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Fire dynamics simulated by the Community Land Model – Importance of single forcing factors

Silvia Kloster (1), Jim Randerson (2), Natalie Mahowald (3), and Peter Thornton (4)

(1) Max Planck Institute for Meteorology, Hamburg, Germany (silvia.kloster@zmaw.de), (2) UC Irvine, Irvine, CA, USA, (3) Cornell University, Ithaca, NY, USA, (4) Oak Ridge National Laboratory, Oak Ridge, TN, USA

Fire is an important Earth System process, which is controlled by climate and at the same time impacts climate in multiple ways. As such fires form a feedback within the Earth System, which might amplify or dampen climate change. For recent fires, we have the capacity to observe global fire activity from space. However, historical information on fires is still very incomplete and little is known about the single driving forces of global fire activity.

Here we present results from a fire model included in CLM-CN based on the work by Arora and Boer (2005) extended by a parametrization of human ignition and fire suppression as a function of population density. In addition, we also account for deforestation fires making use of recently developed land use change scenarios. We evaluate the model against contemporary satellite fire records. Several sensitivity experiments were performed to disentangle the importance of single driving forces impacting fire emissions, such as land use activities, changes in population density and changes in climate. All forcing factors combined lead to a decrease in fire emissions over the 20th century. The increase in population density over the last century leads to an increase in fire emissions. However, when we also take into account fire suppression, only little change in fire emissions on the global scale is found. Land use activities alone lead to a decrease in total fire emissions, despite an increasing deforestation fire source. However, the importance of the single driving forces for the simulated trend over the 20th century varies considerably for different regions. Here we will present a regional analysis of the importance of single forcings and highlight their contribution to the global trend.