2.134 Aqueous photo-oxidation of molecular size separated brown carbon.

Early Career Scientist

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Abstract:

Recent laboratory and field studies have shown that light absorbing organic aerosol particles, known as brown carbon, can be bleached of their colour by photolysis and photo-oxidation on the timescale of hours to days. However, there is evidence that light absorbing chromophores, suggested to be large molecular weight compounds, remain even after 48 hours of atmospheric aging. The lifetime of these chromophores will determine the extent of warming that brown carbon aerosol particles may cause, and therefore their impact on climate. The complex composition of brown carbon is still largely unknown, and most identified small molecule chromophores are reactive in the atmosphere, leading to short lifetimes. It is hypothesized that uncharacterized, oligomeric chromophores may be resistant to atmospheric degradation and have longer lifetimes. The molecular size dependence on absorption loss is investigated during aqueous photo-oxidation of primary brown carbon. Brown carbon aerosol particles were generated from smoldering wood in a heated flow tube (350 °C) and collected on supported Teflon filters. Molecular size separation and characterization was achieved by size exclusion chromatography, with the ability to separate molecules in the range of 100 to 5000 Da. Photo-oxidation was carried out in aqueous solution to simulate aqueous aerosol or cloud water processing. The UV-Visible absorption spectrum of the water-soluble brown carbon was investigated as a function of photo-oxidation time to understand the evolution of different sized chromophores.