

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

### **Anonymous Referee #1**

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#### General comments:

It is known that human activities have impacts on anthropogenic aerosol emissions, but few studies analyze this problem because there are many contributing factors and technical constraints. The authors of this paper employ a state-of-the-art algorithm to distinguish human-induced dust aerosols from CALIPSO satellite observations, and study the relationship between anthropogenic dust burden and population density (growth rate) over various land covers. This paper deserves to be published, but several problems need to be addressed. More discussion, analysis, and references are considered necessary to be added to better support the conclusions.

#### Major issues:

1. The title is better changed to “The relationship between anthropogenic dust emis-

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sion and human activity over global semi-arid regions”. The reason for the suggested title change is that the authors barely discussed about the “impacts” but the “relationship”. In addition, more in-depth analysis about why such a relationship exists between anthropogenic dust and human activity.

2. The abstract should be revised in order to better reflect the content of this manuscript. The authors should add the temporal ranges of the data used, otherwise the values (i.e. population growth rate, dust burden, etc.) will be meaningless.

3. The introduction part is also deemed insufficient. First, not enough references are provided to support the acclaims. For example, in page 1, line 24-26: “The economic policy of most developing countries is an extensive economic model. This type of economic policy always results in a lower efficiency of resource use.” There is no explanation of what is “extensive economic model”. And, there is no support (reference or evidence) of why this model “always” results in a lower efficiency of resource use. Similar problems also exist in the manuscript, such as page 1, line 20-22; Also, Page 7, line 15-17: the authors need to add some supporting references to prove that “semi-arid areas have fragile eco-system to support large population” and that “semi-arid area are sensitive to natural change and human activities”.

Second, there is not enough discussion of the previous studies about the human impact on anthropogenic dust emission. That is, how do different human activities (i.e. agriculture practice, water use, and industrial practice) practically impact the generation/distribution of anthropogenic dust? This is a critical point in order to understand the variations of human-dust relationship in various regions.

4. Since the four semi-arid regions, namely East China, India, North America, and North Africa, are selected for in-depth study, why the relationships between anthropogenic dust and population index in these regions are not investigated/provided? It is also helpful to show the anthropogenic dust column burden changes as a function of population density in the four regions (Figure 12). These regional evidences are crucial

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to support the authors' arguments and thus should be added.

5. A major problem with this manuscript is that quite a few arguments/conclusions derived from the analysis are not considered fully supported by the evidences provided. For instance, in Page 6, line 11-16: the authors argue that the difference in anthropogenic dust in different seasons could be due to the difference in human activities (especially agricultural activities). And, agricultural activities are claimed to be most frequent in summer. Then, why and how do agricultural activities impact the most in summer? Similarly, in Page 7, line 27-29: please explain how the difference in population growth rate closely relates with economic status? In page 8, line 31-33: please explain more about why “the land type experiences more human activities, the more anthropogenic dust aerosol will be produced”? How do you figure out the human activity frequencies?

6. Population density and population change are taken as measurement of human activities. They have a positive relationship with anthropogenic dust in the global semi-arid region. It is better if you can use one figure to show the relationship of anthropogenic dust with population density and population change. In addition, what's the advantage and disadvantage of taking human population density (and variation) as surrogates of human activities? What is the expected impacts on the results?

7. The final problem is with the language. A detail check of the mistakes in grammar and sentence structure is highly recommended.

Minor problems:

- \* Page 1, line 25: “always” is better changed to “frequently”
- \* Page 1, line 28: “anthropogenic effect on emission” – emission of what? Aerosols?
- \* Page 2, line 8: “these regions are . . .” should be “where they are . . .”
- \* Page 2, line 12: “soils distributed by human activities” should be “soil disturbed by human activities”

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- \* Page 2, line 14: “global dust cycle, historical and possible future changes” should be “global dust cycle, as well as historical and possible future changes”
- \* Page 2, line 29: “a study of human activity on anthropogenic dust column burden” should be “a study the impact of human activity on anthropogenic dust column burden”
- \* Page 2, line 33-34: “and investigated its relationship with human activities” should be “and its relationship with human activities is investigated”
- \* Page 3, line 20: what is “population layer”?
- \* Page 3, line 24: what is the unit of “population density”?
- \* Page 3, line 26: section “2.3 Anthropogenic dust detection data” is better changed to “2.3 Dust detection data”
- \* Page 4, line 30: what is “|CAD|>70”? what does it mean?
- \* Page 5, line 5: “the dust density of dust” should be “the density of dust”
- \* Page 5, line 7: “This method does not only modify” should be “This method not only modifies”
- \* Page 5, line 10: “detection” should be “detecting”
- \* Page 5, line 25: “. . . regional anthropogenic dust . . . of globe” should be “. . . global anthropogenic dust . . .” – I think Figure 2 is the global (not regional) average of anthropogenic dust burden, isn’t it?
- \* Page 6, line 9: it’s better to add a legend for Figure 3.
- \* Page 6, line 12: “that may be a result of ” should be “which may be because”
- \* Page 6, line 28: what do you mean by “emission effect”?
- \* Page 6, line 34: “differing” should be “different”
- \* Page 7, line 15: “that are difficult” should be “that is difficult”

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- \* Page 8, line 8-11: please pay attention to the sentence structure. You may consider separate it into several short sentences.
- \* Page 8, line 23: “rear population” should be “rare population”?
- \* Page 8, line 27: what is “cropland mosaics”?
- \* Page 8, line 29: “is remain unchanged” should be “remains unchanged”
- \* Page 9, line 3: “starts obvious increase” should be “shows obvious increase”
- \* Page 9, line 4: “make significant effect in production of anthropogenic dust” should be “have significant effect on anthropogenic dust production”
- \* Page 9, line 9: “the sensitive of” should be “the sensitivity of”
- \* Page 9, line 10: “appears obvious increasing” should be “shows obvious increase”
- \* Page 9, line 14: “benefit in production of . . .” should be “contribute to production of . . .”
- \* Page 9, line 15: “It found that . . .” should be “It is found that . . .”
- \* Page 9, line 21: “correlated to . . .” should be “correlated with . . .”
- \* Page 9, line 25: “on study the influence of . . .” should be “to study the influence of . . .”
- \* Page 17, figure 2 caption: although “AI” is defined in the text, it is still better to give “aridity index (AI)” here for readers who only view the figures.

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Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2015-952, 2016.

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