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Spatial–temporal distribution of explosive volcanism in the 25–28°S segment of the Andean Central Volcanic Zone

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ABSTRACT

The present contribution describes and analyses the spatial–temporal distribution and main features of the volcanic rocks, with emphasis in pyroclastic deposits, located in the 25–28°S segment of the Central Andes. We built a new database, based on our own field studies and compilation from the literature, where we discriminate the different pyroclastic units. We find that the pyroclastic deposits cover an area of at least 7770 km^2 and are distributed mainly along N–S to NNE–SSW, NW–SE to WNW–ESE and NE–SW trends. The spatial distribution of these deposits has varied with time: those >14.5 Ma are concentrated west of 69°W; during 14.5–11.5 Ma explosive magmatism shifted east of 67°W; the deposits <11.5 Ma became more dispersed. The main explosive activity occurred during the 26–18 Ma, 14.5–11.5 Ma and ≤5.3 Ma intervals. For pyroclastic deposits, dacitic compositions dominate during the Miocene, whereas rhyodacitic and rhyolitic compositions are more abundant since the Pliocene. In the 25–28°S segment of the CVZ there is no clear migration pattern of the magmatism, except for the well-known eastward migration occurred at ca. 26 Ma.

Moreover, we find that a) basement lithology or composition or mechanical features influenced distribution of volcanic activity; b) the NE–SW alignment of <2.5 Ma caldera complexes coincides with the maximum depth of the Moho discontinuity and may be a further indicator of delamination processes in the Puna–Eastern Cordillera/Pampean Ranges border; and c) intense explosive volcanism concentrated during the 14–11.5 Ma interval along the eastern Puna border, which coincides in time with a peak in deformation and in space with the contact between basement units with different mechanical properties. No relationship between magmatic activity and azimuth or convergence rate between South American and Nazca plates are found, except for a peak in convergence rate at ~26 Ma.

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1. Introduction

The Central Andes region of profuse volcanism between 16–28°S is known as the Central Volcanic Zone (CVZ: Thorpe et al., 1984) (Fig. 1). It contains abundant ignimbrites and lavas produced mainly since Miocene to Recent (e.g., Baker and Francis, 1978) that are distributed principally in the Puna and Western Cordillera. In the last decades, several studies have documented and analysed these ignimbrites in terms of composition, areal extent and volumes, and spatial–temporal distribution (e.g., Baker and Francis, 1978; Coira and Kay, 1993; Kay and Coira, 2009; de Silva, 1989; Pilger (http://www.pilger.us/id3.html); de Silva et al., 2006; Kay et al., 2010; Trumbull et al., 2006; Mamaní et al., 2010). However, most contributions have focused on the ignimbrites of the Altiplano Puna Volcanic Complex (APVC: de Silva, 1989), north of 25°S. In contrast, the ignimbrites located south of 25°S have received less attention. Even though there is a lot of information on the geochemical characteristics of the volcanic rocks of this part of the Andes (e.g., Goss et al., 2013; Kay and Coira, 2009; Kay et al., 2014; Schnurr et al., 2007; Siebel et al., 2001), at present the number of pyroclastic units, their areal extent, their spatial–temporal distribution and their sources are mostly unknown, mainly because of the lack of volcanological studies. The only characterisation indicates low to medium volumes (<10 km^3), crystal-poor contents and felsic compositions for the pyroclastic units between 67–69°W (e.g., Schnurr et al., 2007). This led to a typification of the ignimbrites from the APVC as very different from those further south, with the exception of large-volume crystal-

