



## An Aitken mode aerosol formation event in the high Arctic: evidence for aggregate breakup

**Michael Lawler**<sup>1</sup>, Eric Saltzman<sup>1</sup>, Linn Karlsson<sup>2</sup>, Paul Zieger<sup>2</sup>, Matthew Salter<sup>2</sup>, Andrea Baccharini<sup>3</sup>, Julia Schmale<sup>4</sup>, and Caroline Leck<sup>5</sup>

<sup>1</sup>Department of Earth System Science, University of California, Irvine, Irvine, United States of America (mlawler@uci.edu)

<sup>2</sup>Department of Environmental Science, University of Stockholm, Stockholm, Sweden

<sup>3</sup>Laboratory of Atmospheric Chemistry, Paul Scherrer Institute, Villigen, Switzerland

<sup>4</sup>Extreme Environments Research Laboratory, École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland

<sup>5</sup>Department of Meteorology, University of Stockholm, Stockholm, Sweden

The summertime high Arctic is an extremely low-aerosol region, where even small inputs of particles can have significant impacts on cloud formation and therefore on the surface energy budget. The relative importance of new particle formation from gas phase precursors and primary sea spray production in this region remains uncertain, as does the role of atmospheric transport. We made direct, time-resolved composition measurements of Aitken mode (~20-60 nm diameter) aerosol over the high Arctic pack ice in August-September 2018, including during an intense Aitken mode formation event on August 30-31. The event particles contained both primary sea spray materials (sodium, potassium, and polysaccharide-like organics) and secondary components (non-sea-salt sulfate, methanesulfonic acid, non-sea-salt iodine, and secondary organics), most of which could be quantified on the basis of analytical standards. The composition is consistent with primary sea spray that had been atmospherically processed, and the aerosol size distribution dynamics imply the action of a process by which larger atmospheric particles or aggregates broke up to form smaller particles. Hypotheses to explain the results will be discussed.