

## ***Interactive comment on “Variability of the Lagrangian turbulent diffusivity in the lower stratosphere” by B. Legras et al.***

**B. Legras et al.**

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1. The Referee correctly points out the lack of comparison with previous results of Waugh et al. and Haynes & Balluch. We have added in the revised manuscript a study of two cases from the AASEII campaign studied by Haynes & Balluch. The results are basically that diffusion of the order of 0.1 is observed outside the polar vortex but that structures exhibiting low diffusion are also present in this domain, so that we do not disagree with Haynes & Balluch. See the final discussion of the revised manuscript for more details.

The difficulty in interpreting Fig.10 (previously 9) is that the exterior slope of the sheet is definitely too smooth to be accounted by  $D = 0.01$ .

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2. We have split Fig.5 in four panels as suggested by the Referee showing separately the action of  $D$  and  $p$  and we now describe the algorithm with greater details. The improvement with respect to the previous version of roughness used in Legras et al. (2003) is that by using shifted envelopes we get rid of the more or less ad hoc pre-filtering which was previously required. Now can now use raw data in our analysis.

3. The figures have been tailored to have a nice appearance using the EGU format suited for the final ACPD version, which uses a fairly standard portrait A4 PDF layout. Unfortunately, ACPD on line version uses another layout in which each figure is stacked with its caption on a single landscape page. This means that large figures, which also have proportionally large captions, may be squeezed to post-stamp format. Moreover, EGU does not provide any tool to help the authors to prepare figures to fit this format. It would be, anyway, too complicated and confusing to make two sets for the same figures. We have, however, split the biggest figure in two parts and reordered panels in all figures in a more consistent way. We have also dropped some of the intermediate times in Fig.3

Other comments

- The expression "that circumventing" has been replaced by "in"
- A uniform random variable in the interval  $[-\sqrt{3}, \sqrt{3}]$  has variance unity.
- The time  $\tau$  is fixed from the availability of REPROBUS outputs. In the initial version of this work we had only those outputs for a limited number of dates.
- Lyapunov exponents are only calculated for the purpose of comparison with diffusive properties. Studying their distribution inside and outside the polar vortex is a matter which is beyond our scope for this work. Moreover, Lyapunov exponents are highly intermittent and the number of points along a flight track is too small to provide a reliable estimate of the pdf.

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- The Referee is certainly right in mentioning that isentropic calculations are less sensitive to the resolution of the wind since spurious gravity modes are dominated in the horizontal by the geostrophic wind.

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Interactive comment on Atmos. Chem. Phys. Discuss., 4, 8285, 2004.

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