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Discussions

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comment

Interactive comment on "OMI measured increasing SO$_2$ emissions due to energy industry expansion and relocation in Northwestern China" *by* Zaili Ling et al.

Anonymous Referee #1

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This study demonstrates an increasing trend in SO2 over the northwestern region in China, in contrast to a well-established decreasing trend already reported for Eastern China. Shen et al., 2016 presented similar results before, however, here, the authors perform regression analysis/MK test, and 'a source detection approach to derive source strengths' using OMI-derived SO2 column density. They also report 30-50

A more rigorous and thorough analysis is required to confirm that the OMI-retrieved SO2 column densities can be used to derive/estimate the increasing trend in SO2 emissions/concentrations over these regions. Here, authors use Level-3 SO2 data at a particular spatial resolution with a constant AMF of 0.35. I would suggest a more detailed and in-depth study using the satellite SO2 column density dataset; in terms of

AMFs, spatial resolutions, various data filtering methods, sampling, averaging etc. and its impact on the results demonstrated here. This sort of a scientific analysis is required in order to come within the scope of ACP (rather than describing the trend analysis and spatiotemporal pattern of SO_2 sources). McLinden et al., Fioletov et al., and Krotkov et al. papers are good references for this. Also, two years of in situ data over 188 sites offer a valuable piece of information (for example, L134:138: representativeness issues should have been addressed/described more carefully) to further test/evaluate satellite data (in addition to the supplementary figure and table). Also, describe in detail how the uncertainties in various datasets impact the results.

Need to correct for grammatical mistakes throughout the paper (examples; L2: economic growth; L9: reduction of; L127: but the both; L133: such the inconsistence; L200: an significant; 412: desert and Gopi? . . .). Also, loose/empty sentences, and repetitions should be corrected while revising the paper. Change 'SO2' to 'SO2' for all the figures.

L81:82: try avoiding the point no.2, you can mention that, however, it's already an established point?

Section 2.1: describe more details of satellite SO2 data, error sources etc. This is the most important part of this paper.

L101:118: Better if you describe figures and tables in the results section. Describe just the 'materials and methods' in this section.

L133:134 skeptical of in situ? So, first, describe the dataset, and associated errors, and then describe your figures/results in that context.

Column density and emissions are correlated (supplementary figure and table). However, describe briefly why there are not linearly related; also, cite some relevant papers relating column density to emissions and surface concentrations (for example, using atmospheric models).

L134:139: how about using higher resolutions to address the issues of representativeness? Also, these are loose/empty sentences.

L150:153: Those publications report some uncertainty estimates; report them here; and describe your figure in that context; more carefully.

L153:156: revise/avoid this sentence.

L157:162: briefly mention the socioeconomic data? GDP?

why per capita emissions used?

Results and discussion section is disorganized throughout. For the results section, first describe the decreases in SO2 over eastern China (as already reported in earlier publications), and focus more on the northwestern region (regions with increasing trend; this is the novel aspect of this paper?) in a separate sub-section.

Figure 4: colorbar should have the units

L385:393: describe 'source detection approach' (describe vertical column vs 'burden'; 'emission burden' a rate?) in the method section more clearly; and describe Figure 10/11 here in the results section itself. Better to overlay the column density data in figure 11. Also, a map of column density possible in figure 10 to see it in the context of these burden maps?

L462: mention about Particulate Matter (PM) in the introduction section itself.