Geoscientific
Model Development
Discussions

Interactive comment on "Atmospheric inverse modeling with known physical bounds: an example from trace gas emissions" *by* S. M. Miller et al.

Anonymous Referee #1

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The manuscript by Miller et al. investigates several approaches on how to deal with constraints in atmospheric inverse problems. It is important to include the known physical bounds when estimating emissions or fluxes not only to avoid meaningless results (i.e. negative emissions) but also to obtain realistic uncertainty estimates. Two Markov Chain Monte Carlo (MCMC) methods are compared with the method of Lagrange multipliers and data transformation. The manuscript is clearly structured and well written. I would recommend its publication in GMD after some minor corrections. Specific comments are given below.

Specific comments:

P4532 L11-12, P4549 L26-27 I don't think this is the first application of MCMC to estimate atmospheric trace gases. Please remove this comment.

P4532 L17-19 I don't agree that Lagrange multipliers offer a real alternative to MCMC methods. As far as I understand Lagrange multipliers are only able to provide a best estimate but not an estimate for the uncertainties. Therefore they are not an alternative. Please reformulate this sentence.

P4537 L18-19 Why can you only enforce a single upper or lower bound that is the same for all elements in s? Surely it must be possible to use different transformation methods for different parameters.

Could you please provide a better overview in terms of the computational requirements (i.e. number of iterations) for each method?

Interactive comment on Geosci. Model Dev. Discuss., 6, 4531, 2013.