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Preliminary results of land cover change effects on selected climate parameters

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Human land-use activities have led to large-scale changes in global vegetation cover over the past centuries, with potentially significant impacts on regional and global climate. Croplands and pastures are now among the largest ecosystems on the planet. In total they occupy 35% of the ice-free land surface. Since surface parameters of agricultural land differ from those of replaced natural vegetation, land cover change can influence climate in a number of ways. For example, modified albedo, surface resistance, fractional vegetation cover and rooting depth alter soil water capacity, available energy, evapotranspiration and temperature.
The urge to comprehensively quantify past, present and future anthropogenic interference with the climate system motivates the utilization of increasingly holistic and consistent scenarios. While climate models have previously assumed constant landcover, a recently developed reconstruction of historical landuse based on HYDE data now enables the analysis of transient land cover change impacts on climate.
In this study, the impact of land cover changes on selected climate parameters 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. The provided land use changes are translated into land cover changes and subsequently into albedo changes. The impact on global climate is assessed by means of PIs (performance indices) commonly used to evaluate GCMs.