SAR IMAGING GEODESY– RECENT RESULTS FOR TERRASAR-X AND FOR SENTINEL-1

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1. Imaging Geodesy Concepts

- Precise calibration of SAR system
- Geometrically accurate processing of SAR data
- Comp. of signal propagation by GNSS measurements or models
- Compensation of Earth dynamics
- Use of multiple acquisitions (different geometries)

Accurate absolute 2D (3D) positioning

2. TerraSAR-X Results

TerraSAR-X Absolute 2D Positioning Accuracy

- Long time experiments running since 2012 in Wettzell, Metsähovi, GARS O’Higgins
- A 1.5m corner reflector can be localized to within 1-2 cm in the slant range plane and about 6 cm in 3D ITRF08
- Accuracy depends on SCR (size), orbit accuracy, troposphere information (GNSS, ECMWF-model), ionosphere

3. New Geodetic Applications

Ground displacements caused by the 7.8-magnitude earthquake that struck Nepal on 25 April 2015. Data: Sentinel-1A.

4. The Australian (GSA) CR Array

Several CRs of different sizes distributed over Sentinel-1 beams and within bursts.

Data are analyzed and recipes for CR placement and for geodetic SAR with Sentinel-1 are developed within ESA Contract No. 4000119113 “Fiducial Reference Measurements for SAR” with Uni Zürich (D. Small & A. Schubert) and N. Miranda (ESA).

5. First results with Sentinel-1: Exciting Potential!

Sentinel-1 analysis in Wetzell (1.5m CR) shows good potential, but varying systematic errors depending on S1A/S1B and beams and burst time.

Australian CR field is excellently suited to analyze and possibly calibrate residual geometric effects in Sentinel-1 A/B.

6. Summary & Outlook

This poster summarizes work performed by the DLR-TUM “Imaging Geodesy” study group co-funded by the German Helmholtz Association 2012-2016.
- The study group has developed methods for 3D positioning of objects from TerraSAR-X with centimeter accuracy
- Many new geodetic applications are currently exploited, e.g. for mapping, land motion, interferometry, etc.
- The work is continued with University of Zürich and applied to Sentinel-1 data under ESA contract. First results clearly indicate the potential for comparable results, taking into account the reduced resolution