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An AMMA-SOP2 case study of a small MCS over Benin: Implications for Lightning NOx production

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The production of NOx by lightning is an important component in the NOx budget of the atmosphere. For further improving the knowledge of the underlying processes there has been performed a series of experiments in different parts of the world like the EU TROCCINOX (Tropical convection, cirrus and nitrogen oxides experiment) project in Brazil during Jan/Feb/Mar 04 and 05 and the tropical EU SCOUT-O3 (Stratospheric-Climate Links with Emphasis on the Upper Troposphere and Lower Stratosphere) in Northern Australia in Nov/Dec 05. For the first time lightning NOx production in Africa was investigated during the special observation period (SOP2) of AMMA in summer 06 during the rainy season in West-Africa. This paper presents a first overview of the measurements available to address this question with respect to a further investigation by numerical modelling studies.

On 15 August 2006 a smaller convective complex developed over Benin and moved westwards during the afternoon and evening hours. The French Falcon made dynamical and chemical measurements of the environment in the early stages of the MCS development. The German Falcon was measuring dynamical, chemical and aerosol parameters during the intense and decaying stage within the region of the MCS anvil. Distinct NO and NOy enhancements were found here which are most probably connected to lightning activity.

Lightning has been measured by LINET (Lightning detection network) which was installed in Benin centred around the Djougou supersite The system is measuring the

magnetic field emitted from lightning events in the VLF/LF range. It is also able to discriminate intra-cloud (IC) and cloud-to-ground (CG) strokes. For providing a most complete view of the convection the lightning stations were installed in the same area which was also covered by the Ronsard polarimetric radar. The radar also observed the cell development on this day and thus the lightning events can be related to the microphysical parameters obtained from the radar measurements.

The analysis of such a case study will reveal insights into the lightning NOx production in African storms. The experimental data will serve to assess the performance of numerical models like MesoNH with respect to the development of the convection in general, the development of precipitation, the lightning activity of the storms and the associated NOx production.