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Fire modeling within the MPI-ESM

G. Lasslop, S. Kloster, and I. Khlystova
Max-Planck Institute for Meterology, Hamburg, Germany

Fire is an important Earth System process, which impacts climate via multiple pathways, including atmospheric chemistry, aerosols, land surface properties and the carbon cycle. At the same time fires are controlled by climate and the frequency of fires is expected to increase with future climate change. As such, fires form a complex feedback cycle in the Earth system which potentially forms an important contribution to the climate sensitivity of the Earth System. The net effect of fires on the climate system remains unclear as depending on the process fires can cool or warm the Earth System. Moreover the climate impact of single processes operates on different time scales ranging from days to centuries. A quantitative analysis of this contribution requires Earth System models that include the coupled climate carbon cycle and take into account fire [U+2010] climate interactions.
Here we will present work on the implementation of fires as a climate [U+2010] dependent dynamic process into a coupled Earth System model. Fires are implemented as a disturbance process in the dynamical vegetation model JSBACH, which is the land component of the MPI Earth System Model. Based on the GFEDv3 dataset we will evaluate fire models of varying complexity on global scale with respect to different fire properties that are important for the fire-climate impact, such as spatial distribution, interannual variability, and the fire seasonality of burned area and carbon emissions. In addition we analyse the functional relationships between fire model drivers and output, e.g. burned area, and the global vegetation patterns that are strongly influenced by fire.