

Interactive comment on “Dehydration and low ozone in the tropopause layer over the Asian monsoon caused by tropical cyclones: Lagrangian transport calculations using ERA-Interim and ERA5 reanalysis data” by Dan Li et al.

Anonymous Referee #3

Received and published: 11 November 2019

The manuscript addresses the problem of the lifting of air by a tropical cyclone in the West Pacific during the Asina Monsoon and the resulting dehydration and low ozone layer in the lower stratosphere. The study consists in two case studies. It uses data from ozone and water vapor balloon profiles and MS data. Another interest is in the comparison of the new ERA5 and the ERA-Interim regarding the Lagrangian trajectories near to a cyclone.

This work is interesting but somewhat misses to provide necessary details and I find the authors could have gone deeper into the analysis.

C1

In 2.3 Provide information about the vertical sampling of the vertical interval and mention that the total diabatic heating rates, including latent heating are used (as it seems the case from the results).

First case

There is a layer of low ozone and low water vapor on 8 August near 365 K which could be a remain of that of the 4 August but no attention has been paid to it. The paper would be strengthened by showing the origin of that layer.

Lines 197-198: It seems that ERA5 predicts that the trajectories where inside the clouds but this fact is not exploited and the parcels are treated as unsaturated in the sequel.

What means, on line 203 that MLS water vapor is retrieved near the parcels location? The MLS value is the same for both ERA5 and ERA-Interim while the parcels are not located at the same level and can MLS see through the cloud anvils under which are located the ERA5 parcels? Therefore, how this value can be used as a reference to evaluate the dehydration? This is a crucial point in the analysis that deserves better description and justification.

Line 209: It is unclear which water vapor is used for this estimate of the relative humidity. Is it the from the balloon flight of 8 August?

On line 212, the authors mention that parcels get dry after passing through the lowest temperature region, but not attempt is made to see whether this can explain quantitatively the observed dehydration, even using a simple freeze-drying process relaxing to saturation. The analysis is too qualitative on this point (provided the previous question is also correctly answered).

I find a bit confusing that the dates are oriented in opposite directions in figs. 4 and 8 on one side and 12 and 15 on the other side.

Second case

C2

Here the MLS water vapor reference is retrieved at a date posterior to the exit of ERA5 trajectories from the clouds but details are still missing and again no attempt are made to quantitatively explain the dehydration.

Looking at trajectories in fig.12, I do not find a convincing rise of 15 K of the low ozone layer between 5 and 10 August as required by fig. 11(b,c).

Why trajectories are stopped at 330 K instead of 350 K as in the first case is not explained.

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-816>, 2019.