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Integration of satellite fire products into MPI Earth System Model

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Fires are the ubiquitous phenomenon affecting all natural biomes. Since the beginning of the satellite Era, fires are being continuously observed from satellites. The most interesting satellite parameter retrieved from satellite measurements is the burned area. Combined with information on biomass available for burning the burned area can be translated into climate relevant carbon emissions from fires into the atmosphere. In this study we integrate observed burned area into a global vegetation model to derive global fire emissions.
Global continuous burned area dataset is provided by the Global Fire Emissions Dataset (GFED). GFED products were obtained from MODIS (and pre-MODIS) satellites and are available for the time period of 14 years (1997-2011). This dataset is widely used, well documented and supported by periodical updates containing new features.
We integrate the global burned area product into the land model JSBACH, a part of the Earth-System model developed at the Max Plank Institute for Meteorology. The land model JSBACH simulates land biomass in terms of carbon content. Fire is an important disturbance process in the Earth's carbon cycle and affects mainly the carbon stored in vegetation. In the standard JSBACH version fire is represented by process based algorithms. Using the satellite data as an alternative we are targeting better comparability of modeled carbon emissions with independent satellite measurements of atmospheric composition.
The structure of burned vegetation inside of a biome can be described as the balance between woody and herbaceous vegetation. GFED provides in addition to the burned area satellite derived information of the tree cover distribution within the burned area. Using this dataset, we can attribute the burned area to the respective simulated herbaceous or woody biomass within the vegetation model. By testing several extreme cases we evaluate the quantitative impact of vegetation balance between woody and herbaceous vegetation on fire carbon emissions. The integration procedure of satellite observed burned area into JSBACH is developed in a way that it can be easily adapted to future satellite fire datasets (e.g. expected ESA CCI Fire-ECV products). Here we will also discuss further possibilities for the integration of satellite fire data into vegetation models.