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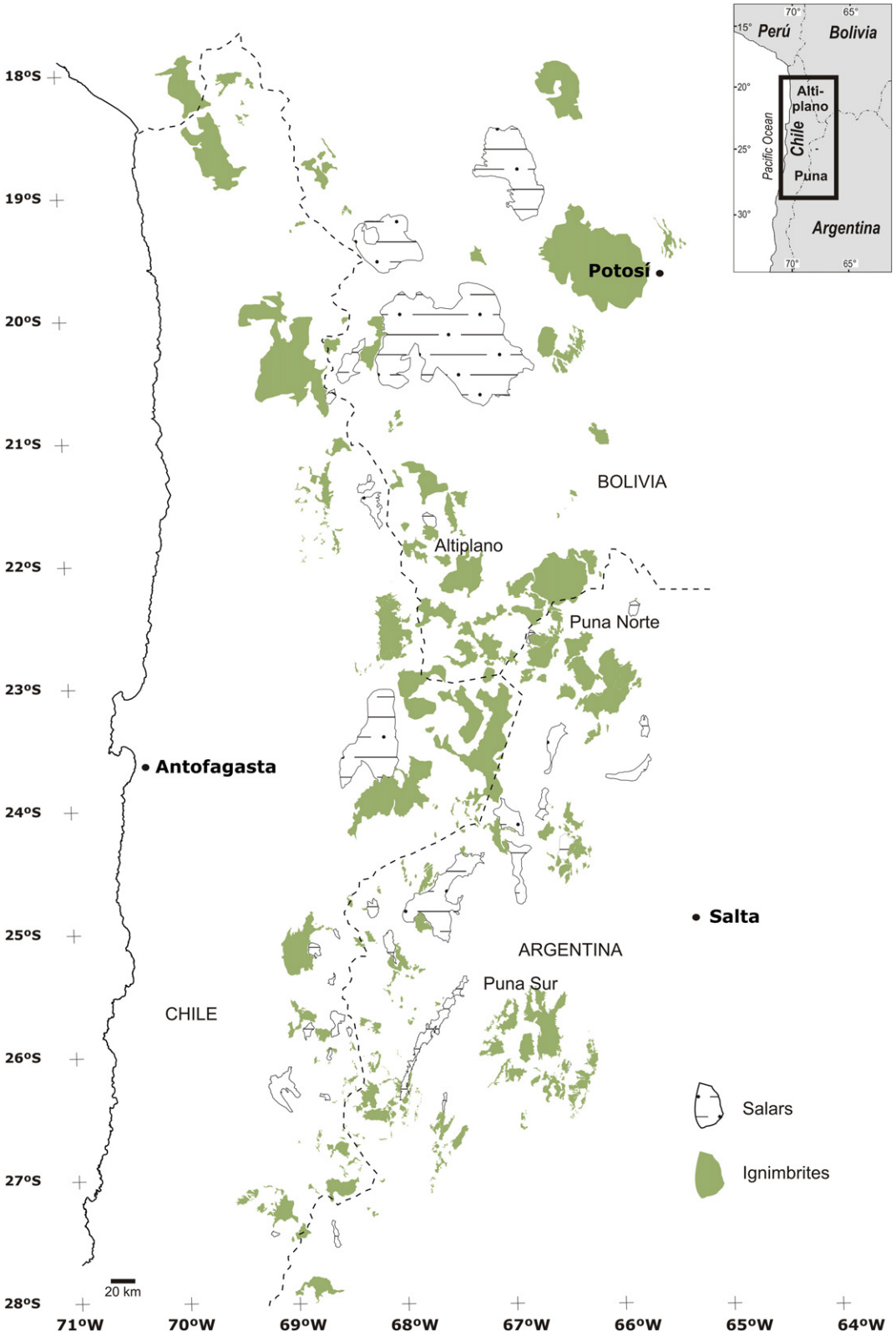

Fig. 1. Regional map of the 18–28°S segment of the Central Volcanic Zone of the Andes showing the present understanding of the distribution of ignimbrites. Modified from Petrinovic et al. (2010).

rich and dacitic to rhyodacitic ignimbrites derived from Cerro Galán (e.g., Sparks et al., 1985) and Luingo (Guzmán and Petrinovic, 2010) calderas.

On the other hand, our knowledge on the characteristics of pyroclastic rocks in the 25–28°S segment of the CVZ impinged us to perform the present study, as we believe that the above mentioned characterisation

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