Geophysical Research Abstracts
Vol. 17, EGU2015-11624, 2015
EGU General Assembly 2015


# The Structure of the Kaali Impact Crater (Estonia) based on 3D Laser Scanning, Photogrammetric Modelling and Strike and Dip Measurements

Michael Zanetti (1), Jakob Wilk (2), Argo Joeleht (4), Rudolf Välja (4), Anna Losiak (5), Tomek Wisniowski (6), Matthew Huber (7), Kristiina Pavel (4), Aivar Kriiska (4), Jüri Plado (4), Wolf Dietrich Geppert (8), Antero Kukko (3), and Harri Kaartinen (3)

(2) Institute of Earth and Environmental Sciences – Geology, Albert-Ludwigs-Universität (ALU) Freiburg, Alberstraße 23B, 79104 Freiburg, Germany(jakob.wilk@geologie.uni-freiburg.de), (1) Wash-ington Uni. in St Louis and the McDonnell Center for Space Science (michael.zanetti@wustl.edu), (3) Finnish Geodetic Institute, (4) University of Tartu, Department of Geology, (5) ING, Polish Academy of Sciences, (6) SRC, Polish Academy of Sciences, (7) Vrije University Brussel, (8) Department of Physics, Stockholm University, Roslagstullbacken 21, S-10691 Stockholm, Sweden

**Introduction:** The Kaali Impact Crater on the island of Saaremaa, Estonia (58.37˚N, 22.67˚E) is part of a crater-strewn-field consisting of nine identified craters, ranging in size from 110m (Kaali Main) to a few meters in diameter [1-3]. The strewn field was formed by the breakup of an IAB iron meteorite during atmospheric entry [4]. The main crater is due to its size an important crater to study the effects of small asteroidal impacts on terrestrial planets.

Despite some anthropomorphic changes, the crater is well preserved. During a scientific expedition in August 2014, we mapped the crater in unprecedented detail using 3D laser scanning tools and made detailed strike and dip measurements of all outcrops. Additional measurements using ground-penetrating radar and electro-resistivity tomography we also conducted to further refine the subsurface crater morphology.

The results include a high resolution topographic map of the crater, previously unreported observations of overturned ejecta, and refined morphometric estimates of the crater. Additionally, research conducted as part of the expedition has provided a new, best-estimate for the formation of the crater (3200a +/- 30 BP) based on $^{14}$C AMS dating of charcoal from within the ejecta blanket [Losiak et al., 2015, this conference].

**Structural Mapping:** Although Kaali Main has been the subject of previous investigation (e.g. [2,5,6]), most of the structural descriptions of the crater pre-date modern crater investigations. Strongly inclined blocks were previously considered being affected by erosion and slope processes, our new observations show that most high dip-angle features fit well with overall dip-angle systematics. The existence of the overturned flap can be demonstrated in at least four areas around the crater.

**3D Laser Scanning:** A point cloud containing 16 million data points was created using 43 individual scans from a tripod mounted Faro 3D 330x laser scanner. Scans were processed using Trimble Realworks software. A DEM, Hillshade, Slope Map and Contour Map were created in ESRI ArcScene software.

**Photogrammetry:** Photogrammetric techniques from images of key outcrops were used to create texture, photo-realistic 3D representations using Agisoft PhotoScan software.

**Acknowledgements:** We extend our sincerest gratitude to the Estonian National Heritage Board for permission to dig and make measurements at the crater.

**References:** [1] I.Kolkun (1922) *Üldine geologia. Tallin,* 170. [2] J. A.Reinwald (1933) *Publications of the Geological Institution of the University of Tartu,* 30:1-20. [3] J.A.Reinwald (1928) *thesis; Univ of Tartu* [4] L.J.Spencer (1938) *Miner. Mag.,* 25:75-80. [5] A.Aaloe (1959) *ENSV TA Geoloogia Instituudi Uurimused,* 2:105-117. [6] A.Raukas et al. (2002) *Impact Studies 2005,* 341-355.