

THE CAPABILITIES OF TERRASAR-X IMAGERY FOR RETRIEVAL OF FOREST PARAMETERS

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ABSTRACT:

The TerraSAR-X mission was launched in June 2007 operating a very high resolution X-band SAR sensor. In Spotlight mode images are collected with 0.75m GSD and also at various off-nadir look angles. The presented paper reports methodologies, algorithms and results emerged from the Austrian research project "Advanced Tools for TerraSAR-X Applications in GMES" with emphasis on retrieval of forest parameters. For deriving forest features like crown closure, vertical stand structure or stand height a digital forest canopy model serves as an important source of information. The procedures to be applied cover advanced stereo-radargrammetric and interferometric data processing, as well as image segmentation and image classification. A core development is the multi-image matching concept for digital surface modelling based on geometrically constrained matching, extending the standard stereo-radargrammetric approach. Validation of surface models generated in this way is made through comparison with LiDAR data, resulting in a standard deviation height error of less than 2 meters over forest. Within the evaluation also the limitations of the proposed method is discussed. Image classification of forest regions is then based on TerraSAR-X backscatter information (intensity and texture), the 3D canopy height model and interferometric information (amplitude, coherence) yielding a classification accuracy above 90%. Such information is then directly utilized to extract forest border lines and crown closure, while the vertical stand structure is extracted from the canopy height model. Overall, the TerraSAR-X sensor delivers imagery that can be used to automatically retrieve forest parameters on a large scale, being independent of weather conditions which often cause problems for optical sensors due to cloud coverage.

TOPIC: New earth observation satellites

ALTERNATIVE TOPIC: Remote sensing applications