

Interactive comment on “Trans-Pacific transport of reactive nitrogen and ozone to Canada during spring” by T. W. Walker et al.

Anonymous Referee #2

Received and published: 2 June 2010

Walker et al. investigates transport of ozone and reactive nitrogen from Asian to Canada using an ensemble of aircraft, satellite, and ozonesonde observation interpreted with the GEOS-Chem chemical transport model. Four sensitivity simulations are conducted to examine contributions from various NO_x sources and the chemical mechanism. A transport event on May 4-5, 2006 is examined in detail to infer ozone production from PAN decomposition. The study is well designed, makes a comprehensive use of INTEX-B observations, and contributes to our knowledge of trans-pacific transport of ozone pollution. However, I have some specific comments that would suggest the authors to address to improve the manuscript before publication.

Specific comments:

Page 8722, Line 9-15: I suggest at the beginning of this paragraph adding 1-2 sentences that introduce the employ of chemical transport models for studying long-range transport.

Page 8724, Line 2: Suggest also citing the INTEX-B intercomparison paper - Kleb, M. M., Chen, G., Crawford, J. H., Flocke, F. M., and Brown, C. C.: An overview of measurement comparisons from the INTEX-B/MILAGRO airborne field campaign, Atmos. Meas. Tech. Discuss., 3, 2275-2316, doi:10.5194/amtd-3-2275-2010, 2010.

Page 8725, Line 24: WMO thermal tropopause is described here, but this information is not used in the following analyses. Please clarify.

Page 8728, Line 18-19: I think another challenge is the systematic bias in the satellite measurements of NO₂ columns that can cause a bias in estimating the emission for a specific time. If so, please clarify.

Page 8729: The method used to derive the emission trend needs a better explanation. As I understand, the values of β in Equ. (1) can be affected by the contributions of lightning NO_x and other NO_x sources outside the region to the NO₂ columns. What is the typical value of β ? How differ from 1 ($\beta = 1$ if following Equ. (2))?

Page 8729, Line 14-15: Suggest changing the sentence to: "The factor β is then used to infer the emission trend between 2003 and 2006 from SCIAMACHY observed NO₂ columns"

Page 8730, Fig 4: Can you comment on the 30 percent difference between the SCIAMACHY and model NO₂ column?

Page 8731, Line 24: Suggest using negative values to represent model underestimates and positive values for model overestimates. This also applies for describing comparisons of NO_x and PAN on Page 8732, Line 5-7, and for ozone on Page 8732, Line 17.

Page 8733, Line 3: Do you use the same tropopause pressure for computing the tropospheric ozone columns from OMI and GEOS-Chem? Please mention.

Page 8736, Fig. 12: Can you comment on the negative values over the US in the top left panel of Fig. 12? Also from Fig.12 and Fig.13, over the eastern Pacific the regions where PAN transport is important (left panels) tend to be regions where Asian ozone contributions are small (right panels), can you comment on that?

Technical comments:

Page 8724, Line 23: Liu et al., 2009 is now published on ACP. Please update - Liu, X., Bhartia, P. K., Chance, K., Spurr, R. J. D., and Kurosu, T. P.: Ozone profile retrievals from the Ozone Monitoring Instrument, *Atmos. Chem. Phys.*, 10, 2521-2537, doi:10.5194/acp-10-2521-2010, 2010.

Page 8725, Line 4: Suggest replacing "consider" with "use"

Page 8725, Line 7: Suggest deleting "aboard"

Page 8734, Line 10: Delete "including"

All the references are ended with numbers of "87xx". Please correct.

Page 8751, Fig 1: please use a larger font size for longitude and latitude labels.

Page 8753, 8754, Fig 3 and Fig 4: Suggest putting the titles a little higher, not overlapping with the maps.

Page 8761, Fig 11: Please use a clear font for the vector labels on the left.

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 10, 8717, 2010.