Comprehensive measurements of atmospheric organic carbon: Field and laboratory studies

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Organic species in the Earth's atmosphere play a central role in many key processes important to human health, ecosystem health, and global climate: they can serve as pollutants or nutrients, they influence atmospheric oxidant levels, and their oxidation products include secondary species such as ozone and secondary organic aerosol. However our understanding of the identity and lifecycle of atmospheric organic compounds are generally limited by their wide diversity in chemical structure, properties, and reactivity, all of which pose major challenges in detection and quantification. This talk will describe a multi-instrument approach to measuring atmospheric carbon, combining measurements from multiple state-of-the-art mass spectrometric instruments to provide a comprehensive picture of the chemical composition of the entire organic mixture. From these combined measurements, the organic species can be described in terms of not only total carbon mass but also distributions of key ensemble properties (such as oxidation state and volatility) that can be used in atmospheric model frameworks. Application of this general measurement both to field data, providing information on ambient organic species, and to laboratory (chamber) studies, providing insight into the chemical transformations that organic species undergo upon atmospheric oxidation, will be discussed.