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Interactive comment on "Trans-pacific transport and evolution of aerosols: Evaluation of quasi global WRF-Chem simulation with multiple observations" *by* Zhiyuan Hu et al.

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We thank Dr. Omid Alizadeh-Choobari for a detailed review. The manuscript will be revised as he suggested and a detailed point-to-point response to all his comments will be provided later. Here we want to provide quick clarification to some of his concerns in the comments.

(1) "Apart from running the WRF-Chem model on the quasi-global scale, which has already been conducted and its performance evaluated by Zhao et al. (2013b), the present study does not provide any new insights into the concept of transport of aerosols across the Pacific Ocean."

As we stated in the manuscript, "Although the quasi-global WRF-Chem simulation described by Zhao et al. (2013b) has been used to provide realistic chemical lateral boundary conditions for multiple regional modeling studies (e.g., Zhao et al., 2014; Fan et al., 2015), its evaluation has not been documented so far.", "We focus on the simulation over the trans-Pacific transport region as a first step to evaluate the simulation for providing consistent lateral chemical boundaries for nested regional simulations used to investigate the impact of transported aerosols on regional air quality and climate.", the purpose of this paper is to provide a documentation of evaluating the quasi-global WRF-Chem simulations particularly for transpacific transport, which is important and was not done in Zhao et al. (2013b) that focused on the sensitivity of modeling dust to size distributions.

(2) "Last paragraph in page 5: The work of Alizadeh-Choobari et al. (2015) can be cited and discussed here. They conducted the WRF-Chem model to study the global distribution of mineral dust and its radiative forcing on the global scale."

We are sorry about missing the discussion of Alizadeh-Choobari et al. (2015). We will surely include it in the revision. In addition, we actually tried the WRF-Chem configuration from Dr. Alizadeh-Choobari for global simulations, and found that only the global simulations without sophisticated chemistry that was used in Alizadeh-Choobari et al. (2015) can run stably. The reason may be due to the convergence issue of solving chemical reactions near the polar regions that are too clean. However, the sophisticated chemistry is needed for the purpose of our studies that are interested in not only dust but also other anthropogenic aerosols. Therefore, a more stable quasi-global WRF-Chem configuration is used in our studies. We will add more discussion about this in the revised manuscript.

(3) "As the authors mentioned, there have been some modifications to run the WRF-Chem model on the quasi-global scale. Please briefly discuss these changes in the model description as this is a quite new aspect and novelty of the present study."

Yes, we first need to make some changes to treat chemical boundaries as zonal periodic boundary conditions to allow the quasi-global WRF-Chem simulation. We also made changes to other parts of the model such as oceanic emission schemes and convective transport scheme of tracers. All these changes are needed to produce reasonable aerosol distributions globally. We will highlight these changes in the revised manuscript.

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