

Interactive comment on “Cloud condensation Nuclei over the Southern Ocean: wind dependence and seasonal cycles” by John L. Gras and Melita Keyword

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Comments:

This remarkable data set has been well presented and discussed and is certain to be widely quoted. There is one aspect of it that could be the topic for future research: the influence of air trajectories on CCN and CN concentrations and their seasonal changes. There are strong temperature gradients between the Antarctic convergence zone and Tasmania. Air moving over progressively warmer waters leads to instability and convective showers, causing scavenging of the aerosol that must influence their concentrations at Cape Grim. The effect will be most important for trajectories near the southern baseline limit. In addition to this there is a zone of phytoplankton maximum

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productivity, particularly active in spring and summer approximately west from Cape Grim. (e.g. Phytoplankton chlorophyll distribution and primary production in the Southern Ocean, J.K.Moore and M.R. Abbott, J. Geophys. Res. 105, C112, 28709-28722, 2000). Trajectories reaching Tasmania from directions between about 260 and 280 degrees are likely to contain higher loadings of DMS and MSA than those from further south. An indication of the locations where bacteria are most prevalent can be seen in Schnell and Vali's figure 5 (J. Atmos. Sci., 33, 1554-1564, 1976) that showed high IN concentrations extending due west from Cape Grim.

If air trajectories are found to significantly alter CCN, CN or MSA concentrations it would be important information for inclusion in global aerosol models.

The presence of a seasonally invariant CCN component that the authors have discovered is very interesting. They attribute it in part to long-range transported material. Black carbon measurements at Cape Grim or Antarctica have a strong seasonal component and are probably indicative of seasonal changes in the more general transported aerosol. As a pure speculation, I suggest oceanic microgels as the invariant CCN component. Verdugo (Ann. Reviews Marine Science, 37, 375-400, 2012) showed such an immense reservoir of these microgels in the ocean that seasonal components would be almost absent.

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