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Development of high resolution land surface parameters for the Community Land Model

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Abstract. There is a growing need for high-resolution land surface parameters as land surface models are being applied at increasingly higher spatial resolution offline as well as in regional and global models. The default land surface parameters for the most recent version of the Community Land Model (i.e. CLM 4.0) are at 0.5° or coarser resolutions, released with the Community Earth System Model (CESM). Plant Functional Types (PFTs), vegetation properties such as Leaf Area Index (LAI), Stem Area Index (SAI), and non-vegetated land covers were developed using remotely sensed datasets retrieved in late 1990's and the beginning of this century. In this study, we developed new land surface parameters for CLM 4.0, specifically PFTs, LAI, SAI and non-vegetated land cover composition, at 0.05° resolution globally based on the most recent MODIS land cover and improved MODIS LAI products. Compared to the current CLM 4.0 parameters, the new parameters produced a decreased coverage by bare soil and trees, but an increased coverage by shrub, grass, and cropland. The new parameters result in a decrease in global seasonal LAI, with the biggest decrease in boreal forests; however, the new parameters also show a large increase in LAI in tropical forest. Differences between the new and the current parameters are mainly caused by changes in the sources of remotely sensed data and the representation of land cover in the source data. Advantages and disadvantages of each dataset were discussed in order to provide guidance on the use of the data. The new high-resolution land surface parameters have been used in a coupled land-atmosphere model (WRF-CLM) applied to the western US to demonstrate their use in high-resolution modeling. A remapping method from the latitude/longitude grid of the CLM data to the WRF grids with map projection was also demonstrated. Future work will include global offline CLM simulations to examine the impacts of source data resolution and subsequent land parameter changes on simulated land surface processes.

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