

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2021-543

Anonymous Referee #1

Referee comment on "On the cross-tropopause transport of water by tropical convective overshoots: a mesoscale modelling study constrained by in situ observations during the TRO-Pico field campaign in Brazil" by Abhinna K. Behera et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-543-RC1>, 2021

Behera et al., On the cross-tropopause transport of water by tropical convective overshoots: a mesoscale modelling study constrained by in situ observations during TRO-Pico field campaign in Brazil

The authors simulated cloud convective clusters and their overshooting tops, deep convection whose cloud top heights are higher than tropopause. The model which the authors used was BRAMS, Brazilian RAMS, and their data was measured during the TRO-pico intensive observation period, where the TRO-pico focused on the water budget measurements between the troposphere and the stratosphere by use of balloon-borne particle and water vapor sensors, and S-band radar, in Brazil. The authors showed, for example, approximately one kilo tons of water vapor was transported from the troposphere to the stratosphere by one overshoot. This paper should be accepted after minor revises because their method and data are quite unique, their results are reasonable, and they thoroughly described what they did in detail, without any ambiguous points.

Minor comments:

L. 75: The authors should write the relative humidity with respect to ice.

L. 85: Are there several IOPs? If so, the authors should describe whole TRO-pico campaign very briefly.

L.170: The authors should add the main aim to introduce NU21 for the simulation and/or the characteristics of Eq. 1; it would imply the results of L. 389, L. 435, and L. 487-492.

L. 226 and Figure 1: The authors should point out "three cells" by arrows in the figure.

Section 6.2 and Figure 8:

- The authors should define "the total mass budget" clearly; Was it integrated by time and whole area (1840km x 1640km)? The authors should add that liquid was neglected.

- L. 433: The author should write "kilo tons (kt)" because kt is usually used for "knot." The authors should explain how to calculate 8 kt, which is probably "ice+WV at 17:30" – "ice+WV at 15:00."

- The authors should explain the legends in Fig. 8. I believe that "17 km < 18 km" denotes of overshoot whose cloud top heights were 17 – 18 km. "intensity" in the caption would be cloud top heights of overshooting tops? The authors should also describe the length of arrows and check "color blindness"; e.g., https://en.wikipedia.org/wiki/Color_blindness

Table 1: The authors should describe the method how to count overshoot. For example, I draw three cases of overshooting tops (see the attached); are they one overshoot or two overshoots?

Please also note the supplement to this comment:

<https://acp.copernicus.org/preprints/acp-2021-543/acp-2021-543-RC1-supplement.pdf>