

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 #1

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This paper presents an analysis of the capabilities of a spaceborne observation system for the monitoring of CO₂ emissions by large power plants. The Carbonsat mission has been pre-selected by ESA, together with another concept, after the Earth-Explorer-8 call for proposals. It is certainly interesting to perform a quantitative analysis of the mission capabilities. The paper is straightforward. The data that are used are well described, the hypothesis are clearly presented and the conclusions are well in-line with the results. The paper can therefore be published with limited changes.

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The paper lacks a proper analysis of the current uncertainties of these power plant emissions. Although several references are provided, I did not feel they provide a valid information for comparison: At several places in the paper, the author cite (Peischl et al, 2010) to support an uncertainty of around 14%. First of all, this value is for hourly emissions, whereas the paper focus is on yearly emissions, which makes the comparison difficult, if not impossible. In addition, the 14% is derived from the MAXIMUM difference of 10% for both flow rate and concentration. There is a confusion between a maximum difference and a statistical (one sigma ?) error. Because 10% is a maximal error, and not a standard deviation (with a Gaussian assumption), one cannot conclude on a 14% combined uncertainty. The authors also cite Ackerman and Sundquist (2008) to quote a “up to 25%” difference in various datasets. It is rather misleading to provide a maximum difference to a random (one sigma) error when the paper cited provide much smaller numbers that quantify the statistical difference between various estimates. Finally, the authors cite Evans et al. 2009 to quote a bias of up to 20%, but the reference is a presentation at a conference that is not accessible.

Other comment In equation 3, 4 and 5, the authors provide their method to compute the random errors. Their presentation is based on a classical matrix approach. However, as they neglect all correlations (off diagonal terms in the matrix), their presentation is unnecessarily complicated. They could just write that $\text{VAR}(E) = \text{SUM}(\text{VAR}(E_i))/n^2$,

Figure 2 does not show the expected weekly cycle. Emissions on Saturdays seem to be larger than on Mondays, that looks very much alike sundays. Please comment.

In the abstract, only the systematic errors are reported. A mention of the random errors could also be useful.

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

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