Atmos. Chem. Phys. Discuss., 12, C12289–C12291, 2013
www.atmos-chem-phys-discuss.net/12/C12289/2013/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "ACE-FTS observations of pyrogenic trace species in boreal biomass burning plumes during BORTAS" *by* K. A. Tereszchuk et al.

Anonymous Referee #2

Received and published: 4 February 2013

The paper is well written and will be of interest to the scientific community. However, it is based on a whole range of assumptions that needs to be addressed before publication.

The authors use ACE-FTS retrievals to investigate emissions from fires over parts in Canada. Over more than a dozen trace gas species from fires are analysed and enhancement ratios with respect to CO (Carbon Monoxide) are reported. As far as this reviewer understands HCN (hydrogen cyanide) is being used as a marker of the source of emissions since HCN is almost exclusively a product of biomass burning. They then link their ACE-FTS measurements to the source by using MODIS derived fire counts in combination with the French IASI instrument which measures CO. A large part of the paper discusses different mechanism that would lead to the production of O3 (zone) over the ACE-FTS retrieval site as a result of biomass burning. The weak part in the

paper is the chapter about stratosphere<->troposphere exchange which this reviewer thinks needs to be clarified and expectations should be lowered.

The other weak point in the paper is the reference to BORTAS. The authors mention BORTAS in the title and in the main text. However, this reviewer cannot see a link to BORTAS except that some ACE-FTS retrievals are collected at the time and locations of the BORTAS campaign in July/August 2011.

Major:

Figure1 and Figure2: The source of emission seems to be convincing if we lay trust in the HYSPLIT calculations. However, I wonder if the authors have an explanation for the high IASI observed CO concentrations over southern Quebec east of the IASI retrieval location for the 2nd August 2011. It would also help the authors mark the location of the BORTAS campaign.

Chapter 2.3 The authors cite a couple of other campaigns: ARCTAS-A, ARCTAS-B, ARCTAS-CARB. I am not sure if this data is available yet but how would BORTAS fit in here and would it support the authors' assumption of the likely source of air masses?

Chapter 3: The authors find that O3 is produced/enhanced outside of the plume but it is destroyed inside the plume. Table 1 also shows a negative enhancement ratio of O3 for the young plume. They support their findings by Figure 3 which shows a HCN and O3 profile. O3 in that Figure is markedly decreased inside the plume. However, as the authors acknowledge they plotted just 1 single profile in Figure 3 which is not necessarily representative. This reviewer once more again wonders if BORTAS data would have been available to support the authors and their findings.

Figure 4 and Figure 5: Please give the number of used profiles.

Chapter 4: The authors speculate that strong pyroconvective updrafts inject sufficient mass into the stratosphere in turn facilitating a stratospheric to tropospheric exchange of O3. This reviewer once more again wonders where is the link to BORTAS? Has

BORTAS measured plumes high in altitude supporting the assumption of the high injection heights? The authors talk about pyroconvective updraft vaulting emissions high into the upper troposphere as if it were an everyday occurrence. We know fires frequently develop pyroconvective updraft injecting emissions into the upper atmosphere but this is not a daily phenomenon. I would suggest the authors find evidence for strong pyroconvective events at the time and location of their retrieved ACE-FTS profiles. If July/August 2011 was marked by severe pyroconvective events in Canada there must be recorded accounts. The main author could for example contact Mike Fromm as he is known for documenting almost every publicly available data of pyroconvective events that would lead to upper troposphere/lower stratosphere injection heights.

Minor:

Figure 7: I cannot find the reference to this Figure from within the main text.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 31629, 2012.