Volcanic conduits for acidic magmas: rheological significance from preliminary insights into the Paraná-Etendeka Magmatic Province, in Brazil

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Understanding geometrical features of ancient structures (e.g. cone-like shape, fissural, calderic) feeding volcanic systems, at local and regional scale, is one of the main targets of volcanologists. They can be used to stablish the long-term hazards at active volcanoes. Therefore the changing geometry of deep feeding systems needs to be known. This way simplified models of conduit formation and evolution, frequently used in numerical simulations, may be tested. In this project geometrical features from older volcanic structures will be used for advanced numerical models to understand mechanisms that controlled and rendered possible the eruption of the huge volumes of acidic magmas in the Paraná-Etendeka Magmatic Province (PEMP), in Brazil. The present work calls attention to such old feeders/conduits. In the PEMP in Brazil, the largest known volumes of acidic volcanites on the planet surface (c. 63,000 km³) are found. They extruded during a relatively short period of time (c.131-134 Ma). Results from previous research projects on the Brazilian continent, where 95% of all volcanic products of the PEMP crop out, point towards acidic lava flows (coulées), lava domes and only subordinate rheomorphic pyroclastic products (such as rheoignimbrites), like those recognized in Etendeka and Uruguay.

In the region of São Marcos, in RGS, some volcanic conduits for the acidic volcanism are exposed along fracture/fissure lineaments. Preliminary observation of some of these conduits reveal a combination of three main features: a) flow structures with the development of positive-flower-structures, as well as filament and regular regions from chaotic flow patterns; b) breccia-like regions with angular and rounded fragmented blocks of partially bubble-rich magma and; c) huge bubbles (> 40 cm!) which complexly refold previous flow lines. Additionally, different intrusive moments may be recognized through deformational signs such as: small pseudotachylitic veins, progressive development of a strong stretching foliation and stair-stepping-like objects along the flow. Successive melting and remelting products from different effusive and/or fragmentation moments at different temperatures seem to have crossed glass transition back and forward. They are nowadays found as frozen structures in the exposed conduits. A later strong hydrothermal activity may have partially obliterated pristine information from the different magmatic endmembers. Nevertheless most flow lines are preserved and may be suitable for morphological studies such as the determination of fractal dimensions for further comparison with experimental data. Whether this late hydrothermal activity may have strongly obliterated previous signs of fragmentation and remelting in the volcanic products, which include thick obsidian-like deposits of perlites with different fluid contents, is one of the open questions. This hypothesis should however be considered in further more detailed studies in the area.

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