Cloud condensation nuclei (CCN) potential of Antarctic marine aerosols

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Cloud frequency and location largely affect the climate as clouds are cooling components of the Earth's radiative budget (Ramaswamy, 2001). The particles which lead to the formation of these clouds are called Cloud Condensation Nuclei (CCN). By modelling the occurrences and critical diameters of these particles we can predict cloud formation.

In a recent study of Antarctic waters, marine and atmospheric researchers collaborated to study marine aerosols in conjunction with marine biogenic sources. The study took place, on a cruise, in January and February 2015. Both chemical and physical measurements were taken, however, this data comes from a continuous CCN chamber used in line with a DMA set-up to study size-resolved particulates (Roberts, 2005). Ambient aerosol was sampled jointly with confined tank studies. Water samples were taken from several locations close to Antarctica and used for sea spray production in a laboratory tank. This work studies the early results of the tank experiments, and the ambient aerosols sampled during the cruise. All ambient sampling conditions were analysed, but careful attention was given to ambient sampling conditions containing the same aerosol species as the lab experiments. The different ambient conditions were classified by the origin of air mass back-trajectories taken from HYSPLIT (Stein, 2015) in conjunction with the cruise's coordinates. Characterization of the CCN potential during these periods can be seen in Figure 1.

The effects of these biological blooms on cloud formation require the analysis of CCN potential. However, for a fuller assessment the total number of CCN produced during these periods must also be reviewed. Work is ongoing, but it would appear that while isolated tank samples exhibit unique CCN properties, ambient periods ascribe no enhanced properties. Since, cloud formation is predicted to increase with total particle numbers in conditions of marine blooms (O'Dowd, 2002; Allan, 2015), further study into total number might reveal a regional climactic effect. The importance of this work on global modelling of radiative effects is significant, due to the increasing number of biological blooms in the Southern Ocean.

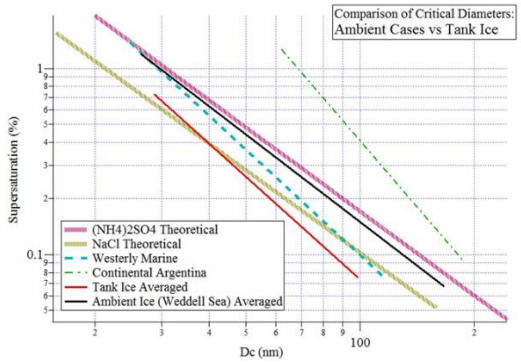

Figure 1. CCN critical diameters for Cases of tank ice, ambient ice samples, and ambient control samples.

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