

Responses to Referee 2

The authors wish to thank the referee for his/her comments on our submitted manuscript. In our following responses, the page and line reference for each comment have been matched according to where the commented text appears on the ACP Discussion paper.

Specific comments:

Page 16975, Sec. 2.2: Please indicate the latitude and longitude of Darwin and Mount Bundy so that readers don't have to check a map.

Indicated as requested.

Page 16976, Line 5: since the same wind profile is used for both simulations, it may be appropriate to emphasize that wind shear would not influence the conclusions presented here.

This has been emphasised as suggested.

Page 16977, Sec 2.3, also Page 16978, Line 17: It's probably useful to explain a bit more explicitly why IHGT and IQV serve the purpose of tracers since not many readers are familiar with this method. What are the conserved quantities (e.g., theta or theta-e or others) utilized to define the tracer?

Sec. 2.3 has been renamed as 'Passive Scalars' and also slightly reworded and expanded to explain more explicitly how IHGT and IQV are essentially scalar quantities of geometric altitude and background water vapour mixing ratio when first initialised at each grid point on every model level. In the absence of mixing, these scalar values will be conserved and thus act as 'passive tracers' to the flow.

Page 16980, Line 1-2: I agree that RH_i difference is large, but the SUBSAT seems to produce larger cooling than SUPERSAT also. Do you think cooling corroborates with the increase in water vapor mixing ratio? Can you provide a rough estimate of each?

To examine this, we calculated the average cooling in the lower TTL (i.e. using only the regions with negative temperature perturbations). The average net cooling in SUBSAT lower TTL (~ -0.15 K) is only slightly greater in magnitude than the cooling in SUPERSAT lower TTL (~ -0.11 K). If anything, increased cooling would further reduce the water vapour mixing ratio and not increase it as was found in SUBSAT. Thus, our explanation that the SUBSAT increase was due to transport seems entirely reasonable.