

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2021-307

Anonymous Referee #3

Referee comment on "Twenty years of ground-based NDACC FTIR spectrometry at Izaña Observatory – overview and long-term comparison to other techniques" by Omaira E. García et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-307-RC2>, 2021

"Twenty years of ground-based NDACC FTIR spectrometry at Izaña Observatory - overview and long-term comparison to other techniques" Omaira Garcia et al., 2021

The paper meticulously describes the methodology of FTIR retrievals and draws on previous work in the field. The writing style is clear and descriptive. It gives a very detailed description of the 20-years FTIR-related measurements from 120/5 HR at Izaña. Such kind of overview paper is valuable for the global users (modelers, satellite developers, atmospheric scientists...) to use their data. Izaña is located in the subtropical region, which is crucial to understand the change of atmospheric compositions. The 20-years FTIR measurements have already been used in many scientific studies, leading to more than 100 peer-reviewed papers. Overall, I recommend this paper to publish in ACP, and I only have a few minor comments:

P8 line 182: WACCM model used in NDACC-IRWG is v4 instead of v6

P8 line 188: why only use the temperature and pressure at 12:00 UT? How about the H₂O? The temperature and H₂O variation can be very large even on one day. Would you like to address such uncertainty on your retrievals?

P9 table 2. do you want to add N₂ also here?

P14 line 261: "the total column-averaged amount of dry air (X_{air}) " is not appropriate. X_{air} is the ratio of O₂ or N₂ derived dry air to DPC, please use a better definition here.

P22 Figure 8. in the bottom panel, are you sure the colors are correct? because the CO is increasing, but you mention that in P23 line 464 that the CO is decreasing.

P22 Figure 8 in the middle panel and Figure 11, I see that the CH₄ and N₂O long-term trends are similar. However, other in-situ measurements show that N₂O is increasing continuously while the annual growth of CH₄ is variable: 1999-2007 stable, and re-increased after 2007 (https://gml.noaa.gov/ccgg/trends_ch4/). Any explanation here? Why we get a different CH₄ trend from Izana FTIR CH₄ measurements, especially between 1999 and 2007, compared to other surface measurements?

P39 line 811, the tropospheric XCH₄ is compared to the surface measurements to found a bias of ~2.6%. I do not support such direct comparison, as they are sampling different vertical ranges still.

P39 line 814, the reference "Zhou et al., 2019" is wrong. It should be "<https://amt.copernicus.org/articles/12/5979/2019/>"