}\text{-H}_2\text{O}$ ,  $\delta\text{D}\text{-H}_2\text{O}$ ,  $\text{R/Ra}$  and  $[\text{U}+\text{F}064]^{13}\text{C}\text{-CO}_2$  values suggested an enhanced fluid contribution from a shallow source. In 2014-2015, the dominant hydrothermal signature characterizing the 2010-2011 fumaroles was almost completely restored. The temporary decoupling of the chemical and isotopic parameters can only be reconciled by admitting the occurrence of a double source of magmatic fluids: a basaltic batch, controlling the fumarolic chemistry in 2010-2011 and 2014-2015, and a small, shallower dacitic batch, likely affected by a significant crustal contamination, whose contribution to the fumarolic fluid emissions achieved its maximum in 2012. It cannot be ruled out that the phreatic to phreatomagmatic eruptions ( $\text{VEI} \leq 2$ ) that have affected Peteroa volcano from January 2010 to July 2011 have played a significant role for the modification of the deep feeding source of the fumarolic gases. The disturbance created by the volcanic events and the related seismic activity ( $\text{MW} < 3$ ), possibly related to the devastating Maule earthquake occurred on February 27 2010, could have activated a silent dacitic magma batch that in 2012 imposed over that of basaltic composition. Although this scenario provides a reliable explanation for the peculiar compositional changes that affected the Peteroa fumaroles in 2010-2015 and is consistent with the volcanic products of PPAVC, such an intriguing hypothesis is expected to be supported by geophysical investigations aimed to locate the two magma sources invoked to construct the proposed degassing model.