Atmos. Chem. Phys. Discuss., 7, S1919–S1920, 2007
www.atmos-chem-phys-discuss.net/7/S1919/2007/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Turbulent vertical diffusivity in the sub-tropical stratosphere" *by* I. Pisso and B. Legras

Anonymous Referee #3

Received and published: 18 May 2007

This paper uses a comparison between vertical profiles of ozone observed by instrumented balloon and profiles reconstructed by noisy backward trajectories to estimate the vertical diffusivity at (one point of) the subtropical stratosphere. It also provides some evidence that sharp gradients in ozone concentration can be associated with large values of finite-time Lyapunov exponents.

The paper is clear and interesting. I have only few minor comments. The main one concerns the interpretation to be given to the values found for the vertical diffusivity. Indeed, it is not clear to me that the smoothness of the observed ozone profiles can be entirely attributed to cross-isentropic mixing caused by 3D turbulence. Horizontal motion unresolved in the winds used for backwards trajectories (and with no vertical counterpart) also causes vertical smoothing. The aspect ratio of the atmosphere

makes horizontal mixing much less effective than vertical mixing, of course, but the much larger horizontal kinetic energies could compensate for this. I wish the authors comment on this and perhaps quantify the vertical smoothing effect of unresolved horizontal motion.

Minor points

p04, l9: An upper bound.

p09, (3)-(5): These equations are not used and could be omitted. (And \rho is not defined.)

p12, l10: The time filtering applied is not clearly explained. Please expand.

p17, l13: Reference is incorrect: should be Giorgilli instead of Giagilli.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 6603, 2007.