

## ***Interactive comment on “Improvement of the retrieval used for Karlsruhe TCCON data” by M. Kiel et al.***

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This technical paper describes an amended method for retrieval of trace gas amounts from solar infrared absorption spectra measured at Karlsruhe Institute of Technology. While KIT is part of TCCON, the detector setup of their instrument is different from other stations, and this paper describes the differences in retrieval approach and demonstrates that the retrieved trace gas amounts are not biased relative to those from other TCCON stations. It is an essential requirement of TCCON to minimise inter-station biases, so the method must be well tested and reviewed. Other stations within TCCON are considering a similar approach in the future, and this paper provides a roadmap for its implementation, as well as possible future changes to retrievals at all TCCON stations. The paper is clearly organised and written and suited to AMT (albeit to a

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limited audience), and I recommend publication after addressing the following minor comments and revisions.

Specific comments and suggestions :

Title: The title is not informative to someone browsing contents. I suggest something like "Improved (or Amended) retrieval of trace gas amounts from near infrared solar spectra measured at Karlsruhe TCCON station"

p12205 L5: Omit the parentheses around 3800 - 11000, this is not correct usage here. Either "... the 3800-11000 cm<sup>-1</sup> spectral region is measured ..." or "... the spectral region (3800-11000 cm<sup>-1</sup>) is measured ..." I prefer the former. There are many other instances throughout the paper.

p12204 L20: ... is available through the TCCON data portal at CDIAC." (The web site address would be better omitted here in the abstract and specified later.)

P12206 L4 & 6. Replace precision with comparability or consistency. We are talking about bias between stations here, not repeatability (~precision)

P12206 L17: ... automated mid infrared NDACC (....

P12207 L13: replace "climatized" with "air conditioned"

L19: A dichroic mirror (Optics...

P12208 L21: It is not at all clear to the reader here how the InSb spectra are used to correct for ghosts, or how this is normally carried out with the InGaAs / Si detectors.

P12209 L20: define cw at first use, or write as O<sub>2</sub> spectral window centred at 7885 cm<sup>-1</sup>.

P12210 L18: It would be more correct to say the residual has a single extremum, rather than that it is parabolic.

L22: replace "cavity" with something more descriptive on first use - black-body cavity

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or black body source, for example. It is more important that it is a source than that it is a cavity.

P12211 L 3: ... curvature in the residuals IS due to... L8: ... of the spectrum that IS caused by...

section 5.1: This is incorrect use of the word "calibrated". You could explain that you ratio the measured spectrum to a black body spectrum, then refer to "ratioed" spectra rather than "calibrated"

P12212 L3" replace "oscillations" with "features"

Section 5.2: It is not clear how the DMFs are "improved". How is this defined or assessed? In principle I would actually expect the "calibration" factors relative to WMO-in situ measurements to change somewhat compared to standard TCCON retrievals. It is important to show that there is no significant difference, but not at all clear what is meant by "improved".

P12214 L13: remove "precision and". The scaling affects bias but not precision.

L24: ...does not take into account CONTINUUM curvature..."

P12216 L 1: ...sufficiently flexible (not sufficient flexible)

P12218 L 15: It is not appropriate to acknowledge co-authors. One or the other.

For brevity, Figures 8 and 9 could be removed.

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Interactive comment on Atmos. Meas. Tech. Discuss., 8, 12203, 2015.

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