



Incorporating anthropogenic land cover changes into studies of climate change

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The recently developed reconstruction of historical landuse data based on HYDE in combination with a set of 4 land use scenarios enables the analysis of transient land cover change impacts on regional and global climate. In this study, the impact of land cover changes on selected climate parameters for the period 1850 to 2100 is analyzed with the earth system model EC-Earth. EC-Earth builds upon the Operational Seasonal Forecast System 3 of the Integrated Forecast System (IFS) of the European Centre for Medium-Range Weather Forecast (ECMWF) and works at a resolution of T159L62. Altered surface parameters due to changes in global vegetation cover are accounted for in the model by adjusting vegetation types, vegetation cover, roughness length and, most importantly, albedo.

The impact of past and future land-use activities on climate is potentially significant, since managed croplands and pastures are now among the largest ecosystems on the planet, with a total share of 35% of the ice-free land surface. Their surface parameters differ largely from those of most natural vegetations they replace. The direction of change, however, merits careful analysis, as effects of opposing signs can occur. These largely cancel out on a global basis but can have significant impacts on the regional scale. This study will therefore identify hotspots of climate-vegetation interaction, and further assess the performance of the model by means of the commonly used performance index (PI).