Reviewer 1 comments

Review of the manuscript "On the impact of dropsondes on the EC IFS model (Cy47r1) analysis of convection during OTREC", gmd-2021-354.

General comments:

This manuscript made an overall evaluation of the fitting of the dropsonde observations and the model states with or without these observations assimilated and the influence on convection-related variables. These field campaign data are novel and valuable though the conclusions in this study are intuitive to me. I would recommend a minor revision before it can be published.

 Minor comments:

1. I think the major conclusion from this study is the accuracy of u and v winds are improved by assimilating the dropsonde observations, while the thermodynamic variables has only limited influence, especially the moisture. I think it should be discussed in the conclusion section on the potential approaches to improve the assimilation of moisture variables. Does it mean the critical problem for moisture variables is the deficiency of model physics?
RESPONSE: Thank you for the suggestion! It could be that the deficiency in model physics gives deficiencies in moisture assimilation. It could also be that the deficiencies in assimilating potential temperature also influences this issue. We discuss this further in the paper.

2. In Data and methods section, please introduce what the control variables are in the DA system. Are they u, v wind or the stream function and velocity potential? Will the selection of control variables influence the fitting of the u, v wind and the vortex and divergence?
RESPONSE: Control variables in the DA system are vorticity, divergence, temperature, and relative humidity. We do not think that the selection of control variables will significantly influence the fitting of u or v.

3. The manuscript has no obvious grammatical problems. However, some descriptions are not clear enough, especially the Data and methods section, for example,

   3. 1 Line56-58, please reword the sentence. Is the resolution of dropsonde observations 13 km? What does it mean "spaced about 1 degree horizontally"? Please

introduce more information about the dropsondes in the data and method section, like the flight altitude, the vertical sampling frequency of the observations.

3.2 Line 79, in Data and methods section, what is the approximate model resolution of the version Cy47r1?

3.3 The model run is from Aug 7 to Sep 30, 2019. How many samples totally are used in this study? What is the output frequency?

3.4 Are all the operational observations assimilated in YDPS and NDPS? Please briefly list their types?

RESPONSE: Thank you for the suggestions! We expand on all the questions in comment 3, in the manuscript.

4. Eq. 1, I think it should be the departures of the observations from the model state.
RESPONSE: We think either way goes. What matters is the correct interpretation of the sign, as noted in the next sentence after the definition.

5. Lines 88-90, "... this only gives estimates of vorticity departures and not real vorticity departures ...", what does it mean here? Please reword the sentence.
RESPONSE: Thank you, we clarify this sentence in the manuscript. Since vorticity is not a field for which we can get observations and model values collocated, we estimate the vorticity by gridding the observations and model profiles and then calculating vorticity using finite differences, which of course will not give 100% accurate results.

6. Lines 136-137, The sentence is not clear, please reword.
RESPONSE: Thank you for the suggestion! We reword the sentence in the manuscript.

7. Lines149-150, why do the largest departures for zonal and horizontal wind occur around 700 hPa?
RESPONSE: That is an excellent question for future work.

8. The description of Fig. 7 is unclear. It seems that Fig. 7b was not discussed. Why does profile is shown for the experiment NDPS but not YDPS?
RESPONSE: Figure 7 is an example aimed at showing what a profile of the model and observed value looks like for different x* (where x=u,v,T,q) values. It is not really necessary to show this for YDPS because this figure is not meant as an exhaustive description of different experiments. We do elaborate on this a bit further in the manuscript.

9. Line 139, which region does Figure 4 show? Averaged over all the regions?
RESPONSE: Correct, it is averaged over all the data in all the regions.

10. Please discuss in the conclusion section what potential studies can be done with these valuable dropsonde observations. Can they be used to adjust the model bias though small as suggested in the evaluation?
RESPONSE: Thank you for the suggestion. We enhance the discussion with your suggestion!