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# Sensitivity of the climate simulations to update of Plant Functional Type distributions

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In the frame of the European Space Agency (ESA) Climate Change Initiative (CCI), a new global land cover (LC) data set is produced. Land cover is classified as one of Essential Climate Variables (ECV), and defined as the physical material at the surface of the earth (for example: trees, grass, bare soil, water). The ESA-CCI-LC product complies with the United Nations Land Cover Classification Scheme (UNLCCS). However, the UNLCCS set of rules is not suitable for climate modelling. Therefore, ESA-CCI-LC categorical classes need to be converted to model specific plant functional types (PFT) distributions. Here we present a conversion method of ESA-CCI-LC classes to PFT fractions and the impact of the new PFT distributions to climate simulations using the Max Planck Institute for Meteorology Earth System Model (MPI-ESM) and its land surface component (JSBACH). The main features of the updated PFT distributions are less trees and more herbaceous types.

We conducted SST driven climate simulations with MPI-ESM and offline JSBACH simulations driven by WATCH forcing data based on ERA-Interim (WFDEI) at T63 resolution. These simulations are evaluated for the 1981-2010 period. Sensitivities of the hydrological, energy and carbon cycles are investigated. The following variables are compared between simulations with the new ESA-CCI-LC and the old reference PFT distributions: (i) evapotranspiration and runoff as an indicator of changes in hydrological cycle, (ii) temperature and albedo as an indicator of energy cycle and (iii) gross primary production (GPP) as an indicator of carbon cycle sensitivity.

First results indicate increased annual mean albedo in northern extra tropical latitudes and therefore cooling at those latitudes. Furthermore, the annual cycle of albedo is in better agreement with satellite observation (GLOBALBEDO-DHR and GLOBALBEDO-BHR). GPP is slightly decreased in the annual mean, while evapotranspiration shows slight increase in southern tropical latitudes. The hydrological cycle is investigated in more detail for the world major river basins (Murray, Parana, Amazon, Mississippi, Mackenzie, Congo, Niger, Nile, Ganges/Brahmaputra, Yangtze and Danube). Annual mean biases of evapotranspiration and runoff show a small decrease for the majority of the river basins except for Niger, Nile and Yangtze. Both model simulations show similar annual cycle of evapotranspiration which is in good agreement with Land-FLUX observation for some basins especially in the late summer and the autumn (Danube, Mackenzie, Mississippi, Lena). An interesting feature is shown for the Congo River basin in which both simulations differs from each other and updated PFT distributions have 35% less tropical evergreen trees and more than 50% less tropical deciduous trees. Therefore this change in evapotranspiration might be due to deforestation in the basin that was not included in JSBACH reference data.