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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Estimating surface CO_2 fluxes from space-borne CO_2 dry air mole fraction observations using an ensemble Kalman Filter" *by* L. Feng et al.

Anonymous Referee #1

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This paper is a worthwhile and well-constructed analysis of how retrievals from the Orbiting Carbon Observatory (OCO) might affect uncertainties in inverse constraint of surface sources and sinks of carbon dioxide.

Taking pre-launch estimates of error in retrieved CO2 from OCO, the authors have constructed simulations of inverse modeling experiments to evaluate the expected reduction in errors of CO2 fluxes, as well as sensitivity studies to examine the impact of ensemble size, resolution of state vector, and instrument scan pattern (nadir vs. glint observations).

The authors consider several different variations on the inversion experiment. However,

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the basic structure of the experiment, in which a relatively small state vector is the target of the inversion, is a legacy of experiments using the in situ measurement network. The work in this paper is important, because it provides a concrete prediction on the error reduction achievable by the introduction of new data into an old experimental framework. However, the OCO data may be capable of more than this study suggests, within a framework designed to capitalize on the greatly improved spatial coverage of the OCO measurements. On the other hand, the estimates of data availability and observation uncertainty used in this study may prove to have been optimistic, and so this work will remain a useful reference point to determine if the satellite observations are truly performing up to specification.

The results presented here will attract far more interest from the broader community once the satellite is actually launched. Prefatory studies such as this one are, however, important to describe what scientists expect to achieve with a new observation, if everything goes as planned.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 19917, 2008.

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Interactive Comment