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## ***Interactive comment on* “Transport analysis of ozone enhancement in Southern Ontario during BAQS-Met” by H. He et al.**

**Anonymous Referee #1**

Received and published: 29 June 2010

### Synopsis & Overall Review

A short summer field campaign “BAQS-Met” in late June-early July 2007 in southern Ontario, that studied atmospheric structure below 20 km with a radar array, sondes, satellite, models and continuous surface measurements, has been used to examine stratospheric intrusions and their impact on tropospheric ozone. The site is Harrow, Ontario (42N, 83W). Three episodes stood out, at 20 June, 1 July and 7 July. On the whole, there is coherence in stratospheric intrusion among tropopause deformation detected by the radar, the satellite view from TES and AIRS when kriging is applied to the daily data, and the sondes. An exception was the 1 July event, when the stratospheric intrusion event observed apparently occurred far upwind of Harrow so it was not observed locally by the radar. The FLEXPART model reasonably well outlines lo-

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cation and timing of the intrusions (though magnitude of ozone in the troposphere is hugely underestimated) and there is good, but not perfect agreement between surface ozone and AURAMS ozone. The paper should be published but in general the findings would be more effective and of higher impact if they are put into context better and more details are supplied in certain places. In addition, a number of errors in writing are pointed out, including basic things like the author affiliation list and references.

#### Detailed Comments/Corrections

Author affiliations. Is D Jones UofT? Osterman's institution and McConnell's appear to be incorrect.

ABSTRACT. Three main points - "Summer" is misleading. You have a dataset of high intensity but less than 3 weeks, so state in "June and July" 2007 or "during a 2.5 week campaign in summer 2007..."

East of Detroit is meaningful to many but pls put lat/long in the Abstract, eg "... at 42N, 83W, just east of Detroit)" or something like that Overall, the Abstract is short and vague, considering the density of good data you have... → for example, line 6... "forecast model, indicate three major occurrences of stratosphere..." → You have demonstrated a substantial degree of coherence among your multiple data sources with two strong case studies and an exception for the 1 July episode. Just say so! Also, how far is the apparent intrusion from Harrow? Eg over ... Beaufort Sea ("some xx km distant") - this should be included.

#### Page-by-Page

Page 5, line 3. "Borne" - spelling Page 5, line 6. Insert reference after Cooper et al., 1998; Thompson et al., 2010) - Thompson, A. M., S. J. Oltmans, D. W. Tarasick, P. Von der Gathen, H. G. J. Smit, J. C. Witte, Strategic ozone sounding networks: Review of design and accomplishments, Atmos. Environ., in press, 2010.

Page 5, line 4 from bottom. Good references but no details - meeting proceedings not

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adequate. Check to see if Pan et al., and Kollonige et al., have been submitted, if not published.

Page 6. 2nd para. In the Intro, the motivation for this specific study is rather weak. What sets up the present paper would appear to be the results in this paragraph, recent studies, but no details are given. For example, what does “excellent qualitative agreement” mean? Or “not ideal”? Here is where a thoughtful listing of prior findings and unresolved findings that BAQ-Met was designed to address would strongly motivate this paper. Being more quantitative would help a lot. In any case, amplify!

Page 6 - line 9. Here is where “summer” should be replaced by 2.5 or “3-week” campaign.

Page 7 - 3rd para. Inadequate details on experiment. Ozone at “supersite” - exactly where, measured with which instrument? Reference to publication? Website - availability of data?

Page 8 - line 4 - TES launched mid-July 2004. Data may not have been available until later in the year but be clear. Line 9 of the first para- version 2 - reference needed.

Page 8 - 2nd line from bottom. This study uses rather than “will use”.

Page 9 - line 2 DISC ref- website ? In the middle of the paragraph about AIRS - confusing. Makes no sense. The material about first guess and sensitivity looks like circular reasoning. It may not be but please clarify.

Page 10 - good summary - less sketchy than some of the prior exptl material.

Page 10 - 2nd line from bottom. Convection not plural. Last line “parameterizes”

Page 12 - UTC not GMT is present SI standard nomenclature.

Page 13 - 3rd para. 4th sentence... comparison between Kriging and sonde is only qualitative ?? What does this mean?

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Page 15- 3rd para. Figure (cap letter)

Page 16 - line 7. The the (twice)

Page 16 - 3rd para. Given the amount of stratospheric influence in your prior studies (page 6) is the statement about “surprising” really correct. From IONS analysis (Thompson et al reference on page 29) approx 25% of soundings in eastern North America in one summer (2004) displayed stratospheric influence. This is about the same figure as analysis with trajectories of a 30-year mid-latitude sonde climatology of Collette and Ancellet (Atmos Environ, 2005). It might be more accurate to state ‘that several significant stratospheric intrusions in high summer confirms the view of C&A (2005) and Thompson et al (2007) that STE, although less active at that time of year than in spring (Appenzeller et al, 1996), is an important process (or “recurring process”)’ or words to that effect.

Page 18 - “at most a modest contribution to the tropospheric budget.” Have you really quantified this in the paper? Might be an overstatement.

Page 18 - 3rd line from bottom. Seems that one needs to say “..at this time, probably because the origins of the intrusion was far upstream” or something like that.

References - MANY format problems. Latek drops middle initials, paper numbers in JGR format are missing, many page numbers startfinish are missing the hyphen startfinish. Refs by James, papers 1 and 2 are out of order. Kollonige / Olsen et al - inadequate references. Was Kollonige work published? Monahan - spelling of Boulder Oltmans, 9, 245... Pan, LL AIRS Meeting ?? If meeting ref is to be used, at least supply URL for access to presentation material Parrington - volume and article # missing Richmond (syntax) TOO MANY MIXED FORMATS eg Schoeberl, Stohl, Wakamatsu for instance

Figure 8 - caption “over 48 hours” - clarify as in text on bottom of p 15

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 15559, 2010.

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