



Ice supersaturated regions and cirrostratus observations at northern mid latitudes and the tropics

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Cirrostratus (Cs) clouds were observed with the mobile Lidar systems MARL and ComCAL during field campaigns in the mid latitudes in 2003 (Lindenberg/Germany, 53°N, 15°E) and in the tropics in 2004-2006 (Paramaribo/Suriname, 6°N, 55°W). The lidar system MARL and ComCAL are capable of detecting thin cirrus including extremely thin clouds with optical depth below 10^{-3} . This study is based on lidar observations and meteorological data obtained from radiosondes as well as the analysis of the European centre for medium range weather forecast (ECMWF). Cirrostratus are ubiquitous in the midlatitudes (55% coverage) and even more so in the tropics (88% coverage). Humidity measurements in the upper troposphere are difficult to conduct and need careful consideration with respect to systematic errors. We discuss the reliability of radiosonde data based on the data obtained during the Lindenberg Upper Air Method Intercomparison (LUAMI) campaign (Nov 2008) where a number of commercial radiosondes was launched together with reference instruments including the NOAA cryogenic frost-point hygrometer (CFH). Relating the humidity profiles obtained from radiosondes to concurrent lidar observations reveals a close correlation between ice supersaturation and the occurrence of Cs. This leads us to the conclusion that on synoptic scales ice particles are almost always present in supersaturated conditions. The ECMWF cloud parametrization reproduces the observed cirrus clouds consistently and a close correlation between the ice water path in the model and the measured optical depth of cirrus is observed.