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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Global inverse modeling of CH_4 sources and sinks: An overview of methods" *by* Sander Houweling et al.

Anonymous Referee #1

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General comments

Paper reviews the current state of methane flux inverse modeling. The historical prospective is also presented. The paper is well written and can be published after rather minor revisions.

Detailed comments.

Page 10 Line 11. Authors refer to Monte Carlo application of the variational approach as a method of choice for uncertainty estimates and note that it is computationally demanding. It should be mentioned that Meirink et al (2008b), see Eq. 8, presented an analytical method for uncertainty estimates, that uses singular vectors retrieved during a single run of iterative optimization process, instead of multiple runs required in randomization approach.

Page 11 Line 6. It is difficult to understand how the use of radiative transfer model in inversion in place of using retrieved profile and averaging kernel matrix would make analysis simpler. The problem of altitude dependence of observed signal, which is different between carbon dioxide and methane, is not going away after incorporating retrieval process in inversion.

Page 15, Line 5. Authors write: "Measurements of the vertical profile of CH4 may further improve the separation between surface sources and atmospheric sinks." This appears as overstatement. As authors admit in the same paragraph, the OH sink-related gradients in troposphere are too small to measure.

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