

MULTISCALE GEOELECTRICAL INVESTIGATIONS ON THE ROCHECHOUART/CHASSENON IMPACT BRECCIA. Y. Quesnel¹, P. Sailhac², J. Lofi³, P. Pezard³, P. Lambert⁴, P. Rochette¹, M. Uehara¹, ¹Aix-Marseille University, CNRS, IRD, INRA, Coll France, CEREGE, Aix-en-Provence, France (quesnel@cerege.fr), ²GEOPS, Univ Paris-Sud, France, ³Geosciences Montpellier, Univ. Montpellier, France, ⁴CIRIR, Rochechouart, France.

Introduction: The Rochechouart impact structure, located nearby Limoges in France, corresponds to a ~100 km² area showing some remains of impact breccia formations overlying the Hercynian crystalline basement. The geological mapping already revealed a variety of breccia compositions and a complex stratigraphy, which is confirmed by the preliminary analyses of the cores sampled from a recent drilling campaign [1]. The age of the impact event is now well resolved: 204-207 Ma [2]. However, there are still some uncertainties among which the size of the initial crater (d = 20 km ? 30 km or more ?), its associated morphology (central uplift ? peak-ring? basin?), and/or the occurrence of an impact-generated tsunami, etc.: all these open questions will be investigated by a series of research projects submitted to the CIRIR and mainly focusing on the core samples [1]. Indeed studying Rochechouart helps to investigate the composition, geometry and physical rock properties at the transition between the allochthonous (when preserved) and autochthonous formations of complex impact structures.

Objectives and methods: our group aims at revealing the thickness and lateral extension of the breccia lenses, as well as to map the impact effects on the basement formations. In parallel to and after the drilling campaign, we mainly investigated the electrical properties of the rocks from the Chassenon area (NW part of the remaining breccia lenses) in the drill holes (electrical resistivity downhole logging), on subsurface (2D electrical resistivity tomography) and at kilometer scale (audio-magnetotelluric, AMT).

Preliminary results: by downhole logging in the SC2 Chassenon drill hole, 4 electrical units were defined [3]: (1) the top 40 m with resistivities are between 80 and 100 Ohm.m; (2) between 40 and ~85 m where resistivities range from 90 to 300 Ohm.m; (3) below ~85 m, resistivities are always greater than 200 Ohm.m, slightly increasing to 1000 Ohm.m at 110-115 m; (4) after a sharp decrease nearby 115 m, very large resistivities up to ~3000 Ohm.m are observed. These 4 electrical units well correlate with the SC2 lithologies defined from cores: Unit 1 (0-40m) – melt-rich suevite; U2 (40-88m) – melt-poor suevite; U3 (88-114m) – brecciated/fractured gneiss; U4 (114-120m) – gneiss [1]. Using electrical resistivity tomography along a 630 m profile centered on the SC2 hole, the vertical resistivity contrasts show a similar, but smoothed, stratigraphy/architecture (Figure 1), while it evidences that the

suevite/gneiss transition depth laterally varies (amplitude of ~50 m). Then, at larger scale, the preliminary results of the AMT measurements reveal that, deeper than 500-600 m, the gneiss appears more resistive than 2000 Ohm.m, meaning that it is probably unaffected by the impact at this depth. We will show similar preliminary results for other drill holes and breccia lenses.

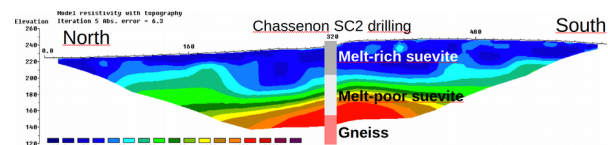


Figure 1: correlation between a geoelectrical cross-section resulting from electrical resistivity tomography data, and the synthetic lithological log in the SC2 drilling hole of Chassenon.

Conclusions and perspectives: these new results demonstrate the pertinence of using multiscale geoelectrical techniques to unravel the detailed geometry and stratigraphy of the breccia deposits in the Rochechouart impact structure. They are in agreement with the geological composition derived from surface mapping and from the recent drilling campaign. This shows that geophysical methods coupled with core sample analyses enable mapping the detailed geometry of large/complex impact crater floor at the decameter scale.

References: [1] Lambert et al. (2019) LPSC 50th, Abstract #2005. [2] Cohen et al. (2017) Meteoritics & Planet. Sci., 52(8), 1600-1611. [3] Rochette et al., this meeting.