Geophysical Research Abstracts
Vol. 20, EGU2018-2689, 2018
EGU General Assembly 2018

Approximating High Frequency Global Aerosol Emissions using the CAM5 Model and a New, Multi-Satellite Constrained Approach

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Remotely sensed observations show changes in the magnitude, spatial, and temporal distribution of both biomass burning and urbanization emissions throughout South, South East, and East Asia. A new approach focusing on the variance of OMI, MOPITT, and MISR measurements has been shown to successfully constrain the emissions over this region during the 2016 fire burning season. Modeling with this new emissions inventory has shown that the best way to match measurements is through a combination of both a known urban emissions inventory and our new and extensively different biomass burning emissions inventory.

This work extends upon these initial findings. The emissions inventory has now been scaled globally. These new emissions maps show the importance of both additional unknown biomass burning sources, as well as previously underestimated or misplaced urban emissions sources.

We use the CAM5 model with chemistry, combined with different scaling approaches to examine how this new emissions inventory leads to improvements in the atmospheric aerosol chemical loading. Comparisons are made between the modeled fields and remotely sensed measurements from AERONET, MODIS, and other sources that are also not used to produce the emissions in the first place. This approach allows us to make an initial approximation of the under/over estimate in the emissions, as well as what scaling factors are required in space and time to make a best match with the measurements.