



Upper Tropospheric Tropical Ice Clouds: In-situ Measurements of Aerosol covering sizes from 6 nm to 1550 μm and Particle NO_y during TROCCINOX and SCOUT-O3

H.-J. Vössing (1), S. M. F. Raupach (1), R. Weigel (1), J. Curtius(1), C. Voigt (2), H. Schlager (2), S. Borrmann(1,3)

(1) Institute for Physics of the Atmosphere, Johannes Gutenberg University Mainz, Joh.-Joachim-Becher-Weg 21, 55099 Mainz, Germany, (2) Institut für Physik der Atmosphäre, Deutsches Zentrum für Luft- und Raumfahrt(DLR) Oberpfaffenhofen, D-82234 Wessling, Germany, (3) Max Planck Institute for Chemistry (Otto Hahn Institute), Joh.-Joachim-Becher-Weg 27, 55128 Mainz, Germany

In situ measurements of cloud and aerosol properties in the tropical UT region were performed using the high altitude research aircraft Geophysica. During the TROCCINOX-2 campaign, continental tropical convective clouds were probed in southern Brazil. Tropical convective marine clouds were the aim of the SCOUT-O3 campaign with particular emphasis on the "Hector" system above the Tiwi Islands near Darwin, Australia.

In TROCCINOX-2, the four channel condensation nuclei counting system COPAS was utilized on Geophysica with a lower cut off starting at 6 nm. And a special configuration of the FSSP-SPP-100 optical particle counting system, designed and modified for use on Geophysica, was deployed; it measured distributions of particle diameters between 0.2 and 8 μm , or alternatively between 0.8 and 32 μm .

In SCOUT-O3, additionally the cloud imaging probe CIP (DMT Inc. Boulder, Co, USA) was successfully flown for the first time on Geophysica. It images and measures cloud particles within the size range of 25 μm to 1.55 mm.

Thus, all instruments combined allow for the detection of aerosol and cloud particles with sizes between 6 nm and 1.55 mm, covering almost six orders of magnitude.

In this contribution data are shown from various flights sampling tropical cirrus clouds, anvils of deep convective systems, as well as thin and well developed cirrus clouds, both from Brazil and Australia. Besides particle size distributions, the presented data set also contain shadow images of cirrus ice particles with simple and more complex habits, as well as additional information on the volatility of the ultrafine particles.

In a case study the obtained microphysical data are correlated with the measurements from the DLR NO_y instrument. Particulate NO_y was observed in a cirrus cloud containing large, complex ice crystals. In this cloud, the ice crystal shape, volume and nitric acid content of the ice could be derived with high accuracy.

Also, the occurrence of visual and subvisual cirrus clouds above the Tropopause in the tropical TTL is discussed.