**RESISTIVITY TOMOGRAPHY OF THE ARAGUAINHA IMPACT STRUCTURE: CONSTRAINTS ON MELT AND BRECCIA EMPLACEMENT** C. H. Tong[1], C. Lana[2], Y. R. Marangoni[3] and V. R. Elis[3], [1]Department of Earth and Planetary Sciences, Birkbeck, University of London, Malet Street, London WC1E 7HX, U.K., vincent.tong@ucl.ac.uk, [2]Department of Geology, University of Stellenbosch, Private Bag X1, Matieland 7620, South Africa, [3]Instituto de Astronomia, Geofisica e Ciencias Atmosfericas, USP Rua do Matao, 1226, Cidade Universitaria, Sao Paulo, SP 05508-090, Brazil.

**Summary:** We here discuss the novel application of resistivity tomography to imaging the shallow subsurface of the central uplift of the Araguainha impact structure [1]. Our resistivity model shows contrasting resistivity features near the granite-sedimentary boundary in the study area. We have identified consistent inward-dipping structures in the central uplift. Using complementary direct geologic observations and gravity data, we provide empirical evidence supporting a centripetal resurge of melt and breccias during the impact process.

**Geologic setting:** In order to characterize the subsurface geometry of central uplift, we present five electrical resistivity tomography (ERT) profiles of the shallow subsurface from the central uplift of the 245 Ma Araguainha impact structure in Brazil, the largest complex impact crater found in South America. The 12 km-diameter central uplift of the structure consists of a 4 km-wide well-exposed core of alkali Precambrian/Ordovincian granites and a collar of the Permian/Devonian sandstones of the Parana Basin [2]. The contact between the alkali granite and the Parana sediments is partially overlaid by polymict and monomict breccias [3]. Our structural interpretation of the ERT profiles is based on the systematic changes in the decameter-scale resistivity features resolvable by the tomographic method.

**Methods:** We acquired resistivity data in the study area using dipole-dipole configuration with 50 m electrode spacing (IRIS resistivity instrument with two potential electrodes and six current electrodes). The tomographic images are obtained by using the RES2DINV inversion package for determining the L1-norm inversion resistivity models based on the raw resistivity measurements [4]. The horizontal node spacing of the resistivity models is 50 m, whereas the vertical spacing is ~20 m. We also concurrently acquired gravity data along the five profiles by using a portable LaCoste-Romberg gravimeter. Bouguer (2670 kg/m$^3$) and terrain corrections have been applied. 1967 International Gravity formula is used in the calculation of latitude-dependent theoretical gravity. Altitude and location of measurement points were obtained by differential GPS. All data are tied to the Brazilian Gravimetric Network by a local reference gravity station at Ponte Branca, Mato Grosso. The convergence to the final resistivity models is rapid (3 to 6 iterations), and the errors (rms residuals) of the resistivity models are low (3.2–8.7%), particularly given the complexity of the subsurface resistivity structures.

**Main conclusions from resistivity models:** The observed dipping geometry of the polymict breccias and impact melt of the impact structure, which is tectonically well-preserved [2], implies that the molten material and breccia flowed towards the inner part of the peak ring near the granite-sediment boundary. This flow is compatible with the observation that parts of the regions with high electrical resistivity overlay the granite-sediment boundary and cover parts of the granite core or are found in the presumably granitic region.

The influence of the flow dynamics of breccias and impact melt on surface crater morphology varies with the pre-impact rheological structure. On the basis of the results of our study, we anticipate different planetary bodies in the Solar System, where layered target rocks are common [5], display distinct patterns of surface morphology in the vicinity of their central uplifts, reflecting their near-surface pre-impact rheological structures.

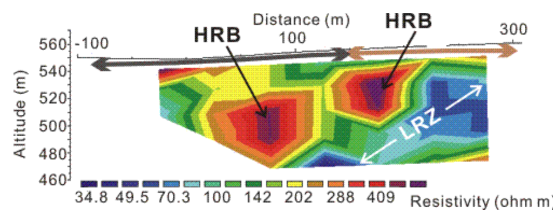


**Fig. 1** A profile from electrical resistivity tomography showing high-resistivity blocks (HRB) with low-resistivity zone (LRZ) in the central uplift of the Araguainha impact structure.

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