

The biogenic role in cloud formation and aerosol chemistry

My research is focused on natural organic aerosols and in particular the role of living organisms in aerosol chemistry and cloud formation⁽¹⁾. Until now the chemistry of atmospheric aerosols has been considered to be strictly abiotic. Biological material and even living micro-organisms are present in the atmosphere but their interactions with the chemistry of aerosols and the formation of clouds has not been much studied.

As a first project I studied previously measured aerosol compounds, polyols and 2-methyltetrols, which have water-solubility comparable or larger than inorganic salts. These compounds have been expected to be efficient CCN, which, for the 2-methyltetrols, would be important at global scale because they are thought to be oxidation products of isoprene. Köhler curves for C3 - C6 polyols and the 2-methyltetrols was determined from osmolality and surface tension measurements. Contrary to what expected, and in spite of small surface tension effects for the 2-methyltetrols, these compounds did not display lower critical supersaturation than inorganic salts or other organic compounds, mostly because they do not dissociate in water.

Algae blooms and enhanced cloudiness have been observed⁽²⁾, but the compounds causing it have not yet been determined. In my current project I have determined the CCN properties of pure bacteriological extracts. The results show that this group of common, natural compounds can improve the CCN properties of inorganic salts substantially. Aerosol samples influenced by bacterial sources, e.g. blue-green algae, have been produced in a bubble tank. These marine samples and in-situ collected aerosol from the Amazonian rainforest and boreal forest will be analyzed chemically in the nearest future in order to detect and quantify the occurrence of the efficient CCN material from microbial sources.

References

1) Review

Jiming S., and Ariya P. A. 2006. *Atmospheric organic and bio-aerosols as cloud condensation nuclei (CCN): A review*, Atmospheric Environment. 795-820.

2) Specific

Meskhidze N., and Nenes A. 2006. *Phytoplankton and Cloudiness in the Southern Ocean*. Science 314, 1419-1423.