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Airborne in situ Observations in the tropical UTLS over West Africa: First Results and Implications for Trace Gas Transport

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We present new in situ observations of trace gases in the tropical tropopause layer (TTL) and the lower stratosphere (up to 20 km) over West Africa obtained during the AMMA/SCOUT-O3 deployment of the M55 Geophysica aircraft from Ouagadougou, Burkina Faso, in August 2006. On board the aircraft long-lived tracers (N_2O, CH_4, CO_2, H_2, F12, F11, H-1211, SF_6) were measured by the University of Frankfurt's High Altitude Gas Analyzer (HAGAR), CO by the Cryogenically Operated Laser Diode (COLD), and O_3 by the Fast Ozone ANalyzer (FOZAN). The deployment comprised four transfer flights between Italy and Ouagadougou and five scientific flights on site, including survey flights aimed at improving our understanding of large-scale transport and flights above and around mesoscale convective systems aimed at investigating their impact on the tropical UTLS.

A first analysis of these measurements will be presented with regard to the principal transport processes that control the chemical composition of the TTL and tropical lower stratosphere. Vertical profiles and correlations between the various species, serving as stratospheric tracers, as boundary layer tracers, or age-of-air tracers will be used to i) contrast observations of the background TTL and convectively influenced air, ii) diagnose irreversible mixing of convectively overshooting air with the background TTL, iii) detect isentropic mixing across the subtropical tropopause and the subtropical transport barrier, and iv) to assess slow up-welling in the upper TTL and

the lower stratosphere. Comparisons will be made with data obtained during previous tropical Geophysica campaigns (APE-THESEO, TROCCINOX, and SCOUT-O3) and the present observations will be put into a climatological context.