

Earth Syst. Sci. Data Discuss., referee comment RC1  
<https://doi.org/10.5194/essd-2022-215-RC1>, 2022  
© Author(s) 2022. This work is distributed under  
the Creative Commons Attribution 4.0 License.

## Comment on **essd-2022-215**

Anonymous Referee #1

---

Referee comment on "Carbon dioxide cover: carbon dioxide column concentration seamlessly distributed globally during 2009–2020" by Haowei Zhang et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2022-215-RC1>, 2022

---

<General Comments>

Long-term and regional scale monitoring of CO<sub>2</sub> from space is important for understanding climate changes. Satellite can cover globally but clear sky ratios vary much region by region. Spatial-temporal technique are useful. However, I found several critical issues in this paper. I recommend resubmission.

(1) GOSAT sampling pattern and CO<sub>2</sub> density enhancement over large emission sources

The GOSAT sampling pattern consists of grid observation and target observation. The sampling pattern is not uniform. GOSAT is targeting global megacities which shows local enhancement. Over the ocean, GOSAT is tracking the specular reflection points of the sun, of which sampling pattern is not grid. Authors should describe in more detail how to use these data for analysis.

(2) GOSAT data source

I do not understand why authors use the NIES level 3 products.

Level 3 products are spatially interpolated already. As mentioned in (1), they are

problematic. There are several Level 2 GOSAT products other than NIES such as ACOS, RemoTeC, University of Leicester, and JAXA. Why do authors use NIES products? There is no product defined as "official".

<Specific Comments>

(1) 2.2 validation data TCCON

When the authors use the multi-year data in TCCON comparison, the coefficient of determination becomes too good. The annual growth of global CO<sub>2</sub> density should be removed for the analysis. The deviation and bias of matched up data should be presented.

(2) 2.2 Validation data: OCO-2 Level 2 product

The version of the OCO-2 level 2 products should be described. Older OCO-2 products have topography dependent bias. The difference in footprints of GOSAT and OCO-2 creates errors.

<Technical Corrections>

(1) Page 15 Table 1

Is the unit of RMSE ppm?

(2) page 19, Figure 2

The branching of left and right should be described.