MULTISENSOR SAR ANALYSIS FOR FOREST MONITORING IN BOREAL AND TROPICAL FOREST ENVIRONMENTS

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ABSTRACT

The world forests are in the focus of the United Nations global forest assessment and GSE Forest Monitoring initiative. Due to the remoteness of the boreal and tropical forest, their widespread distribution and their hard accessibility remote sensing technology provides suitable means for a sound monitoring.

Anchored in the Landsat optical remote sensing satellite, the next global forest resource assessment (FRA) of the United Nations Food and Agriculture Organisation (FAO) investigates the conditions of the world forests on more than 13.000 sample sites at each latitude/longitude intersection. However, the optical data quality will be significantly hampered in the permanent cloud covered regions worldwide, i.e. mainly the tropical forest domain. Since microwaves are nearly independent of most atmospheric effects, FRA-SAR 2010 analyses the potential of the German synthetic aperture radar (SAR) satellite TerraSAR-X to fill in the data gaps within the Landsat dataset. The TerraSAR-X satellite operates at the X-Band and is able to deliver data with a resolution which is comparable to aerial photography. Hence within the framework of FRA-SAR 2010 all in all 350 images throughout the tropics with a resolution of approximately 2 m will be analysed on a global scale, to help to complete the forest assessment in a sound manner. Furthermore, FRA-SAR 2010 will also investigate the synergy potential of different wavelengths by using additional data form Envisat (C-Band) and ALOS (L-Band). Forest type and forest structure mapping is most likely enhanced by the combined analysis of all three sensors. Publishing of the FRA-SAR 2010 processing chains and methods will improve future forest assessments most notably in the developing countries in the tropical regions, because FAO will educate local experts with these outcomes in several training workshops.

On the other hand, the GSE Forest Monitoring service is designed to provide reliable and up-to-date forest information required for monitoring of Russian forests. One of the most wooded regions of Russia is the Irkutsk Oblast compromising 4.5% of Russian territory. 82% of the territory is covered by forest, which corresponds to an area of 71.5 million hectares or 9.9% of Russian forested areas. Forest information are provided by the conduction of periodical forest inventories and intermediate forest enterprises in order to update forest inventory data with respect to changes caused by forest management activities and natural disturbances. According to formal requirements forest inventories must be conducted every 10 -15 years. For updating the SFA (State Forest Account) as well as for management and monitoring purposes an annual update cycle is obligatory. The GSE FM service provides a powerful tool for effective forest monitoring and inventory at regional scale. Reliable and up-to-date information on forest extent and changes therein will be generated using high-resolution ALOS PALSAR, ENVISAR ASAR and TerraSAR-X data. Cross-polarized C-Band and L-Band SAR data at large incidence angles will be used for forest mapping issues. TerraSAR-X high resolution Spotlight Mode data are feasible for validation of the above data. The data could be used as part of the regular forest inventory and annual procedure of the SFA as well as to update the existing databases of the FA of GSNR. Furthermore, the synergy from different wavelengths used in FRA-SAR 2010 will be investigated outside the tropics and transferred to the boreal region.