

ATS/CIRA Colloquium

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Cold-loving critters: Where do Arctic microbes come from and what do they have to do with clouds?

Hosted by Sonia Kreidenweis

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via Microsoft Teams

The accelerated rate of warming in the Arctic is of great concern due to potential impacts that include release of greenhouse gases from permafrost, melting glacial ice contributing to sea level rise, and declining sea ice cover exposing the darker ocean surface. Clouds play a crucial role in regulating the energy reaching the sea ice and snow surfaces, but the magnitude of their effects on surface temperature is not well constrained in the Arctic, in part due to limited information on aerosols that serve as seeds for cloud particle formation. Specifically, aerosols that serve as ice nucleating particles (INPs) are vastly understudied, especially in isolated places above the Arctic Ocean and tundra. Here, I present results from 6 different field deployments over the last 3 years in the Arctic, including in an oilfield location, the tundra of central Alaska, the coastal Arctic ocean waters, and the central Arctic Ocean. These observations involve assessing sources of INPs from the ocean, permafrost, sea ice, and snow. I will also demonstrate how these challenging field measurements are achieved under conditions such as stormy seas, complete darkness, low subzero air temperatures, and with the presence of polar bears. To date, a full year's worth of INP measurements have not been conducted anywhere in the Arctic and no INP data exist from the central Arctic in the winter or spring, creating a significant gap in understanding Arctic mixed-phase cloud (AMPC) microphysical processes. The year-long transpolar drift experiment, Multidisciplinary drifting Observatory for Study of Arctic Climate (MOSAIC), provided the opportunity to execute these novel INP measurements. The overarching goal of the work from these combined studies is to achieve unprecedented characterization of INP abundance and sources (including biological) to evaluate their capacity to modulate cloud ice formation in the Arctic.