PREPARING THE 2017 DRILLING CAMPAIGN AT ROCHECHOUART IMPACT STUCTURE.

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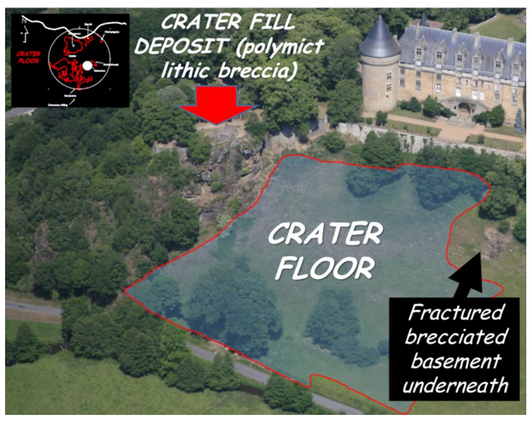
Introduction :

➔ The Rochechouart impact structure [1], dated at ~203 Ma [2], is among the most accessible large impact sites on Earth [3-4]. Yet it has never been drilled for impact research and it is understudied.

Single vol.75 of Geologica Bavarica published back in 1977 on Ries, counts more peer review papers than the whole literature on Rochechouart

➔ The initial diameter estimated between 30-50 km, remains undetermined [3-4].

➔ Owing to its variable degree of erosin, Rochechouart offers unique perspectives on impactite petrography, geochemistry and geophysics, including excellent exposures of i) melt-rich impactites at the bottom of the crater deposit, ii) fine grained impactoclatites at the top, and iii) para-autochocthonous target underneath.



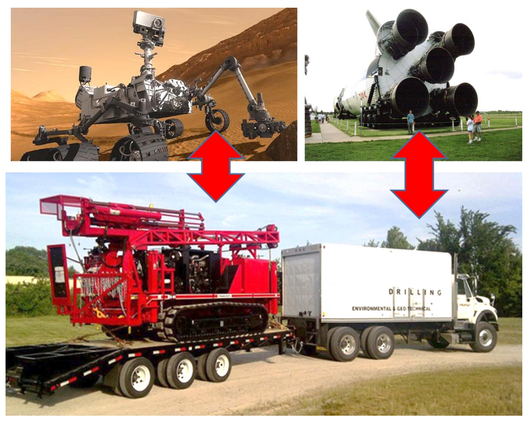
Drilling context and rationale :

➔ Similar to return sample missions to the Moon, Mars (planned), and to other drillings at terrestrial impact craters

(yet much more modest…, especially in terms of cost)

➔ Will deliver samples that will be made available to the scientific community beguinning in 2018

➔ Programme entirely funded with French taxpayers money, realized by and within **NNR** *"Réserve Naturelle Nationale de l'Astroblème de Rochechouart-Chassenon",* set up and operated on behalf of NNR by **CIRIR**, "Center for *International* Research on Impacts and on Rochechouart" *(funded and created by local authorities) (name under approval).*



Scientific Objectives (non exhaustive):

Specific issues: initial crater size and morphology, age, projectile, composition.

General issues: *(similar to the 2016 drilling programme at Chicxulub [5]):*

➔Large crater formation mechanics

➔Characterization of impact-induced alteration processes

➔Evaluation of possible effects of large impacts on the habitability of planets and the emergence of life

Although different in size, both Chicxulub and Rochechouart triggered impact-induced hydrothermal systems and projectile-derived chemical signatures are preserved in the impact deposits [6-7]

The Rochechouart drilling results will improve our understanding of the formation and emplacement of crater deposits, including the unpredicted large abundance of unmelted material [3]. The drill cores should enable characterizing the fate of siderophile element patterns (projectile contamination) as related to cooling and alteration of impact deposits [3 and references therein] which will have implications for meteorite studies [4].

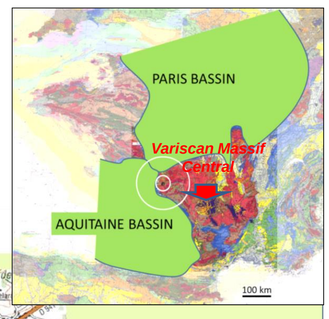
Programme:

➔ 8 sites along two 10 km radial traverses across the center of the structure.

