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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Influence of meteorological variability on interannual variations of the springtime boundary layer ozone over Japan during 1981–2005" *by* J. Kurokawa et al.

Anonymous Referee #1

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This paper evaluates the relationship among meteorological variability over Western Pacific, the inter-annual variability (IAV) of springtime boundary layer ozone over Japan as well as trans-boundary transport of air pollution from continental Asia (or clean air masses from western Pacific) to Japan. The authors use the regional air quality model (CMAQ) and regional emissions inventory in Asia (REAS) driven with RAMS meteorological fields to conduct multi-year simulations over East Asia. This paper presents some interesting findings- the IAV of springtime O3 over west and central Japan (WCJ) is mostly influenced by the IAV of circulation patterns over western Pacific

which alternatively transport the polluted Asian air masses or the clean maritime air masses to WCJ. The methodology used in this study is sound. Below are major and minor points that should be addressed prior to publication in ACP.

Specific comments:

1 Model evaluation: one major weakness of this paper is that the authors evaluate the model results only over WCJ. The authors need to use other sources of observations (such as EANET observational data) to evaluate model results over a broader area, particularly for the upwind regions from WCJ (e.g., continental Asia or western Pacific).

2. 20ppbv overestimation of ozone: the authors did not discuss in detail on the causes of this significant overestimation. Does this overestimation appear in both urban and rural sites? Is there any overestimation outside Japan (e.g., the continental Asia, or western Pacific)? One way the authors may want to do is to compare the ozone concentrations at several key sites (in both urban and rural areas) to further investigate the reason. Lacking a more careful evaluation it is difficult to determine what level of confidence we believe these results.

3. Page 7567: the region that the authors choose to calculate the ASPA is based on the significance of surface pressure anomalies. However, from Fig. 4ef, the largest surface pressure anomalies could appear in the central Pacific. The authors should provide more information on the basis they choose to calculate ASPA.

4. Page 7570: the authors compared the ASPA with ENSO, I wonder if you have compared the results with NPI (North Pacific Index). The location of ASPA is quite close to the major surface pressure anomalies over the North Pacific, which are mostly captured by NPI.

Minor comments:

1. Page 7561, line 20: "biomass-burning emissions . . . has some impact on IAV of O3 . . .", "some impact" is unclear. Since you are using climatological biomass burning

emissions, can you comment on the relative importance of IAV of biomass burning emissions on the IAV of O3 over WCJ?

2. Page 7562, lines 18-20: "Thus ... is appropriate", why? You can use 25-year averaged emissions instead.

3. Page 7563: again the authors discussed how ozone is measured in Japan. However, they did not show enough information on model evaluation. The authors should discuss more on model evaluation.

4. Page 7564, bottom: the trend of O3 in WCJ is $\sim$0.4ppbv/year, I am wondering the trends of ozone precursors emissions in both WCJ and CEC.

5. Page 7568 lines 6-8: "when the O3 flux anomaly along LSJ is large, low O3 air masses are transported to WCJ...", !? what are the directions of the O3 flux along LSJ?

6. Page 7569 line 16-19, "Our examination ... This finding indicates that the IAV of FAWJ is determined mostly by the IAV of westerly winds over LWJ", this seems obvious. How about LSJ?

7. Page 7580, Fig. 1, since most of the analysis is based on E00Myy, why not show NOx emissions for 2000?

8. Fig. 3, Fig 3a is mostly repeating Figure 3b. For figure 3b, both left and right axes should keep the same. Add E00Myy line and show the error bars for observations data in Figure 3b. In addition, the authors may add a plot to show the time-series of ozone precursors' emissions (i.e., NOx or VOCs) from WCJ and CEC.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 7555, 2009.