# Response to Referee 1:

*This manuscript documented the performance of the CAMS Cy48R1 in comparison with CAMS Cy47R3. This is an important work, and the paper is well structured. I only have a few minor comments.*

We thank the referee for the recognition of our work, and for the compliment on the structure of the paper.

*Out of curiosity, what's the meaning of Cy47R3, Cy48R1?*

The cycles in CAMS follow the cycles of the ECMWF Integrated Forecasting System IFS. The cycle numbers are basically version numbers, where the first number is the major (yearly) upgrade number, and R1, R2 etc refer to typically smaller updates during the year. ECMWF is approaching its 50th birthday, and the cycles also approach 50.

The upgrades are discussed in lines 55-60 of the introduction. We added: "Detailed information about the ECMWF IFS upgrades can be found on ECMWF (2024h)".

*Line 49: add full name of NDACC, WMO-GAW, AERONET, IAGOS, ICOS, IASOA?*

Full names have been added in the revised manuscript. Same for NASA, ESA, EUMETSAT.

*As noted by the authors, summer validation over the Northern Hemisphere (winter for the Southern Hemisphere) is missing. Please add some more discussion on this. Is the performance in the missing months expected to be similar to other months?*

Unfortunately only 9 months of data are available to us. Indeed, for atmospheric composition we may expect seasonally-dependent validation results. We have added the following text:
"The choice to generate 9 months of e-suite data is made based on practical timing and computational resources considerations. The length of the e-suite run has been discussed in the CAMS team, and for the next upgrade to Cy49R1, planned for the end of 2024, the e-suite will hopefully cover a full year."

*Do you have any assimilation plan for the geostationary satellites?*

Yes. The following has been added:
"CAMS is continuously extending its activity by testing and using new emerging datasets such as trace gas retrievals from the geostationary Geostationary Environmental Monitoring Spectrometer (GEMS) and Tropospheric Emissions: Monitoring of Pollution (TEMPO), improved retrievals from past and present missions, and preparing for future missions such as Sentinels 4 and 5."

*Line 230: “smaal” typo?*

Corrected

*It will be helpful to have a table of all assimilated satellite products in CAMS in the previous and current version, and their assimilated period.*

Instead of a table, we have added Figure S2 in the supplement. It shows which satellite data products are assimilated and for which period. The latest additions are VIIRS AOD and TROPOMI CO, as discussed in the paper.

*Figure 2: Why e-control – o-control is not shown over Asia like Figures 1 & 3?*

The e-control – o-control is now added to figures 1 and 3.

*Line 259-261: “At most airports worldwide the bias in the lower troposphere (pressure > 850 hPa) is slightly larger for the e-suite than for the o-suite, and in particular over airports located in Western Africa and Eastern Asia (not shown). Conversely in the free troposphere, the bias is smaller in the e-suite that in the o-suite for most visited airports (Eskes et al., 2023b).” Why is that the case? Overall, the paper focused on evaluating the performance of the e- suite relative to o- suite but often does not explain the differences.*

The text has been reformulated and now reads:
“In the free troposphere, the bias is about the same between the e-suite than in the o-suite for most visited airports for the analysis or the 1-day forecast (Figure S5). For the control run we observe larger differences, and the o-control shows mainly positive biases, the e-control mainly negative biases compared to IAGOS, see also Fig. 4. These differences are reduced and results are improved by the data assimilation in the free troposphere.”

In general, ozone is influenced by many aspects including emissions, implementation of the chemistry, changes in precursor gases etc. Therefore it is very difficult to say what is causing the observed ozone changes, especially because many aspects were changed in the Cy48R1 upgrade. Interestingly the data assimilation brings the ozone results of the e-suite and o-suite closer to each other, improving both.

*Change “ozone sonde” to “ozonesonde”?*

In the original paper we used a mix of  both. Now all occurrences of “ozone sonde” have been replaced by “ozonesonde”, as suggested by the referee.

*Line 556: change “china” to “China”*

Done

*I like it that the author mentioned in the conclusion "CAMS is actively acquiring and testing (surface) data from South America, Africa, and Asian countries other than China." I hope in the future more data from the Global South will be added in the evaluation.*

This is certainly the plan. We are currently assessing the quality of a number of candidate measurement datasets.

*The manuscript is very long with many details. While this might be the nature of such type of papers (Technical Note), it is not easy to follow the whole text for general readers. The abstract and conclusion are helpful because they listed main points.*

We have been struggling to find the right balance by not providing too much, or too little results. The comparison with so many independent measurement datasets for a number of species and aerosol properties generated many results. At the same time we aimed at providing a full overview of the activity. We have carefully selected only those figures which document the main conclusions. Note that referee 2 asked us to add those figures from the report (Eskes, 2023) that are referred to in the paper. In response we have created a supplementary material document which contains those figures.

We are glad that the reviewer appreciates the summaries in the abstract and conclusion, which we tried to keep short and to the point.