

## ***Interactive comment on* “The Total Carbon Column Observing Network Site Description for Lauder, New Zealand” by David F. Pollard et al.**

**David F. Pollard et al.**

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We thank the reviewer for taking the time to review our manuscript and for their constructive comments.

Below we have included the full text of their review as indented text, interspersed with our responses addressing their specific comments as non-indented text and changes to the manuscript in italicised font.

The paper “The Total Carbon Column Observing Network Site Description for Lauder, New Zealand” describes an important data set related to the abundance of the greenhouse gases in the atmosphere. The paper has

enough details to understand the properties of the dataset and can be published with the minor adjustments. The main issue with the paper is a saturation with abbreviation. Some sentences contain up to five abbreviation, which makes it very difficult to follow. I would highly recommend to check the text and remove abbreviations where possible.

It is, perhaps regrettably, something of a necessity when dealing with measurement networks, satellite missions (both spacecraft buses and instruments) and field campaigns, that there will be a significant number of acronyms, as for these examples the acronyms become synonymous and interchangeable with the full name of the entity. When referring to instrument names and part numbers it is also necessary to rely heavily on acronyms as these are often the only designations that are widely recognised. We had considered dropping the IFS when referring to the two Bruker instruments described in the manuscript. However, this would result in the identifier beginning with numerals, which is possibly more of a hindrance to the reader. The items of software described (e.g. GGG, GFIT and LINEFIT) are not actually acronyms but the names of those packages. In section 5.1, we have attempted to simplify the text by including *"In the following discussion, ME will refer to the modulation efficiency at the maximum OPD of 45 cm used for TCCON measurements."* at the end of the first paragraph and removed subsequent occurrences of *"at max. OPD"*.

There are some other changes/clarifications required: p.1, l.4 – “masl” better to write m a.s.l.

*This has been amended in the manuscript.*

p.1, l. 20 – “are causing modification of the climate system” – greenhouse  
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gases have an impact on radiation budget, rather than modify climate system

We have altered this sentence to read *"are causing changes to the global radiation budget, which in turn is modifying the climate system."*

p.2, l.7 - "masl" better to write m a.s.l.

*This has been amended in the manuscript.*

p.2, l.11 – opening bracket is missing in front of Sherlock et al.

*This has been rectified and a citation to the IFS 120HR dataset included.*

p.3, l. 7-8 – this sentence is not appropriate here as you do not discuss gases but rather networks ("Other greenhouse gas measurements made at the site are summarised in Sect. 3.4.")

This has been moved to a separate paragraph and changed to: *"Other greenhouse gas measurements are also made at the site, these are summarised in Sect. 3.4."*

p.3, l. 21-22 – this sentence should be in the section related to data, not to instrument description ("Data for the period from 20th June 2004 to 28th February 2010 were submitted to the TCCON archive.")

In order that the reader is aware of the period that this instrument was used as the main TCCON instrument, this sentence has been changed to: *"This was the operational TCCON instrument from 20th June 2004 until 28th February 2010"*

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p.5, l. 23-24 – did you try other re-analysis? Why NCEP was chosen? What is a spatial resolution of the re-analysis product?

NCEP has been adopted by the TCCON in order to ensure that the retrievals at all of the sites in the network are consistent, as described in Wunch et. al. (2015). The reanalysis product has a T62 spectral resolution (approx. 210 km). Further details are available in Kalnay et. al., (1996).

p.5, l.25 -27 – do you refer to Chemistry Transport Model? If so, which one.

No, the empirical functions are scaled by the long-term trend for the species in question.

p.6, eq. 2- where does  $X(\text{H}_2\text{O})$  comes from?

The vertical column of  $\text{H}_2\text{O}$  is retrieved in GFIT by scaling and integrating the a priori profile from the NCEP reanalysis product.  $X\text{H}_2\text{O}$  is then derived by means of equation 1 in the manuscript in the same way as other species. *This has been clarified in the text following the equation. The sentence at p.5 l.25 has been changed from "A priori profiles of all retrieved species are generated..." to "A priori profiles of all retrieved species other than water vapour are generated".*

p.6, l.25 – please spell out SZA. How is this variable reflected in the final dataset?

*This has been expanded here and the definition removed at p.8 l.14.* The solar zenith angle is recorded for all retrievals in the final dataset.

p.7, l. 8 – spell out LSE

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This has previously been defined at p.5 l.15.

p.8, l 26 – space is missing between “error” and “e.g.”

*This has been corrected in the manuscript.*

p. 21 – please clarify what is meant with “standard error”

This has been changed to *“standard error (standard deviation of the sample mean)”* in the table caption.

p.26 – I do not think that data for 21 and 24/10/2013 should be excluded from the archive as they can be useful for other than climate studies applications. It would be better to have them included but properly flagged.

The data on these days had anomalous values for the Xair diagnostic, therefore the Xgas retrievals are also questionable. A more thorough investigation will be undertaken in due course and the data included in a future release if the retrievals are reliable. In any case, data from these days can be made available on request.

## References

Kalnay, E., Kanamitsu, M., Kistler, R., Collins, W., Deaven, D., Gandin, L., Iredell, M., Saha, S., White, G., Woollen, J., Zhu, Y., Chelliah, M., Ebisuzaki, W., Higgins, W., Janowiak, J., Mo, K. C., Ropelewski, C., Wang, J., Leetmaa, A., Reynolds, R., Jenne, R., and Joseph, D.: The NCEP/NCAR 40-year reanalysis project, Bulletin of the American Meteorological Society, 77, 437–471, doi:10.1175/1520-100477(1996)077<0437:tnyrp>2.0.co;2, 1996.

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Interactive comment on Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2017-60>, 2017.

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