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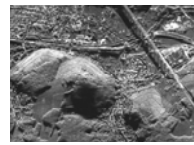**Assessment of TerraSAR-X Orthorectified Imagery Based on Commonly Used DEMs as well as on TerraSAR-X Stereo DEM**

Ralf Düring / Wolfgang Koppe

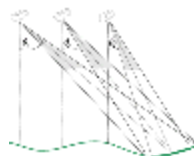# Dependency of pixel location accuracy

Objective:

- Get a better understanding on the influence of different elevation sources for accuracy of orthorectified TerraSAR-X imagery
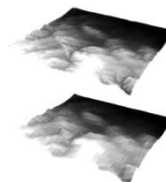
Sources of error:

Orbit precision

Type of Orbit
Predicted Orbit (PRED)
Rapid Orbit (RAPD)
Science Orbit (SCIE)

Incidence angle

DEM precision

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Test Scenario

Input data:

Data	Stripmap	Spotlight
TerraSAR-X scenes	15 (5 test sites)	14 (4 test sites)
Incidence angle range	22 – 42°	25 – 48°
DEMs used	Globe, SRTM-C, TerraSAR-X Stereo, Airborne INSAR, Airborne Lidar Accuracy: 1 – 100 m (absolute)	
Terrain	flat – rolling – mountainous	

Range displacement varies depending on absolute vertical error of the DEM and the incidence angle of the image based on:
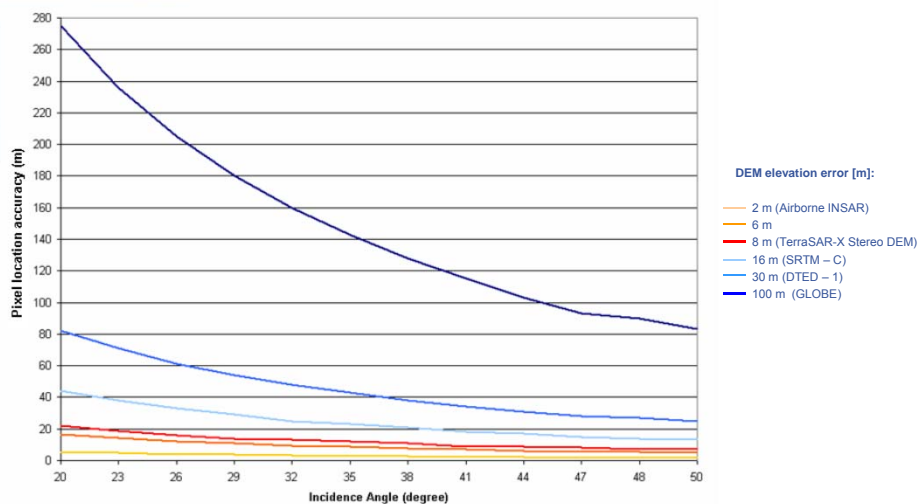
$$\Delta g = H * \cot \theta$$

Δg – ground range displacement
H – height error
Θ – incidence angle

3

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Pixel Location Accuracy: DEM vs. Incidence Angle

DEM elevation error [m]:
- 2 m (Airborne INSAR)
- 6 m
- 8 m (TerraSAR-X Stereo DEM)
- 16 m (SRTM – C)
- 30 m (DTED – 1)
- 100 m (GLOBE)

4

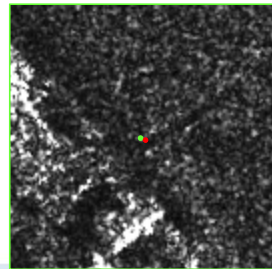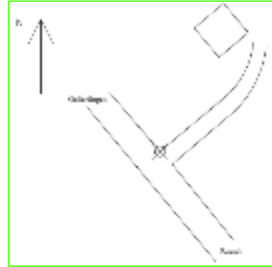*infoterra*
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Measurement of pixel location accuracy
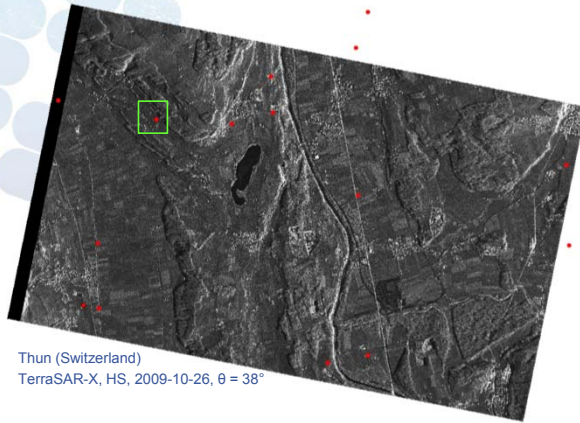
Thun (Switzerland)
TerraSAR-X, HS, 2009-10-26, θ = 38°

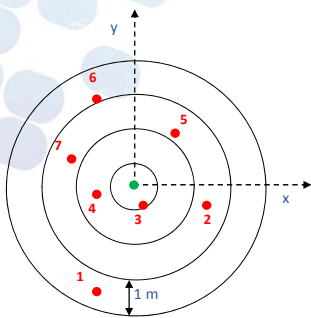Difference between measured and image coordinate for one point

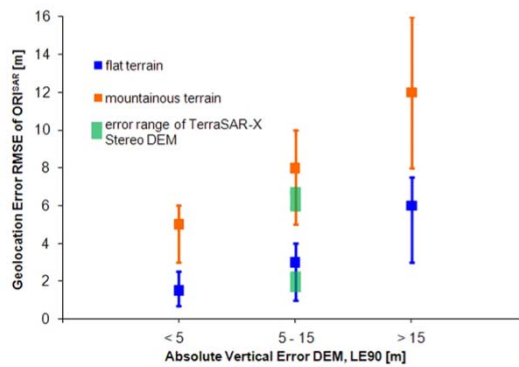Results of pixel location accuracy measurement

Error plot for: Thun (Switzerland)
TerraSAR-X, HS, 2009-10-26, θ = 38° based on ….. DEM

Error ranges of all acquisitions (SL), separated into terrain classes and DEM acuracy