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SUPPORTING NEAR-REALTIME FOREST MONITORING IN SIBERIA USING A DATA MIDDLEWARE INFRASTRUCTURE AND MULTI-SOURCE EARTH OBSERVATION DATA

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ABSTRACT:

Forest cover disturbance rates are increasing in the Boreal forests of Siberia due to intensification of human activities and climate change. In the framework of the EU FP7 ZAPÁS Project two satellite data sources were used for automated forest cover change detection. Annual ALOS PALSAR backscatter mosaics (2007 - 2010) were used for yearly forest loss monitoring, such as growing stock volume (GSV), forest cover and disturbances, re-/afforestation. Time series of the Enhanced Vegetation Index (EVI, 2000 - 2014) from the Moderate Resolution Imaging Spectroradiometer (MODIS) were integrated in a web-based data middleware system to assess the capabilities of a near-realtime detection of forest disturbances using trend and change event detection methods.

Annual validated and high resolution (25 m) GSV maps (2007 - 2010), forest cover and disturbance maps (2007/2010), and a re-/afforeststion map were integrated in the Siberian Earth System Science Cluster data integration middleware covering an area of over 580 km² in Central Siberia. Local scale maps were connected to 14 years of MODIS NDVI/EVI observations for further time series based forest change assessments. A fully automated forest loss detection was performed using the Earth Observation Monitor (EOM) and compared with the local scale maps.

The SAR-based average accuracy of the forest loss detection was 70%, whereas the MODIS-based change assessment using breakpoint detection achieved interannual average accuracies of 50 % for trend-based change detection. For single years accuracies up to 80 % were achieved. It was demonstrated that SAR remote sensing is a highly accurate tool for up-to-date forest monitoring in the remote Boreal forests of Siberia. However, the web- and mobile based (iOS/Android) data middleware system of the Earth Observation Monitor which is linked with the Google Earth Engine provides operational near-realtime information on forest cover change and easy-to-use tools for on demand change monitoring in remote Siberian forests.

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