

## ***Interactive comment on “Nitrogen oxides measurements in an Amazon site and enhancements associated with a cold front” by A. M. Cordova et al.***

### **Anonymous Referee #2**

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#### General comments:

The case study is dealing with the long range transport of air pollutants in the tropics originating from biomass burning. The transport path from the source region to the experimental site is documented by in-situ measurement data, by satellite observations and model results. The enhancement of trace gas concentrations in a central Amazon site is attributed to fires far in the south. The interpretation of the data is clearly and traceable in most cases, although there are still some questions concerning details of the meteorological conclusions (specific comments).

The paper addresses transport phenomena in an area of unsteady and low basic flow and the tools used for data interpretation are suitable to get reliable results. The com-

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bination of measurements and model simulations enables the authors to discuss long range transport processes although only data of one experimental site are available. The traceability of the results is easy to do and the scientific work done by other authors in this field of investigations is considerably cited. The overall presentation of the paper is clear and the abstract is appropriate. After some revisions and additional information as stated in the following (specific comments and technical corrections) I can recommend publishing the paper in ACP.

Specific comments:

1. Title, abstract, introduction: cold front

The enhancement of the trace gases at Balbina site is connected with the arrival of a cold front. But the exact time of the cold front reaching Balbina is not shown. A surface weather chart for the area is not given and time series of surface wind direction, pressure and air temperature are missing to fix the day and time of the arrival of the front. I think the case discussed here is indeed very similar to the case reported by Marengo et al. (1997) which is cited in the paper. But as shown by Marengo et al. the cold front itself, associated with turning of the wind and significantly increasing pressure does not reach Balbina site. In cases of cold air surges these phenomena are restricted to the southern and central Brazilian stations. The central and northern Amazon sites are affected by the cold air surges of the tropospheric trough, but I wonder whether at Balbina a typical cold front could be observed. This is not clear from the data.

p. 2302, line 21: It is not shown, that the cold and polluted air crosses the equator.

2. Experiments and analytical methods

The trace gas concentrations discussed are quite low. Some additional information about detection limits, precision and accuracy of the NO<sub>x</sub> and O<sub>3</sub> instruments is necessary. Are the calibration procedures for these instruments traceable to any international and certified standards?

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I do not think that a good location for a weather station measuring meteorological surface conditions is on top of a water tank. What did radiation, temperature and humidity sensors measure (data above a water surface (open tank) or data above a metal or plastic surface)? What kind of radiation was measured (long-wave, short-wave, both, incoming, outgoing)? This should be indicated in Fig. 4.

### 3. Results and discussions

p. 2306, line 14: It is not shown that the cold air reached Balbina with frontal characteristics (see statement above).

p. 2307, line 1: Discussing a cold front passing a certain site, it is not useful to show daily cycles of meteorological parameters averaged over some days (June 19 to June 22) as done in Figures 3 and 4. The averaged CLAIRE 2001 conditions should be compared with the 3 or 4 individual daily cycles during the cold air surge.

p. 2307, line 8: If there is a cold front detected, the exact time and date should be mentioned (Fig. 5a, b).

p. 2307, line 14: Do the backward trajectories starting from Balbina at the same time (Figs. 6a and b) vary in height? If the answer is yes, this should be mentioned.

p. 2307, line 19: NO concentrations are higher than NO<sub>2</sub> concentrations for several days in Figure 7 (June 16, July 12 and 13).

p. 2307, line 20: What is the reason for the typical daily cycle in NO<sub>2</sub> concentrations on June 19 and 20? If this increase is associated with horizontal advection of cold air, connected with a cold front, the daily cycle is doubtful. I would expect a concentration pattern independent of any daily cycle in this case.

p. 2308, line 12, surface temperature: Is this soil surface temperature or air temperature near the surface (measured on top of the tank)?

p. 2308, line 18: in Figures 8 to 10 data of the cold front event are averaged over some

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(4?) daily cycles. But as the passage of a front is not daily periodic, the individual daily cycles of the measurements should be shown.

p. 2308, line 26: are there any indications for the turning of the wind from the surface weather station?

p. 2309, line 8: Do you mean biogenic VOC concentrations reduced by less solar radiation?

p.2309, line 17: What is the reason for the periodic BC increase at nighttime if advection takes place on synoptic scale?

Technical corrections:

1. p. 2303, line 23: (Kirchhoff, 1988; Kirchhoff and Alvala, 1996)

2. p. 2303, line 29: (Browell and Fenn, 1996)

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