VARGEÃO DOME IMPACT CRATER AND THE CERRO DO JARAU STRUCTURE (BRAZIL) – A FIRST REPORT AFTER RECENT FIELDWORK

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Introduction: Meteorite impact craters in volcanic targets are significantly underrepresented on Earth but are prominent features on other planetary surfaces. The study of such crater structures could possibly give new insights into impact related processes such as shock metamorphic effects and structural deformation on planetary bodies with volcanic surfaces, the behavior of volcanic materials under shock loading, and the formation and evolution of impact structures in general. We undertook a first field campaign to investigate two circular structures in Brazil, in particular targeting structural geological observations.

The Vargeão Dome is situated at 26°50'S/52°07'W in the state of Santa Catarina, Brazil, with a diameter of 12 km diameter. This complex impact structure is situated in the São Bento Group/Serra Geral Formation of the Mesozoic Paraná flood basalt province [1]. The Serra Geral Formation comprises mainly basalts and subordinate intermediate as well as acidic volcanic rock types. Some outcrops of sandstones related to the underlying Botucatu Formation are interspersed in the central area of the crater. Various types of breccia are present in this well exposed but deeply eroded crater structure. Inside the structural rim, at a location in the eastern part of the crater, a well exposed and not too severely weathered road cut (~60 x 5 m) exhibits moderately altered volcanic rock in contact to an adjacent breccia dyke. Breccia clasts of angular to well rounded shapes of various sizes were observed. Some of these clasts exhibit fitting patterns. Our working hypothesis is that this locality shows the occurrence of a pseudotachylitic breccia (sensu strictu). Structural findings at Vargeão include large-scale concentric and radial lineaments, and intense faulting. However, due to the climate (and intense agriculture) most rocks are severely wheathered.

The Cerro do Jarau structure is ~13.5 km in diameter and situated at 30°12'S/56°32'W in Rio Grande do Sul in southernmost Brazil, close to the border with Uruguay. The circular structure is formed in sandstones and basalts of the Jurassic-Cretaceous São Bento Group of the Paraná Basin [2]. A possible impact origin is still controversial today, as, e.g., no definite shock metamorphic evidence, such as planar deformnation features (PDF) or shatter cones, has been found yet. Apart from the investigation of the obvious circular arrangement of sedimentary strata in the outer ring structure, detailed structural observations throughout the structure were made on meso- to micro-scales. Different stages of folding and faulting were observed. Folding at mm, dm, and decameter scales could be discriminated, in places within one outcrop. From these initial results it can already be stated that the observed structural deformation makes it difficult to explain the degree of folding and faulting with purely tectonic deformation. In particular, the observed radial and concentric folding and faulting would rather be consistent with impact related deformation [3]. Locally, millimeter-spaced intense micro-faulting with mm-scale displacements was observed; this phenomenon strongly resembles the multiply striated joint sets (MSJS) that were related by [4] to the shatter cone impact deformation phenomenon based on a structural study in the collar of the Vredefort Dome, South Africa. Unfortunately, occurrences of shatter cones or other striated surfaces that were reported at Cerro do Jarau in the past could not be confirmed by us. Different types of breccia are present that are currently investigated in the laboratory for classification, possible shock metamorphic effects, , and, thus, hints at their origin.

Further structural, petrographic and first geochemical results will be discussed at the Conference.

References: [1] Crósta A. P. et al. 2012. *Meteoritics & Planetary Science* 47: 1945-5100. [2] Crósta A. P. et al. 2010. *Geological Society of America Special Papers* 465: 173-190. [3] Kenkmann T. et al. 2012. *Journal of Structural Geology* 62: 156-182. [4] Nicolaysen L. and Reimold W. U. 1999. *Journal Geophysical Research* 104: 4911-4930.