

Contribution of Terrestrial Bioaerosols on The Ice Nucleating Particles in The Arctic

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Abstract

Aerosol acts as a trigger for cloud particle formation and affects cloud properties, contributing to Arctic climate change. In the temperature range between 0 and -36 °C, cloud particles generally exist as supercooled water droplets but can form ice crystals if they coexist with ice nucleating particles (INPs). As a result, both water and ice particles can exist in the Arctic low-level cloud, resulting in changes in cloud properties and thereby Arctic climate. Despite the important role of INPs in the Arctic climate, understanding of Arctic INP is still poor, causing large uncertainties in Arctic climate prediction. We conducted observations of Arctic marine aerosols including INPs, during the Arctic research cruise of R/V Mirai in 2022. As a result, we observed significant increases in INP concentrations off the coast of Canada, especially in the high-temperature condition. Individual INP analysis indicated that bioaerosol was a dominant source during this period. Fluorescence particle concentration and the aerosol particle compositions for coarse mode particles also suggested a significant injection of bioaerosol during this period as well. Submicron aerosol particle compositions and backward trajectory analysis suggested that forests around Alaska and Canada were the dominant source of these bioaerosols. Our results suggest that bioaerosols transported from terrestrial sources play an important role in the existence of Arctic INP, not only for the land sites but also for the marine regions.

Early Career Scientist

NO, I am not an early career scientist.

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