THE ROCHECHOUART IMPACT CRATER FROM A DOWNHOLE LOGGING POINT OF VIEW

J. Lofi[1], E. Le Ber[1], P. Pezard[1], P. Lambert[2] and P. Rochette[3]. [1] Geosciences Montpellier, Université de Montpellier, CNRS (UMR 5243 - CC 060 - Bat. 22. Université de Montpellier, Campus Triolet, Place E. Bataillon, 34095 Montpellier Cedex 05, France, johanna.lofi@umontpellier.fr), [2]CIRIR (Center for International Research and Restitution on Impacts and on Rochechouart 87600 Rochechouart-France). [3]CEREGE (Centre Européen de Recherche et d'Enseignement des Géosciences et de l'Environnement, Aix-Marseille Université, CNRS, IRD, CEREGE UM34, Aix en Provence, France)

Summary: downhole logging data were acquired in September 2018 in seven open boreholes drilled in the impact structure of Rochechouart. The good recovery and quality of the data allow to recognize the various lithological and structural units forming the crater and to characterise their physical properties.

Downhole logs measure various formation properties (eg. Gamma ray, resistivity, P-waves, magnetic susceptibility…). They are usefull in calibrating the interpretation of geophysical survey data and provide a link for an integrated understanding of physical properties on various scales, from core samples to geophysical surveys (e.g. [1, 2] in impact crater structures).

In September 2018, in the framework of the CIRIR, a complete data set of downhole logging data were acquired in 7 open boreholes drilled in the impact structure of Rochechouart (Table 1). The following measurements were acquired from slimline tools with the Géosciences Montpellier equipment:

- natural radioactivity (Gamma) and spectral radioactivity (Potassium, Uranium, Thorium) of the formation (SGR tool),
- speed of acoustic waves (P and S waves) of the formation from digital recordings of wave trains at 10 kHz (SONIC tool),
- acoustical and optical wall imaging (high resolution and oriented) and well trajectometry (ABI and OBI tools respectively) (Figure 1),
- electrical resistivity of the formation by current injection (DLL3 tool),
- magnetic susceptibility and electrical resistivity by induction of the formation (EM51 tool)
- and physico-chemical parameters (temperature, pressure, conductivity, pH, EH, redox) of the borehole fluid (Idronaut tool).

Borehole name	Borehole depth (m)	Probe	Investigated interval (meters below ground level)
SC2 (Chassenon)	120	DLL3, EM51, Idronaut, Sonic, SGR512, OBI, ABI	1.50-120
SC7 (Valette)	60	DLL3, EM51, Idronaut, Sonic, SGR256, OBI	1.00-59.80
SC11 (Puy Chiraud)	60	DLL3, EM51, Idronaut, Sonic, SGR256, OBI	1.15-50.15
SC14 (Rochechouart)	60	DLL3, EM51, Idronaut,Sonic, SGR512, OBI, ABI	1.40-60.10
SC16 (Montoume)	60	DLL3, EM51, Idronaut, Sonic, SGR256, OBI	1.00-61.70
SC17 (Recoudert)	60	DLL3, EM51, Idronaut, Sonic, SGR256, OBI	1.70-60.70
SC18 (Champagnac)	60	DLL3, OBI (1.5-15m) because of instable hole	5.80-58.5 (DLL3)

Table 1. Intervals and tools logged.

Logs were acquired in open hole conditions. Well data were acquired with a step size of 5 cm for scalar logs and 2–4 mm for high-resolution wall imaging. Acquisition speeds were between 1 and 15 m/min depending on the tool. With the exception of the Idronaut (recording on descent), the data were acquired during the ascent of the tools. As the holes were only partially filled with water, certain measurements (ABI, LL5, Idronaut, Sonic) were only acquired below the water level. No notable problems were encountered during operations. The recovery and overall quality of the downhole logging data are good with the exception of the SC18 borehole wich was unstable.

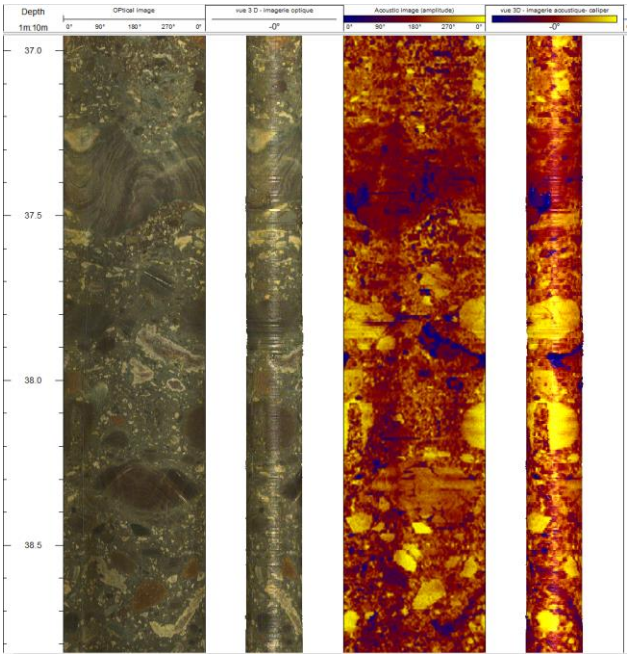

Figure 1. Exemples of unrolled and rolled high resolution optical and acoustical images acquired in hole SC2. The images are oriented with respect to magnetic North. Depth is given in meters below ground level.

Preliminary results show that donwhole logs can be used to charactarise the physical properties of the lithological units that have been recognized in the impact crater and which present specific physical characteris-

tics. Core-log integration have been performed and borehole images used to repositioned accurately in depth the cores sampled in the various holes [3].

References: [1] Christeson G.L. et al. (2018) *EPSL, 495, 1-11*. [2] Quesnel Y. et al. (2021) *G^3, 22, e2021GC010036*. [3] Lambert P. et al (2019) *LPS L Contrib. No. 2132*.

Acknowledgements: Field expenses were covered by the CEREGE and the CIVA project of the Amidex foundation. Laurent Brun, Gilles Henry and Jéhanne Paris are warmly acknowledged for their help with data acquisition. acknowledgements here if this apllies.