Geophysical Research Abstracts
Vol. 20, EGU2018-1674, 2018
EGU General Assembly 2018

Revising the hygroscopicity of inorganic sea salt particles and the importance for global climate models

Paul Zieger (1,2), Olli Väisänen (3), Joel C. Corbin (4), Daniel G. Partridge (1,2), Sandra Bastelberger (5), Mehrnoush Mousavi-Fard (5), Bernadette Rosati (4), Martin Gysel (4), Ulrich K. Krieger (5), Caroline Leck (6,2), Athanasios Nenes (7,8,9), Ilona Riipinen (1,2), Annele Virtanen (3), Matthew E. Salter (1,2)

(1) Department of Environmental Science and Analytical Chemistry, Stockholm University, Stockholm, Sweden (paul.zieger@aces.su.se), (2) Bolin Centre for Climate Research, Stockholm, Sweden, (3) Department of Applied Physics, University of Eastern Finland, Kuopio, Finland, (4) Laboratory for Atmospheric Chemistry, Paul Scherrer Institute, Villigen, Switzerland, (5) Institute for Atmospheric and Climate Science, ETH Zürich, Zürich, Switzerland, (6) Department of Meteorology, Stockholm University, Stockholm, Sweden, (7) School of Earth and Atmospheric Sciences and Chemical and Biomolecular Engineering, Georgia Institute of Technology, Atlanta, Georgia, USA, (8) Institute of Chemical Engineering Sciences, Foundation for Research and Technology Hellas, Patras, Greece, (9) Institute or Environmental Research and Sustainable Development, National Observatory of Athens, Palea Penteli, Greece

Sea spray is one of the largest natural aerosol sources and plays an important role in the Earth's radiative budget. These particles are inherently hygroscopic, that is, they take-up moisture from the air, which affects the extent to which they interact with solar radiation. In recent work (Zieger at al., 2017), we have observed that the hygroscopic growth of inorganic sea salt is 8-15 % lower than pure sodium chloride, most likely due to the presence of hydrates. Further, we have observed an increase in hygroscopic growth with decreasing particle size (for particle diameters $<$ 150 nm) that is independent of the particle generation method. By varying the hygroscopic growth of the inorganic sea salt within a general circulation model (GCM), we have determined that the lower hygroscopicity we observe leads to a reduction in aerosol-radiation interactions, manifested by a latitudinal-dependent reduction of the aerosol optical depth by up to 15 %, while cloud-related parameters were unaffected. As a result of this work, we propose that a value of $\kappa_s = 1.1$ (at $\mathrm{RH} = 90\,\%$) is used to represent the hygroscopicity of inorganic sea salt particles in numerical models.

Zieger, P., Väisänen, O., Corbin, J., Partridge, D. G., Bastelberger, S., Mousavi-Fard, M., Rosati, B., Gysel, M., Krieger, U., Leck, C., Nenes, A., Riipinen, I., Virtanen, A. & Salter, M.: Revising the hygroscopicity of inorganic sea salt particles, Nature Communications, 8, 2017.