The Uncovered Potential of Using Chemistry to Study the Grand Challenge of Aerosol-Cloud Interactions

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2023 INC - CNRS Ambassador

Abstract: Ambient aerosol particles are very complex as their size ranges over several orders of magnitude and their chemical composition is continuously evolving and difficult to fully speciate. Their lifetime in the atmosphere is typically a few days, making it hard to study them. Even more uncertain than the basic properties of particles is the nature of their interactions with clouds. While aerosol particles impact clouds, clouds also influence aerosol particles in ways that are poorly understood. The 6th assessment report of the Intergovernmental Panel on Climate Change (2021) confirmed, again, that the largest uncertainty in estimating global anthropogenic radiative forcing is associated with the interactions of aerosol particles with clouds. Quantifying the nature and magnitude of these interactions is challenging owing largely to both observational challenges and the complexity of cloud systems. This talk will showcase the underappreciated and unique role that chemistry and associated measurements play in helping to understand the interplay between clouds and aerosol particles. Focus will be placed mostly on observational approaches, including airborne field campaigns such as the Aerosol Cloud meTeorology Interactions oVer the western ATlantic Experiment (ACTIVATE, NASA), which involved coordinated flights between two aircraft over the northwest Atlantic Ocean to study the continuum of boundary layer cloud types spanning stratiform to cumulus. Lastly, this seminar will introduce a new binational France-U.S (CNRS-Univ. Arizona) project utilizing chemistry (surfactants) as an engine to learn about cloud droplet processes: Interactions aérosols-nuages dans l'atmosphère: recherches doctorales multidisciplinaires (INSPIRE) between our group and LCE at Marseille.

Bio: Armin Sorooshian is a professor of Chemical and Environmental Engineering at the University of Arizona. He received his BS degree in Chemical Engineering from the University of Arizona and his PhD degree in Chemical Engineering from Caltech. After a 1 year postdoctoral fellowship with the Cooperative Institute for Research in the Atmosphere (CIRA) in Colorado, he began his faculty career at the University of Arizona in 2009. He specializes in field measurements relevant to aerosol-cloud interactions and has been involved with 15 airborne field projects since 2004, including 7 as the Principal Investigator. He is currently the PI of a NASA mission called ACTIVATE (Aerosol Cloud meTeorology Interactions oVer the western ATlantic Experiment).