Geophysical Research Abstracts,
Vol. 10, EGU2008-A-10303, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-10303
EGU General Assembly 2008

Lightning-produced Nitrogen Oxides During ACTIVE; Observations in Two Different Convective Regimes

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The production of nitrogen oxides by lightning (LtNOx) in both Hectors and monsoon convection storms during the ACTIVE campaign (Nov. 2005- Dec.2006) in Northern Australia is being studied using data from airborne platforms that measured NO, NOx as well as a host of other meteorological microphysical parameters during a series of transects along the anvil outflow regions of storms. On the ground, a comprehensive array of instruments, including a lightning detection network as well as a C-band polarimetric radar, were used to further characterize the storms as well as the background atmosphere in the experiment area. Due to its locations and its duration, the ACTIVE campaign afforded the unique opportunity for studying the production LtNOx during two successive and markedly different convective regimes in the same area. During the first phase campaign (Nov.-Dec. 2005) Hector storms were sampled, and NOx enhancements of between 0.5 and 4.7 nmol/mol, were measured in the anvil outflow regions. These enhancements are on a par with those measured in subtropical storms in the Florida peninsula during the CRYSTAL-FACE field campaign and are significantly higher than any measured in continental tropical convection. Although biomass burning season contributed to the enhancements, the NOx/CO ratios seem to point to lightning as the primary source. NOx values in the range of 1.7-2.3 nmol/mol were measured during a flight sampling the outflow region of a monsoon storm during the campaign's second phase, in January 2006. While not as high as those measured during the first campaign, these enhancements are nevertheless significant and still higher than those measured in tropical continental thunderstorms in previous campaigns. A survey flight made to sample and the aged anvil plume of a storm that occurred more

than 12 hours prior measured NO mass mixing ratios well over 3 nmol/mol, underscoring the high post-storm concentration and the potential for long-range transport of the species. The campaign's data is also being investigated for possible connections between cloud ice-crystal habits and the in-cloud measured NOx enhancements.