Characterization of Atmospheric Aerosol Liquid Water Content Across the United States

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Aerosol Liquid Water (ALW) is abundant and ubiquitous in the atmosphere, and is an important contributor to particulate matter pollution leading to negative impacts on human health and the environment. The purpose of this study is to characterize the levels of inorganic and organic ALW content across the United States to improve our understanding of ALW in the atmosphere. A climatology of ALW content is conducted using ten years data of inorganic and organic atmospheric composition encompassing a range of diverse cities at 46 sites, each at a different state across the United States. Data is provided by the Environmental Protection Agency's (EPA) Chemical Speciation Network (CSN). The organic portion of ALW content is calculated using Koehler's theory based on concentrations of organics as well as their physical properties (i.e., density and hygroscopicity). As for inorganic water concentrations, these are simulated using ISORROPIAv2.1 aerosol thermodynamic equilibrium model. Concentrations of inorganics such as sulfate, ammonium, nitrate, and chloride are used together with meteorological data as inputs for the model. The total ALW content is calculated as the summation of inorganic and organic water. The characterization of seasonal inorganic and organic ALW levels will enhance our understanding of the main factors affecting ALW in the atmosphere. Results herein, will provide insight into the formation of atmospheric pollutants in the aqueous phase in order to devise control strategies to mitigate their detrimental impacts.