

VARGEÃO'S CRATER: SHOCK METAMORPHISM EVIDENCES IN IMPACT BRECCIAS AND PEPPERITES

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INTRODUCTION

Located on the western side of the state of Santa Catarina, Vargeão Crater is one of the largest and well preserved impact structures found in Brazil. Developed over the rocks of the Serra Geral Group, the crater is one of a few examples of these structures developed on this kind of target rocks on Earth. In addition, it has a high central peak, where sandstones that normally are arranged stratigraphically under these volcanic rocks, making this crater unique. In order to trace further evidences to contribute to studies related to craters developed on volcanic rocks, our study aims to trace new ways to address such structures and humbly corroborate with knowledge about these exceptional geological agents.

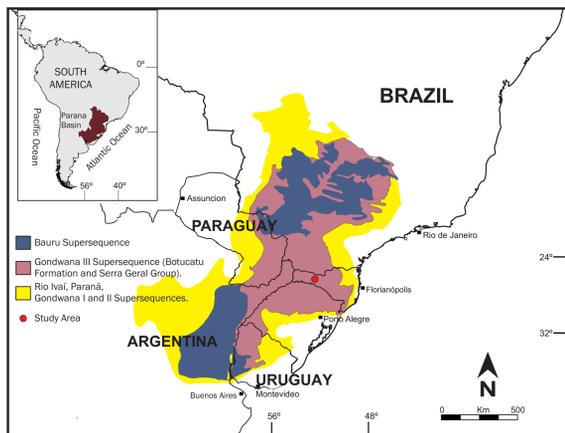


Figure 1. Location of the studied area at the Paraná Basin (Waichel, 2006).

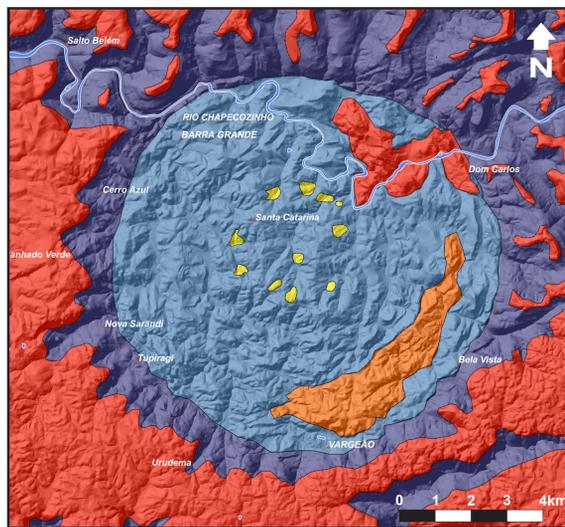


Figure 2. Lithologic map and stratigraphy of the Vargeão's Crater. In the center of the poster is the block diagram of the crater based on its DTM in composition with the lithologic map (Stratigraphy in its sides is merely illustrative).

METHODS

The main objectives of the current work were to develop the petrographic and geochemical characterization of samples collected in the crater and regions nearby to its edge. Comprised mainly by volcanic rocks, volcanoclastic rocks and impact breccias, the sampling was made in order to trace any differences in the mineralogical and geochemical patterns of the target rocks. In addition, the fieldwork and laboratory research was also intended to verify the development of typical features related to the shock metamorphism, such as Planar Fractures (PF), Planar Deformation Features (PDF), and Shatter Cones, according to examples found in French (1998) and Crosta et al., (2012).

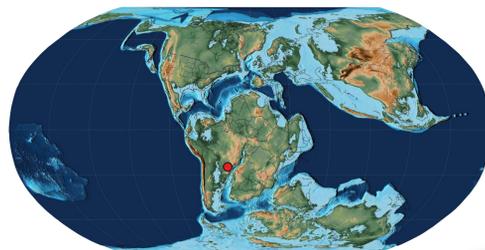


Figure 4. Paleogeographic map of the Earth at the probable moment of the impact: 123 ± 1,4 Ma (NÉDÉLEC et al., 2013)

