Comparative accuracy assessment of global land cover datasets using existing reference data

As land cover is one of the Essential Climate Variables, its observation is used for many climate models and other applications. Several global land cover (GLC) maps were generated for this need using various data sources and methods (e.g. legends). Such differences make the comparison of the GLC products challenging and create confusion on selecting suitable datasets for specific applications. This study aims to compare the thematic accuracies of the recent GLC maps for the year 2005, namely the Globcover, LC-CCI and MODIS using the Globcover-2005 reference dataset. This study also demonstrates weighted accuracy assessments of the GLC maps in terms of specific applications to support users to better select GLC datasets for their applications and to understand the uncertainty of GLC data as model inputs.

The LCCS classifier information of the Globcover-2005 reference datasets was translated into the legends of the GLC maps. Samples with translation issues were identified and the entire reference dataset with 3857 samples was consolidated. The legends of the GLC maps and the reference dataset were harmonized into 13 general classes for comparative accuracy assessments. The accuracies of the GLC maps were also analysed in terms of applications of climate modelling such as general circulation models (GCM) and dynamic global vegetation models (DGVM), agriculture monitoring, biomass estimation and biodiversity assessments using weighted accuracy assessment.

Overall area weighted accuracies were 71.05±1.5%, 71.36±1.3% and 61.3±1.5% for the LC-CCI, MODIS and Globcover maps respectively. Increased overall accuracies were observed in the weighted accuracy assessments since not all confusion errors are important for certain applications. Overall weighted accuracies of the GLC maps varied from 76-93% for different applications. For DGVM applications, the LC-CCI map had the highest accuracy (83.3±1.2%,), while the MODIS map had the highest accuracies for other applications (88-93%). The LCCS classifier information was valuable to use the reference datasets for assessing multiple maps and the information on class proportion is recommended for this. Weighted accuracy assessment is suggested for uncertainty estimation of applications that use the GLC maps.