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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Role of vertical and horizontal mixing in the tape recorder signal near the tropical tropopause" *by* A. A. Glanville and T. Birner

Anonymous Referee #2

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The discussion between reviewer #1 and the authors has been interesting as well as instructive, and I would like to comment on some of the topics. First, the neglect of dehydration should be an acknowledged drawback but it does not invalidate the analysis to the point that the paper should be rejected. It cannot be the root cause for finding very large vertical diffusion except during 3 months of the year.

By definition, dehydration is always a negative tendency in the water vapor budget. Thus, the vertical mixing term will be overestimated only when the mixing tendency is negative in the model, which is during Nov-Dec-Jan. For a full eight months out of the year (March-October), the mixing tendency is positive; neglecting dehydration would lead to an underestimation of mixing, so the resulting large vertical mixing values for

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March-October are not an artifact from this.

A realistic accounting of dehydration in this simple model is probably not feasible. Moving the analysis to higher altitudes might help reduce any impact from dehydration, but there is also a need for understanding what is going on at 80 hPa and I would argue that the results for March-October are interesting enough in their own right. There is no need for “extraordinary claims” nor extraordinary evidence, but there is sufficient evidence for the potential importance of vertical mixing in the tropical lower stratosphere.

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-312, 2016.

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