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Integration of fire and land satellite products into the land biosphere model JSBACH

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The modern development of Earth-System Models (ESM) makes extensive usage of satellite data. A typical way to use the globally measured fields is to compare it with model results. However, each model requires also direct integration of certain datasets used as the set of initial or/and boundary conditions. With the recent progress in the satellite technique and processing algorithms, the quality and amount of data products strongly increased. Data users are often confronted with the question which dataset to select as the most relevant and reliable.
Our current aim is to explore the use of two satellite datasets, the GFEDv3 (Global Fire Emission Dataset version 3) Burned Area and the GlobCover Land Cover. Both datasets have high index of maturity and represent important parameters for the MPI-M ESM, in particular for its land component - the land biosphere model JSBACH. The main role of this land-surface scheme is to provide the lower boundary condition to the atmospheric model calculations such as of vertical diffusion, radiation, and water and carbon fluxes.
We review and integrate the MODIS Burned Area dataset as provided by the GFEDv3 (Global Fire Emission Dataset version 3) into the JSBACH model. The GFED approach is based on the Carnegie-Ames-Stanford Approach (CASA) model and its main objective is the calculation of trace gases emission from fires. For the JSBACH, the integration of the satellite data is an alternative approach to the original calculation schema, which is based on a number of temperature and moisture thresholds. In addition, some sophisticated algorithms are currently under development. In this exercises, we estimate the differences introduced by the fire information from satellite into the global carbon cycle and consider the amount of modeled carbon emissions to atmosphere, comparing this with carbon emissions calculated by regular JSBACH fire schema. As the GFED approach is currently the only one existing, our estimations will provide the first alternative to the GFED helping to assess its uncertainty.
In addition, we review the existing vegetation initialization schema and exchange the original land cover information (based on the AHVHHR data from 1994) with the new better quality satellite products. In particular, we use the ESA GLOBCOVER Project precursor, the GlobCover2000 dataset, to define the spatial distribution of Plant-Functional types. Iterating the pre-processing steps required for the conversion of GlobCover2000 data into the model-original PFTs we study the sensitivity of the land biosphere on the example of several model output variables.