Atmos. Chem. Phys. Discuss., 8, S9073–S9076, 2008
www.atmos-chem-phys-discuss.net/8/S9073/2008/

Atmospheric Chemistry and Physics Discussions

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.

G. Ancellet et al.

Received and published: 13 November 2008

Answer to reviewer 2 major remarks:

1) 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).

The introduction has been rewritten according to the two reviewers recommendations.

In particular, past studies have been better acknowledged in the present version.

2) The paper needs to address how the objectives of the AMMA flights were designed to answer the chemical issues associated with deep convection.

The section 2.1 has been rewritten to emphasize the objectives of the flights, namely the MCS outflow studies and the analysis of the meridional cross-sections of the chemical composition during the dry spells. A table is provided to list the flights and their objectives. The main goal was to establish a link between the variability of ozone and its precursor and the main transport pathways identified during the WAM.

3) Both the abstract and introduction 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.

The reference to modeling issues has been removed from the introduction as it induces some confusion about the objectives of this paper. The MCSs flights from the French Falcon alone are not suitable for initialization of CRM models because of the bias toward convective environmental conditions. Ideally, such initial conditions should be calculated by including the UK-BAE 146 measurements in the free troposphere and take off and landing during the transect flights in cloud-free environments. The manuscript in preparation by Reeves et al. for publication in ACP will address this issue of bringing together all the aircraft data for building reference vertical profiles. Following the same idea, the combination of latitudinal transects at different altitudes by several aircrafts will be of great use for testing global and regional models. Again, this point is treated in the Reeves et al. paper.

ACPD

8, S9073–S9076, 2008

Answer to specific comments:

We thank the 2nd reviewer for suggestions in the improvement of our English grammar. They have been included.

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

We fully agree with this suggestion and the title was changed accordingly

Clarify the use of the term hydroperoxide

Throughout this paper hydroperoxide includes H2O2 and ROOH generically, it has been defined in the introduction and it was checked that the meaning is really the same everywhere in the paper.

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

It is true that we expect large NOx values also above 7 km in relation with tropical convection. Since we do not have NOx measurements during the MCS flights where the aircraft flew in the outflow, it is difficult to discuss this point. The NOX data for the long meridional transects always correspond to observations of the air masses 1 or 2 days after the convective uplift. The altitude of the convected air masses can then be quite different from the initial outflow. Furthermore CO values are not very high either above the 7-km NOx maxima. This indicates that the fingerprint of the convective outflow is then indeed near 7 km and not higher above the continent on this day.

p. 15958, lines 3 and 21: Arent there lightning observations that could be used to verify whether lightning contributed to the enhanced NOx mixing ratios? 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

ACPD

8, S9073–S9076, 2008

region.

We are not aware of specific lightning measurements that could match our observations. But as suggested by the reviewer we have requested the ZEUS network data for our observing period namely from 11/8 to 20/8/2006. Maps of the flash positions for each day have been produced. The corresponding figures are posted on the web site at the following address: http://www.aerov.jussieu.fr/themes/PCT/zeus.html . We notice that significant lightning events occurred east of the 2°E meridian during the period 16/8-18/8 so 2-3 days before the flights performed on 19/8 and 20/8 when we observed high NOx concentrations. Thus the lightning NOx source cannot be ignored during the convective events. A note is made in section 3.2 line 440.

p. 15963: For the MCS flights the CO, O3, and peroxide data are discussed, but there is no mention of NO or NO2 observations.

Unfortunately, the NOx instrument did not work during the MCS flights. We agree that it's a pity.

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