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► **To cite this version:**

P. Rochette, F Demory, O Cherait, L Hervieu, B Celerier, et al.. CORE AND DOWNHOLE PETROPHYSICAL PROPERTIES OF THE ROCHECHOUART IMPACT ROCKS. Large Meteorite Impacts and Planetary Evolution VI, Sep 2019, Brasilia, Brazil. hal-03543116

HAL Id: hal-03543116

<https://cnrs.hal.science/hal-03543116v1>

Submitted on 11 Feb 2022

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CORE AND DOWNHOLE PETROPHYSICAL PROPERTIES OF THE ROCHECHOUART IMPACT ROCKS. P. Rochette¹, F. Demory¹, O. Cheraït¹, L. Hervieu¹, B. Celerier², J. Lofi², P.A. Pezard², P. Lambert³, Y. Quesnel¹, ¹Aix-Marseille University, CNRS, IRD, INRA, Coll France, CEREGE, Aix-en-Provence, France (quesnel@cerege.fr), ²Geosciences Montpellier, France, ³CIRIR, Rochechouart, France.

Introduction: The Rochechouart impact structure (Limousin, France), has been submitted to scientific drilling operated by CIRIR to 60 m depth at six sites and 120 m depth only at Chassenon [1]. All the holes intercept impactites, mainly suevites and impact melt rocks, and most also cross cut the contact with brecciated granitic to gneissic target.

Objectives and methods: Through the measurements of physical properties both on cores and in-situ with logging instruments we foresee a number of applications from understanding the origin of the geophysical anomalies observed in Rochechouart [2] to constraining the pressure, temperature, redox condition versus time from the impact. Indeed transformation of the impactites properties occurred on impact but also within an unknown time interval afterwards, due to intense hydrothermal activity. Comparison of in-situ and core measurements will also allow to calibrate the depth reported on cored material, that may suffer uncertainties with respect to in-situ depth. Petrophysical properties measured are electrical resistivity, magnetic susceptibility, seismic velocity, density and porosity, paleomagnetism, and magnetic anisotropy. The last two lab-based techniques allow to evaluate, 1) the flow of material in the impactites sheet, and 2), the time interval between impact and remanence acquisition due to cooling or post-impact crystallization of new magnetic grain. A comparison with previous measurement from surface outcrops [3-4] should also unveil the effect of surface weathering and the vertical gradients in petrophysical properties.

Preliminary results: large porosities and electrical conductivities are measured in impactites, Chassenon being characterized by a high clay content. These data are consistent with surface geophysical profiles (electrical and electromagnetic, gravimetry).

Magnetic properties of bedrocks are mainly paramagnetic (low susceptibility and remanence), as for the majority of the impactites. More strongly magnetic impactites are found only on a limited depth range in Chassenon, Valette and Puy Chiraud cores: 0-38, 15-38, 2-12 m, respectively. The most magnetic site is Valette. In Chassenon the first 13 meters are less magnetic than the underlying suevite. These observations well illustrate the fact that coring gives access to material unavailable in surface outcrops. The magnetic mineral identified in the strongly magnetic intervals is magnetite, that has been produced by impact processes.

Measurement of large samples (about 40 cc) ensures a better representativity of directional data in such heterogeneous material. Magnetic anisotropy is high in the bedrock gneisses (up to 20%) and low in the impactites (less than 5%) with a generally planar fabric. Anisotropy directions will be reoriented in azimuth using the paleomagnetic vector, and compared with planar features measured in borehole imagery. A significant number of impactites samples from Valette and Puy Chiraud show a near vertical maximum axis of the fabric as well as foliation plane, indicating a vertical extension, at odds with emplacement as an horizontal sheet. On the other hand, the upper part of Chassenon does show a consistently horizontal foliation.

References: [1] Lambert et al. (2019) LPSC 50th, Abstract #2005. [2] Quesnel et al. this meeting. [3] Carporzen and Gilder (2006) *Geophys. Res. Lett.* 33, L19308. [4] Eitel et al. (2014). *Earth Planet. Sc. Lett.* 387, 99-106.