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Interactive comment on "Feasibility for detection of ecosystem response to disturbance by atmospheric carbon dioxide" *by* Bjorn-Gustaf J. Brooks et al.

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We thank the reviewers for their well-thought-out comments, both of which provide some nice guidance for our reworking of this manuscript and items that would increase its usefulness to those in the inversion community. The important criticisms come down to the basic outlay of our study. This reply will explain a few reasons for our choice of this particular experimental design as opposed to a fully comprehensive design that might have yielded more applicable results to inversion modelers.

In the study we evaluated the potential of one method for detecting carbon-cycle anomalies through a framework that included artificial flux anomalies and forward simulations for calculating anomaly concentrations. A primary concern for this approach

raised by the reviewers is that it does not account for uncertainty arising from confounding biospheric fluxes and the lack of consideration about how these propagate through inversions. Consequently it is hard to consider the results as a fully-comprehensive or real-world applicable diagnosis of detection capacity. The approach we used fed several imposed anomalies through already-available model output data to fetch disturbance magnitudes. While this "off-line" approach using model output and MDM thresholds does not have the same rigour as would a full propagation of sources of error through new inversions, it does nonetheless provide some interesting details about the priority of factors controlling anomaly sensitivity including CO2 station location and seasonal variability in transport. Although perhaps not so broadly useful to all readers these results do tell us something about these stations and biosphere atmosphere carbon exchange in the mountains.

Another primary concern apparent from both reviews was the "excessively artificial" nature of some of these simulated experiment scenarios. While it is true that these were quite artificial, we did carefully describe all the assumptions that went into each scenario (e.g., uniform flux anomaly, prototypical drought). Consequently we acknowledge that the results can't be used to answer questions about whether the signal from actual droughts should be represented in the retrieved fluxes covering that area. Creating a truly believable drought was not our intent, but we did want to examine the effects of hypothetical droughts with readily-available data sets, albeit given several important assumptions. Although our results were not able to determine the true drought sensitivity of these CO2 stations we were able to evaluate the extent to which readily-available data sources (e.g., retrieved fluxes, footprints, site uncertainty estimates) could be used to characterize site sensitivity to disturbance.

Taking everything into account the assumptions we made framed the study too far from real-world application to be useful to a broad audience. The reviewers input has been very helpful in illuminating that. For the time being we will stop work on this study while we plan how to refocus the experimental setup such that it balances the interest of a

broad audience, including inversion modelers, while still providing useful information to the instrumentation community such as why a specific sensor precision might be necessary. Again, we kindly thank the reviewers for their time and effort.

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