MAPPING TERRESTRIAL IMPACT CRATERS WITH THE TANDEM-X DIGITAL ELEVATION MODEL. M. Gottwald[1], T. Fritz[1], H. Breit[1], B. Schättler[1], A. Harris[2], [1] German Aerospace Center, Remote Sensing Technology Institute (DLR-MF), Oberpfaffenhofen, D-82234 Wessling, Germany, manfred.gottwald@dlr.de, [2] German Aerospace Center, Institute of Planetary Research (DLR-PF), Rutherfordstraße 2, 12489 Berlin, Germany

Introduction: We use the global digital elevation model (DEM) generated in the TanDEM-X mission for mapping confirmed terrestrial impact craters. The TanDEM-X mission generates a global DEM with unprecedented properties. It permits both for simple and complex craters detailed investigations of the morphology of the particular structure and of the surrounding terrain of outstanding quality.

Methodology: The DEM derived in the TanDEM-X mission [1] is generated from data of the German X-band TerraSAR-X and TanDEM-X satellites, launched in June 2007 and June 2010, respectively. This DEM achieves global coverage together with an accuracy in the sub-10 m range and a spatial resolution of 12 m at the equator. Thus it exceeds the quality of current elevation models generated from space-borne remote sensing data, e.g., SRTM X-band (15 m / 30 m with limited coverage) considerably.

We apply the TanDEM-X DEM to the impact crater record of the exposed entries in the well-appreciated *Earth Impact Database* of the Planetary and Space Science Center at the University of New Brunswick, Canada [2]. As of April 2013, this database lists 184 entries with 122 being of ‘exposed’ type. The selected approach provides very high confidence that only structures of confirmed impact origin are analyzed. Our initial purpose is to generate a TanDEM-X impact crater catalogue including, e.g., high precision maps together with cross sections yielding elevation profiles. The catalogue can be used for further detailed studies or the development of search algorithms for potential impact features in selected areas.

Early Assessment: We have already browsed the database of quality monitoring products generated in the DEM processing environment when individual X-band acquisitions are processed to yield the interim raw DEM data, including high resolution DEM images (2D and 3D), at the locations of the exposed *Earth Impact Database* entries. In total we identified 109 sites where the TanDEM-X DEM displays either a simple, complex (mostly eroded) or partially submerged structure. Two exemplary maps, the Haughton impact crater on Devon Island and the recently added Tunnunik structure on Victoria Island are illustrated in Fig. 1. Fig. 2 shows two TanDEM-X DEM elevation profiles for the Haughton impact.

First quantitative conclusions such as relations between detectability and crater properties can be drawn. It is obvious that even in the early assessment based on quicklook-type data the lower detection limit in suitable terrain corresponds to a diameter of only about 100 m.

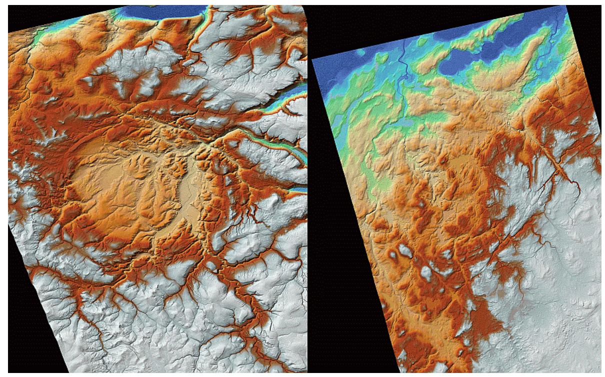

Fig. 1: Two TanDEM-X DEM maps of impact craters with Haughton (left) and Tunnunik (right). Color coding differs in both images.

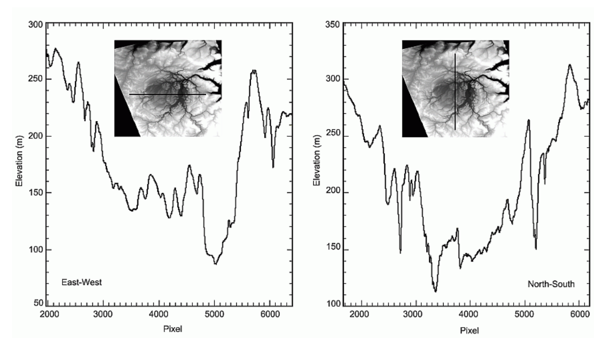

Fig. 2: East-west (left) and north-south (right) elevation profiles through the Haughton crater.

Conclusions: Our preliminary analysis has shown that the TanDEM-X DEM can be a powerful tool for the study of terrestrial impact craters. We will apply our analysis successively to the entire data set as the operational TanDEM-X DEM scenes will become available in 2013-2014 thus generating the intended impact crater catalogue of confirmed structures for reference purposes.

References: [1] Krieger G., et al. (2007) *IEEE Trans. Geosci. Remote Sens., 45, 11,* 3317-3341. [2] Earth Impact Database, Planetary and Space Science Center (PASSC), University of New Brunswick, Canada (http://www.passc.net/).