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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Quantifying the impact of BOReal forest fires on Tropospheric oxidants over the Atlantic using Aircraft and Satellites (BORTAS) experiment: design, execution and science overview" *by* P. I. Palmer et al.

Anonymous Referee #2

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The paper of Palmer et al. provides a description of the BORTAS experiment. Basically the paper reports a short description of the meteorology based on geopotential anomalies, three examples of satellite observations during the campaign, a long discussion of the project strategy and some highlights of published analyses. There is an undoubted interest in publishing an overview paper for a measurement campaign but I consider that this article should be largely improved and extended in some parts. Based on my experience, the main point of concern of overview papers is to ensure to bring a novel and meaningful scientific innovation as required in a publication in ACP. It is certainly

worth to resume the main scientific results of the campaign but it may be also important to provide an introductory publication giving for instance (1) the scientific basis, (2) an accurate description of the meteorological context and possible specificities of the campaign period (3) background conditions of atmospheric composition desumed from the observations (4) an overview of peculiar observations that will be discussed in deeper detail elsewhere and (5) results that will not be reported in specific publications.

The manuscript addresses the above issues presenting a large wealth of potential information but without a desirable (at least to my opinion) in-depth analysis. The quality of the presentation may be also improved to better focus on the main message(s) of this paper. The manuscript is quite long on the observational and modeling strategy but it often occurs that the reader is left wanting more of the main results and methodologies. There are several repetitions and, sometimes, we get the impression that parts manuscript resemble more to a campaign wash-up report than to an overview publication. I do understand that it may be difficult to have a meaningful analysis leaving room for the other publications but I suggest to take a look to what done for instance in Reeves et al. ACP, 2010 that gives a complete view on the AMMA-chemistry aircraft campaign, of the mean observed concentrations and a close look to specific data that are analyzed in detail in other publications. Similar approach was chosen (for a fraction of the wider campaign described by Reeves) by Cairo et al., ACP 2011 that, in addition, provides a detailed assessment of the meteorology, atmospheric transport and their variability during a 2 weeks campaign in 2006.

One possible way to clarify the presentation is to provide an introduction that could serve for other BORTAS papers, strengthen the description of the meteorological and emissive condition and extend the discussion of the results. In the following I will provide some suggestions section by section.

Abstract may be revised (and somewhat shortened if necessary), reducing the focus on the campaign activities and highlighting the results. For instance the campaign re-scheduling due to the Icelandic volcanic eruption should be kept (if needed) in the

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campaign description section.

Introduction: Large part of the introduction deals with the description of the campaign and the related activities. This smears out the necessary synthesis of the current state of the art on the role of forest fires on atmospheric composition and why BORTAS brings (or is expected to) novel information. In particular it would desirable to have a status on the knowledge on the main (expected and already published) science foci presented in section 4. Discussion on VOC oxidation and RO production processes may be shortened and figure 1 skipped.

Meteorological data: It would be desirable to have also mean wind fields with superposed the fire position and campaign locations and if relevant precipitation. Retroplumes (or more simply back-trajectories) from flight area may also be reported here as done in the following subsection for the PICO observatory. Concerning discussion of figure 3, a sentence on how representative BORTAS may be for mean July conditions would be useful. Why climatology is restricted to 1979-1995 ? Would it be useful to extend it to 2012 ? Here it would be useful to present retroplumes (or retro-trajectories) for the BORTAS flights and connect them to the fire spots. This section may also include the background information on the chemistry and emissions. So, discussion from line 7-26 page 4147 may goes very well here.

Campaign description: First part of the introduction (lines 4-27) may be included here. The altitude sampling may be added to the flight path to fully assess the representativeness of the observations. This may also be the place to include the list of models given in 3.5 that are now slightly out of context. It is not clear where data from Pico observatory are used here. If worth, the information on how Canadian fires impact the free troposphere in the Atlantic may be discussed in more details with one plot in the last section. In general I suggest to reduce this section and try to report the discussion of results in a proper subsection (see below).

Satellite data: Analysis of satellite data from IASI and ACE are presented as an ex-

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ample of what may be observed or how the comparison with aircraft data may looks like without fully exploiting the information that may come from it. The comparison with TES profile (for a single day) looks a bit out of context here. For instance it would have been desirable to provide mean fields for the whole BORTAS period or for all the flight days than few single days. Is it possible to compare them to GEOS-5 fields that may have been introduced beforehand ?

Model products: see above

FIrst results and science overview:

This section should be clarified. I would add a couple of sentences presenting the results and clarifying that perspectives and on-going work are reported in the conclusions.

I warmly suggest to break it in subsections. One natural division may be: 1 Identification of CO plumes 2 Emission ratios for organic compounds 3 Ozone photochemistry 4 Source attribution

referring to the already published material at the beginning of each section.

Subsection 1 may be extended with one or more plot. It would desirable to see the data from flight B625 compared to the ones with interception of plumes to strengthen the discussion on the threshold used for plume identification. This is an important information to be given here. Despite the fact that the flight strategy was plume-hunting oriented, it would be useful to know which fraction of data are available for in-plume studies.

Subsection 2 may report a selected plot or at least the ER values from Lewis et al. 2013 and a more through discussion. Again, quantitive results from Purvis 2013 (that is not yet published in ACPD) may be anticipated here mentioning that there is a paper in preparation.

Subsection 3 should include as well a plot for the L-shape O3-NO data.

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Discussion on source attributions in PM2.5 is incomplete. Table 4 is a list of observations and more robust comparison should be presented with a plot. i guess this may be taken from Gibson, 2013.

Conclusions: This part should be completely rewritten to include a synthesis of sections 3 and 4 and to list the on-going analysis. In this context I am not sure to understand what is meant by the sentence at page 4153, lines 14-17 that seems too vague.

Minor points:

- Line 9 page 4146: define the m/z ratio. - Could you provide a reference for the sentence in lines 11-14 page 4148 ? - Add the journal for Gibson, 2013 - Figures 3 and 11 are difficult to read

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 4127, 2013.