



Development of wildfires in Australia over the last century

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Wildfires and their emissions are key biospheric processes in the modeling of the carbon cycle that still are insufficiently understood. In Australia, fire emissions constitute a large flux of carbon from the biosphere to the atmosphere of approximately 1.3 times larger than the annual fossil fuel emissions. In addition, fire plays a big role in determining the composition of vegetation which in turn affects land-atmosphere fluxes.

Annually, up to 4% of the vegetated land-surface area is burned which amounts to up to 3% of global NPP and results in the reslease of about 2 Pg carbon into the atmosphere. There are indications that burned area has decreased globally over recent decades but so far there is not a clear trend in the development in fire-intensity and fuel availability.

Net emissions from wildfires are not generally included in global and regional carbon budgets, because it is assumed that gross fire emissions are in balance with post-fire carbon uptake by recovering vegetation. This is a valid assumption as long as climate and fire regimes are in equilibrium, but not when the climate and other drivers are changing.

We present a study on the behaviour of wildfires on the Australian continent over the last century (1911 - 2012) introducing the novel fire model BLAZE (BLAZE induced biosphere-atmosphere flux Estimator) that has been designed to address the feedbacks between climate, fuel loads, and fires. BLAZE is used within the Australian land-surface model CABLE (Community Atmosphere-Biosphere-Land Exchange model).

The study shows two significant outcomes:

A regional shift in fire patterns shift during this century due to fire suppression and greening effects as well as an increase of potential fire-line intensity (the risk that a fire becomes more intense), especially in regions where most of Australia's population resides. This strongly emphasises the need to further investigate fire dynamics under future climate scenarios.

The fire model BLAZE has been developed at the CSIRO Oceans and Atmosphere, Canberra, Australia and will be part of the upcoming release of the dynamic global vegetation model LPJ-GUESS version 4.1 within the MERGE project at Lund University, Sweden. It will also be included in the EC-Earth ESM within the EU Horizon 2020 project CRESCENDO.