

1 Supplementary material

1.1 MOZART results

Reviewer nr. 2 added a comment/suggestion regarding adding a second global CTM model to the evaluation in its the comments: "One thing that might be interesting is to add evaluation of another global model for use as LBCs for Europe (e.g., MOZART-4/GEOS-5 from NCAR)."

An additional model *was* used during the work that resulted in this study. The results from this evaluation is added below with an evaluation of LBC's from the MOZART model. Figure 1 and 2 show the results for the two trace gases CO and O₃, respectively. Comparing these results to the results from the global EMEP model, there are no striking differences between the two model evaluations. This is however not the major reason as to why we did not include the MOZART model. Instead the reason is because the CAM-Chem model is used to create the *a priori* estimate for the MOPITT v.6 retrievals, and the CAM-Chem model is to a large degree based upon the MOZART model. Using the MOZART model would, therefore, not create a fair comparison and we could not ensure the independence of the data sets. In addition to this reason, we did not have access to any other global CTM data.

1.2 ORIG boundary conditions

Reviewer nr. 2 suggested we add the original boundary conditions in Fig. 2 and 4 in the manuscript. We have added the original boundary conditions as supplementary table instead, because we argue that these figure are already busy as they are and adding yet more information would make them too busy. Therefore we suggest having these "ORIG" boundary conditions tabulated in supplementary materials.

Table 1 and 2 show the monthly varying boundary conditions for the five different boundaries, c_x , refers to a specific model domain boundary where x = top, west, east, south and north.

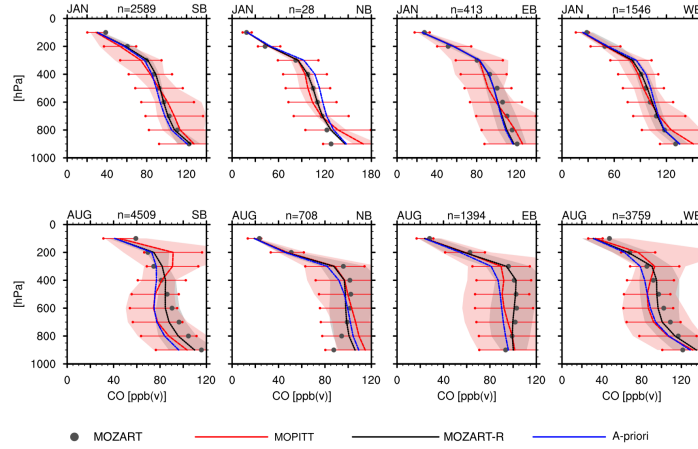


Figure 1: Carbon monoxide mixing ratios for January (first row) and August (second row) at the four cardinal boundaries (denoted SB, NB, EB and WB), observed by MOPITT (red solid line) and simulated retrievals from MOZART (black solid line). The retrievals (MOZART-R) are calculated by using Eq. (1) with MOZART model data (grey dots) and applying MOPITTs averaging kernel and adding the a-priori profile (blue dashed line). The red and grey shaded area correspond to the range of values in which the satellite and retrieval values vary at each level. The satellite uncertainties are represented by the red horizontal lines.

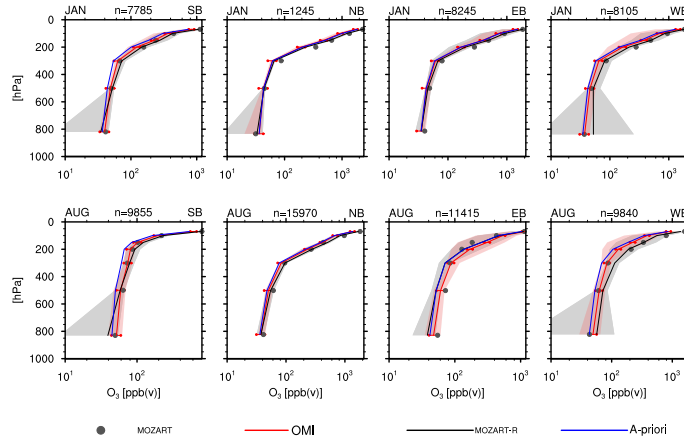


Figure 2: Same as Fig. 1, but for O_3 and for OMI satellite retrievals.

Table 1: CO monthly varying boundary conditions, given in volume mixing ratios, $\cdot 10^8$, for the original setup for the MATCH model.

	C _{top}	C _{west}	C _{east}	C _{south}	C _{north}
January	12.6	14.1	18.7	12.6	15.0
February	13.4	14.3	18.7	14.2	15.3
Mars	13.4	13.9	18.1	13.7	15.4
April	13.5	14.3	16.8	13.4	15.1
May	11.4	12.3	13.7	10.9	12.7
June	9.9	9.8	11.4	9.3	10.4
July	8.3	8.2	10.4	8.1	8.8
August	8.5	8.3	10.0	7.9	8.7
September	9.6	9.9	12.3	9.2	10.2
October	10.0	10.7	14.7	10.1	11.5
November	10.8	11.9	16.4	10.7	13.0
December	11.7	12.8	18.0	11.8	13.5

Table 2: O₃ monthly varying boundary condition, given in volume mixing ratios, $\cdot 10^8$, for the original setup for the MATCH model.

	C _{top}	C _{west}	C _{east}	C _{south}	C _{north}
January	5.1	3.7	3.5	3.7	3.8
February	5.5	3.5	3.6	3.4	4.0
Mars	5.9	4.2	5.0	4.3	4.5
April	6.6	4.6	4.2	4.4	4.5
May	7.4	4.4	4.5	4.7	4.4
June	7.4	4.4	4.5	4.7	4.4
July	6.7	3.4	4.1	4.0	3.4
August	6.2	3.2	5.1	3.9	3.2
September	5.9	3.0	3.8	3.9	3.0
October	5.5	3.0	3.2	3.4	3.2
November	5.5	3.2	2.2	3.2	2.9
December	5.1	3.6	2.2	3.6	3.6