

# Marine polymer gels Effects on Clouds

Marine Gel SOLAS-Workshop: Kiel Germany, 11–13 December 2012

Observations from the Arctic during the last two decades question the key role attributed to dimethyl sulphide (DMS) in the CLAW hypothesis postulating that DMS from the ocean affects cloud properties and can feedback to the plankton community. This acts to regulate climate by increasing cloud albedo when sea-surface temperatures rise. In the emerging picture of the Arctic atmosphere, DMS concentration will determine the mass of the particles by producing material for their growth. But it is the number of airborne marine polymer colloidal gels or marine gels that will primarily influence the number of CCN and the resulting optical properties of the cloud droplets.

A review of research outside the Arctic does not corroborate the CLAW hypothesis for other regions as well. There is thus growing evidence that marine gels may contribute significantly to the primary marine aerosol and cloud condensation nuclei over remote areas of the oceans.

During late autumn in 2012 an international group of 13 participants met at GEOMAR in Kiel to summarize the current state of knowledge of polymer gels in the ocean and atmosphere, and to articulate a research agenda for future progress in understanding the production, emissions, and possible climate impact of these biological derived matters on cloud formation and cloud optical properties. Participants who were invited collectively spanned a broad range of expertise, including atmospheric chemistry and physics, marine microbiology and chemistry, meteorology, and cloud microphysics, as well as a broad range of research approaches, including field measurement, laboratory measurement, and modelling.

Thanks to all participating in the Gel Workshop it was a fascinating couple of days. Overall, the workshop high-lighted both common and disparate perspectives across disciplines, which underscored the need for such meetings. The following examples of issues and current controversies were discussed: Is the “gel theory of marine CCN” origin consistent with primary marine aerosol observations?, Is the “gel theory of marine CCN” coupled to the sulfur cycle?, Does CCN activation of gels occur?, What physical/chemical processes are involved?, Is “downsizing” of atmospheric gel particles possible (i.e. small particles from larger ones)?, Does the composition/abundance of marine surface-active gels vary spatially/temporally? Do variations in ocean biology influence variability of the primary organic aerosol?, What are the connections between marine gel emissions and future environmental change: polar, costal and open ocean?

It is clear that the marine and atmospheric communities each have unique perspectives, tools, and data to bring to bear on the role of polysaccharide gels in marine organic matter cycling, primary organic aerosol formation, and cloud condensation nuclei activity. It is also abundantly clear that by combining the collective expertise of our communities the field could be advanced rapidly.

This workshop was a step towards developing a common vocabulary and research agenda for understanding the environmental behavior and impact of these fascinating biomaterials. Going forward, there are likely to be many opportunities for international research coordination and collaboration.