Manuscript egusphere-2025-5272, "Long-term trace gas and black carbon measurements at the high-altitude station Mount Kenya: tropical atmospheric variability and the influence of African emissions", by Leonie Bernet et al.

Replies to review RC2 from C. Labuschagne, 13 Feb 2026

We thank Reviewer 2 for his careful assessment and constructive suggestions. Below, we provide the answers to his comments (in blue).

Reviewer 2, general comments:

This study of Bernet e*t al*, presenting data from a renewed effort for continuous of multi-year in-situ measurements of trace gases and black carbon from the Mount Kenya GAW station (MKN) is well articulated and presented. […] The introduction section explained precisely what the authors had set out to do […] In this regard, the various objectives of the paper were achieved.

Thank you for your positive feedback.

It is noted that in-situ observations at MKN have been conducted since the early 2000s, with a focus in this work on the continuous data from the more recent 2020 to 2024 time period. It would be useful to extend the discussion a bit further to also include the first period of measurements, but due to the large data gaps it might not be possible and will introduce more bias to the overall data set. One simply cannot extend trend calculations over periods where such large data interruptions have occurred. I think the authors should use this argument to explain / elaborate on this, in order to clarify the reason(s) for not extending the discussion to include the entire data set since inception.

The discussion of trends covering the full dataset is now expanded, also in view of the comments of reviewer #1.

With regards to the long-term greenhouse gas measurements at MKN, the authors managed to show increasing trends consistent with global patterns. They should perhaps expand that aspect of the discussion bit more, and mention & discuss the tropical derived values against the global background observations. This will further highlight the need for tropical and equatorial observations.

An extended discussion of long-term trends is now added to section 3.2.

Reviewer 2, specific comments:

Figure 1 – please enlarge (similar sizing as Fig. 2) and add a placemark for the MKN station.

Thanks for this valuable suggestion. The domain of panels shown in Figure was enlarged to match the domain shown in Figure 2.

Line 283: correct typo “ground”

done

Line 344: Please rephrase – I did not see the 2x minima for CO2 clearly, however, the general remark of NE – SE seasonal displacement of the ITCZ still holds.

The seasonal CO2 pattern is discussed in a separate paragraph thirty lines below (lines 372 ff. of the initial manuscript). It is now clarified in the beginning of the seasonality section that the opening statements do not hold true for all species.

Line 397: Please check the statement related to CO2 diurnal amplitudes – I could not easily discern the 417PPM CO2 and stated ~4PPM reduction during nighttime.

Thank you for spotting the inconsistency between the numbers shown in Fig. 4 and those mentioned in the text. The text referred to an earlier version of the analysis that did not yet include the final year (2024), which explains why the values no longer matched the figure. We have revised the text accordingly and removed the reference to the absolute nighttime values. The updated sentences now read: "*Nighttime CO2 values drop rapidly by approximately 3 to 4 ppm after sunrise (Fig. 4a) with larger decreases typically observed during the wet season. These daytime reductions reflect lower CO2 levels in the PBL driven by ecosystem uptake.*".

Line 444: correct typo CH4 (subscript)

done