"Remote Sensing and Modeling of Wildfires and Smoke Emissions: Implications for the Asia Oceania Region"

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Wildfires and other types of biomass burning are a seasonal phenomenon in different land ecosystems around the world. These fires, which can originate from natural or anthropogenic causes, depending on region and circumstances, are estimated to consume biomass containing a total of 2-5 petagrams of carbon globally every year, generating intense heat energy, and emitting smoke plumes that comprise different species of aerosols and trace gases, which can have adverse effects on human health, air quality, and environmental processes. However, because of the inherent difficulty in quantifying these emissions in near real-time by traditional methods, it has hitherto been challenging to represent fire emissions reasonably well in models. Fortunately, a series of recent studies have revealed that both the rate of biomass consumption and the rate of emission of aerosol particulate matter by open biomass burning are directly proportional to the fire radiative energy (FRE) release rate, which is fire radiative power (FRP) that is measurable from space. We have leveraged this relationship to generate a global, gridded dataset of emission coefficients (Ce) of smoke particulate matter using measurements of FRP and aerosol optical depth (AOD) from the Moderate-resolution Imaging Spectro-radiometer (MODIS) sensors aboard the Terra and Aqua satellites. This first version of the Fire Energetics and Emissions Research (FEER.v1) global Ce product is available at 1°x1° resolution at http://feer.gsfc.nasa.gov/, and provides a relatively simplified way to represent fire emissions in a variety of models, even in near real time. In this presentation, we demonstrate examples of implementation of the FEER.v1 emissions in WRF-Chem, which is a fully-coupled meteorology-chemistry-aerosol model that is used to simulate regional smoke transport and impacts, as would be advantageous for studying the characteristics and impacts of fire emissions in the Asia Oceania region.