

Dear Adrienne Jeske and Holger Tost,

thanks for the replies to my comments and the revisions.

I really appreciate the better clarity regarding the altitudes/model levels in the new version.

In this review, I will only focus on the discussion regarding the changes in CVTRANS, as your current argumentation does not convince me, and given that also the second reviewer asked for validation.

One thing that strikes me when reading the revised manuscript is, that CVTRANSturb first gets mentioned in ~line 170, but it is not described in detail how this is different from CVTRANSnew other than that it has 'enhanced turbulence'. From your review replies, I got the impression, that correcting the physics of CVTRANSold actually leads to CVTRANSturb, and that you then apply some sort of 'damping' to make it CVTRANSnew = a model that does not diverge 'too much' from the original version.

*"We avoid large changes in the simulation results by using CVTRANS 3.0 with relatively small turbulent mixing and not using the version CVTRANSturb"*

Thus, you actively tune the model to not diverge much from the old version? Thus, the 'correct physics' (you were aiming at correcting the physics?) would be in CVTRANSturb? So this is where I feel that some validation should be in place, more than "in comparison to the old version", plus explanation of what exactly the 'enhanced turbulence' is, or whether it is rather 'dampened turbulence' in CVTRANSnew. When CVTRANSturb is the version with 'correct physics', I would like to see a discussion of why the mixing then is too strong (if it is too strong, this would need to be shown in a validation).

If you did not want to change the results of CVTRANS in the first place, it becomes unclear, what the meaning of changing it then is?

Additionally, maybe the colour scales are misleading, but for instance looking at Fig. 3a) and 3b) I can see significant differences. Fig. 4 on the other side, fails to show these differences, e.g. below the diagonal, also almost nothing for the change in upper right corner above diagonal in 4a) – isn't the transport here even mentioned in the abstract? I would expect a discussion about the differences here then, and to actually see them in the Figure.

In conclusion, I think that a more convincing discussion around the different model versions and their validity is needed (including CVTRANSturb), and I hope that my issues with the current description became more clear now.