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Atmospheric Measurement Techniques Discussions

Interactive comment on "Ensemble-based satellite-derived carbon dioxide and methane column-averaged dry-air mole fraction data sets (2003-2018) for carbon and climate applications" *by* M. Reuter et al.

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Reuter et al. describe the new Ensemble Median Algorithm (EMMA) XCO2 and XCH4 data products. The products provide consistent long-term Climate Data Records (CDRs) for these two Essential Climate Variables (ECVs). Observations by SCIAMACHY/ENVISAT, TANSO-FTS/GOSAT and OCO-2 have been used spanning 2003-2018, monthly at 5°x5°. I agree with the assessments of the other two reviewers that the paper is generally well-written with nothing too contentious or surprising in the results, but I have a few comments that I would like to see addressed before acceptance

for publication.

The most substantial issue is the need for clarification on bias-correction. On Table 1, the NIES data v02.75bc is described as bias corrected. Are the other data products bias corrected or not? ACOS v9.0.03 for OCO-2 primarily differs from v8 with respect to bias correction (but also filtering) so this fact should be clarified. If the OCO-2 data have been bias corrected, the citation Kiel et al. (https://www.atmos-meas-tech.net/12/2241/2019/) should also be added to Table 1. I understand that a global bias correction is applied in the EMMA method (as shown for Figure 5), but whether each individual XCO2 or XCH4 data set has any other bias correction applied first needs some clarification. Figures 1 and 2: The thumbnail global XCO2 and XCH4 maps as presented have little value other than to show the spatial coverage, which itself varies widely over a 6-month period due to seasonal factor. With separate color scales for 2003 and 2018, instead of a 60 ppm XCO2 scale and 240 ppb XCH4 scale, at least some more spatial variation for each map would be conveyed. That's my opinion, but it is really up to the authors.

Figures 5 and 6: a horizontal solid or dotted line at zero would provide a useful reference point to improve the readability of these figures. Figure 9 caption: outside of the high latitudes and Tropics, the Himalayas also seem to be an area of significant scatter. Figure 11: The label "NASA v9.0.03" should probably be revised to "OCO-2 v9.0.03".

Other things: Line 139: "is currently is" -> "is currently" Line 206: "than" -> "then" Line 248: "collocation" -> "co-location" Line 303: recommend removing "a special observation mode, namely" since glint is not really that special. For OCO-2 it accounts for well over 50% of the data. The lack of SCIAMACHY glint capability is already elaborated upon later.

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