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Usage of different land cover maps within a DGVM: Effects on simulated carbon pools and fluxes in Siberia

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Dynamic global vegetation models (DGVMs) are an essential tool for investigating the evolution of carbon pools on land with changing climate and atmospheric CO2 content. Due to their application on a global scale they make use of 0.5° by 0.5° wide grids of climate and soil data. However, the structure of the landscape is often highly heterogeneous within one of such grid cells in the boreal zone. Especially the heterogeneity of soil texture and the patchy disturbance history but also local climate conditions due to topography or open water bodies contribute to this.

One possibility to deal with this scaling problem in the model is to use additional information about the distribution of vegetation types and density that are based on satellite data. In this study two different types of satellite maps are coupled to the Lund-Potsdam-Jena DGVM (LPJ): The land cover map of the Global Land Cover 2000 project (GLC2000) that is based on SPOT-4-VEGETATION data from 2000, and the continuous fields maps produced at the University of Maryland that are based on MODIS data from 2001. They come with a grid cell size of 1 km and 500 m, respectively.

With these additional informations current net primary production (NPP) and biomass as predicted by LPJ are much more comparable with independent results from forest inventories in Central Siberia. In two extra simulations for the SIBERIA-II project study transect in Central Siberia, we used (1) the land cover map produced by the University of Wales Swansea instead of the GLC2000 map and (2) the continuous fields map alone. The comparison of simulated NPP, carbon emissions from fires and ultimately biomass demonstrates the low impact of the land cover maps classifying the dominant species on simulation results. This can be due to two different

facts, (1) because the LPJ model represents well the broad distribution of vegetation types in Siberia on his own and (2) both land cover maps are not very different (mean R^2=0.8). On the other hand, the information about the distribution of vegetation density (MODIS vegetation continuous fields map) highly improves model results.