TERRASAR-X STEREO DIGITAL ELEVATION MODELS FOR COMPLEX TERRAIN CONDITIONS IN ALPINE REGIONS AND ITS SUITABILITY FOR ORTHORECTIFICATION PURPOSES OF OPTICAL AND SAR IMAGERY

N. Kiefl[*a] W. Koppe[a] S. Hennig[b a]

[a] Infoterra GmbH, Development & Innovation, Claude-Dornier-Strasse, 88090, Immenstaad, Germany
[b] Infoterra GmbH, Production & Technology, Claude-Dornier-Strasse, 88090, Immenstaad, Germany

Technical Commission VII Symposium 2010

KEY WORDS: DEM/DTM, Analysis, SAR, Stereoscopic, Orthorectification

ABSTRACT:

The technology of interferometry is already well established for generation of digital surface models (DSM). However, the short wavelength of the TerraSAR-X satellite implies temporal incoherence for repeat pass interferometry and therefore is not well suited in order to derive reliable surface models in all regions of the world. Nevertheless, it is already possible to generate reliable surface models with TerraSAR-X only by taking advantage of the possibility to acquire data at different incidence angles. The used technology is based on methods from photogrammetry, the so-called radargrammetry. The technology for radargrammetric or stereo DSM processing is already implemented at Infoterra GmbH's infrastructure and enables the generation of DSMs based on StripMap mode data (3 m spatial resolution) with a vertical height accuracy of 5 to 10 meters (LE 90) for slopes smaller than 20°. In the frame of Infoterras globally performed DEM verification campaign a development project with a focus on the refinement of the radargrammetric processing methodologies and verification of results for an area with complex terrain conditions was conducted. The test site is the Juneau Icefield (Alaska, USA), which provides difficult terrain conditions for DEM generation. The area is mainly covered by snow and ice and is characterized by very steep slopes. To emerge the best acquisition scenarios for DEM generation, several data sets were acquired in different TerraSAR-X modes with varying incidence angle combinations in different seasons. The verification results for the different test cases with respect to height accuracy as well as suitability for orthorectifcation purposes of SAR and optical (RapidEye) data will be presented. The statistical analysis showed that the vertical accuracies are strongly dependent on the disparity angle of the input scenes. They vary between a vertical error of 16.2 meters (LE90) for small (9°) and 6.5 meters for larger disparity angles (20°).

TOPIC: Microwave remote sensing
ALTERNATIVE TOPIC: Remote sensing applications