

The manuscript by Minqiang Zhou et al., presents the three weeks of ground-based remote sensing observations of XCO₂, XCH₄, XCO and XN₂O using the EM27/SUN FTIR spectrometer, along with in situ surface measurements of CO₂ and CH₄ at the Qomolangma Station.

This study provides valuable total column greenhouse gas measurements in a region where observational data are scarce, particularly over the Qinghai-Tibetan Plateau. The manuscript is generally well written. However, further discussion and clarification in parts of the data analysis and interpretation would strengthen the overall impact and scientific value of the work. I consider the study suitable for publication after the authors have thoroughly address the specific technical comments outlined below.

Specific comments:

Line 109: The manuscript states that co-located measurements of EM27/SUN and TCCON were performed to derive calibration factors. However, these are two spectrometers with different spectral resolutions. How strong is the correlation between the measurements from the two instruments? Were side-by-side comparisons performed both before and after the campaign? If so, were there any noticeable changes in instrument performance before or after the campaigns, especially considering the long-distance transportation?

Line 148: XN₂O is not a primary target gas retrieved by the EM27/SUN spectrometer. Could the authors clarify how the precision of XN₂O measurements from EM27/SUN compares with that from TCCON, in terms of variability, biases or overall data quality? Additionally, are there any limitations or uncertainties associated with retrieving XN₂O using EM27/SUN?

Line 195-205: In this paragraph, the authors discuss the varying correlations among XCO₂, XCH₄, and XCO across three different weeks. Could the authors elaborate on the possible reasons behind these differences – such as the influence of different emission sources or atmospheric processes? Specifically, during the second week, the correlations among Xgases are notably higher. Were there any changes in meteorological conditions, such as wind direction or speed, that may have contributed to the transport of polluted air masses from source regions during that period? Incorporating a meteorological model, such as WRF or back-trajectory analysis, could help better interpret these variations and strengthen the conclusions.

Line 215: Significant enhancements of CO₂ and CH₄ were also observed in the surface measurements, particularly on 16 May, consistent with the FTIR observations. It would strengthen the manuscript to include further discussion on the potential causes of these enhancements on that specific day. For example, were there any known emission events, changes in local activity, or meteorological conditions (e.g., atmospheric stability, wind patterns) that could explain the observed peak in both gases?

Line 226: It might also be helpful to clearly state the criteria used to define collocation between the EM27/SUN and surface measurements.

Line 232-233: *"The CH₄ mole fractions in the stratosphere are much lower than those in the troposphere due to the chemical reaction and atmospheric dynamic transport"*. The sentence does not appear to be closely related to the content presented here. It looks it better fit with next paragraph.

Are the authors suggesting that the lower CH₄ amounts in the stratosphere reduce the total amount of XCH₄ measured by the EM27/SUN compared to higher surface measurements? Please elaborate further on the behavior of CH₄ in this context.

Line 240: Although surface measurements are generally higher than those from EM27/SUN on average, the biases between the two vary over time and show opposite patterns for CO₂ and CH₄, as illustrated in Figure 5. EM27/SUN reports higher XCO₂ than surface CO₂ before around 18 May, while it shows relatively lower XCH₄ compared to surface CH₄. It shows the other way around after May 18. Could the authors provide further explanation for these discrepancies?

Technical comment:

Line 74: using a the ... >>> using a ...

Line 221: Fiugre 4. The small panel shows the daily variation (ΔX_{gas}), please denote how the background was removed.

Line 229: Figure 7 >>> Figure 5