

TanDEM-X: A High Resolution Radar Topography Mission

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Abstract: *TanDEM-X (TerraSAR-X add-on for Digital Elevation Measurements) is an innovative spaceborne radar interferometer that is based on two high-resolution radar satellites in close formation flight: TerraSAR-X (launched on June 15, 2007) and TanDEM-X (launched on June 21, 2010). The primary objective of the TanDEM-X mission is the generation of a consistent global digital elevation model (DEM) with height accuracy of 2 meters and posting of 12 meters. It is expected that this data set will become a reference in geosciences and remote sensing applications.*

TanDEM-X has an ambitious time schedule to reach the main mission goal. The operational bi-static data acquisition has started in December 2010. The next two years are dedicated to the global DEM acquisitions, followed by six months of additional acquisitions to cover difficult terrain with extreme topography. The across-track and along-track baselines are optimized in each phase of the mission for DEM performance and vary between 200 and 400 meters. After the DEM acquisitions even larger baselines can be adjusted for DEMs with higher accuracy (posting of 6 m and relative vertical accuracy of 0.8 m) on local scales and for the exploration and demonstration of scientific experiments. The global DEM data set will be available by mid 2014.

Key technologies of the TanDEM-X mission are the bistatic data acquisition employing an innovative phase synchronization link, a new satellite orbit for formation flight allowing for the collection of bistatic data with short along-track baselines, the interferometric data processing with multiple baselines as well as the use of new interferometric modes for system verification and DEM calibration.

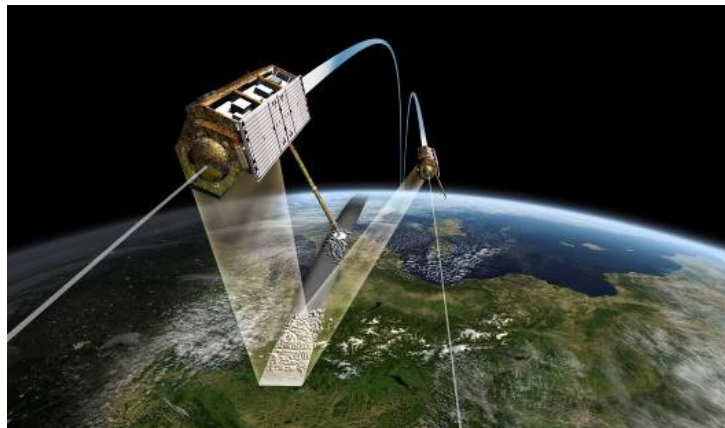


Fig. 1 -TerraSAR-X and TanDEM-X flying in close formation. The across-track and along-track baselines are optimized in each phase of the mission for DEM performance and vary between 200 and 400 meters.

Beyond the generation of a global TanDEM-X DEM as the primary mission goal, applications based on along-track interferometry like measurements of ocean currents are important secondary mission objectives. Along-track interferometry will also allow for innovative applications to be explored and can be performed by the so-called dual-receive antenna mode on each of the two satellites and/or by

adjusting the along-track distance between the TerraSAR-X and TanDEM-X satellites to the desired value. Combining both modes will provide a highly capable along-track interferometer with four phase centers. Furthermore TanDEM-X supports the demonstration and application of new SAR techniques, with focus on multistatic SAR, polarimetric SAR interferometry, digital beam forming and super resolution.

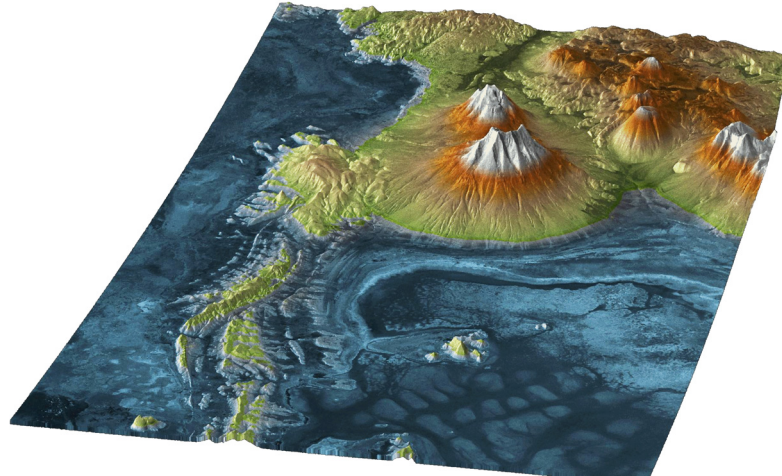


Fig. 2 - Digital elevation model generated by TanDEM-X showing the largest salt flat in the world (Salar de Uyuni, Bolivia). Since the start of the operational phase in December 2010, TanDEM-X is mapping ca. 12 Mio. square kilometers per month in interferometric mode.

The TanDEM-X mission is implemented in a public-private partnership (PPP) between DLR and EADS Astrium GmbH. The science proposal submission for data requests is available at the TanDEM-X Science Service Portal: <http://tandemx-science.dlr.de/>. More information about the TanDEM-X mission is available under <http://www.dlr.de/hr/tedx/>.

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