

Thanks to the editor for the good suggestions and careful editing.

Editor comments.

Line numbers refer to the manuscript without track changes.

Abstract: Your abstract has ~340 words. Please pay attention to the ACP author guidelines that recommend a length of 250 words. I realize that the abstract got longer due to the revision; however, some of the text seems unnecessarily wordy, e.g.

There are much larger DMS concentrations simulated close to the sea surface than observed, indicating that the DMS emissions may be too high from all models

could be shortened to

Simulated DMS concentrations near the sea surface exceed observed levels, suggesting potential overestimation of DMS emissions in all models.

or

In this study, we compare the spatial and temporal distribution of four sulfur-containing species, dimethyl sulfide (DMS), sulfur dioxide (SO₂), particulate methanesulfonate (MSA), and particulate sulfate (SO₄), that were measured during the airborne NASA Atmospheric Tomography (ATom) mission and

simulated by five AeroCom-III models to analyze the budget of sulfur cycle from the models.

could be shortened to

We compare spatially and temporally resolved measurements from the NASA ATom mission with simulations from five AeroCom-III models for four species of the sulfur cycle (dimethyl sulfide (DMS), sulfur dioxide (SO₂), particulate methanesulfonate (MSA), and particulate sulfate (SO₄)).

Etc

Please try to shorten the abstract accordingly.

Thanks. We adopted the suggestions and revised the abstract. There are now 247 words.

Minor/technical comments:

I. 72: replace 'sun's rays' with 'solar radiation'

Done

I. 73: replace 'affect cloud physics' by 'act as efficient cloud condensation nucleus'

Done

I. 79: replace 'radiation forcing' by 'radiative forcing'

Done

I. 80: replace 'model results' by 'model studies'

Done

I. 126/7: This sentence seems somewhat out of place or misleading. The sulfur cycle in the ocean likely differs a lot from that in the atmosphere, involving other compounds (e.g. H₂S, thionates), concentrations and fluxes. Please clarify why the oceanic sulfur cycle is relevant.

Change “in the ocean” to “... over the remote ocean”.

I. 159/60: Can this information be simply added to the sentence in line 154, e.g. ‘...high-resolution time-of-flight aerosol mass spectrometer at 1-s and 60-s resolution’?

We thought through the logical flow. It seems best to leave this sentence where it is. This sentence is logically related to the next three sentences, which discuss detection limits and negative measurements associated with different data averaging intervals.

I. 214: ‘for all AToms’ sounds colloquial. Do you mean ‘for all ATom periods’?

Change it to “for all ATom periods”.

I. 243: ‘computational efficiency of scientific research’ sounds odd. Do you mean ‘computational efficiency of the aerosol models’?

Change it to “computational efficiency of the aerosol models”.

Figures 2 and 3 (and wherever else applicable):

(i) Spell ATom consistently with the text (i.e. upper case ‘AT’ and lower case ‘om’)

Done

(ii) specify ‘statistical values’ in the caption – I assume that you mean ‘median’ and ‘mean’ (please also check the manuscript and use the more accurate terms where appropriate e.g. I. 298, 311)

In Fig. 2 caption, we define the statistical values as “Statistical values include the range of the data from minimum to maximum, the three levels of the 25th, 50th (median), and 75th percentiles in the box, and the filled circle for the mean.” We now place this sentence before the sentence that refers to it.

Figures S3 and S4: Adding so many numbers in the figure panels and even overlapping the traces makes the figure look messy. I suggest that you create a table comparing the median and mean values of Figures 2, 3, S3, S4. This way the reader could also more clearly see the ‘substantial drop’ as referred to as in I. 317.

Done. We now have Table S1 to give these numbers for Figs. 2-4 and Table S2 for Figs. S2-4. Numbers on Figs. S2-4 have been removed.

I. 313: what do you mean by ‘unobserved episode events’? Is it important to mention or could it be deleted?

Change the sentence to “... episode events that were not reported in measurements.”

I. 317/8: ‘but the model statistics change relatively small’ is not clear.

Delete “but the model statistics change relatively small”.

I. 334: This sentence should be simplified or split into two, e.g. (please check whether this reflects the intended meaning!)

The median of the predicted DMS concentrations is higher in most cases than that of the observations.

The difference between the modeled and observed mean values is much higher (more than a factor of 10) than that of the median values. This reflects a few very high predicted DMS values.

Change the sentence to “The model DMS median values are mostly higher than the observed values. The model DMS mean values are even higher than the observed means (sometimes by more than a factor of 10). This reflects a few very high predicted DMS values.”

I. 361: replace ‘span’ by ‘range’

Done.

I. 363: remove ‘easily’.

Done.

I. 368: ‘E3SM performed SO₄ simulations among other models.’ is misleading and/or colloquial. Do you mean ‘the results of E3SM are generally within the ranges as predicted by the other models’?

Yes. The sentence has been revised accordingly.

I. 372: ‘The complexity of the chemistry deserves more attention’ – this is a very generic vague sentence. Either specify what you want to say or remove.

Remove it.

