

Addendum to Reply on RC2

We thank reviewer #2 for their thorough and helpful comments. In response to the comment below, we have revised the trajectory density calculations for Figs. 7 and 10 to account for the physical area of grid cells, which varies with latitude. For consistency, Figs. 9 and 12 have also been updated to express moisture uptake and loss per km². While the changes have little impact on the Greenland coast case (Figs. 7 and 9), the central Arctic case (Figs. 10 and 12) is notably affected with high latitude areas playing a more prominent role in the revised figures. Three of the comments by reviewer #2 require revisiting, as the changes impact our previous responses:

Q: Fig. 7: Please explain how you calculated this spatial density distribution for parcel trajectories. This can help readers better interpret the results.

A: The caption for Fig. 7 now reads: *'(...) (b) Spatial density distribution of $nTp\theta$ trajectories, obtained by binning all parcel positions along their trajectories into $2^\circ \times 2^\circ$ grid cells. Values represent the probability density per km² of parcel positions, normalised by the total number of positions and the physical area of each grid cell, thereby accounting for the decrease in grid-cell area with increasing latitude.'*

Q: Fig. 10: Since all these parcels are released in central Arctic, shouldn't central Arctic have the highest density distribution?

A: We have now modified the way the trajectory densities are computed by taking all latitude-longitude positions of the parcels along their trajectories and binning them into $2^\circ \times 2^\circ$ grid cells. The values are then normalised by the total number of trajectory points and the area of the cells in km². This way, we account for smaller grid cells at high latitudes, and the central Arctic correctly shows the highest parcel densities, consistent with parcels being released there.

Q: Fig. 12: Please explain why there is a lack of moisture loss over the central Arctic where extreme AR precipitation occurs, and parcels are released.

A: The apparent lack of moisture loss over the central Arctic in the previous figures was an artefact of not accounting for the decreasing physical size of grid cells at high latitudes. Smaller cells accumulate less moisture loss in absolute terms, leading to an underrepresentation of high-latitude precipitation. After normalising by grid-cell area (per km²), enhanced moisture loss over the central Arctic is evident and consistent with the diagnosed upward motion of air parcels. The text has been altered to state: *'In the Arctic, enhanced moisture loss is observed in the vicinity of Greenland and Svalbard consistent with upward motion of air parcels.'* See lines 397-398 on page 19.