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In situ Tracer Observations during the SCOUT-O3 Tropical Aircraft Campaign: A first analysis of TTL transport and mixing

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We present new in situ trace gas measurements within the tropical tropopause layer (TTL) and the lower stratosphere (up to 20 km) over the maritime continent obtained on board the M55 Geophysica aircraft during the SCOUT-O3 Tropical Aircraft Campaign in November/December 2005. The observations were made during 8 (mostly northbound) flights from Darwin, Australia (12°S, 130°E) and 4 transfer flights between Darwin and Bangkok, Thailand. A suite of long-lived tracers (N2O, CO2, F12, F11, H-1211, SF6) was measured by the University of Frankfurt's High Altitude Gas Analyzer (HAGAR), CO was measured by the Cryogenically Operated Laser Diode (COLD) instrument, O3 by the Fast Ozone ANalyzer (FOZAN), and NOy by the SIOUX instrument.

We will present a first analysis of these measurements with respect to principal transport processes in the TTL using profiles of and correlations between the various species serving as stratospheric and boundary layer tracers. Numerical Lagrangian simulations from the CLaMS model will support the analysis of the observations. The campaign included both survey flights designed to sample the background TTL and flights sampling the plume, turret, and outflow of the deep convective cell "Hector" frequently appearing north of Darwin and reaching up close to the tropopause. A focus of our study will be the irreversible mixing of the convectively overshooting air with the background TTL. Furthermore we will examine the data for horizontal

stratosphere-troposphere exchange across the subtropical tropopause. These processes critically control the chemical composition of the TTL and thus the composition of air transported upward to the stratosphere.