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Interactive comment on “Significant impact of the East Asia monsoon on ozone seasonal behavior in the boundary layer of Eastern China and the west Pacific region” by Y. J. He et al.

Y. J. He et al.

Received and published: 15 October 2008

We would like to appreciate the Reviewer 1 for the appropriate and constructive comments. We have carefully considered the comments, and made a revision and also added some necessary contents into the manuscript by taking account of all the comments given by the two reviewers. Below we will address the comments point by point.

(1) Why is a 15-day running average used for the data pre-process?

In fact, there has nearly no concern with which day running average used for the main conclusions in this study. The main purpose of this study is to investigate the general O₃ seasonal patterns and the relationship with the penetration of East Asia summer monsoon. Therefore, we do not care of the short-term high/low O₃ episodes. As

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shown in Figure 2a and 2b, there would be too crowded if without smoothing. In order to emphasize the typical seasonal patterns and alleviate the effects of other factors, we want to apply a running average to smooth the plot lines with a proper time period, which should be long enough to remove the small fluctuations and not too long to keep the main features of seasonal variations. During the data pre-process, we have already tried the running average with 3, 5, 7, 9, 11, 13, 15, and 17 days, and found that 15-day is a proper period for the data analysis.

(2) It is easier to evaluate model performances by displaying paired modeled and observed ozone time series in one plot than drawing all observed lines in one plot and modeled in another.

To evaluate the model performance is important for this study, but it is not the main objectives. We specially want to present a detailed comparison of ozone seasonal patterns among the different monitoring sites. Therefore it is better to draw all the observed lines in one plot and modeled in another one, as shown in figure 2a and 2b. As for the evaluation of the model performance, we will add a scatter plot and a brief discussion into the text.

(3) Ozone chemical production is quite nonlinear, so none emissions in China would lead to ozone destructions or unreasonable ozone concentration distributions over there. If so, to which extent are the results of this sensitivity experiment reasonable?

Ozone nonlinear chemical reaction is a quite sophisticated subject. At present, most of the studies about the emission contribution are based on the sensitivity experiments. In this study, we also applied the sensitivity experiment to estimate the contributions of China-emission by closing all the emissions of whole China (excluding Taiwan). The simulation results could well predict the "real" O₃ concentrations under the conditions of zero China-emission. As for the contribution of China-emission under current situations (China-emission on), the sensitivity experiments may potentially overestimate the absolute values due to the nonlinear chemical reactions. In order to estimate the

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accuracy of our results, a series of sensitivity experiments were performed by setting China-emission from 100% to zero with a step of 10%. The simulation results show that, based on the different emission amount, the nonlinear chemical production is quite clear over China mainland (e.g. Mt. Tai, Beijing), particularly in summer time, but it is not clear over the regions outside China (e.g. Hedo, Oki); our results may over-estimate the contribution of China-emission by 10%-20% over China mainland, and are quite reasonable over the regions outside China. In order to give an appropriate and accurate conclusion, we will change some expressions and add a brief discussion about the influence of the nonlinear chemical production into the text.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 14927, 2008.

ACPD

8, S8256–S8258, 2008

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