

Interactive comment on “Intercomparison of in-situ NDIR and column FTIR measurements of CO₂ at Jungfraujoch” by Michael F. Schibig et al.

Anonymous Referee #2

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Review of 'Intercomparison of in-situ NDIR and column FTIR measurements of CO₂ at Jungfraujoch' by Schibig et al.

The paper by Schibig et al., shows a comparison of two very different measurement time series at Jungfraujoch station in Switzerland. Ground-based as well as FTIR column measurements from 2005-2013 are presented. The authors report a consistent trend for both data sets which are in agreement with other stations on the northern hemisphere. The FTIR data set is biased low by 13 ppmv since the stratospheric column reduces the mean column value. The data are filtered for pollution events and clear sky conditions and evidence is provided, that the variability of both data sets is partly due to local CO₂ variations. The seasonality is shows very interesting differences between both data sets, which are not explained fully. Both data sets show the seasonal minimum at the same time in August, but different times for the

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maximum, which occurs in January for the FTIR data set and in March for the NDIR in-situ measurements. This is explained by different source regions for the respective months on the basis of FLEXPART footprint calculations for 2009-2011. Differences in the vertical distribution are mentioned and particularly the role of the CO₂ gradient at the tropopause is not really discussed. In general the manuscript is well written and should be published in ACP, but the analysis of the seasonal differences and the footprint analysis should be sharpened.

Main comments: The NDIR shows the minima in August as well as the FTIR, but the maxima show differences in their time of occurrence. The FTIR shows the maximum for January whereas the NDIR exhibits its maximum in March. I'm not sure if the FLEXPART footprints in Figs. 6-8 do provide meaningful results for the free tropospheric partial columns. I don't see for a long-lived tracer like CO₂ any reason why a ten day backward footprint for the free troposphere should provide an indication of sources and sinks. For the lowest layer this might be valid, but how does the respective footprint explain the seasonal differences in the free troposphere? How different are the footprint distributions in January, March and August from the other months? The different time of occurrence of the respective winter maxima is also not explained by the footprints. Is it maybe caused by seasonality of e.g. warm conveyor belts and therefore seasonality of the vertical tropospheric column? I suggest to analyze the FLEXPART output for this. Which role plays the seasonality of different tropopause height occurrence frequency over JFJ in winter and summer for the interpretation of the CO₂ columns and the summer - winter difference between FTIR and NDIR? Further as mentioned in the manuscript also the seasonality in the UTLS modifies the column. Is it possible to quantify this a bit more?

p.5. l. 13: Please specify the long-term stability (i.e. error due to drift) and the total uncertainty of the NDIR.

Technical: Fig.3: The caption refers to black lines or dots, which I can't find. Please correct.

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