The Role of Ocean-Atmosphere Interactions in Atmospheric Oxidation and Long-Range Transport of Pollutants

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ABSTRACT: The atmosphere plays a critical role in climate, chemical processing, and chemical transport. Major advances have been made in our understanding of atmospheric composition and processes over the past two decades, but uncertainties remain, particularly in the area of ocean-atmosphere interactions. I will describe two lines of research in this area currently being pursued by my group: i) the activation of unreactive sea salt chloride into reactive chlorine species that influence the oxidizing capacity of the atmosphere; and ii) the long-range transport of persistent organic pollutants.

The role of chlorine atoms (Cl) in atmospheric oxidation has been traditionally thought to be limited to the marine boundary layer, where they are produced through heterogeneous reactions involving sea salt. However, recent observation of photolytic Cl precursors (ClNO2 and Cl2) formed from anthropogenic pollution has expanded the potential importance of Cl to include coastal and continental urban areas. Photolysis of precursors to yield Cl can have large impacts on tropospheric oxidation, which we are just beginning to explore. Using aerosol and gas-phase field instruments, we will study the formation and impacts of chlorine activation in St. John's.

The long-range transport (LRT) of persistent organic pollutants leads to global distribution of these compounds, many of which are bioaccumulative and toxic. We are exploring the influence of marine aerosols on LRT of perfluoroalkyl acids and naturally occurring organobromine species. Using precipitation measurements, along with size-resolved aerosol measurements, and a custom aerosol generation tank, we can begin to understand how these compounds might be removed from the ocean and travel long distances on marine aerosols.