Atmospheric
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# *Interactive comment on* "Characterization of uncertainties in atmospheric trace gas inversions using hierarchical Bayesian methods" *by* A. L. Ganesan et al.

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This manuscript describes an enhanced method of calculating consistent uncertainties in Bayesian inversions of surface sources. It extends previous formulations to include the uncertainty in the hyperparameters (such as scaling factors for uncertainties and correlation scales) in the uncertainty of the resulting fluxes.

This manuscript was a pleasure to review. It is rare that I find a new paper almost unimprovable. I could certainly find areas where the work can be extended but these should be taken up in future rather than delaying the current manuscript. In particular,

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the current work addresses a small problem where the Monte Carlo techniques used for hyperparameter estimation are feasible. This isn't generally the case for the large or very large problems we usually encounter. It would be very useful to explore what approximations are both feasible and maintain most of the advantages of the method described here. I am happy to recommend the paper be published in present form.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 33403, 2013.