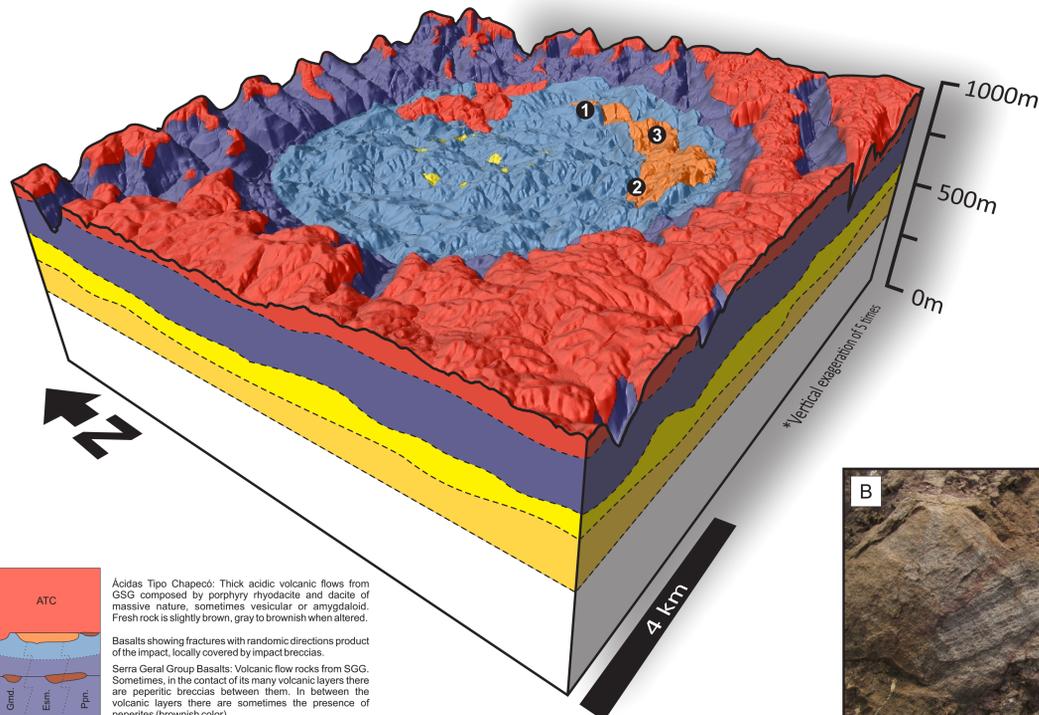
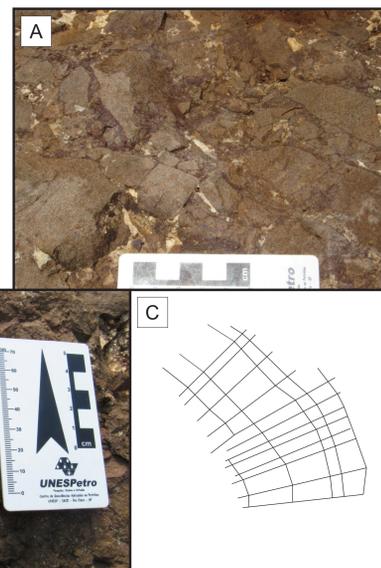


Figure 5. Point 3 on the block diagram: (A) Impact Breccia; (B) Shatter cone and its detail sketched on (C).



CONCLUSIONS

The results acquired with this work corroborate to the affirmative that the Vargeão crater is definitely product of a great collision of a cosmic projectile against the volcanic rocks of Serra Geral Group. For the reason that there are not many studies about craters developed over the basalts, our research contributes directly to the small number of studies related to this sort of rock. The understanding that between the volcanic layers of basalt there are these peperitic breccias, which is a type rock that remarkably records impact effects, shed lights on one more way to find those shock metamorphism effects on this particular geology. Furthermore, we recommend to deep into studies about the geochemical features of EGP elements of the impact breccia, once the major, minor and trace elements do not reveal any promising result.

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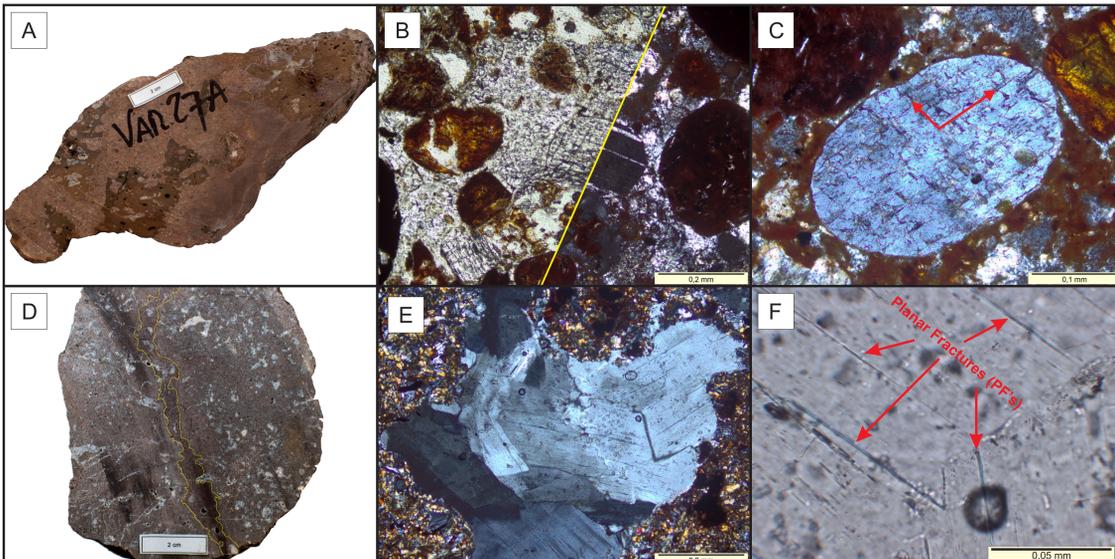


Figure 3. (A) Peperite - (Point 1 on the block diagram); (B) Peperite - Photomicrography showing grains of different sizes and composition, including a strongly fractured plagioclase - PPL/XPL; (C) Peperite - Quartz crystal showing superb rhomboedric Planar Fractures - XPL; (D) Impact Breccia - (Sample from point 2 on the block diagram); (E) Impact Breccia - Quartz crystals surrounded by a fine irruptive matrix - XPL; (F) Impact Breccia - Detail of the quartz crystals showing its awesome Planar Fractures - XPL.