

Final Response to RC1 on “Results of a Long-Term International Comparison of Greenhouse Gas and Isotope Measurements at the Global Atmosphere Watch (GAW) Observatory in Alert, Nunavut, Canada”

By Referee #1 (received and published: 08 Jul. 2023)

Thanks very much for the editor’s effort to coordinate the reviewing and for the reviewer’s constructive feedback and comments. We will answer the questions and address the concerns point by point raised by *Referee #1* below in the format of “reviewer’s comments/ author’s responses”.

In "Results of a Long-Term International Comparison of Greenhouse Gas and Isotope Measurements at the Global Atmosphere Watch (GAW) Observatory in Alert, Nunavut, Canada" Douglas Worthy and co-authors present the results of long time series of atmospheric flask samples analysed for greenhouse gases to check the whether different laboratories succeed in obtaining the WMO GAW recommended compatibility goals for greenhouse gases, as recommended in WMO (2020), and specifically whether the observations at Alert observatory analysed by the Canadian ECCC are compatible with 5 other global labs.

This important paper is clear and well written, but unfortunately way too long. I appreciate the level of detail and accuracy invested to document all the important details that are useful and needed to understand the conclusions, but in its current shape it is hard for the reader to see the tress for the forest. Also it is good to have all data now available in one place for future analyses. So I recommend to not remove but move many details (e.g. those in section 2.3 and 3.x including most of the figures) to a supplement and replace those sections with more general and short descriptions of the commonalities.

Thanks for your suggestions. We’ve moved the subsections of 2.3.1 to 2.3.7 to a supplement, however, we believe that section 3.x contains the primary information of the paper and should remain unchanged.

I also agree with the first reviewer that the abstract also need to be shortened (by about 50%).
Thanks for your suggestions! The abstract has been shortened.

I would also appreciate an explanation why the documentation and analysis took so long (first results are from 1999 and latest results analysed are from 2017) and depending on the reasons would like to see recommendations on how this could be improved in the future, as timely information on scale differences between labs is crucial to detect and improve compatibility issues. And what would this mean for the global GAW network, should all associated labs cooperate in these regular comparisons and with which frequency and minimal delay time should the data be analysed? Would a central database like now set up by NOAA be helpful in coordinating the results?

An earlier publication of the inter-comparison results would have been preferable, but proved challenging due to the significant number of participating groups involved. Additionally, delays were often encountered in the implementation of new calibration scales.

In 1999, NOAA established a comparison site, exclusively accessible to data providers. The platform is currently still in use and contains preliminary results for quality control purposes, as a solid foundation for subsequent comprehensive analyses. We concur that periodic comprehensive analyses are valuable, particularly for tracking scale and/or instrumentation changes. Thus, we

recommend that future analyses should be performed every 2 years by a dedicated group and reported during regular WMO GGMT meetings.

WMO (2020): GAW report #255, 20th WMO/IAEA Meeting on Carbon Dioxide, Other Greenhouse Gases and Related Measurement Techniques (GGMT-2019). Available at:

https://library.wmo.int/index.php?lvl=notice_display&id=21758

Thank you for the suggestion. This GAW report has been added to the “Reference”.

As I assume a major rewrite is needed I only have a few smaller textual comments and suggestions:

L94: please quote the most recent WMO GAW GHG Bulletin (2022) available at

https://library.wmo.int/index.php?lvl=notice_display&id=22149

Your suggestion has been followed and WMO GAW GHG Bulletin (2022) has been added.

L104: remove being:

done

L107 : world data centers -> the world data center:

done

L115: Start new line with: However

done

L124 In this regard, -> Fore these reasons,

done

L245: explain co-sponsored (what support is provided?)

We eliminated the term “co-sponsored” because we were informed by NOAA that the WMO and IAEA do not provide any financial support to the RR program. Their contribution was primarily in the developmental stage of the program to advocate for groups to participate in the RR exercises during GGMT meetings.