ARE THE IMPACT MELT ROCKS FROM THE ARAGUAINHA IMPACT STRUTURE, BRAZIL, HOMOGENEOUS?: EVIDENCE FROM GEOCHEMISTRY AND Sr-Nd ISOTOPES.

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Introduction: The Araguainha impact structure, located in central Brazil, is – with a 40 km diameter, the largest of the ten confirmed impact structures of South America. The structure was formed at the NE border of the Paraná basin at the end of the Permian [1]. It is well exhumed, and the target stratigraphy is well exhibited in and around the 8 km wide central uplift [2-4]. The structure is formed in shocked Ordovician alkali granite that is sometimes porphyritic, Neoproterozoic phyllites/metasandstones of the Cuiabá Group, and Devonian sandstones of the Furnas Formation, as well as arenitic (sandstone), metapelitic, and quartzitic supracrustal lithologies of Paleozoic age. Impact melt rocks, partially impact melted alkali granite - the so-called Transitional Granite [3], possible pseudotachylitic breccia (PTB), and melt rock clasts of different compositions in suevite are the main lithologies associated with the impact, in the central uplift area. All the target rock strata can be recognized in polymict impact breccias. Outside the central uplift, the Paleozoic supracrustal sequence of the Paraná basin outcrops.

An extensive major and trace element geochemical database exists for Araguainha lithologies [see 2-4]. The data show that all granite-based samples have very similar major element compositions but display some differences with respect to trace elements. Melt rock clasts from suevite range in composition from granitic to quartzitic [3,4]

Objectives: The well exposed stratigraphy, the preservation of impact-related melt rocks and the available database make this structure an excellent candidate to evaluate 1) how homogeneous, in terms of geochemical composition, the impact melt rocks are; 2) what the grade of involvement of the supracrustal rocks from the Paraná basin was in the generation of melt, and what the role of Cuiabá Group rocks was; and 3) what the Sr-Nd isotope systematics are for these rocks. In order to better discriminate the impact-generated partially and completely melted lithologies and assess the nature of precursors for melt rock clasts in suevite, a series of 22 representative samples is being analyzed at the Geochronology Laboratory of the University of Brasilia for their Sr and Sm-Nd isotope characteristics. At the time of writing the Sr data for this sample suite are complete, whereas the Sm-Nd data will be presented only at the conference.

Results and discussion: Based on the chemical data of [3, 4], several generalized conclusions can be drawn: 1. Alkali granite (AG) and Transitional Granite (TG) form a data cluster at typical granitic major element compositions. AG samples mostly have 70-75 wt% SiO_2, ~13 wt% Al_2O_3, > 3.3 wt% Na2O, > 4.8 wt% K_2O and have mostly similar Rb abundances (~200 ppm) but are variable in Sr content. 2. The TG has lower SiO_2 contents (68.9-73.7 wt%), ~14 wt% Al_2O_3, and variable Na_2O (3.3 to 6.19 wt.%) and K_2O (0.62 to 5.44 wt%); these samples have similar contents in Rb (from 20 to 241 ppm) as the AG but are more enriched in Sr. 3. Cuiabá Group samples mostly have reduced SiO_2 (60.9 to 66.9 wt%) with respect to AG, however, one sample is of arenitic character with comparatively enriched SiO_2. All Cuiabá samples, except the more silicic one, are enriched in Al_2O_3 (>15.5 wt%) and have similar contents ocf Sr and a small enrichment in Rb. 4. Impact melt rocks are similar in SiO_2 contents (~70.7 to ~72 wt%) to the AG, and have much more Rb (> 228 ppm) but similar Sr contents (~85 ppm) than the granitic phases. One sample, with 78 wt% SiO_2, may be carrying a small sedimentary component from a Cuiabá Group or supracrustal source. 3. The analyzed PTB samples have lower SiO_2 contents (between 63.7 and 71.6 wt%) compared to AG, and the samples with reduced SiO_2 are strongly increased in, possibly secondary, Fe_2O_3. They are similar to the TG with respect to Rb and Sr concentrations.

In terms of initial $^{87}Sr/^{86}Sr$ ratios (recalculated to 253 Ma), the AG and TG samples are similar (between 0.72124 and 0.72860), whereas the Cuiabá samples are a little more enriched (between 0.73142 and 0.73861). The PTB samples and one impact melt rock are very homogeneous in Sr isotopes (between 0.72326 and 0.72581) and similar to the AG and TG composition. This demostrates that the impact melt rocks generated at the Araguainha impact structure are homogeneous. Nevertheless, the Sm-Nd isotopic results for this sample suite must be awaited still. It will be discussed at the conference.

References: [1] Tohver, E. et al. (2012). *Geochimica et Cosmochimica Acta*, 86:214-227 [2]. Engelhardt, W.v. et al. 1992. *Meteoritics* 27:2-457. [3] Fischer S. (2015). MSc Diss., Freie Univ. Berlin. [4] Preuss, J. (2012). Diploma Thesis, Univ. Potsdam.