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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Characterization of coarse particulate matter in the western United States: a comparison between observation and modeling" *by* R. Li et al.

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We thank the two reviewers for their helpful comments to further improve the manuscript. Our responses to the comments are as follows.

Reviewer 1:

Reviewer 1's first concern is about the uncertainties of PM10-2.5 concentrations since they were not direct measurements, but the difference between PM10 and PM2.5 concentrations that may be measured with different methods. As mentioned between line 14 on page 11465 and line 7 on page 11466, in this paper PM10-2.5 concentrations were calculated using collocated PM10 and PM2.5 mass concentrations, both of which

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were measured using Federal Reference Method (FRM). Furthermore, the AQS PM10 and PM2.5 data have gone through quality control and quality assurance and are considered to be of the best quality, and have been successfully used by numerous studies. Given the big differences between measured and modeled PM10-2.5 concentrations, the uncertainties of the measurements cannot affect our conclusion that the modeling system significantly underestimated PM10-2.5 concentrations across the western United States.

Reviewer 1 raised a very good question: what are the major sources for the PM10-2.5? Current knowledge of PM10-2.5 sources is very limited, and as a result, some important sources were not included in the US emission inventories and some emissions were significantly under-estimated in the US inventories. This is one of the findings of our study. A certain location is usually influenced by multiple sources including both natural and anthropogenic sources. The temporal patterns of PM10-2.5 concentrations may be affected by the relative importance of these sources, which may change temporally. Some locations may be predominantly affected by human activities such as traffic and agricultural harvesting, some may be primarily influenced by natural sources such as wind-blown dust, and some places may have similar influences from natural and anthropogenic sources. Further research, such as chemical analyses and source apportionment tools, can help elucidate the relative importance and characteristics of different sources at various measurement sites.

Reviewer 1's next comment is whether it is difficult to conduct sensitivity studies regarding possible causes for underestimated model concentrations, including incomplete sources and underestimated emissions. We appreciate the value of these types of sensitivity studies; however, they require development of emission inventories for new sources and re-development of existing inventories, which both require large efforts. This paper highlighted the need for these future developments.

The other minor comments have been addressed as follows:

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Abstract: p11466, L4, “reporting” should be “reported”.

Following the suggestion, “reporting” has been changed to “reported”.

L12-13, delete “To obtain insights for regional PM10-2.5 modeling”; “also” should be deleted.

Following the suggestion, both “To obtain insights for regional PM10-2.5 modeling” and “also” have been removed.

L24, “of the analysis” should be deleted.

Following the suggestion, “of the analysis” has been deleted.

Reviewer 2:

Reviewer 2 thinks the paper topic is useful to the modeling community and the paper is well written. However, Reviewer 2 has a concern that the paper is too long and the tables have too many details. Following the suggestion, we can shorten the paper and reduce some details of the tables to further improve the manuscript, including means, medians, 5th and 95th percentiles of hourly average water vapor mixing ratio as well as medians of hourly average temperature, hourly average wind speed, hourly soil moisture, measured PM10-2.5, modeled PM10-2.5, and ratio of measured to modeled PM10-2.5 in the tables. We do believe there is some value in the presentation of the site-specific information, since this is the first time it is published and could be useful to others investigating PM in the US.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 11445, 2012.