Geophysical Research Abstracts
Vol. 20, EGU2018-1860, 2018
EGU General Assembly 2018

Ice particles over the Asian Monsoon: observations during the field campaign StratoClim 2017

Christian Rolf, Armin Afchine, Nicole Spelten, and Martina Krämer
Forschungszentrum Jülich GmbH, IEK-7, Jülich, Germany (c.rolf@fz-juelich.de)

The StratoClim field campaign with the Russian high-flying aircraft M55-Geophysica took place out of Nepal 2017 in the monsoon period July to August to investigate, amongst others, size distributions and number concentrations (Nice) of ice particles in the sub-tropical upper troposphere/lower stratosphere (UTLS) region. The measurements are performed by means of the cloud spectrometer NIXE-CAPS (Krämer et al., 2016), capable to detect aerosol and ice particles in the size range 0.6 to 937 um. Ice water content (IWC) was additionally determined from total water measurements with the hygrometer FISH (Meyer et al., 2015).

5.5 hours of ice clouds in the temperature range 185 to 240 K are observed during 8 flights in the altitude range 10–19 km in and over the Asian monsoon anticyclone. Preliminary data evaluation shows that exceptional ice clouds are observed in comparison to the cirrus climatology, which is part of the Jülich in-situ airborne data base (JULIA). JULIA contains 124 hours of IWC and 71 hours of Nice from 19 field campaigns between 75N and 25S. At temperatures lower than 200 K, the StratoClim IWC as well as Nice are frequently about a factor of 10 to 100 higher than in the total climatology. IWCs are higher than ever recorded. These cirrus most probably originate from frozen liquid drops (liquid origin cirrus, Krämer et al., 2016) that are uplifted in deep convection. A part of this type of ice clouds is observed above the cold point of the temperature profile, that means that overshooting events in the deep convection are observed. Another part of the measurements show very low Nice , which are reported and discussed earlier in the literature. We interpret these clouds as in-situ cirrus formed in the outflow of the Asian monsoon.

Further analysis of the measurements, incorporating model simulations with the large-scale Lagrangian model ClaMS-Ice (Rolf et al., 2016) will be performed to answer questions on the observed cirrus types: can we reproduce the in-situ origin cirrus formed in the outflow? Which freezing mechanism, homogeneous or heterogeneous freezing produces the low ice crystal number observed in the in-situ cirrus? The liquid origin cirrus that formed heterogeneously in deep convection, do they contain also ice particles that are nucleated in a subsequent homogeneous freezing event ? First results will be presented at the conference.

References

- Krämer et al. (2016): A microphysics guide to cirrus clouds – Part 1: Cirrus types, Atmos. Chem. Phys., 16, 3463-3483, doi:10.5194/acp-16-3463-2016.
- Meyer, J., Rolf, C., Schiller, C., Rohs, S., Spelten, N., Afchine, A., Zöger, M., Sitnikov, N., Thornberry, T. D., Rollins, A. W., Bozóki, Z., Tátrai, D., Ebert, V., Kühnreich, B., Mackrodt, P., Möhler, O., Saathoff, H., Rosenlof, K. H., and Krämer, M.: Two decades of water vapor measurements with the FISH fluorescence hygrometer: a review, Atmos. Chem. Phys., 15, 8521–8538, doi:10.5194/acp-15-8521-2015, 2015.
- Rolf et al. (2016): Reconciliation of in-situ observations and large-scale simulations of mid-latitude cirrus clouds, 17th ICCP Conference, Manchester, July 25-29.