GMES SENTINEL-1 ANALYSIS OF MULTI-TEMPORAL LAND OBSERVATION AT C-BAND

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ABSTRACT

The availability of reliable land cover information is crucial for a wide range of applications, like for example monitoring of land-use change and land degradation as well as administrative matters. In global scale, the mapping of land cover and land cover change is crucial for a reliable understanding of global processes and changes. But also on local to regional scale this product is of interest. ESA's upcoming C-band radar satellite mission SENTINEL-1 is designed to fulfill the requirements of the Global Monitoring for Environment and Security programme (GMES). SENTINEL-1 represents the continuation of ESA's series of C-band radar missions ERS-1, ERS-2 and ENVISAT ASAR. It can be concluded from earlier studies that radar based land cover products require frequent and consistent coverage and acquisitions in more than one polarization. The frequent revisit and acquisition in two polarizations of SENTINEL-1 indicates an increased potential for operational land cover products.

In the first phase of the ESA project RadarCover, an algorithm for the classification of five basic land cover classes, namely Water, Grassland, Agriculture, Forest and Settlement, was developed based on multi-temporal datasets of C-band backscatter. The analysis revealed a high accuracy of Maximum Likelihood and Decision Tree classifiers above the widely accepted success criteria of 85% when having at least four C-band acquisitions in two polarizations (VV&VH or HH&HV). The results indicated a high potential of the upcoming SENTINEL-1 mission for land cover mapping applications as SENTINEL-1 will consistently provide the required dual polarization C-band measurements with short revisit times. The algorithm developed was shown to be independent of specific acquisition dates, i.e. arbitrary combinations of acquisition dates, preferable during period of growth (except winter acquisitions) could be used to classify land cover with high accuracy.

The fully automatic algorithm includes a pre-processing chain of geocoding, texture calculation, topographic normalization and also calculation of interferometric coherence. The transformation to a larger area is currently investigated. Furthermore, aim of this investigation is to assess the potential of the synergistic usage of backscattering intensity and interferometric coherence for large scale land cover monitoring in Europe.