



A Dynamic Land Cover Model for COSMOS

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Recently we constructed a land cover model to investigate the influence of vegetation and desert dynamics as well as anthropogenic land cover change on the climate and the carbon cycle. This model is specifically designed to run within a modular land surface scheme (JSBACH), which in turn is coupled via an atmosphere general circulation model (ECHAM5) to a coupled climate-carbon cycle model. It will be available as one setup of the community Earth system models (COSMOS) to other research institutes.

Based on already implemented photosynthesis and carbon balance schemes the recent development includes a module of vegetation dynamics. This is implemented in the tiling structure of JSBACH by assigning each plant functional type (PFT) to one tile. The cover fractions of these tiles are changed with time, which affects the climate and the carbon storage.

The time-evolution of the vegetation composition is derived from succession processes such as establishment and mortality of each PFT. Thereby, we follow the new approach that advantage in PFT establishment depends directly on relative differences in net primary productivity between the PFTs. Mortality is due to aging and disturbances (fire, wind break). Dynamics of bare land fraction depend in turn on the annual maximum of leaf biomass. Additionally, land-use change can be represented by excluding a part of the grid box from natural vegetation dynamics. This area is treated as crop land or pasture and can vary in time according to a series of land-use maps.

More details about the structure of the land cover model, first results about the interactive distribution of PFTs in the coupled climate-vegetation model, and the impact of

the vegetation dynamics on the carbon cycle will be presented.