Atmospheric
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Interactive comment on "Characteristics of dust storm events over the western United States" *by* H. Lei and J. X. L. Wang

Anonymous Referee #1

Received and published: 2 July 2013

This manuscript presents an interesting study on investigating the characteristics of dust storms in the western United States based on analyses of multiple datasets. This study aims at (1) analyzing characteristics of dust storm events based on different datasets and (2) identifying of historical dust storm events and reconstructing dust climatology. Overall, this manuscript is technically sound and addressing a topic within the scope of Atmospheric Chemistry and Physics. I recommend the following revisions before acceptance for publications. Major Comments 1. Historical dust storm events over the western United States were not well archived. This study used available dust storms collected from media and NASA records. Dust storms in NASA earth observatory record have already been confirmed by satellite images. However, how did you confirm the dust storm events recorded by media? 2. Dust storms are classified

into four types. What meteorological characteristics are associated with each type of dust storms? For example, surface wind speed, vertical wind speed or boundary layer conditions, precipitation, air pressure etc... These would make it much easier for the audience to find take-home messages from this study, and also could be useful for others dust related efforts. Minor comments 1. Isn't it expected that PM10 is a good indicator of dust in the air? Does this need to be stated? Or is it better compared to PM2.5? 2. Several ratio indicators are used in this study. The descriptions of them are in different format. It is better to unify the description of them. 3. Section 2 - how do you know if these particular cases are representative of each group of dust storms? 4. Page 14203, Lines 20 - and PM2.5 can be high for non-dust sources. 5. Fig. 6. AOD could be showing "dust" (particulate) aloft that is not seen in surface measurements. 6. Page 14207, Lines 8 - "this property". What is "this" referring to? 7. related to Fig. 2. Ideally data from all instruments would have been available for all 4 cases, however that was not the case. Why wasn't IMPROVE data used for D1? Could add EPA standards for PM10 and 2.5 in the text. 8. Fig 6 shows load AOD values (purples) for all 4 cases. Shouldn't these low values be seen here?

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 14195, 2013.