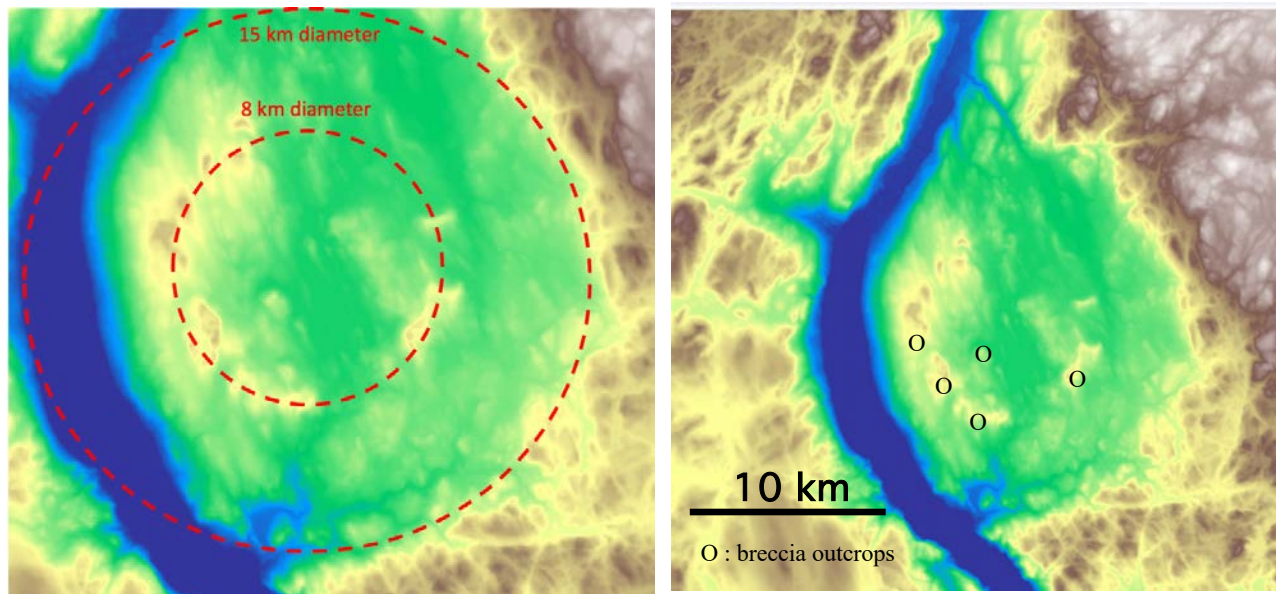


Lake Marsal: a large impact structure candidate in Quebec (Canada)

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We investigate a new impact structure candidate, centered on Lake Marsal in Quebec, Canada (lat 51.2°N, lon 64.7°W). A roughly circular depression over 15 km in diameter is highlighted on satellite imagery by the arcuated Magpie lake and river to the West. It shows an average altitude difference between floor and rim of 200 to 300 m with a faint circular inner ring of circa 8 km diameter within the depression (see SRTM topographic maps below). Outcropping geological formations in the area are essentially Grenvillian (1.2 Ga) gabbro-norite, anorthosite and granite, but the 8 km topographic inner ring more or less corresponds to discontinuous outcrops (indicated by **O** in the map below) of a post-orogenic breccia of unknown age (assumed to be Paleozoic by [1], but without any dating). This probably flat lying polymict breccia layer with an abundant fine-grained mafic matrix (about 80%) loaded with xenocrysts, bears partly digested centimetric to decimetric clasts of local Grenvillian lithologies. With 55.3 wt.% SiO₂, 5.3 wt.% Na₂O+K₂O and 9.5 wt.% Fe₂O₃, its composition is mafic/intermediate but particularly enriched in K, Ba, Sr, Zr, REE, compared to Grenvillian mafic rocks.

This formation, interpreted as a volcanoclastic diatreme formation named Marsal breccia by [1], in an area devoid of post Grenvillian magmatism (the nearest one, the Sept-Iles complex [2] is 160 km away) is in fact more in agreement with a crater floor clast-poor melt rock, quite similar to the Mistastin and Janisjarvi cases [3,4]. The Bouguer gravity anomaly and aeromagnetic maps do not show any circular anomaly over the depression. However, the spatial resolution of the raw data may be too low to distinguish any anomaly of diameter < 5-10 km. Therefore, a field campaign may help to determine if a residual geophysical anomaly could be observed. We will present microscopic petrographic investigations of samples from this melt breccia, obtained from the geological survey of Quebec (Ministère des Ressources naturelles et des Forêts, secteur mines). Crystallization features of silicates, abundant magnetite, sulfides and zircons are quite suggestive of an impact melt rock. Based on the already available preliminary evidence, Lake Marsal seems to be a serious candidate to become the 11th confirmed impact structure from Quebec, Based on the level of erosion, with only remnants of melt on the floor, Its age could be in between the Mistastin and Charlevoix cases (38 and 450 Ma, [3,5]). Confirmation of impact origin may be gained from the available sampling or else may wait for a future dedicated expedition.



Acknowledgments: we thank Joel Lapointe, from Shawinigan, Quebec, for pointing to us this potential crater and the geological survey of Quebec for providing samples and information.

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