Estimating the origin and the destination of the atmospheric moisture and its associated properties, such as travailing distance, is an interesting scientific question that also has a wide range of applications in water management, mitigations of climate change and weather forecasts. Via this study, authors offer a global monthly dataset on high resolution generated from a state-of-art tracking model and reanalysis dataset, ERA5. Analyses and data quality reported herein are convincing. I suggest an conception of this manuscript after the following comments being answered satisfactorily.

Thank you for these positive words.

1. Line 88: Are these 25 model levels or pressure levels?

They are pressure levels, which we now clarified in line 88. Note that the model itself, being Lagrangian rather than Eulerian, does not contain individual levels or grid cells.

2. Lines 91-94: If authors run UTrack using global evaporation, then the distribution of atmospheric moisture in each column should be similar to the Q (specific humidity) that obtained from ERA5 archive (if not on hourly scale, then it should be on daily and longer time scale). Is it
the case?

That is correct. As the model is forced by these data, and the moisture parcels are distributed vertically with the local moisture profile, they are indeed the same.

3. Line 156: Conventionally, the precipitation recycling ratio is defined as nrho= P_et/P_tot. Therefore, what defined as the evaporation recycling ratio herein, is called the precipitation recycling ratio elsewhere, vice verse. I will suggest that either add a caveat to remind readers about this difference, or re-brand the term to follow the convention.

We agree with this definition of precipitation recycling ratio, but please note that our evaporation recycling ratio refers to the fraction of evaporation that precipitates over land and is therefore different from mentioned definition of precipitation recycling. Hence, our definitions are consistent with those in the literature. To avoid confusion, we added the definitions for land and basin evaporation recycling as formulas in lines 157-158: "(epsilon_xy = P_E,xy,land / ET_xy)" and "(epsilon_xy = P_E,xy,basin / ET_xy)".

4. Lines 224-227: Can authors explains a bit more why the delta latitude is smaller in backward analysis? Why this is not shown in longitudinal transport? It is convincing as authors explain the difference in the local differences. How about this on global scale?

This has to do with the variability in the atmospheric moisture cycle intensity. Consider, for example, an oceanic site in a low precipitation area. In this location the evaporation will always be high and precipitation will always be low. Therefore, evaporation entering the atmosphere at that location will typically be transported far away, because the chance of precipitation is low. However, the small amount of precipitation that will fall in such a location will quite likely originate from evaporation close by, because there is so much evaporation in that location. The reverse reasoning will hold for a very wet location where P>>E. Any evaporation from that location will not be transported far away, but the precipitation there will come from far, as there is not much local evaporation. As mean precipitation has an upper bound that is much higher than the mean evaporation, there are many more regions where E>P than where P>E. Therefore, it appears on the maps in Figures 6 and 7 that there is a strong difference in distance between forward and backward tracking.

Note that this difference will not be present if the atmospheric moisture flow and E and P fluxes are relatively constant. So, in homogeneous atmospheric vertically integrated moisture transport and constant E=P, the upwind length scale is equal to the downwind length scale. We hypothesize that there is much more variability in the north-south direction than in the east-west direction, due to homogeneous east-west moisture flows in the tropics and mid-latitude, with erratic interaction between these two systems in the form of atmospheric river flows. This would explain the stronger difference between upwind and downwind length scale in the latitudinal direction than in the longitudinal direction. However, the details of these exact interactions could be explored in future studies using the presented dataset.
We have added this to the explanation in section 3.1 (lines 229-238):

"The difference between the forward and backward tracked distance can be explained by the variability in the atmospheric moisture cycle in several dimensions. In dry areas, the downwind length scale will be long, because any evaporation will travel very far before it rains out. The upwind length scale will be short because of the large amount of local evaporation relative to the local precipitation. Contrastingly, in wetter areas, the reverse is true and the upwind length scale will be longer: the precipitation falling in wet areas will have come from far away, because of the limited local evaporation relative to the precipitation. In these areas, the downwind length scale is shorter because evaporation from wetter areas will have a larger chance to be part of a nearby precipitation event. As can be seen in Figures 6 and 7, the difference between forward and backward distance typically is larger in the meridional than in the zonal direction. We hypothesize that this is due to the fact that there is less variability in the moisture transport in the zonal direction than in the meridional direction."

5. Both the precipitation and evaporation recycling ratios are high over the ragged topographies. Does this indicate that the mountains can intercept moisture flux transported from upstream and can trap evaporation originated locally? If this is the case, should we see a long/normal travailing distance in backward analysis from the upstream, and a short travailing distance in forward analysis to the downstream? I suggest a discussion on this point.

That is correct, as is illustrated by some differences between Figures 6 and 7. Take, for example, the "forward delta longitude" for the Andes (Fig. 6B), which is much lower than the "backward delta longitude (Fig. 7B). We added a sentence about this in the discussion (lines 320-322): "There could be a benefit in classifying the weather patterns in terms of the length scale difference between the upwind and downwind parts of the atmospheric moisture cycle."