INITIATIVE ON
Extreme Weather and Climate
COLUMBIA UNIVERSITY

Addressing the Fuel Consumption biases in Global Fire Models

S. Mangeon
S. Mousafeiris
N. Andela
M. Forrest
G. van der Werf
D. Bachelet
C. Burton
S. Hantson
S. Kloster
G. Lasslop
F. Li
J. R. Melton
G. Folberth
C. Yue
A. Voulgarakis

Global Fire Models aim to predict global fire activity and emissions on long timescales. To do this, they differ in their approach. The first Global Fire Models adapted local semi-empirical relationships to the global scale. More recent models use empirical relationships between environmental variables and observations of global burnt area and emissions. All are removed from the realities and scale of combustion. To overcome this, we propose using the link between burnt area and emissions, the Fuel Consumption. This provides us with a tool to disentangle the uncertainties in modeling fuel load (vegetation models), and modeling fire emissions. Using new global datasets of Fuel Consumption, we will show Global Fire Models hold systematic biases. They over-estimate the fuel consumed in boreal forests and areas of light vegetation, while they under-estimate it in tropical forests. The fire emissions in tropical forests are dominated by human practices of land use and deforestation. This human-factor, our Global Fire Models either ignore it or under-estimate it. Fortunately, we will show models with simple approaches to combustion provide good predictions, and can be included and adapted easily. Fuel Consumption should be central to the development strategy of our Global Fire Models. Eventually it will improve the reliability of our predictions of fire activity and emissions on long timescales.