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A continuous flow diffusion chamber to study ice nuclei

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Aerosol particles are key components of the Earth's atmosphere and can influence the environment in which they reside via several mechanisms. With regards to radiative forcing, direct and indirect effects are known. The former includes the absorption and scattering of radiation, the latter includes the ability to act as nucleation sites for cloud droplets. However, they may also act as ice nuclei (IN). Most ice clouds are thought to involve heterogeneous nucleation, although clouds at temperatures below -36^{o}C can be formed homogenously (Pruppacher and Klett 1978). The current knowledge concerning IN is severely limited, as indicated by the last assessment of the Intergovernmental Panel on Climate Change (IPCC) (Houghton et al 2001). Both natural and anthropogenic sources have been studied. Natural sources include dust storms, volcanic eruptions and bacteria. Anthropogenic sources consist mainly of combustion products and are found to be of importance only on local scales (Szyrmer and Zawadzki 1997).

IN may act by several mechanisms: deposition, condensation-, immersion- or contact-freezing (Vali 1985). Difficulty in studying possible IN arises from the fact that nucleation mechanisms may change depending on the ambient conditions. The elemental composition of IN may be found by investigating the residue from ice crystals collected in situ. However, this technique does not reveal any information regarding the nucleation mechanism. Various chambers have been designed in order to do this, but currently none are able to investigate all modes of nucleation simultaneously.

Continuous flow diffusion chambers (CFDC) were first introduced in the 1980's. Two designs are available: parallel plate and annular column. The latter design avoids some of the gravitational problems encountered by the former. The annular column design was first constructed at Colorado State University by (Rogers 1988) and current work here involves a similar construction. This poster will outline the design of the chamber,

and outline planned future work.

The chamber will be used to test a variety of dust samples for ice nucleating ability over a range of temperatures and supersaturations. In addition to these initial experiments, a CVI (Counter-flow Virtual Impactor) will be attached to the exit of the chamber to allow further investigation of the fraction of the samples that activate ice formation. Preconditioning of the dust samples by using the cloud chambers at The University of Manchester will also be carried out.

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