

## ***Interactive comment on “Retrieval of CO<sub>2</sub>, CH<sub>4</sub>, CO and N<sub>2</sub>O using ground- based FTIR data and validation against satellite observations over the Shadnagar, India” by Mahesh Pathakoti et al.***

### **Anonymous Referee #1**

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The authors present and discuss data of column-averaged greenhouse gas abundances collected during several months with a high-resolution FTIR spectrometer in Shadnagar, India. The information about a new ground-based spectrometer operated at this site is a valuable information and deserves publication, but the observation period is too limited and the elaboration presented in my opinion needs extension.

Why are only data recorded between start of and mid 2016 taken into account? Is the observatory inactive since?

Although GFIT is used for the data analysis, a huge bias in XCO<sub>2</sub> versus OCO-II data is found (- 1.5%). I wonder whether the GGG suite and same retrieval setup is ap-

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plied as used by TCCON? If not, the analysis of GHGs should be repeated with the standardized TCCON code.

A presentation of XAIR instead of the current figure showing VCD of O<sub>2</sub> would be more useful for the reader for judging the level of stability achieved by the spectrometer. Presenting VCDs of other gases is also not too useful (XGas is the relevant quantity), so Fig. 3 could be removed.

I would suggest to include an intercomparison of the observed annual cycle with a model or climatological expectation for the variability of Xgas.

Detailed comments:

Abstract, line 31: not clear how the specified range of precision is established.

Introduction, line 45: consistently -> continuously

Introduction, line 55: should be: "their contribution to CH<sub>4</sub> emissions remains uncertain"

Introduction, line 67: The Petri et al., 2012 reference is hardly appropriate here.

Introduction, line 73: offer the potential

Introduction, line 79: a record . . . has been available

Introduction, line 83: measurements with high precision

Introduction section starting line 88: it might be useful to mention the COCCON network in this context, see Frey et al., AMT, 2019 and references therein.

Section2, line 115: cloud free conditions

Section 2, line 116: omit make, Bruker Optics

Section 2, line 136: DC signal recording

Section 2: Please specify the data source or instrument of the ground pressure values

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used for the data analysis

Section 3, line 151: The common code used by TCCON is GFIT, PROFFIT is used by several NDACC groups.

Section 3, line 156 ff: NDACC uses WACCM climatological profiles, the standardized GFIT TCCON analysis should not use this dataset.

Section 3, line 164: a priori

Section 3, line 177: omit “and O2”, instead state “...that affect the target gases (Washenfelter et al., 2016).”

Section 4, line 188 ff: preferably discuss XAIR, not VCD (O2), as the latter quantity varies with ground pressure.

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