THE TANDEM-X DEM – STATUS OF THE NEW DATASET FOR STUDYING TOPOGRAPHY OF THE GLOBAL IMPACT CRATER RECORD

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Introduction: Between December 2010 and September 2014 the German Aerospace Center (DLR) operated the X-band radar satellites TerraSAR-X (TSX) and TanDEM-X (TDX) in close formation as a single-pass SAR interferometer. Data from Earth's entire land surface acquired in bistatic mode permitted generation of a global high quality digital elevation model (DEM). Its accuracy, both in resolution and height, exceeds similar existing datasets from spaceborne mission, e.g. SRTM in 2000, by at least a factor of 3 [1].

TanDEM-X DEM Status: From the individual data acquisitions over a period of almost 4 years a total of ~ 485000 scenes, each ~30×50 km^2, has been extracted. These are referred to as *Raw DEMs*. From the Raw DEMs the final DEM is being generated region wise. Currently more than 50% of the land mass are already finalized and access for scientific purposes will be granted via an AO proposal scheme starting mid-2015. The global coverage will be available by the second half of 2016.

Raw DEMs from the first year's acquisitions have been assembled in the Intermediate DEM (IDEM). Although it does not exploit the full potential of a 4 year long interferometric mission, its accuracy already comes close to that of the final DEM, particularly in moderate terrain. The IDEM has regional coverage only. It covers 11 of the 188 confirmed impact structures in the Earth Impact Database (EID) [2]. This includes some of the Canadian entries at geographic latitudes > 60°N which were missed by the SRTM DEM.

Impact Structures in TanDEM-X Raw DEMs: After the first year of interferometric data acquisitions had been successfully accomplished, we started our investigations of impact crater mapping by using the available Raw DEMs and the IDEM. The crater sample was taken from the EID. Even this early assessment already showed the superior quality of the elevation data when applied to the location of the impact structures [3].

Meanwhile we have scanned the entire Raw DEM database and extracted detailed topographic information for 80 impact craters constituting the majority of the global record of exposed structures. 60% were of complex type with diameters > 5 km displaying various levels of preservation. Most of the craters required access to only 1-2 Raw DEMs, i.e. the entire sample was covered by less than 0.1% of the TanDEM-X DEM. The very large structures such as Vredefort or Chicxulub can only be fully mapped when the final DEM becomes available.

Conclusion: Our work, based on the complete raw dataset, demonstrates the excellent quality of the TanDEM-X DEM in support of crater research. It will serve as a very useful repository for impact studies using spaceborne remote sensing data.

References: [1] Krieger G. et al. 2013. *Acta Astronautica* 89:83-98. [2] Earth Impact Database (Planetary and Space Science Center, University of New Brunswick, Canada): http://www.passc.net/EarthImpactDatabase/ (accessed April 2015). [3] Gottwald M. et al. 2013. Abstract #3001. Large Meteorite Impacts and Planetary Evolution V.