Geophysical Research Abstracts
Vol. 21, EGU2019-9204, 2019
EGU General Assembly 2019

Impact of fire on the carbon cycle and climate

Gitta Lasslop, Sander Veraverbeke, Alysha Coppola, Apostolos Voulgarakis, and Chao Yue
Senckenberg Biodiversity and Climate Research Centre, Frankfurt am Main, Germany (gitta.lasslop@senckenberg.de)

Earth system models are an important basis to develop adaptation and mitigation strategies for climate change. Fire impacts the carbon cycle and climate on global scale and therefore is an important component in Earth system models. We here review the literature over the recent years with respect to advances in understanding and quantification of the impacts of fire on the carbon cycle and climate with the aim to identify potential for model improvement and research needs to adequately represent fire in Earth system models.

The quantification of peatland carbon and pyrogenic carbon ages provides important constraints for models. Both components are mostly not included in global models. Peatlands accumulated carbon for the holocene. Climate change and human activities increase the vulnerability of this old carbon pools, that will likely not recover their pre-fire state. Charcoal is a byproduct of incomplete combustion. This pyrogenic carbon is accumulated in soils and ocean sediments for hundreds and thousands of years. Although it is a small fraction, the huge reservoirs show that it is an important component of the carbon cycle. The reservoirs are big in comparison to expected losses from the terrestrial carbon stocks and therefore might indicate that fires are a net sink. Human climate mitigation strategies plan to use biochar as a measure of negative emissions. This will lead to a large perturbation of the pyrogenic carbon cycle, a better understanding of it is therefore important. The effects of fire impacts on vegetation not only influence the carbon cycle but also the effect on climate. The ability of ecosystems to recover after fire determines the duration of the impacts. The strong impacts of humans on fire regimes strongly influences global patterns. The relationship between humans and fire is however not sufficiently well understood.

Improvements in global models for peatland burning, pyrogenic carbon and the effects of vegetation types and traits are possible based on the recent advances and will help to improve Earth system model to provide the necessary information on the future fate of carbon storage and climate.