



THE BASAL VOLCANIC BRECCIAS IN THE CAXIAS DO SUL SUBTYPE (PARANÁ MAGMATIC PROVINCE): EVIDENCE FOR AN EXPLOSIVE START?

Letícia Freitas Guimarães¹; Adrian Hornby²; Ulrich Kueppers²; Adriana Alves¹; Valdecir de Assis Janasi¹; Donald Bruce Dingwell²; Evandro Fernandes de Lima³

¹Programa de Pós-Graduação Geociências (Mineralogia e Petrologia) – IGc-USP

²Department Für Geo- und Umweltwissenschaften, Ludwig-Maximilians-Universität (LMU). München, Deutschland

³Instituto de Geociências, Universidade Federal do Rio Grande do Sul. Porto Alegre, Brasil

RESUMO: Volcanic breccias result from a wide range of fragmentation processes that may occur under intrusive, effusive and explosive conditions. Constraining the mechanisms responsible for the generation and emplacement of volcanic breccias requires a non-trivial synthesis of careful textural and petrological description and field associations. In this work textural analysis on volcanic breccias related to the initial phase of the silicic magmatism in the region of São Marcos (southern Brazil), Paraná Magmatic Province, aimed at elucidate the eruptive dynamics, a topic still intensely debated in this Province. The volcanic breccias are matrix-supported, coarse grained and poorly poorly sorted with angular to rounded fragments dispersed in a fine-grained matrix. The juvenile fragments are dense to pumiceous, massive to banded dacites; lithic fragments were not recognized. Grain size distribution analysis (GSD) was carried out on 3 samples located within the fissural conduits zone (SM-82_Br01; SM-82_Br02; SM-82_Br04), where these rocks are better preserved, and on a single outcrop outside but adjacent to this zone (SM-01). The dacitic breccias showed maximum measured clast sizes ranging between -8 and -9.5 ϕ (256 – 725 mm) and the smallest recognized sizes varying between -3 and 1.5 ϕ (8 – 0.4 mm); however, due to the resolution limit of the photographs and the weathered condition of the matrix, our analysis do not include the fine fragments that constitute the matrix. The GSD fractality could be quantified by a single power law for all samples, with low to moderate D values (up to 2.3), suggesting low eruptive energies. Vesicle size distribution (VSD) and the axial ratio, form factor, roundness and solidity for both clasts and vesicles were measured on the 3 samples from the conduits zone. The breccias are characterized by low vesicularity clasts, with median vesicle area fractions around 5% for all samples, but pumiceous clasts with up to 43 area% are found. VSDs are represented by single exponential curves, concave upwards for all samples, with vesicles becoming more deformed/complex with increasing size, suggesting a single continuous process of vesicle nucleation and/or growth under unstable flow regime. Regarding the fragments shape parameters, all the samples have high values of solidity, and a positive correlation of roughness and angularity with fragment size was recognized, suggesting the occurrence of secondary fragmentation processes, although field evidence, in accordance with the inferences from GSD and fractal analysis, characterizes proximal deposits. Based on a comparison of the set of characteristics described here with several types of effusive and explosive volcanic breccias, we propose a block and ash flow source for these breccias, and develop a model where shallow magma migration and storage under a fissural conduit system can lead to the formation and collapse of lava domes.

PALAVRAS CHAVE: textural analysis, volcanic breccias, Paraná Magmatic Province, block and ash deposits