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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Concurrent observations of air pollutants at two sites in the Pearl River Delta and the implication of regional transport" *by* H. Guo et al.

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We thank the two referees for their constructive comments, suggestions and information. We have taken the remarks into consideration while revising the manuscript for ACP. Our initial responses to the two referees are as follows, along with indications of how the manuscript has been revised for consideration by ACP. We hope that these changes will strengthen the main points from our measurement data and data analysis and make them clearer in the revised manuscript.

Referee #1:

Thank you for your comments. We are currently performing a thorough analysis of

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the data. We agree that the highlight in this study is a dataset simultaneously collected in inland PRD and Hong Kong. The previous analyses using back trajectories have shown some information about the inter-transport between the two areas, but the trajectory method cannot quantify the regional influence because the turbulence dispersion has not been included. To enhance this analysis, we are using a Lagrangian backward particle release simulation together with emission inventories to understand the potential source regions for typical pollution episodes at the two sites, and further try to quantify the inter-regional contribution and the sub-regional air pollution transport mechanisms in the great PRD region. For the methodology of this simulation, please refer to Guo et al., (2009), Ding et al., (2009) and Stohl et al., (2003). The results of the model run will be completed in July and will be included in the revised paper.

Stohl, A., et al. (2003), A backward modeling study of intercontinental pollution transport using aircraft measurements, J. Geophys. Res., 108(D12), 4370, doi:10.1029/2002JD002862.

Ding, AJ et al. (2009), Transport of north China air pollution by midlatitude cyclones: Case study of aircraft measurements in summer 2007, J. Geophys. Res., 114, D08304, doi:10.1029/2008JD011023.

Guo H, Ding AJ, Wang T, Simpson IJ, Blake DR, Barletta B, Meinardi S, Fu TM, Li YS, Hung WT. Source origins, modeled profiles and apportionments of halogenated hydrocarbons in the greater Pearl River Delta region, southern China. J. Geophys. Res., 114, D11302, doi:10.1029/2008JD011448, 2009.

Referee #2:

Point 1) the authors should examine the causes of 2 O3 episodes in Hong Kong and 13 episodes in the inland PRD. Are they the same or not?

We are using particle release simulation to explore the potential sources of these episodes and to understand the possible transport mechanisms of different air pol-

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lutants at the two sites (See reply to Referee #1). The model results will be available in July and will be included in the revised paper.

Point 2) what about the local vs. regional contribution to O3 itself and its precursors (VOC and NOx) during episode days? Are they both VOC limited based on the data in this study?

In this manuscript, we qualitatively discussed these topics and due to the space limitations we did not discuss them quantitatively in detail. The quantitative discussion on the local and regional contributions to O3 and whether O3 is VOC or NOx limited has been reported in another paper, which has been submitted to Environmental Science and Pollution Research. We have added the paper to this manuscript as a reference and have provided a brief summary of the results as follows.

"The analysis of an observation-based model (OBM) supports O3 production being VOC-limited in the PRD region. In addition, O3 and its precursors on some episode days mainly originated from atmospheric transport, contrary to the predominantly local O3 production on other O3 episode days."

Point 3) NOx was found higher at TC. Is that from TC itself or impacted by other urban areas in Hong Kong with higher traffic density when wind blows from east to the west? This is possible. In addition, NOx emissions from aircraft at a nearby major airport and from airport related traffic could also be the causes when the prevailing wind was from the north and northwest. We will add more discussion in the revised manuscript.

Point 4) when northerly wind prevails, CO was increased while O3 exhibited a decreasing trend. What about other pollutants?

The other primary pollutants are similar to CO. We have added more discussion on other pollutants such as SO2 and NOx when northerly wind prevails in the revised manuscript.

Point 5) Some of the analyses gave different conclusions... The authors should give

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the readers a clear picture whether the air masses at TC were mainly impacted by local emissions or regional transport.

We are sorry about the confusion. We have modified the wording to clearly indicate the source regions of air masses at TC. In general, NOx was mainly affected by local emissions such as nearby aircraft emissions and local traffic whereas SO2 and CO were influenced on a regional scale.

Minor questions

1) what are the criteria of selecting those specific days for collecting NMHC samples?

We have added a sentence: “These potential high O3 episode days were selected for NMHCs and carbonyl sampling on the basis of weather prediction and meteorological data analysis.” in the revised manuscript.

2) define “zero air”.

We used pure nitrogen gas (>99.999% purity) as zero air to clean the canisters. The “zero air” has been replaced by “pure nitrogen gas” in the revised manuscript.

3) Any data or evidence to show that O3 from the sea was higher during the study period?

We did not have measurement data collected over the South China Sea. This conclusion was based on the fact that wind direction was from the southeast in the evening when the O3 level was higher at TC than that at WQS. Furthermore, early studies found that the O3 level gradually increased from the east to the west of Hong Kong while the South China Sea is downwind of the western Hong Kong. Another possible reason for this could be a higher dry deposition of O3 in the inland area than that over the ocean. We have modified the discussion in the revised manuscript to include these comments.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 9747, 2009.