

Interactive comment on “Role of convective transport on tropospheric ozone chemistry revealed by aircraft observations during the wet season of the AMMA campaign” by G. Ancellet et al.

Anonymous Referee #2

Received and published: 13 October 2008

General Comments: This manuscript reviews and analyzes the trace gas measurements taken onboard the French Falcon aircraft during the wet season AMMA campaign. The data presentation and the analyses conducted are of high scientific quality. However, the overarching atmospheric chemical issues associated with regional transport and convection need to be discussed to a greater degree in the introduction. There is a need for a more comprehensive introduction which discusses previous work concerning the effects of deep convection on tropospheric chemistry in the tropics (for example the ABLE-2A, ABLE-2B, TRACE-A, and TROCCINOX experiments in Brazil).

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The paper needs to address how the objectives of the AMMA flights were designed to answer the chemical issues associated with deep convection. The abstract and introduction both stress that the work presented in the paper is needed prior to modeling under the AMMA framework. However, this objective is not mentioned again in the paper. The authors need to aim the presentation more toward this ultimate goal of model simulations. They should address how the observations should be used in setting up model experiments. I presume that cloud-resolved model simulations for MCS events will likely require initial condition profiles derived from the aircraft measurements. The paper would be stronger and more useful if such profiles were provided.

Specific comments: Title: Much of this paper deals with the survey flights which reflect regional transport, not just the role of convective transport. Therefore, I think a more appropriate title would be "Effects of regional-scale and convective transport on tropospheric ozone chemistry revealed by aircraft observations during the wet season of the AMMA campaign";

Throughout the paper: The term hydroperoxide is used. I don't think this is standard terminology. There is hydrogen peroxide and there are organic peroxides.

Abstract: Line 22: "of the air masses to where the convection";

Introduction: line 11-12: "goals of these projects were aimed at";

Many other English grammar improvements can be made. Referee #1 has already provide a list of these items, and I will not repeat them.

p. 15948, line 6: The text does not explicitly say that the second instrument was used for NO₂. Therefore, change the sentence to the following: "NO is directly measured by the first analyzer and NO₂ is measured by the second instrument after conversion to NO";

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p. 15949, line 25: flight campaign (13 August). The same is true;

p. 15951, lines 18-19: Isn't most of the convective activity in this region deeper than 7 km. I'm wondering why the mixing ratios at the upper level flight leg (>10 km) were not also affected?

p. 15952, line 13: main characteristics are at low altitudes;

p. 15958, lines 3 and 21: Aren't there lightning observations that could be used to verify whether lightning contributed to the enhanced NO_x mixing ratios? I think there was a small scale lightning network installed as part of AMMA, but it may not have been in the correct location for the convection in question here. But, there are global networks, such as ZEUS and the WWLLN that should detect flashes in this part of Africa. It is difficult to use these data quantitatively due to poorly-defined detection efficiency, but qualitatively these data could be used to indicate whether or not lightning did occur in a particular region.

p. 15963: For the MCS flights the CO, O₃, and peroxide data are discussed, but there is no mention of NO or NO₂ observations. Were these measurements not performed on these flights? If not, this is quite unfortunate. The NO_x observations would have been most interesting, reflecting both transport from the boundary layer and production by lightning. If the AMMA data are to be used in modeling the effects of convection on tropospheric ozone production, the lack of such data will severely limit the usefulness of such modeling.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 15941, 2008.

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