

Interactive comment on “The Open-source Data Inventory for Anthropogenic Carbon dioxide (CO₂), version 2016 (ODIAC2016): A global, monthly fossil-fuel CO₂ gridded emission data product for tracer transport simulations and surface flux inversions” by Tomohiro Oda et al.

Anonymous Referee #2

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Summary: The authors present the new ODIAC2016 gridded (1deg by 1 deg), global, monthly FFCO₂ emission dataset and the underlying ODIAC V3.0 emission model. The ODIAC model relies on multiple open-source datasets to improve the existing emission inventory provided by CDIAC. The specific target is to provide a better spatial and temporal disaggregation of sources (using e.g. nightlights, gas flaring, bunker fuel statistics), which is a critical improvement, if this dataset is to be used in atmospheric transport models or large scale inversion systems. The authors discuss the construc-

tion of the new emission model and its limitations. The study is well-written and the scientific methods chosen are sound. Despite the large amount of processes captured, the paper is quite comprehensive in its description, but should focus more on one critical point its discussion – the vertical disaggregation of emissions in ODIAC v3. This will be highly relevant for regional scale atmospheric transport modellers, but can be easily added to the existing manuscript. If this general comment and minor comments are addressed, I fully recommend the publication of the manuscript and would assume that this dataset is of extraordinary interest to the community of regional and global GHG modellers as it is unique in its approach and of high quality. General comments: The section on spatial disaggregation fails to clearly address the issue of emission heights. Aviation emissions are distributed according to AERO2k but are then aggregated to a single layer – but at which height? Especially, for Northern Canada, where emissions increase by 5 orders of magnitude in some regions in ODIAC2016 compared to CDIAC the chosen injection height might be critical. Furthermore, it is unclear which emission height is assumed for flares and point sources – the impact on regional scale models could be significant. This should be discussed more clearly. Specific comments: Caption figure 1: ‘ODAIC 3.0’ -> ‘ODIAC 3.0’ P3 L43: please be more specific – ‘timely manner’ = we can expect annual release of updates to ODIAC2016? P6 L17: ‘carbo’ -> carbon P7 L11: The product discussed in this manuscript has 1deg by 1deg resolution according to P4L32, but section 4 is not always explicit about the resolution of the disaggregation (or this is sector specific). I assume 1km by 1km was used for some sectors and then a re-aggregation to 1deg by 1deg was performed for the global ODIAC2016 product? P7 L13: Please specify at which resolution the data was disaggregated here P7 L18: Needs details on what is considered a point source (only data from a specific database or a emission rate per site?) and what is a non-point source. P7L29 indicates that non-point source is the default category for point sources that cannot be correctly located. P7L36: What happens to other emissions in flare pixels? What is the impact of overlaps of urbanised area nightlights and O&G extraction regions e.g. in the Barnett shale (Dallas-Fort Worth region) or Niger Delta? Is this a potential bias or

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insignificant? P8L10: 'we does not' -> 'we do not' P8L24: was this climatology based on external driver (e.g. correlation of seasonal emission changes with seasonal temperature changes/anomalies) or just mean seasonal cycles of emissions for the years 2000-2010? A recent study by Breon et al. suggests a significant impact of temperature anomalies on FFCO₂ emissions (<http://iopscience.iop.org/article/10.1088/1748-9326/aa693d>) and we could expect an impact on seasonality of emissions from this as well. Fig2. Refers to CDIAC/GLB+projection while Table 1. Ignores this and shows ODIAC2016 in comparison to the three others. Please consider removing this inconsistency. Fig3. Caption: 'top 20 emitting' -> top 10 emitting Figure 6 and 7: I assume the caption or colour scale is wrong here and units are NOT 'The units are tonnes carbon/year/ cell (1×1 degree)'

Emissions of 1 tonne carbon/(a*cell) a 1deg by 1deg grid cell seem extremely unreasonable. Additional suggestion: Show a histogram of differences between ODIAC and other inventories here (or in appendix).

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