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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Study of the footprints of short-term variation in XCO_2 observed by TCCON sites using NIES and FLEXPART atmospheric transport models" *by* D. A. Belikov et al.

Anonymous Referee #1

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The authors presented a very interesting approach for selecting the colocated satellite XCO2 retrievals according to the sensitivity footprint of each TCCON site. Overall the paper is well written, and should be published after minor revisions.

Major comments:

The authors used a trajectory model to calculate the sensitivity of a given TCCON observation (more exactly the boundary layer concentrations) to the emissions from neighbouring regions. Then they determined the 'footprint' of the TCCON site by choosing model cells with sensitivity above some predefined levels. My opinion is that such a simple definition may has some obvious issues:

1) Model cells with similar sensitivity do not necessarily make similar contributions to the observed TCCON column, because they can have some rather different emission/uptake strengths (for example one cell over ocean, and another may over land).

2) The boundary layer concentrations are only part of the retrieved XCO2 columns. As a result, the satellite XCO2 observations selected according to the TCCON 'footprint' may still have large spread. I think as a result, there is no significant reduce in the standard deviation when compared to other approaches (Tables 4-8).

Minor comments:

1. Line 2-3, Page 4: 'within $\pm 30^\circ$ longitude, $\pm 10^\circ$ latitude, ± 5 days, and ± 2 K of the selected TCCON location' ,

As 5 days have been mentioned, 'location' may not be a proper word.

2. Line 11, Page 4: 'Limitations of the techinks !!! ' Please delete it.

3. line 28, Page 8: 'dimensions of $2.5^\circ \times 2.5^\circ$, $\pm 5.0^\circ \times \pm 5.0^\circ$, ...',

Change $2.5^\circ \times 2.5^\circ$

4. Line 3, Page 11: '...are within 0.81–0.93 ppm',

remove 'ppm', as correlation coefficients have no unit.

5. Line 13-15, Page 11: 'The dry season (May to September), the build-up season (high humidity, but little rain: October to December) and the wet season associated with tropical cyclones and monsoon rains (December to April).',

Not a complete sentence.

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