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Boundary layer aerosol and trace gas climatologies from ACTIVE

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The Aerosol and Chemical Transport in tropIcal conVEction (ACTIVE) aircraft campaign was conducted from November 2005 to February 2006 from Darwin, Australia, to characterise the influence of both monsoonal and localised deep convection in the surrounding maritime and land environment, in determining the composition of the Tropical Tropopause Layer (TTL). Aircraft and ozonesonde field measurements were taken in two phases - the first in November/December 2005 to study pre-monsoon deep convection (so-called Hector storms over the Tiwi Islands off the northern coast) and the second in January/February 2006 to study monsoon convection. In both phases ACTIVE collaborated with two other simultaneous international campaigns at Darwin - the EU SCOUT-O3 project in November/December and the US/Australian TWP-ICE project during the monsoon period. For ACTIVE, the high altitude Australian Egrett aircraft and lower altitude NERC Airborne Research and Survey Facility (ARSF), Dornier-228 aircraft were employed to measure chemical and aerosol species in the inflow and outflow of tropical storms. This paper discusses the inflow climatology of such species, which include aerosol size and composition, CO, O_3, VOCs and CFCs, measured at low altitude (less than 10000 ft) by the Dornier as a function of the evolving local and regional meteorology. The chemical and aerosol background is seen to be strongly delineated by changes in the prevailing meteorology, as well as by singular events such as the influence of inland biomass burning. In general, we observe four contrasting periods to the background convective inflow: the first of which consists of a relatively polluted and highly variable biomass-burning period throughout November, followed by a second, less variable, moderately polluted phase throughout December, characterised by regular deep convection in the afternoon over the Tiwi Islands and frequent large-scale squall lines over the Darwin area in both cases. The third and forth phases include a very clean active (and inactive) monsoon period throughout January

and a monsoon break period in February, during which the boundary layer background shows a slow return to a more pre-monsoon state. The climatologies presented here will provide a useful dataset of the Darwin region and a valuable resource for model simulation of chemical and aerosol transport by deep convection in the region, and hence links to improved understanding of TTL composition and dynamics.