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Interactive comment on "Anthropogenic carbon dioxide source areas observed from space: assessment of regional enhancements and trends" *by* O. Schneising et al.

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Overall, this is a methodologically solid, stylistically accessible, and refreshingly concise paper that addresses a relevant scientific question well within the scope of ACP: How well can satellite remote sensing CO2 measurements constrain the location, magnitude, and changes of anthropogenic emissions? This issue is significant because space-based measurements are increasingly considered as a possible major contributor to global systems for monitoring, reporting, and verification of policy implementation for reducing greenhouse gas emissions.

The authors do a nice job of demonstrating how well one existing data set (SCIA-

MACHY) can detect regional industrial CO2 emissions, and illuminating some of the potential uncertainties in doing so. This is no mean feat, as they need to do extensive data manipulation to minimize apparent biases and extract significant signal levels even for large, intense emission regions.

The use of the SCIA CO2 and application to the regional emission problem is novel, the methods are clear and valid, references appropriate, and the results are substantial, although perhaps a bit sobering. My only presentation request would be to make the 'delta' figures somewhat larger as they are difficult to see even on-screen.

A couple comments to consider for the final paper: P. 31511, clarify that 'altitude in km' is the altitude of the observed surface. P. 31515, expand the discussion of how the linear regression compensates for retrieval errors due to aerosols since there is no direct aerosol term in Eq. 1. Does this come in through the radiance term or elsewhere? Is this compensation to be expected for other space sensors. Also, how good is the bias correction expected to be for the Yangtze since conditions may be quite different from the 8 sites for which the correlations are derived.

Finally, a comment on the implications of this study for future measurements and analyses seeking to establish a scientific basis for policy assessment: there is currently a huge gap between what the science can provide and what the policy user needs are likely to be. This paper's admirable analysis says that the existence of major emitters can be detected from space (at SNR $\sim$ 2). The requirement, however, for detecting relatively gradual changes (e.g., 10%/ 10 years) and attributing them to the scale of small countries/cities/sectors is going to be much more difficult to achieve. Proposed future space sensors will be more capable and more precise, but this problem is not going to be solved by foreseeable satellite CO2 measurements. It will require a network, perhaps constellation, of in situ and remote sensing; emission-point, ground, aircraft, and space-based measurements; and a multi-scale analysis system that is well-beyond current capability.