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Paleo- and rock-magnetic record of the Imbabura volcanic units: Implications for the tectonomagmatic evolution of the volcano and for the Earth's magnetic field at equatorial latitudes

E.J. Piispa[1, 2], P. Larrea[3], K. Choez[1], K.E. Bristol[2], M. Roverato[1], A.V. Smirnov[2], C. Mandon[1]

[1]School of Earth Sciences, Energy and Environment, Yachay Tech University, Urcuqui, Ecuador

[2]Department of Geological and Mining Engineering and Sciences, Michigan Technological University, Houghton, MI, USA

[3]Departamento de Geología, Universidad de Chile, Santiago de Chile, Chile

The Inter-Andean valley of Ecuador comprises 17 stratovolcanoes perceived as dormant but that are actually classified as potentially active. One of the most prominent of them is the Imbabura-Cubilche volcanic complex (ICVC), which is composed of the Imbabura volcanic edifice (4620 m.a.s.l.) and the Cubilche volcano (3826 m.a.s.l.). Previous works have defined and petrographically described three main volcano-stratigraphic units for the Imbabura edifice, Imbabura I, II and III (e.g., Hall and Beate, 1991; Ruiz, 2003; Le Pennec et al., 2011; Andrade et al., 2018). However, a better understanding of the spatio-temporal and chemical evolution of the volcanic complex and its products is needed. The ICVC experienced enormous landslides which partially destroyed both edifices (Le Pennec et al., 2011; Roverato et al., 2018), followed by constructive episodes and migration of the eruptive vent, including the formation of the present-day Huarmi Imbabura dome (Imbabura III). Geochemically, the ICVC is composed of medium-K lava successions, many hundreds of meters thick, ranging from low silica andesites to dacites.

In order to fully understand the Northern Andean volcanic systems and predict their potential activity, it is necessary to undertake multidisciplinary and detailed investigations of the past volcanic events and units. This project combines field studies, tephro-stratigraphy, petrology and geochemistry with a special emphasis on the rock magnetic and paleomagnetic data. This provides the Earth's magnetic field direction and strength recorded by cooling volcanic deposits, but is also used to cross-correlate lavas, edifice sectors and pyroclastic density currents, thereby improving the relative chronology of the volcanic events. Here we present the results obtained from more than 180 individually oriented samples from 24 sites distributed all around the volcanic complex and from different volcanic units. Furthermore, we will discuss the implications of our results for the spatiotemporal evolution of the volcano and the Earth's magnetic field at equatorial latitudes.

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