Lightning Activity and NOx Production (LNOx) in a Hector Blow-Up: First Observations During SCOUT-O3/ACTIVE

H. Huntrieser[1], H. Schlager[1], A. Roiger[1], H. Höller[1], K. Schmidt[2], G. Allen[3], S. Viciani[4], A. Ulanovsky[5], F. Ravegnani[6], and D. Brunner[7]

[1]*Institut für Physik der Atmosphäre, Deutsches Zentrum für Luft- und Raumfahrt (DLR), Oberpfaffenhofen, Germany;* [2]*Physics Department, University of Munich, Germany;* [3]*School of Earth, Atmospheric & Environmental Sciences, University of Manchester, UK;* [4]*Istituto Nazionale di Ottica Applicata (CNR-INOA), Firenze, Italy;* [5]*Central Aerological Observatory, Moscow, Russia;* [6]*Institute of Atmospheric Sciences and Climate (CNR-ISAC), Bologna, Italy;* [7]*Laboratory for Air Pollution and Environmental Technology, Empa, Dübendorf, Switzerland*

Hector is a tropical mesoscale thunderstorm system that develops on a regular basis over the Tiwi Islands, just north of the Australian mainland. The area extending from these islands to the Indonesian archipelago (termed the "maritime tropical continent") belongs to a major region of global latent heat release, maintaining the planetary-scale Hadley and Walker circulations. In 2005, the SCOUT-O3/ACTIVE field campaigns were conducted in this area during the transition season November-December. An explosive Hector storm developed on 19 November, as a result of interactions between sea breeze and gust fronts from previous convection. Trace gas measurements inside, above, and below the anvil outflow were carried out with three aircraft. These are the first in-situ measurements of NOx in the Hector outflow ever performed. A Lightning Location Network (LINET), operating in the VLF/LF range, registered strokes. Observed mean anvil-LNOx mixing ratios and stroke rates were much higher (factor ~4) than observed in a previous tropical field experiment TROCCINOX over Brazil (Huntrieser et al., ACP, 2008). If we assume that Hector is a typical global thunderstorm, the annual global LNOx production rate based on our LNOx mass flux and stroke rate estimates in Hector would give ~6-7 Tg(N) a^{-1}. In comparison, estimates for two nearby continental thunderstorms developing in a tropical and subtropical airmass gave ~2-3 and ~7-8 Tg(N) a^{-1}, respectively. The tropical continental thunderstorm produced much less LNOx per flash compared to the subtropical and Hector thunderstorms, which may be caused by the shorter mean flash component length observed in the first storm.