

Interactive comment on “Urbanization effect on sunshine duration during global dimming and brightening periods in China” by Yawen Wang et al.

Anonymous Referee #2

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Review of Manuscript entitled "Urbanization effect on sunshine duration during global dimming and brightening periods in China" by Wang et al. Dimming and brightening are interesting phenomena observed across the world, which were widely reported in the publications. Causes for these phenomena and implications for climate change were also widely discussed. China has experienced some interesting features in the long-term variation of surface solar radiation and much attention has been paid to this issue. Using population as an indicator, the authors discussed the urban and rural differences in the trend of sunshine duration across China. The effect of urbanization on the dimming and brightening was discussed in detail. Some interesting results were presented in this manuscript. This manuscript may be improved and my major concerns are as

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follows. 1. The major finding of this study is that urbanization may play an important role in the dimming period, but not in the brightening period in China. But as suggested by the authors, the urbanization level was low and stable (P6, L5) before 1978, which was accompanied by a significant decreasing trend of sunshine duration. This looks some controversy to the conclusion. 2. The authors argued that urbanization might not be able to reflect variation of atmospheric environment since 1990s because regulations were gradually taken into action. This is somewhat speculative and needs some evidence. Satellite aerosol data such as MODIS AOD products during last 16 years may be used to shed light on this issue, otherwise, the speculation is not acceptable. 3. The authors used sunshine duration as a proxy data for surface solar radiation. It should be noted that sunshine duration mainly reflect cloud information. It may be argued that long-term variation of cloud cover did not support that of sunshine duration. However, cloud cover can not reflect all effects of cloud on surface solar radiation, furthermore, long-term trend of cloud cover obtained from surface manual observations is not free of large uncertainty. Therefore, it is suggest to exclude cloud effect on surface solar radiation in the analysis, for example, to perform similar analysis based on sunshine duration measurements in the case of cloud cover of 20%. 4. There are some stations showing long-term trend of sunshine duration quite different from that obtained in the majority of stations (Figure 2), some discussion on this issue is required. This might be related to cloud variation since the general tendency in the urbanization in China should be not quite different. 5. The manuscript should be polished in language.

Some minor issues. 1. Abstract, this ratio should be defined. 2. Why the urbanization effect on dimming diminished when urbanization level exceeds 50%. I wonder whether there are regions where the urbainization level reached to this level in the eastern China before 1990s. 3. P2, L24, delete due to the nature of their composition 4. P2, L35, delete furthermore 5.P3, L3, since sunshine duration is related to cloudiness, why is is excluded in the analysis 6. P3, L10, urbanization also occurs in the rural regions? 7. P4, L20-25, what's difference between county and county-level cities 8. P4, L3-5, i do not understand why three big cities were excluded in the analysis since they

may be use good examples for showing urbanization effect on surface solar radiation. This, certainly, is related to the method, I do not understand why the analysis were performed in each province. 9. P4, L7-8, not understood. 10. Annual ULE, PD, USP data? 11. Why the trends derived in rural and urban stations did not overlap in 14% pairs. 12. P5, L 16-20, Since sunshine duration remains to decrease slightly in China, it seems not suitable to say brightening. 13. P6, L3-5, total cloud cover stabilized or decreased? 14. P6, L26-30, it should be cloud cover effect, not cloud effect. I do not agree with this discussion on cloud effect. 15. P7, L5-10, It seems in the Wang et al. study, rural-urban pairs are discussed in the 5*5 degree grid.

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