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# Effects of wild fires and land-use / land-use-change related fires on the global terrestrial carbon cycle for the 20th and the 21st century

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Fires contribute significantly to global biogeochemical emissions, and are a major disturbance factor in many ecosystems. Fire regimes may be altered strongly under future climate regimes, particularly with increasing temperatures and changing precipitation patterns; human land use decisions might trigger or amplify such changes. Fires are still poorly represented in many global models, although some dynamic global vegetation models (DGVMs) include basic fire modules [e.g. LPJ, Sitch, et al., 2003; Thonicke, et al., 2001]. New work describes a process-based model of fire risk, spread and intensity (SPITFIRE) [Thonicke, et al., 2010]. SPITFIRE is now embedded within LPJmL [Bondeau, et al., 2007] where managed agricultural land (croplands and grasslands) coexist with potential natural vegetation. Here we present the first attempt to simulate all sources of biomass burning at a global scale accounting for natural and human-caused wildfires and the most important fire sources from agricultural land use, including crop residue burning, woodfuel use and deforestation fires, to allow the quantification of respective emissions. Our simulations show global fire emissions of 4.2 PgC/year for 2000, which is on the upper limit of the figures given by (Bowman /et al./ 2009, 2 to 4 PgC/year) and more than half of emissions from fossil-fuel combustion (7.2 PgC/year). We present results for the global quantities of the spatial and temporal changes of carbon emissions from natural and human-caused biomass burning for the time period 1901 to 2099. We run the LPJmL with the A2 and the B2 SRES emission scenarios, three different climate scenarios from Global Climate Models (GCMs) and corresponding IMAGE land use scenarios, and assume human-caused ignitions to continue 'business as usual'.

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