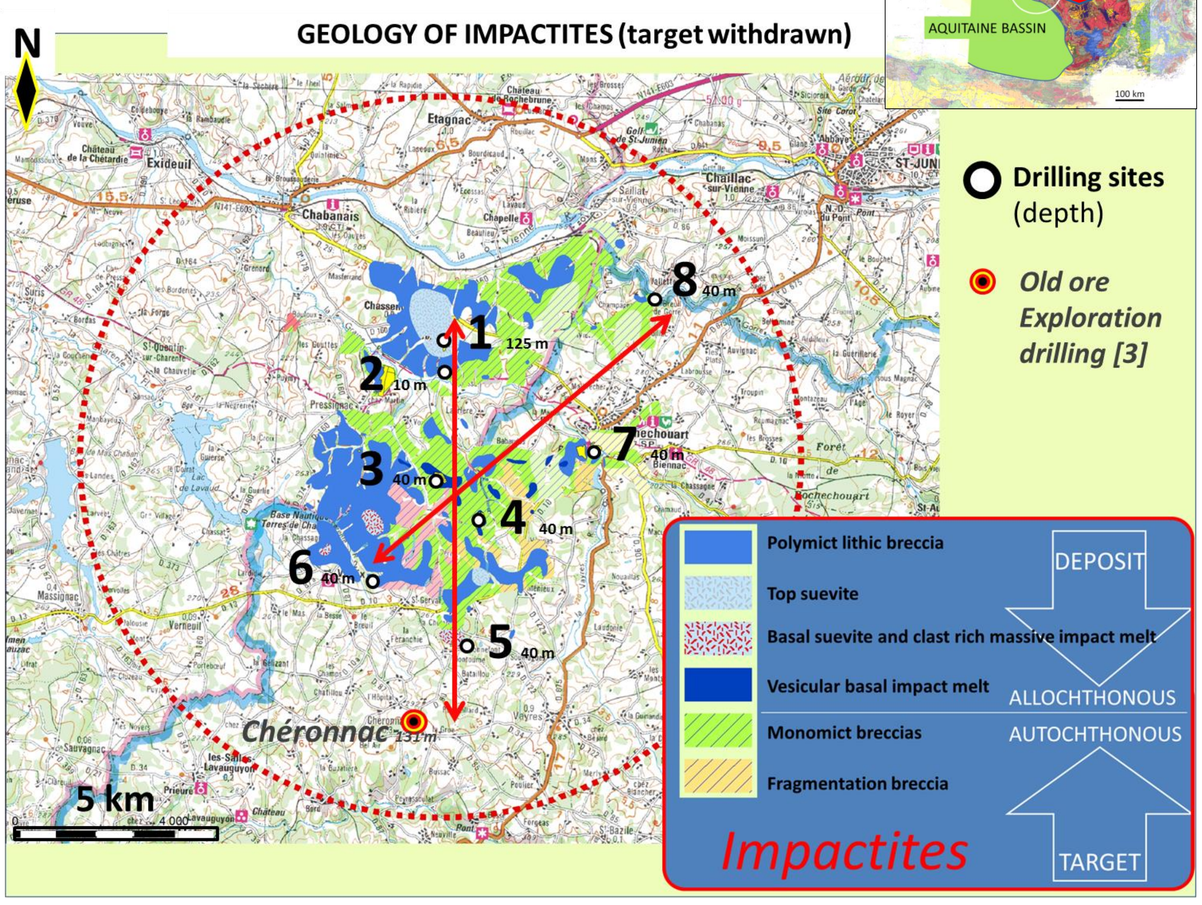
➔ 27 shallow drill holes, with a cumulate length of 400m, intersecting the complete range and the full sequence of preserved impactite deposits.

➔ At 7 sites, drilling will transect the structural crater floor and terminate 30 m below.

Lateral and vertical gradients of shock, temperature, and alteration should be revealed. This will allow an appraisal of impact deformation, including the formation of breccia dikes and pseudotachylites [8-9] and post-impact alteration [3].



SITES	LITHOLOGY		Drilling	
	Crater fill	Underlying target *(impact damages)*	Hole n°	Depth (m)
n°1: Chassenon	Top suevite with impactoclastites Polymict lithic breccia underneath	Gneiss *(weak)*	1 2-3	125 1 each
n°2 : Champonger	Polymict lithic breccia	Gneiss *(weak),* Microgranite *(weak, includes shatter cones)*	4 5-6	10 3-1
n°3: Valette	Vesicular basal impact melt rock	Gneiss and granitic gneiss *(strong, up to partial melting)*	7 8-11	40 1 each
n°4: Recoudert	Vesicular basal impact melt rock	Gneiss and granitic gneiss *(unknown)*	12 13-14	40 1 each
n°5 : Montoume	Massive basal impact melt rock *(Clast rich particulate melt)*	Mostly granitic gneiss *(weak)*	15 16-19	40 1 each
n°6: Puy Chiraud (Videix)	Massive basal impact melt rock Polymict lithic breccia underneath ?	Granite and granitic gneiss *(strong)*	20 21-23	40 1 each
n°7: Rochechouart castle	Polymict lithic breccia	Granitic gneiss *(weak)*	24 25-26	40 1-3
n°8: Champagnac quarry	Polymict lithic breccia *(monomict ?)*	Mafic gneiss, diorite cut by variscan hydrothermal veins *(weak, include impact hydrothermal veins and pseudotachylites…)*	27	40



Conclusions:

The 2017 drilling campaign is an important step towards better understanding of: 1) the Rochechouart impact structure; 2) large impacts and collateral effects (including habitability of early Earth and planets, emergence and evolution of life).

Project master : **National Reserve**

Project manager : (on behalf of National Reserve and public authorities)

TASKS	OPERATOR	2016	2017	2018	2019
Scientific programme setting	CIRIR (on behalf of National Reserve and public authorities)				
Funding	National Reserve (Funding sources : Local authorities, French State, EU)				
Autorisations, selecting drilling Cie, contracts…	National Reserve				
Final validation	Scientific Committee of the National Reserve				
Realisation of the drillings	Selected drilling Cie				
Call for PI's and organizing scientific valorization	CIRIR and its team members (PI's, Committee of Sages)				
Set up of the research projects	Individual PI's (with CIRIR support for logistics and coordination)				
Initial examination of cores	CIRIR team members (on site Support Task Force and PI's)				
Sample preparation (halving, indexing)	CIRIR (on behalf of the National Reserve) and team members on site				
Sample distribution	National Reserve (with CIRIR support)				

MetSoc 2016

Drop Box!

Expression of interest, Suggestions, Comments

Those interested in drilling outcomes, participating in the research, or in the organization of the drilling, the initial examination of cores and sample distribution, please contact us !

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