Kimberly A Prather
Distinguished Chair in Atmospheric Chemistry, Scripps Institution of Oceanography, University of California, San Diego

Biosketch:

Professor Kimberly A. Prather is the Distinguished Chair in Atmospheric Chemistry at Scripps Institution of Oceanography and the Department of Chemistry and Biochemistry at University of California, San Diego. Professor Prather's research group has performed field studies worldwide to advance our understanding of the major sources, composition, and reactivity of atmospheric aerosols. A major focus of Professor Prather's research involves improving our understanding of how aerosols impact clouds. Professor Prather is the founding Director of the NSF Center for Aerosol Impacts on Chemistry of the Environment (CAICE), an NSF Center for Chemical Innovation. CAICE scientists have transferred the ocean-atmosphere system into the laboratory to investigate how marine phytoplankton, bacteria, and viruses influence atmospheric chemistry, clouds, and climate. Most recently, she has advocated in media interviews and briefings with public health and other leaders the importance of acknowledging aerosol transmission in an effort to reduce the global spread of COVID-19 and end the ongoing pandemic. Professor Prather is also involved in education and outreach activities aimed at creating more diverse and inclusive environments in the environmental sciences.

Recognition for Professor Prather's work includes being an elected member of the American Philosophical Society, American Academy of Arts and Sciences, National Academy of Engineering, and National Academy of Sciences, and an elected fellow of American Association for the Advancement of Sciences and the American Geophysical Union

Abstract:

Tiny Critters, Huge Impacts: How microbes impact climate and health

To predict future climate, we must understand the impacts of placing unprecedented human-induced stressors on the coupled ocean-atmosphere system. Current models simplify the factors controlling marine aerosol composition and associated cloud processes because the overall impacts of each of these interdependent processes are difficult to unravel. One challenge involves understanding how marine microbial emissions alter atmospheric chemistry and air quality. While field studies have studied the impact of ocean biology on clouds and climate, such efforts have been limited due to the additional complexities from pollution being added to the environment from humans.

This lecture will provide an overview of unique ocean-atmosphere-in-the laboratory studies conducted in the NSF Center for Aerosol Impacts on Chemistry of the Environment (CAICE; https://caice.ucsd.edu). CAICE experiments were designed to determine the composition of the marine atmosphere with a major focus on the factors controlling the chemical mixing state, cloud formation, and ice nucleating ability of marine aerosols. Over the past decade, CAICE scientists have successfully transferred the full physical, chemical, and biological complexity of the ocean-atmosphere system into the laboratory at Scripps Institution of Oceanography. This presentation will highlight results obtained using this uniquely controlled approach, including accounting for previously unexplained changes in clouds in regions with phytoplankton blooms. This lecture will also discuss how these results can be used to improve climate models. Additionally, the next steps that will be taken to probe the future climate scenarios using the new Scripps Ocean-Atmosphere Research Simulator (SOARS) will be discussed. SOARS will use wind and waves to simulate the complex marine atmosphere boundary layer under varying scenarios of temperature (from tropical to polar), atmospheric gas phase concentrations, and ocean pH.

Finally, the latest research investigating the factors controlling the ocean-to-atmosphere transfer of bacteria, viruses, and trace gases to the atmosphere will be discussed. These studies are aimed at developing a better understanding of the impacts of coastal air quality on the health of residents living in and around coastal regions. Serving as a bridge between human and environmental health, these field and lab studies are serving to better understand how the changing ocean and atmosphere microbiome are affecting air quality and climate.