EGU21-7609
https://doi.org/10.5194/egusphere-egu21-7609
EGU General Assembly 2021

Impact crater versus bioherm on the Nullarbor Plain, Australia

Matej Lipar[1], Mateja Ferk[1], and Andrej Šmuc[2]
[1]Research Centre of the Slovenian Academy of Sciences and Arts (ZRC SAZU), Anton Melik Geographical Institute, Ljubljana, Slovenia (matej.lipar@zrc-sazu.si; mateja.ferk@zrc-sazu.si)
[2]University of Ljubljana, Faculty of Natural Sciences and Engineering, Department of Geology, Ljubljana, Slovenia (andrej.smuc@ntf.uni-lj.si)

The Nullarbor Plain is ~200,000 km^2 large planar karst surface in southern Australia, composed of middle Cenozoic shallow-water limestones of Eucla Group. The youngest formation, covering the top of the plain, is middle Miocene extremely fossiliferous sub-tropical Nullarbor Limestone. In the late Middle Miocene the area was uplifted and exposed to terrestrial denudation and erosion since. Although the plain is in general considered extremely flat, the present geomorphological features indicate a relatively complex geomorphology formed by a combination of tectonic deformation, fluvial and aeolian activity and karst denudation. Due to the absence of orogenesis and only minor influence of post-Miocene sediment deposition, the geomorphology of the Nullarbor preserved footprints of Earth processes through a long, middle Miocene-to-present, time span.

The presence of dry climate and consequent lack of vegetation also aided for numerous meteorite findings, but no visible impact deformations have been recorded. The latter, in combination with capability of the plain to inherit/imprint old geomorphological features, and accessibility of recently built 0.4 arc sec TanDEM-X-DEM by the German Aerospace Centre, motivated the search of a possible meteorite craters with spatial analysis of the plain. The analysis of DEM images revealed a single geomorphological feature with circular uplifted rim (diameter: 1200 m – 1300 m; height: 7 m in relation to outer elevation; width: 200 – 450 m), central uplift (diameter: 500 m; height: 10 m in relation to outer elevation), and a circular trough in between (2 – 3 m higher than outer elevation). Its morphology differs from other geomorphological features observable on the Nullarbor Plain, and represents a unique phenomenon, which cannot be explained as a part of tectonic, volcanic, fluvial, karst or aeolian processes.

This feature is therefore a candidate for a possible relict of a meteorite crater, which occurrence is supported by topographical characteristics including uniqueness of the shape compared to other features on the plain. On the other hand, geological characteristics of the exposed rock within the “crater” lack any of the general diagnostic evidence for impact events (e.g., shocked quartz, brecciation), but rather indicate presence of boundstones with frame-builders preserved in in-situ position and thus suggesting the preservation of a bioherm. The occurrences of bioherms, however, are seldom individual (unlike impact craters) and more likely occur in clusters. The question remaining for this conference discussion is whether dissolutional imprinting of an impact

crater could denude any of the characteristic impact structures whilst preserving the shape, or are we looking at a single bioherm preserved as a primary marine depositional feature?

ACKNOWLEDGEMENT: We acknowledge the financial support of Slovenian Research Agency (P6-0101; I0-0031; N1-0162), the Australian Speleological Federation Karst Conservation Fund and TerraSAR-X / TanDEM-X (DEM_GEOL2288).