I. 380: Do you mean ‘than by the other two AeroCom models’?

Change the sentence to “SO₂ is better simulated by model IMPACT in the NH than other four AeroCom models and by models CAM-ATRAS and OsloCTM3 in the SH than other three AeroCom models.”

I. 386: do you mean indeed ‘provides’ or ‘predicts’?

“Predicts” seems more relevant here. Done.

I. 409: do you mean ‘the data set is large’ or ‘the values are large’?

Change the sentence to “... the data set is large ...”.

I. 411 and I. 412: words seem missing here, e.g., ‘inventory’ or ‘data base’, since the inter/extrapolation techniques did not create emissions.

Change the sentence to “... the data set ...”. Also see answer to I. 409.

I. 415/6: What do you want to say here? CAM-ATRAS and OsloCTM3 cannot ‘report anything in Section 4’. Do you mean that CAM-ATRAS and OsloCTM3 predicted similar values for DMS emissions as discussed in Section 4?

Change Section 4 to Table 4. CAM-ATRAS and OsloCTM3 predicted similar values for DMS emissions in Table 4 (and discussed in Section 4).

I. 423: Data can be collected in the atmosphere but not by models. What do you mean here?

Change the sentence to “The data submitted by the AeroCom models ...”.

I. 430: ‘to a sulfur compound’ can be removed.

Done.

I. 437: ‘Of the five models...’ seems to be redundant and repeating information of line 425.

Remove the sentence.

I. 440: What do you mean by 'phase stages'? Would 'gas-particle partitioning' be more accurate?
Change as suggested.

I. 451: What do you mean by 'anomalous behavior' (what would be normal behavior)? Can you use the word 'bias' here?
Change as suggested.

I. 452: which knowledge? Be more accurate here.
Change the sentence to "With the information provided by Figs. S9-11, ...".

I. 458: 'The most high concentration areas' – do you mean 'the areas with the highest concentrations' or 'most of the areas that show high concentration'?
Change the sentence to "The areas with the highest concentrations".

I. 459: 'Things are a bit more complicated' is very colloquial – rephrase
Remove it.

I. 464: 'tropospheric atmosphere' should be replaced by 'troposphere'
Done.

I. 465: 'in the Pacific is higher than that in the Atlantic' would imply SO₄ concentrations in the oceans – I assume that you refer here to 'above the Pacific and Atlantic oceans'
Yes. Change the sentence to "... over the Pacific is higher than that over the Atlantic ...".

I. 468: 'simulated and observed worlds' should be replaced by 'simulations and observations'
Done.

I. 469: 'Differences may be caused by majority models or a few individual models.' What do you mean here?
Figs.10-12 show the difference between observed and simulated values for different regions and ATom periods. The simulated values are the averages of multi-model median (MMM). Bias in the MMM can be attributed to the majority of participating AeroCom models or to individual models, depending on the where and when the comparison is made. Examples explaining this are given in the discussions that follow this sentence.

I. 481: What do you mean by 'potential source of horizontal transport' ? Horizontal transport is a consequence of dynamics, i.e. advection. Or do you mean 'potential source of SO₂ by horizontal transport'?
Change to "potential source of SO₂ by horizontal transport".

I. 510: replace 'reserves' by 'serves as'
Done.

I. 525: replace 'has' by 'predicts' (GEOS predicts...)
Done.

I. 528: 'models CAM-ATRAS and OsloCTM3 emit highest DMS' – please improve colloquial wording. Models do not emit anything.

Change the sentence to "..., models CAM-ATRAS and OsloCTM3 predict the highest DMS emissions ...".

I. 532: replace 'reversely' by 'inversely'

Done.

I. 534: why is 'diversity' in quotation marks? What is meant here?

Remove quotation marks here.

I. 547: do you mean 'predictor' rather than 'simulation' here?

Change to "predictor".

I. 578: is 'and' redundant?

Remove "and".

I. 586/7: Should 'its' be replaced by 'their' (i.e. related to the oceanic sources)?

Yes. Change to "their".

I. 599: 'but' seems redundant here

Replace "but" with ",".

I. 603: 'orchid' is not a common color. Either call it 'pink' or remove (there is only one shaded area in the figure)

Remove "orchid".

I. 625: Be more specific: replace 'sulfur' by 'sulfur species' or 'sulfur cycle'

Change to "sulfur species".

I. 634: remove 'sources' and 'resultant'

Done.

I. 669: 'Several potential directions for improving sulfur simulations are suggested above.' – Either remove this sentence or specify where 'above' and which directions.

Remove this sentence here and add "to improve sulfur simulation" in I. 755 in revised (R2) highlight version.

I. 671: 'all modelers should focus on the calculation of the air-sea exchange flux formula, as it plays a key role in determining DMS emissions.' – this is very vague. Certainly not 'all modelers' ... be clearer and more accurate here. What type of models are you referring to?

Change sentence to "All modelers involved in this work should focus on the calculation of the air-sea exchange flux formula as it plays a key role in determining DMS emissions. To our knowledge, many other aerosol models employ similar formulas in air-sea flux calculations, so the findings here are applicable to them as well."

I. 677: This is a very vague concluding sentence of your study. I suggest removing it.

Done.