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Characterization of ultrafine Aerosols in the tropical and mid-latitude UT/LS by in situ Measurements

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Nucleation and aging processes in connection with ultrafine aerosol particles in the UT/LS have important implications for cloud microphysics, the maintenance of the stratospheric Junge Layer, for heterogeneous and ozone related chemistry, as well as for radiative transfer. Especially aerosol particles nucleated in the tropical UT regions are susceptible for transport into the stratosphere and global distribution. Since in situ measurements are sparse, particularly in the tropical UT/LS, a four channel particle condensation counter was operated during the transfer flights from Germany to Brazil and to Australia on board of the Russian high-altitude research aircraft Geophysica. Together with the local flights from the Troccinox 2 and Scout-O3 campaigns a latitude range from 58° North to 21° South was covered between January and December 2005. The ultrafine particles were measured by utilising the COPAS CN counter with 3 channels detecting number densities of particles with size diameters above 6 nm, 10 nm, and 15 nm, respectively, this way providing coarse size resolution. In addition a pre-heated channel operating at 250° C provided measurements of non-volatile residual particles larger than 10 nm. Together with the data from a modified FSSP 100 optical particle counting system detailed data of the background aerosol in cloud free air and in the vicinity of clouds were obtained. Juxtaposition of the tropical vertical profiles with respect to potential temperatures for the flights from Darwin (Australia) and locations in Brazil, showed remarkable similarity in 2005. Variability in the UT ultrafine concentration is seen if mid-latitude data from 1999, 2003 and 2005 are plotted on theta level profiles. However, for altitudes above 15 kilometres these con-

centrations remained constant in this time period thus indicating a stabilisation of the Junge aerosol layer on very low levels. In the presentation particle data are correlated with concurrent measurements of dynamical tracers (such as N2O and CFCs) and with ozone. Also, ultrafine particle characteristics with respect to volatility over the continent (Brazil and Central Australia) are compared with the measurements of the Atlantic and Pacific Oceans. Due to a wide range of longitudes and latitudes covered the overall data set has the potential for providing valuable input for global UT/LS modelling purposes.