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A first minimum in-situ 10Be age for the Tswaing Meteor Crater, South Africa.

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The well-preserved Tswaing Meteor Crater–aka Pretoria Saltpan –with a diameter of 1130 m is located ca. 40 km NNW of Tshwane (Pretoria). It has been a subject of several scientific investigations. The crater is formed on a ca. 2 Ga Nebo Granite, the acid phase, of the Bushveld Complex (Lebowa Granite Suite). The interior structure floor is not far removed from the local ground water level and hence the floor is partially filled by a highly saline lake (Tswaing means the place of salt). The elevation of the rim over the present structure floor is ˜120 m, while it rises about 60 m above the surrounding plain. The rim, with minimal seasonal brush, has a fair number of granitoid boulders. These are thought to have been uprooted during the cratering event from the Nebo granite basement bedrock. The basement rock is some 200 m below the current floor. The drill cores from this lake give a unique insight into past climate and flora of the region (Partridge et al. 1993, Kristen et al. 2007, Metwally et al. 2014, Scott 2016).

The meteorite impact origin of Tswaing was largely inferred from morphological observations and was later supported by structural and experimental fission track measurements (Reimold et al., 1992). The currently accepted age of 220±50 ka the is based on fission track dating (Storzer et al. 1993). However, this is an average over wildly varying measuements. While a similar result age was inferred by the core drilling on the crater floor that revealed an infilling consisting of 90 m of organic lacustrine sediments, this is based on extrapolation from the average infilling rate of 50 cm/ka of the radiocarbon dated section of the core (Partridge et al, 1993). This rate also has evident significant variance over the first 20 m of the core.

The boulders from the ejecta of the impact around the rim of the crater present an excellent opportunity to independently verify the age of the cratering event through the exposure ages of these boulders by cosmogenic radionuclides using accelerator mass spectrometry. To this end we collected 15 samples from around rim, pre-treated them, and processed selection of 10 at the Helmholtz-Zentrum Dresden-Rossendorf for AMS analysis. Here we will present first results from the AMS measurement of the samples, a contextual interpretation, and the implications for the actual age of the Tswaing impact crater.

References:
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Student Submission

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