Atmos. Chem. Phys. Discuss., 8, S5829–S5830, 2008
www.atmos-chem-phys-discuss.net/8/S5829/2008/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Technical Note: Four-dimensional variational data assimilation for inverse modelling of atmospheric methane emissions: method and comparison with synthesis inversion" *by* J. F. Meirink et al.

Anonymous Referee #1

Received and published: 12 August 2008

General comments

This technical note illustrates the possible move from analytical optimal estimation to the more sophisticated (but mathematically-equivalent) variational optimal estimation. The topic is illustrated with an example from the inversion of methane fluxes. This well-written paper should be published, provided the minor points listed hereafter are clarified.

Specific comments

p. 12025, l. 15-24: the paragraph suggests that 4D-Var does not use the adjoint technique, which is not correct.

p. 12028, l. 8: with 64-bit computations, one may expect machine precision to be much smaller than 10^{-14}.

p. 12032, l. 19: defining the representativeness error based on model gradients makes the error increase with increasing resolution. This is not appropriate.

p. 12033: l. 23-25: does this 2.5 factor make sense? For instance, the wetland error is 80

p. 12038, l. 18-19: this diagnostic does not indicate whether the assimilation is optimal, but whether it is **not** optimal, i.e. measurement and prior errors have been **im**properly set. Last, measurement and prior errors should not be set relative to each other, they exist independently.

p. 12038, l. 25: the equivalence between Eq. (12) and Eq. (13) only holds when the system is optimal, which is not the case here.

p. 12041, l. 5-9: such an advantage can only be obtained with a non-diagonal R matrix, that has to be inverted. This is not trivial.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 12023, 2008.

ACPD

8, S5829–S5830, 2008

Interactive Comment