

Interactive comment on “Towards space based verification of CO₂ emissions from strong localized sources: fossil fuel power plant emissions as seen by a CarbonSat constellation” by V. A. Velazco et al.

Anonymous Referee #2

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Review of paper by Velazco et al “Towards space based verification of CO₂ emissions ...” for publication in AMT.

The paper by Velazco et al investigates three different satellite configurations of the proposed CarbonSat and their ability to verify annual emissions from large power plants. Hourly emission data from several power plants in the United States are used, along with a transport model, to simulate these hypothetical measurements. The work builds on an earlier paper by Bovensmann et al that quantified the systematic and random

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error components for a single overpass. Velazco et al extend this work to annual emissions from a single CarbonSat and a constellation of 5 satellites in 2 different configurations.

Data from four US power power stations provide the data base from which a simple statistical analysis is used to conclude which configuration of the three studied gives the best outcome in terms of reducing the systematic and random error components.

The paper is well written, clear and concise. The original aims of the work are quite consistent with the stated summary and conclusion. All tables and figures are well presented. Therefore this paper is acceptable for publication in AMT subject a few very minor corrections as listed below.

1. Page 3, line 9: accross => across
2. Page 3, line 35: “... in 2009, unfortunately, ...” => “... in 2009, but unfortunately, ...”
3. Page 4, line 12: “...2018 earliest.” => “...2018 at the earliest.”
4. Page 8, equation 4: the assumption of data independence for configuration 1 and 3 is reasonable given that any air parcels after a day would have moved on as it were. But what about configuration 2, with 5 measurements 2 hours apart? What effect might a 2 hour correlation length make in the first one or two off-diagonal elements?
5. Page 9, line 13: This sentence might read a bit better thus; “The reason for this, in this example, is that the ...”
6. Page 9, lines 22-27: the night – day bias is mentioned here, while the cloudy – clear bias is also quantified at 3%. Given the data, is the bias in the night – day data of about 0.8 Mt CO₂/yr (by inspection of the reported numbers earlier on this page) at all consistent with what might be expected from sampling only during the day? Or maybe there is no independent way of doing this as presumably this is reflected directly from the emission data at hand. This former bias is around 3% as well so it is interesting

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that this bias is consistent with quite different sampling intervals.

7. Page 11, line 20: "...coverage is important, such as for ..." => "...coverage is important for ..."

Interactive comment on Atmos. Meas. Tech. Discuss., 4, 5147, 2011.

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