New methodology provides better size estimates of meteorite impact craters

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Credit: University of Western Ontario

Using newly developed methodology, planetary scientists from Western University have re-estimated the diameter of eight well-known impact craters on Earth. The journal *Science Advances* published an explanation

of the new technique and the improved estimations today.

Gordon Osinski from Western's Centre of Planetary Science and Exploration (CPSX) says that the first question most commonly asked about an impact crater is: "How big is it?"

The NSERC/MDA/CSA/CEMI Industrial Research Chair in Earth and Space Exploration explains that determining size of impact craters on extraterrestrial bodies, where recent or ongoing plate tectonics, volcanism, and active erosional processes are lacking, is relatively straightforward and is achieved by measuring the diameter of the highest points of the crater rim.

On Earth, however, erosion and other geological processes have either destroyed or obscured the topographic rim at the vast majority of impact craters. For this reason, Osinski and his collaborator Ludovic Ferrière from Vienna Museum of Natural History developed the new methodology, which is based on measurements and spatial distribution of shatter cones found in impact craters. Shatter cones are rare geological features that are only known to form in the ground beneath meteorite impact craters or in nuclear explosions.

Osinski and Ferrière also suggest that shatter cones may reduce the strength of an impacted body, in this case the Earth, which not only contributes to further collapse of the crater but also provides valuable data about the obliquity (the angle of approach) of the impactor (asteroid or comet).

"Shatter cones are one of the most used and trusted shock-metamorphic effects for the recognition of meteorite impact structures. Despite this, there is still considerable debate regarding their formation," says Osinski, also an Associate Professor in Western's Departments of Earth Sciences and Physics and Astronomy. "We have now provided new

observations of shatter cones from several complex impact craters on Earth, which gives us valuable insight into the formation of shatter cones, their spatial distribution and setting within impact craters and their potential role in weakening the target before crater collapse."

More information: G. R. Osinski et al. Shatter cones: (Mis)understood?, *Science Advances* (2016). DOI: 10.1126/sciadv.1600616

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