

Digital Elevation Modeling using TerraSAR-X Radargrammetry

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SUMMARY

A digital elevation model (DEM) is the basis for all geospatial related questions: it is used for orthorectification of airborne and spaceborne imagery, for topographic mapping, for the simulation of stream flows and various other applications. The data sources used for the DEM processing can be manifold. As spaceborne acquisitions can cover larger areas in a short timeframe it facilitates the elevation modeling in a time and cost efficient way. As repeat pass InSAR processing for elevation modeling shows limitations due to the sensibility of X-band SAR data the methodology of Radargrammetry using TerraSAR X data was analysed. TerraSAR-X StripMap and SpotLight stereo data pairs are used as input for the radargrammetric processing. The standard inputs for radargrammetric processing are data acquired in StripMap mode with a resolution of approximately 3 m. The output of the data processing is a digital elevation model (DSM) with a spacing of 10 m. Depending on the relief conditions and availability of incidence angles, which is depending on TerraSAR X orbits, a disparity angle range between 15° - 25° for the stereo pairs is selected. The processing is carried out on Single Look Slant Range Complex (SSC) data in the internal Infoterra processing environment for TerraSAR-X. As the radar signal is backscattered at the top of any features on the earth surface the resulting elevation model is a DSM which includes all features like trees and houses. The capabilities of using TerraSAR X data as input for Radargrammetry show good results. Due to the high impact of vegetation and atmospheric changes on the X band using InSAR technique for DEM generation is limited. The discussed method is more stable and shows comparable results. Radargrammetry using TerraSAR X data is a well suited method to generate elevation models from high resolution SAR data. As the acquisition parameters have a strong influence on the resulting DEM accuracy intensive tests have been archived during the development period of the Radargrammetry processor at Infoterra. The archives accuracy of the TerraSAR X Stereo DEM shows improvements in comparison to global DEMs available at the moment. Thus, it gives already a preview on the quality and level of detail to be expected from the DEM, which will be acquired within the TanDEM X mission.

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