

HIGH BANDWIDTH SPOTLIGHT SAR INTERFEROMETRY WITH TERRASAR-X

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TerraSAR-X is a new German X band SAR satellite launched in June 2007. DLR is the owner of this satellite and operates the payload data ground segment. DLR is furthermore responsible for scientific exploitation of the data while the rights for commercial exploitation are allowed to EADS Astrium Infoterra.

During a 6 month commissioning phase after launch thousands of TerraSAR-X images were acquired and analyzed. A significant task during this phase was to verify the quality of the images with respect to their application for SAR interferometry. In the framework of this task it was also possible to explore the potential of SAR interferometry with much higher resolution than openly available so far.

The highest resolution of TerraSAR-X is achieved in *high resolution spotlight* mode with 300 MHz range bandwidth. This corresponds to a resolution of about 1 meter in azimuth and 0.5 meter in range. Images with this mode offer exciting new potentials, but the interferometric data processing requires some care and algorithmic modifications compared to conventional stripmap mode processing:

1) The dynamic antenna squint angle in azimuth direction requires accurate imaging control at the sensor and the resulting fast Doppler drift rate needs to be taken account for in the InSAR processor. The paper demonstrates that excellent spotlight interferometry results have been achieved in several test sites.

2) The high range bandwidth brings the range resolution rather close to the dimension of the wavelength. In consequence simple approximations for the geometric distortions of the SAR images are no more sufficient. Instead, SAR interferometry and radargrammetry have to be considered jointly in data processing. The paper shows how InSAR processing has to be modified to achieve good results.

3) Furthermore the high resolution can help in interferometric phase unwrapping by exploiting the wavelength dispersion with split bandwidth techniques. The paper shows some first results of this new application.

The algorithms and results are illustrated with numerous high resolution images mainly from urban areas.