

4.133 Atmospheric processes influence the light-absorption properties of brown carbon in haze particles from Indonesian peat and biomass burning.

Early Career Scientist

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Abstract:

Elevated fine aerosol concentrations in the Southeast Asia region due to wildfires influence the atmospheric and hydrological systems in the regional scale. Atmospheric observations of the wildfire haze in the region showed that aerosol particles are dominated by organic species. These organic aerosol species include brown carbon (BrC) which absorbs visible and near-ultraviolet (UV) light. Owing to its light-absorption properties, atmospheric BrC affects the radiative balance of the atmosphere. A laboratory study demonstrated that a notable fraction of BrC exists in aerosol particles emitted from combustion of Indonesian peat and biomass. On the other hand, atmospheric observation during a wildfire haze event revealed that concentration of BrC in the region is insignificant. We hypothesize that the difference in the existence of BrC in the fresh laboratory-generated organic aerosol and the ambient samples are induced by atmospheric processing.

In order to test the hypothesis, we are investigating impacts of atmospheric processes on the chemical composition and optical properties of BrC from Indonesian peat and biomass burning. We are oxidizing the primary organic aerosol and secondary organic aerosol precursors in a Potential Aerosol Mass continuous flow reactor. The residence time of particles in the reactor is approximately 150 sec. The oxidation experiments are conducted in dry (20–30% relative humidity/RH) and wet conditions (60–70% RH). Carbon monoxide and ozone levels are observed over the course of experiments. The chemical composition of particles is measured by a Time-of-Flight Aerosol Chemical Speciation Monitor and the optical properties of BrC are measured by a UV-Vis spectrometer and a fluorescence spectroscopy.