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Discussions

Interactive comment on "The impact of human activity on anthropogenic dust emission over global semi-arid regions" *by* X. Guan et al.

Anonymous Referee #2

Received and published: 24 February 2016

The authors aim to explore the relationship between population and anthropogenic dust in semi-arid regions, which has significant implications for local climate change - an important research topic facing the climate change research community. The study clearly reveals that the global semi-arid regions present in average the highest anthropogenic dust burden, and the dust emissions vary substantially across semi-arid regions with different population density and socioeconomic development levels. This paper has great potential for making an important contribution to scholarly discussions on the interactions between human intervention and climate systems at both global and local levels.

Here are some comments and suggestions for the authors to consider in the revision.

My main concern is that the human impacts on dust emissions are not only deter-

mined by the number and growth rate of the population but also affected by the types and intensities of human activities. To choose the four semi-arid regions of different continents and at various socioeconomic development levels for the study of the relations between population density/change and anthropogenic dust burden is a good research design. However, the decision of excluding almost half of the semiarid areas with a population density below 10 persons/m2 from the analysis unfortunately makes the research less robust. The areas excluded are believably dominantly the less populated regions in North America and North Africa, which represents two regimes of human activities and seems to generate very different impacts on anthropogenic dust emissions. While the inclusion of these areas in the analysis of overall interacting patterns may lead to mixed results, one should consider analyzing the relationships in the four regions separately and exploring whether or not there is a common pattern in the relationship between population density and anthropogenic dust burden among all four regions. Even if the resulted relationship varies across regions, it could lead to further analysis of the reasons: why they differ? Is it due to the different levels of aridity, or different types and intensities of human activities? Would the pattern be clearer after controlling AI index, or/and economic level/activity?

Other comments:

In section 4.1, it would be preferable to use "mixed dust" instead of "combined dust" to avoid confusion, particularly when Figure 5 stacks (or combines) anthropogenic and natural dust burden from the "mixed" dust regions.

The sentence of Lines 28-29 on Page 6 can be moved to introduction section, and expressed as a key contribution of this research.

While Figure 4 displays anthropogenic vs. combined (mixed) dust burden, the text on Page 6 talks about the natural vs. mixed dust burden. It should make them consistent.

While Page 7 Line 19 says "both India and East China have higher population density (>= 250 persons km-2) which is also displayed in Figure 6, the other parts of the paper

uses 45 persons/km2 for East China. Is the number in Figure 8 derived from the data of Figure 6? Please explain why.

The last paragraph of Page 7 and Figure 7 is not really relevant and could be removed.

There are some contradictions in texts of the first two paragraphs on Page 8. For instance, it says 8% population increase in East China in the first paragraph but 6.16% in the second; 30% increase in N. Africa in the first paragraph, and 29.26% in the second.

While the paper is generally well written, the second half of the text needs to be improved. In particular, Section 4.2 and 4.3 are not always easy to follow. For instance, what does it mean "Most semiarid regions locate in the anthropogenic dust areas"(Page 8 Line 18)? What is "rear population" (Page 8 Line 23)?