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Chemistry of Atmospheric Brown Carbon

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Fundamental understanding of the complex chemistry of light absorbing atmospheric aerosols (aka Brown Carbon - BrC), their physico-chemical properties and environmental impacts is a challenging task because no single method of analytical chemistry is capable of providing the full range of analytical chemistry information. Micro-spectroscopy approaches can visualize individual particles and their internal structures; however, they largely exclude molecular-level information, and are limited to elemental and chemical bonding characterization. Contemporary methods of high-resolution mass spectrometry can provide detailed information on the molecular content of BrC, but these methods use bulk particle samples and provide no knowledge of the individual particle composition. Therefore, application of complementary analytical methods of chemical analysis is necessary for comprehensive characterization of aerosol properties ranging from bulk molecular composition of BrC constituents to microscopy level details of individual particles. Combined assessment of the results provided by complementary analytical chemistry techniques offers unique insights to understand the composition and physico-chemical properties of BrC aerosols determining their effects on air quality and climate. This presentation will give an overview of recent field and laboratory studies of BrC with an overall goal to understand fundamental relationship between chemical transformations of airborne particles and their environmental and climate impacts.