

Responses to comments on revised manuscript (EGUSPHERE-2024-2686: Evaluating tropospheric nitrogen dioxide in UKCA using OMI satellite retrievals over South and East Asia, by A.K. Pandey et al.)

Author responses in red below.

Public justification (visible to the public if the article is accepted and published):

Dear author team,

thanks for submitting the revised version of your study on NO₂ over Asia. Unfortunately I could not track all responses to the referee comments in the revised manuscript. Please check for the points listed below and clarify which changes to the text were made.

Please cite all these changes to the manuscript in your response and refer to the positioning of changes with line numbers from manuscript version 3.

Response to comments by reviewer#1

-- general comment 1: in your response you state, that the discussion was extended with regard to model biases. Please clarify which changes in the manuscript were made regarding this detail.

[General comment 1 in initial review: 1. In the discussion, can you compare your results to other modeling studies or comment on whether the same biases are likely to affect other models? This could broaden the applicability of the study.]

Our response states that we can't directly compare our results to other modelling studies without something like a dedicated model intercomparison project, such as that presented by van Noije et al. (2006). We have extended the discussion to reflect this response:

Lines 339-344 note that model-observation discrepancies may reflect various uncertainties in emissions, and that to compare our results to other models, a new NO_x-focussed model intercomparison and evaluation would be useful. We also highlight this in the paper's closing statement (lines 360-361).

-- question 3 on uncertainties:

[General comment 3 in initial review: 3. Uncertainties in NO_x emissions and emission trends are another potential cause of model biases. More discussion is needed on the NO_x emissions used in the model and their uncertainties.]

Lines 297-299 discuss some likely problems with the spatial distribution of emissions used.

Lines 194-196 and 320-324 discuss the neglect of the diurnal cycle of emissions.

The above discussions were already in the original submission. We added lines 339-340 to note that emissions may also contribute to the model-observation discrepancies. In our response we note that our paper focusses on potential process biases rather than emissions biases, hence the relative lack of discussion about emissions.

-- choice of regions

Lines 93-101 in the revised text present our justification for the choice of regions.

-- Discussion on errors in emission trends:

[Comment in initial review: Could errors in the assumed emission trends also be a cause of model-obs mismatch? This should be discussed.]

We added lines 339-340 to note that uncertainties in emissions' trends may also contribute to the model-observation discrepancies.

Any changes to the text done for these aspects? Please specify.

Response to comments by reviewer#2

-- (1) motivation

-- (4) novelty of study

I agree with the given responses to reviewer #2, but were there any changes to the text highlighting the motivations and the novelty of the study in the manuscript?

We substantially re-organised the Introduction (lines 30-85) to clarify the motivation and novelty of the study. The changes are summarised in our response to reviewer #2, and in the revised introduction text.