LINKING U-Pb ISOTOPES WITH SHOCK TEXTURES IN ZIRCON: PRELIMINARY RESULTS FROM THE ARAGUAINHA IMPACT STRUTURE, CENTRAL BRAZIL.

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Introduction: The 40 km diameter Araguainha Dome in central Brazil is the largest impact structure known in South America [1,2]. The central uplift (~6 km wide) is composed of a shocked Cambrian alkali granite, a metasedimentary sequence of the Cuiabá Group of Neoproterozoic age, and a sedimentary sequence of the Lower Paleozoic Furnas Formation. The alkali granite is extensively pervaded by impact melt and, possibly, pseudotachylitic breccia. A largely melted specimen of Cuiabá metasediment was selected for this study. Sample Am-21B not only allows to study shock deformation but also the relationship between shock (impact) metamorphic effects and (partial) resetting of the U/Pb system of zircon. The sample is characterized by an aphanitic matrix with abundant quartz clasts (including some pebbles) and shock deformed and even melted zircon.

Methods: Some 200 shocked zircon grains were imaged with a JEOL QUANTA 450 scanning electron microscope at UnB in order to provide information on the microdeformation structures and zoning inside the grains. After image characterization and in order to investigate the behavior of the U/Pb system, U-Pb isotope analyses were performed on zircon grains with particular textures. The analyses were run on a Thermo-Fisher Neptune MC-ICP-MS coupled with a Nd:YAG UP213 New Wave laser ablation system (30 µm spot size) at the Laboratory of Geochronology of Brasilia, Brazil.

Results: The zircon grains are rounded to sub-rounded and measure between 100 and 300 µm in size. Backscattered electron images indicate that granular, vermicular (plus baddeleyite) and planar microfeatures are the most common textural features on the surfaces of the analyzed zircons. Some grains display two sets of planar microdeformation features - both planar deformation features (PDF) and planar fractures (PF) have been recognized. The BSE images also show that internally many grains are totally granularized and along some rims occurs vesicular texture and locally zircon has been transformed to baddeleyite (ZrO_2). Cathodo-luminescence indicates that many grain interiors retain primary features, like sector zonation.

The preliminary results show that the U/Pb isotope systematics were perturbed to different degrees and that there is no clear relationship between the degree of resetting of the U/Pb system, discordance, and textures. The first available data indicate that zircon with granular textures defines a lower intercept age of 219 Ma, zircon with vesicular texture (plus baddeleyite) defines a lower intercept of 222 Ma, and zircon with melted parts defines a lower intercept age of 224 Ma. The three preliminary lower intercept ages are significantly younger than the proposed impact age of 254 Ma [3]. This age can be simulated by our data, but our best results could be interpreted either to indicate a younger impact age of possibly 220 Ma or point at Pb loss processes. It can also not be included that it was not possible to remove all common lead from these data. This study will be continued with more samples shocked to varied degree. In order to improve the obtained set of data and to understand what the cause(s) of the discordant data are, zircon grains from this sample are currently analyzed by SIMS at Heidelberg University.

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