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Discussion: "Volcanic stratigraphy of intermediate to acidic rocks in southern Paraná Magmatic Province, Brazil" by Polo and Janasi (2014), *Geologia USP. Série Científica*, 14(2), 83-100

Discussão: "Vulcano-estratigrafia das rochas intermediárias a ácidas ao sul da Província Magmática Paraná, Brasil" de Polo e Janasi (2014), Geologia USP. Série Científica, 14(2), 83-100

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INTRODUCTION

Polo and Janasi (2014) published a geological study at the 1:50,000 scale of a portion of the Paraná volcanic province around Barros Cassal in the state of Rio Grande do Sul, Brazil. They state in their introduction that "[…] the results revealed key stratigraphic relations between different units of intermediate to acidic volcanic rocks, as well as important contemporary sedimentation, thus far poorly known. This article presents these results and discusses their implications for the stratigraphy of the […]" province.

We presently acknowledge the relevance of the studies made on the regional stratigraphy of the volcanic compound units, but we make a correction on the origin and stratigraphic significance of the sandstones and breccias present in the region. This includes the interpretation of the climate dominant in the region in the Lower Cretaceous, in addition to some other aspects.

We made a reconnaissance field study of the area mapped by Polo and Janasi (2014) in order to support the present interpretations.

DESCRIPTION AND INTERPRETATION

Polo and Janasi (2014) mapped and described "Sandstone deposits with variable thicknesses and lateral discontinuities […] interbedded with the upper lavas from the lower sequence, interlayered with and above the entire second sequence, and interacting with the base of the upper sequence". They mention that "the end of the Caxias do Sul magmatism is coeval with the deposition of sand. This sand filled the fractures of the latest Caxias do Sul lavas and also it was accumulated in depressions between domes and lava flows, forming small deposits from 0.2 to 3.0 m thick. The fine to medium-grained red sandstone is constituted of round grains of quartz and feldspar, as well as devitrified obsidian and chalcedony".

DISCUSSION

Two main aspects require correction in the interpretation of the origin of the sedimentary rocks. These come from the presence of breccias and sandstones of the Tupanciretã Formation overlying all volcanic rocks in the area and the fine-grained sand layers intercalated with the volcanic rocks.

Conglomerates, breccias and sandstones described near the top of the hills correspond, in our interpretation, to geological units of the Tupanciretã Formation (Menegotto et al., 1968). This formation was deposited in a humid climate in the Cretaceous, overlies large regions of the Serra Geral Group in Rio Grande do Sul, and may correlate to the Caiuá Formation in Mato Grosso do Sul, São Paulo and Paraná states (Brazil). It has interdigitated layers of conglomerate with sandstones and may attain 60 m in thickness.

The thin, discontinuous sandstone layers intercalated in the volcanic flows was probably originated by the injection of fluidized sand from the Botucatu Formation paleoerg. The poor rock exposure in the region makes it difficult to characterize the geological relations between the sandstone layers and the lavas. But the intrusive nature of the sand is clear in the province. The authors are presently directed to the detailed studies on the origin of the

fine-grained sandstones intercalated with the volcanic rocks, because overwhelming genetic evidence for intrusion is displayed by Hartmann et al. (2012a, 2012b, 2012c), Duarte et al. (2014) and other chapters in Hartmann and Baggio (2014). These studies covered the Paraná volcanic province from Uruguay to Mato Grosso do Sul, including the intervening Brazilian states. The evidence leads to the undisputed interpretation that the intercalated sandstone layers were formed as injectites of hot water containing fluidized sand.

Thick layers of sandstone may be present at the base of the sections in the Barros Cassal region, possibly as lifted Botucatu Formation blocks. Also, vertical displacement of blocks may be involved, such as demonstrated for the Ametista do Sul region by Rosenstengel and Hartmann (2012). This fault-block structure can be displayed by the geochemical characterization of each lava flow across the region.

RECOMMENDATIONS

We consider very important and relevant that the authors revise the stratigraphy of the mapped region to separate the Tupanciretã Formation into specific horizons. In our understanding, the formation covers the Serra Geral Group regionally and in the mapped area, because a humid climate only developed after the end of volcanism.

We also recommend that the authors consider the possibility that the thin sandstone layers were formed above each lava flow (or as injected sills) and originated in the paleoerg and other deeper sedimentary units of the Paraná basin. Their intrusion occurred as fluidized sand in hot water, only remaining the sand as an extrudite, sill or dike. Evidence has neither been described in the region (Polo and Janasi, 2014) nor observed in the studies of Hartmann and his coworkers in the province for the downfilling fractures in the volcanic rocks with sand.

Any clarification of the issues will be welcome, particularly if geographic coordinates are given for each feature described, so field checking can be organized.

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REFERENCES

Duarte, S. K., Hartmann, L. A. (2014) Evolution of sand injectites from the Novo Hamburgo Complex, Paraná volcanic province. In: S. B. Hartmann, S. B. Baggio (Orgs.) *Metalogenia e exploração mineral no Grupo Serra Geral* (v. 1, 203-232). 1 Ed. Porto Alegre: Gráfica da UFRGS.

Hartmann, L. A., Arena, K. R., Duarte, S. K. (2012a). Geological relationships of basalts, andesites and sand injectites at the base of the Paraná volcanic province, Torres, Brazil. *Journal of Volcanology and Geothermal Research,* 237-238(1), 97-111.

Hartmann, L. A., Baggio, S. B. (Orgs.) (2014). *Metallogeny and mineral exploration in the Serra Geral Group*. Porto Alegre: Editora da UFRGS.

Hartmann, L. A., Baggio, S. B., Duarte, S. K. (2012b). Decoding geochemical and gamma-spectrometric signatures from lavas and sand injectites at the base of the Paraná volcanic province, Novo Hamburgo, Brazil. *International Geology Review,* 55, 510-524.

Hartmann, L. A., Duarte, L. C., Massonne, H. J., Michelin, C., Rosenstengel, L. M., Bergmann, M., Theye, T., Pertille, J., Arena, K. R., Duarte, S. K., Pinto, V. M., Barboza, E. G., Rosa, M. L. C. C., Wildner, W. (2012c). Sequential opening and filling of cavities forming vesicles, amygdales and giant amethyst geodes in lavas from the southern Paraná volcanic province, Brazil and Uruguay. *International Geology Review,* 54, 1-14.

Menegotto, E., Sartori, P. L., Maciel Filho, C. L. (1968). Nova sequência sedimentar sobre a Serra Geral no Rio Grande do Sul. *Publicação Especial do Instituto de Solos e Culturas, Seção Geologia e Mineralogia, Santa Maria,* 1, 1-19.

Polo, L. A., Janasi, V. A. (2014). Volcanic stratigraphy of intermediate to acidic rocks in southern Paraná Magmatic Province, Brazil. *Geologia USP. Série Científica*, 14(2), 83-100.

Rosenstengel, L. M., Hartmann, L. A. (2012). Geochemical stratigraphy of lavas and fault-block structures in the Ametista do Sul geode mining district, Paraná volcanic province, southern Brazil. *Ore Geology Review,* 48, 332-348.