Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2018-1199-RC3, 2019

Atmospheric Chemistry and Physics Discussions

Interactive comment on "From ERA-Interim to ERA5: considerable impact of ECMWF's next-generation reanalysis on Lagrangian transport simulations" *by* Lars Hoffmann et al.

Anonymous Referee #3

Received and published: 1 February 2019

This work is a very useful comparison of the transport properties of the new ECMWF reanalysis ERA5 compared with the ERA-I and should help in popularizing the usage of ERA5. There are, however a few points that need improvements or clarifications as listed below

1) I am unsure that the description of meteorological condition during 2017 is relevant to the scope of this work. This subsection and the two figures 2 and 3 are not exploited in the sequel and are only distracting.

2) I am also unsure that the details of disk storage at FZJ in 2.2.2 are of public interest if the ERA5 deposit is only for internal usage.

3) The dispersion of parcels by diffusion is effective only over a couple of days. The subsequent dispersion is due to the explicit wind shear and strain of the resolved eddies. This needs to be clarified with the help of figure 5. Actually, it seems that we see several regimes in figure 5: a diffusive regime with a sqrt(t) behavior (that generates diverging RVTD at small t), an exponential regime characteristic of chaotic dispersion and a linear regime due to large eddy dispersion.

4) The very good conservation of the potential temperature in the ERA5 compared to ERA-I is an interesting and somewhat puzzling point. It could be due to the improvement in the transport in the model or to the fact that the troncature of the model is more consistent with the spectrum of motion and that rejected modes that generate aliases are only weakly excited. Another possibility is that the temperature assimilation increments are much reduced in ERA5 with respect to ERA-I. In any case, this circumstance should facilitate the determination of appropriate vertical diffusivity to represent the lacking subgrid-scale motion in Lagrangian trajectories. It is quite possible that the required value should be smaller than 0.1 m2 s-1 found in previous studies based on ERA-40 winds.

5) It is important to mention that convective properties are quite different in the ERA5 which displays much more intermittency than the ERA-Interim.

6) I do not think that the layer 8-16 km corresponds to the UT/LS in the tropics as it encompasses the mean layer of convective detrainment at 12-13 km.

7) I do not see what additional information is brought by figure 11.

8) The comment about assimilation increments of the vertical velocities must be removed or rewritten since there is no assimilation increment of the vertical velocities for hydrostatic models where the vertical velocity is a diagnosed quantity.

9) The downsampling procedure does not really leads to a fair comparison between ERA5 and ERA-I. The spatial downscaling can be seen as a smoothing but the tempo-

ral downscaling cannot since the archived wind data are not time integrated quantities but instantaneous values. This section is quite important as users might not all be able to download and store hourly ERA5 data at maximum spatial resolution.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2018-1199, 2018.