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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Mesoscale convective systems observed during AMMA and their impact on the NO_x and O_3 budget over West Africa" *by* H. Huntrieser et al.

Anonymous Referee #1

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This work seeks to clarify the impact of convective transport and lightning NOx production on trace gas distributions through extensive analysis of two events observed during the AMMA field project. To achieve this, the authors combine lightning observations from LINET, satellite observations of storm evolution, and ECMWF meteorological analyses with aircraft observations from several platforms. The paper, following on the authors' similar analysis of storms observed during several other field campaigns, is very thorough, well reasoned, and clearly explained. I think it would be preferable to reduce the overall length, if possible, though I can find no obvious areas in need of substantial reduction. Their results from AMMA support previous findings that tropical storms may produce less NOx on a per flash basis than do subtropical and midlatitude

storms. This is an important result which will likely contribute to improved parameterizations of lightning NOx production in chemical transport and climate models in the future. In addition, the subject matter should be of great interest to the ACP readership. I recommend publication.

One area that could benefit from further explanation is the handling of lightning observations during the August 6 MCS (Section 4.2). The authors state that the LINET system was not operational until 11 UTC. Estimates of production per flash are based on the flash rate between 11-12 UTC (when the aircraft sampling ended) – is this correct? Is it possible that flashes prior to 11 UTC contributed to the NOx observed by the aircraft? If the flash rate were larger earlier in the storm (as is likely), how would this impact the production per flash estimate for this storm? The authors have done very well with a limited amount of information, but I think a bit more explanation of this point is required. Also, is there any other source of lightning information that may be used to provide information on the earlier part of the storm – perhaps WWLLN observations?

Minor and technical corrections:

P. 22768, Line 7 – Statement about isoprene is awkward – remove or reword.

P. 22768, Line 24 – Change 'up to' to 'until'

P. 22771, last line – 'TLL' should be 'TTL'

P. 22772, Line 18 – NOx is generally but not strictly conserved. I would consider rewording for clarity with something like 'During the short timescales of convective transport from the BL to the UT, NOx is generally conserved but not NO or NO2 individually.'

Section 2.2, Paragraph 2 – The background on NOx that comprises most of this paragraph is informative and well written, but I'm not sure that it belongs in the instrumentation section.

Figures 3, 7 – Is there a way to identify portions of the flight which where in and out-of-cloud or was nearly all the sampling in-cloud? If there is a clear indication, it would be

useful to indicate this on the figures (perhaps by shading the background grey) to help separate cloud effects from background mixing ratios.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 22765, 2010.