We greatly thank the reviewer for their feedback on our manuscript. Please find our response here to their comments.

Dene Bowdalo

# Reviewer 1

The GHOST harmonised dataset is a valuable contribution to the surface atmospheric composition measurement community in that it brings together key data from 38 observing networks in a standardized way. The dataset has the potential to streamline data workflows for the atmospheric composition measurement community and also opens the possibility of conducting longer scale spatial and temporal analyses. I rated the uniqueness of this manuscript as 'good' due to the fact that this dataset could be replicated if needed. However, the cost and effort required to replicate the dataset would be high, making the open sharing of this data important. The usefulness of this manuscript and the corresponding dataset is excellent. I especially appreciated the thorough definitions of the variables and metadata included in the appendix. As a researcher, I wish that more datasets had such clear and thorough documentation on variables and metadata. The manuscript and dataset is complete and also includes access to the code.

**1.1.** The presentation quality should be improved as the manuscript is lengthy and long articles are not expected for ESSD. More specifically, section 3 (GHOST processing workflow) should be streamlined and made more concise in order to improve the presentation quality. With some revisions, especially to section 3, this manuscript will be a nice contribution to the Earth science community.

> With regards to the length of the manuscript and section 3 in general, we acknowledge that this is a longer than typical manuscript for ESSD, however we feel that the detail is necessary for a few key reasons. Firstly, this is one of the largest harmonisation efforts of this kind that we know of, and thus for the sake of reproducibility we felt it critical to layout each step of the processing workflow, so the work can in theory be entirely reproduced. We attempted to be as concise as possible in each subsection of section 3, moving as much supplementary information as possible to be the appendix where appropriate, however the amount of detailed thought we put into creating each stage of the workflow resulted in a large number of subsections. Despite this, we feel section 3 importantly emphasises the scientific rigour employed in creating the dataset, and can only serve to enhance confidence in the quality of the dataset as a result.