

**Review of Lloveridge et al. paper “Retrieving 3D distributions of atmospheric particles using Atmospheric Tomography with 3D Radiative Transfer – Part 2: local optimization” submitted to AMT**

The paper evaluates the tomographic retrieval described in detail in part 1. The software package Atmospheric Tomography with 3D Radiative Transfer (AT3D) is publicly available. In the paper AT3D applies to synthetic measurements (10 stochastically generated cumuliform clouds) with a known truth. This is a fundamental paper that deserves to get published in AMT. I enjoyed reading it, and I am sure it will be well cited. The only concern I have is that this manuscript is too long and requires a lot of time and affords to get through. I would recommend dividing it in two parts: methods and results. It will help to get more readers. Anyway, it is up to the authors to make the decision.

**Some Minor Suggestions**

Pg. 2. Give a reference to Evans (1998) when mentioned SHDOM the first time.

Pg. 4-5. Comparing Eqs. (1) and (3), I don't see the derivative  $dR/da$ . How to compute approximate Jacobian? Why does it accuracy degrade with more isotropic phase function?

Pg. 6. Please provide an example of the smallest and the largest singular values for a typical ill-conditioned (optically thick clouds) problem.

Pg. 10. Stochastically generated clouds used to be more popular, e.g., Cahalan et al., 1989; Lovejoy, 1992.

Pg. 11. Did you use other that  $-5/3$  exponents? Provide a reference, e.g., [\*Lovejoy, S., D. Schertzer, P. Silas, Y. Tessier, D. Lavallée, 1993: The unified scaling model of the atmospheric dynamics and systematic analysis of scale invariance in cloud radiances. Annales Geophysicae, 11, 119-127.\*](#)

Pg. 12. I would recommend replacing Fig. 2b with a more informative one, at least with color scale.

Pg. 14. Please define  $\|\cdot\|_1$  and  $\|\cdot\|_2$  in Eqs. (6) and (7).

Pg. 14. Please define again what is *Noisy-GT* here or use *Noisy-GroundTruth* instead.