First measurements and test of proper operation of the Finnish Meteorological Institute Aerosol Cloud Interaction Tube (FMI – ACIT)

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Clouds and their interaction with aerosol particles provide some of the greatest uncertainties in predictions of climate change. This is, in large part, because the properties of clouds and their formation processes are poorly understood. Lately a new Finnish Meteorological Institute Aerosol Cloud Interaction Tube (FMI-ACIT) has been constructed. It is a multi-purpose instrument for investigating atmospherically relevant interactions between aerosol particles and water vapour under defined laboratory conditions.

FMI-ACIT combines principles of a laminar flow diffusion chamber (Lihavainen *et al*. 2001) and design of a laminar flow tube (Brus *et al*. 2010). It consists of three main parts: a saturator, a preheater and a condenser.

Optical Particle Sizer Spectometer (3330 OPS, TSI Inc., USA) which detects particles in the range 0.3-10 μm, was used as a counting system. As a second counting system Cloud, Aerosol and Precipitation Spectrometer probe (CAPS, Droplet Measurement Technologies, Boulder, CO, USA) can be connected at the bottom part of the condenser to detect activated particles. However only the Cloud and Aerosol Spectrometer (CAS, 0.51-50 μm) with depolarization feature is going to be used in this study.

To obtain the saturation ratio and the temperature profiles inside the FMI-ACIT we adopted *femtube* CDF Model described in Lihavainen (2000). (see Fig.1)

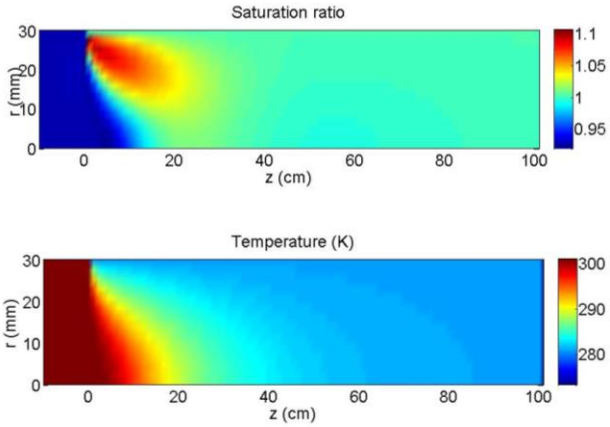

Figure 1. Calculated Saturation ratio and temperature profiles inside the flow tube condenser (flow direction from left to right) ($T_{sat.}$ = 299.3K $T_{preh.}$ = 300.6K $T_{cond.}$ = 280.8K, Q =2.1lpm)

First laboratory campaigns have been conducted using ammonium sulphate as a test aerosol. These particles were produced and introduced into the FMI-ACIT through an aerosol inlet on the top part of the preheater. FMI-ACIT's counting efficiency was tested in 5 different ranges of relative humidity of the condenser to confirm its proper operation. (see Fig.2)

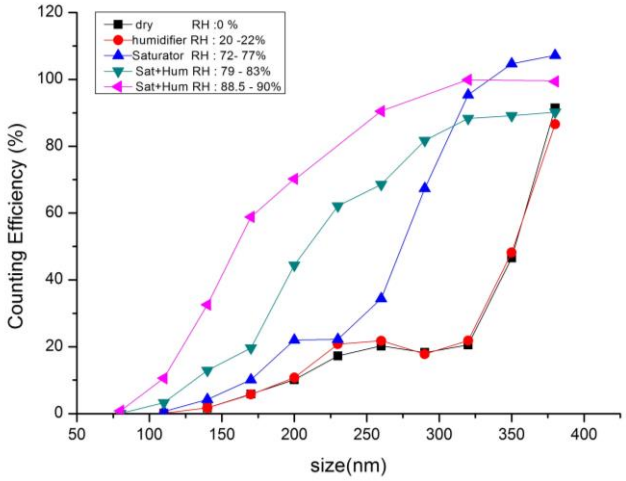

Figure 2. FMI-ACIT's counting efficiency for different particle sizes at 5 ranges of relative humidity (Q = 2.1 lpm)

Also other aerosols with different hygroscopicity and shapes like desert dust, black carbon, sea salt will be used in further campaigns.

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