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Balloon electric field measurements near an active convective storm during the AMMA campaign

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In the course of the AMMA campaign electric field measurements were performed by the AIRS experiment flown onboard a stratospheric balloon launched from Niamey (Niger). This balloon flight aimed at two main scientific objectives, the observation of high altitude electrical processes in the vicinity of an active convective system and the search for possible effects of lightning on atmospheric chemistry in the lower stratosphere. In addition, this flight was also used to validate the operation of an advanced electric field instrument which is planned to be used in future landed mission on Mars as well as on terrestrial balloon flights. The AIRS electric field instrument is a double-probe sensor which measures the vertical component of the atmospheric electric field from DC to 4 kHz and the electrical conductivity of the atmosphere. Added to the AIRS payload was optical sensors to detect lightning and the flight chain also included several other experiments to measure atmospheric parameters. The flight occurred in the late afternoon of August 7, 2006 with $\sim$ 1 hour at the ceiling altitude of 23 kilometres.

During the ascent the balloon was far from any active cloud and the DC atmospheric electric field and conductivity profiles were rather typical of fair weather conditions. Small scale electric field variations and turbulence were observed between $\sim$ 11 km altitude up to the tropopause at 16.5 km that can be interpreted as resulting from the crossing of charged cirrus clouds. More interesting is the detection of the same kind of structures in the electric field above the tropopause that are associated with the detection of thin faint stratospheric cirrus clouds of charged ice particles detected

by another instrument on the same flight. In the last part of the flight, the balloon drifted in the vicinity of a convective cell with moderate dimensions and activity as observed from meteorological radar data. Numerous lightning were detected by the optical sensors, most of them probably due to cloud to cloud discharges of moderate intensity. Their signatures on the electric field data that mix both impulsive effects due to the generated EM wave and slower variations due to the rearrangement of electrical charges within the clouds will be discussed.