

Interactive comment on “Global XCO₂ anomalies as seen by Orbiting Carbon Observatory-2” by Janne Hakkarainen et al.

Anonymous Referee #1

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The authors present global anomaly maps of the CO₂ column in the atmosphere from measurements of the OCO-2 satellite. They show that the main characteristics of the maps (coherent signals from year to year, positive anomalies in the presence of surface emissions, negative anomalies in the presence of surface sinks) are consistent with current model simulations. They could also have noted that they are all consistent with the XCO₂ literature (e.g., Olsen and Randerson, 2004, doi:10.1029/2003JD003968; Keppel-Aleks et al. 2011, doi:10.5194/acp-11-3581-2011, 2012, doi:10.5194/bg-9-875-2012, etc.), and even with the OCO-2 literature (e.g., Eldering et al., 2017a,b, doi:10.5194/amt-10-549-2017, doi:10.1126/science.aam5745 and references therein). In this context, the aim of the authors is not clear: is their paper the presentation of a teaching material, a new evaluation of the OCO-2 XCO₂ retrievals, a statement that no

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more discoveries are expected on XCO₂ from OCO-2? The authors must clarify and justify their message.

Minor points

- p. 3, l. 10: repeated from p. 2, l. 30.
- p. 3, l. 15: looking at Wunch et al. (2017, Table 3) the plural to “differences” is not justified and should be replaced by a singular (the median differences among the sites may be greater than 0.4 ppm and the RMS differences among the sites may be greater than 1.5 ppm). In fact, site-level statistics would be more relevant here than global figures alone, because the authors examine spatial gradients rather than average levels.
- Figure 1: the area definition for the background estimation is missing.
- p. 4, l. 5: The authors explain that the independence of their estimate to *a priori* fields is a strength, but why does this independence matter in what is presented? Would this still be a strength if some *a priori* field was more accurate?
- p. 9, l. 2-3: do all inverse modeling systems estimate scaling factors to fluxes? I would have thought they estimate simple flux increments.
- p. 9, l. 8: very attractive for what?
- p. 9, l. 11: need to quantify “very sensitive”.

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