

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 (SO<sub>2</sub>), particulate methanesulfonate (MSA), and particulate sulfate (SO<sub>4</sub>), 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 (SO<sub>2</sub>), particulate methanesulfonate (MSA), and particulate sulfate (SO<sub>4</sub>)).*

*Etc*

Please try to shorten the abstract accordingly.

Minor/technical comments:

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

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

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

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

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. H<sub>2</sub>S, thionates), concentrations and fluxes. Please clarify why the oceanic sulfur cycle is relevant.

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'?

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

I. 243: 'computational efficiency of scientific research' sounds odd. Do you mean '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')

(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)

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.

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

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

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.

I. 361: replace 'span' by 'range'

I. 363: remove 'easily'.

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'?

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.

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

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

I. 409: do you mean 'the data set is large' or 'the values are 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.

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?

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

I. 430: 'to a sulfur compound' can be removed.

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

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

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

I. 452: which knowledge? Be more accurate here.

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'?

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

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

I. 465: 'in the Pacific is higher than that in the Atlantic' would imply SO<sub>4</sub> concentrations in the oceans – I assume that you refer here to 'above the Pacific and Atlantic oceans'

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

I. 469: 'Differences may be caused by majority models or a few individual models.' What do you mean here?

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 SO<sub>2</sub> by horizontal transport'?

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

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

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

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

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

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

I. 578: is 'and' redundant?

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

I. 599: 'but' seems redundant here

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

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

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

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

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?

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