



Experimental Investigation of Aerosols Produced by Cosmic Rays

J.O.P. Pedersen, M. B. Enghoff, H. Svensmark and N. D. Marsh

Center for Sun-Climate Research, Danish National Space Center, Copenhagen, Denmark
(jopp@spacecenter.dk)

Satellite observations have shown that the Earth's cloud cover is strongly correlated with the galactic cosmic ray flux. While this correlation is indicative of a possible physical connection, there is currently no confirmation that a physical mechanism exists. We are therefore setting up an experiment in order to investigate the underlying microphysical processes. The results of this experiment will help to understand whether ionisation from cosmic rays, and by implication the related processes in the universe, has a direct influence on Earth's atmosphere and climate.

Since any physical mechanism linking cosmic rays to clouds and climate is currently speculative, there have been various suggestions of the role atmospheric ions may play; these involve any one of a number of processes from the nucleation of aerosols up to the collection processes of cloud droplets. We have chosen to start our investigation at the smallest scales, namely the role of cosmic ray produced ions on atmospheric aerosol nucleation and growth processes. Aerosol theory suggests that this is one of the most promising areas to search for an effect. However, guided by the nature of our initial results, it will be possible to develop the experiment to cover additional processes involved in the route to cloud droplet formation.

The experiment will be conducted at the Danish National Space Center where a clean room facility has been provided. It comprises an 8 m³ reaction chamber across which an electric field is applied to control the number of ions present. This will enable experiments to be performed both with and without the presence of ions, thus providing information as to the potential role of ions in aerosol processes.