

Review of Flemming et al.

I think this is a standard paper describing a reanalysis product. It is likely to be useful to the scientific community; however, it is a bit difficult to read, partly owing to its length. The paper should be accepted for publication once the authors address a series of points, detailed in the specific comments and technical comments. They largely concern quantification and/or clarification of statements made.

Specific comments:

- L. 32: Indicate why ozone at the surface cannot be improved by the assimilation.
- L. 56: Quantify the “sufficient accuracy”.
- L. 58: Provide details of the surface properties.
- L. 109: List the key species.
- L. 208: Why did you use scenario 8.5 instead of another one?
- L. 286-287: Did you use the averaging kernels for data other than MOPITT? Explain your choices.
- L. 291: The data used are flagged “good” or not flagged “bad”?
- L. 375: Does the decrease in the burden indicate a positive result from the assimilation?
- L. 397: Explain in the text why you do not assimilate MOPITT observations over the Arctic.
- L. 451: Why is there only a little effect on the surface? Why are there no changes between CR and CAMSiRa from the assimilation?
- L. 471: Is it reasonable to calculate a linear trend? What assumptions do you make?
- L. 516: Provide references for this statement.
- L. 523: Is the comparison with MACCRA and CAMSiRA within the errors of these datasets?
- L. 535: Why is there an exaggeration of the sea salt emission?
- L. 594: Discuss why this seems unrealistic.
- L. 662: Quantify the trends. Explain (or remind the reader) how you test for significance. Same for L. 751 and L. 757.
- L. 674: Provide further details of the artificial accumulation of sulphate by the assimilation.
- L. 767: Why is this remarkable? Because unexpected? Please avoid subjective comments.
- L. 852-865: What is the fidelity of the GOZCARDS dataset?

Technical comments:

- L. 36: Do you need “clearly”?
- L. 128: practise -> practice.
- L. 159: were -> are.
- L. 167: I suggest you do not start a sentence with an acronym.

L. 221: Have you introduced the acronym for POET?

L. 389: "in the" repeated.

L. 535: Replace "probably" by "likely". Do this elsewhere as well.

L. 551: was -> were.

L. 799: "...V3.4) is at the..."

L. 835: latitudes.

L. 978: CAMSiRA.