We thank referee#1 for the helpful comments. Point-by-point responses to reviewer's comments are listed below (in blue).

Review of "**Near Global Distributions of Overshooting Tops Derived from Terra and Aqua MODIS Observations**" by Yulan Hong, Robert J. Trapp, Stephen W. Nesbitt and Larry Di Girolam

This is an interesting paper on providing insight about the frequency and size distribution of overshooting cloud tops into the low stratosphere for deep convective cloud systems on a global basis. This study represents the first such study using MODIS IR measurements where both TERRA (descending, ~10:30 am/pm LT equator crossing) and Aqua (ascending, ~13:30 pm/am equator crossing) MODIS measurements were employed. With about 20 years of MODIS daytime and nighttime data from both TERRA and Aqua they are able to derive global seasonal patterns, land-sea contrast, and information on diurnal variability of overshooting cloud tops. The paper is well written describing current and previous algorithms for detecting overshooting cloud tops. I would recommend publication after generally minor changes.

* Figure 1: Please separate (a) and (b) parts of the figure more – in the pdf version the labeling for these two parts overlap.

Thank you for pointing this problem. It is now fixed.

* Line 236: "cirrus anvil"

Corrected. Thank you!

* Table 1: If possible, please include uncertainties for the coefficients in this table. The table caption lists significance at 99% but it is not certain what the 99% is relative to (all coefficients assumed to be zero under the null hypothesis?). The table caption also says regression coefficients which the text indicates are the bi (i=1,2,3) constants, but instead xi (i=1,2,3) numbers are referred to in the table. The xi's if understood correctly represent the three temperature differences (input training data) to derive the bi's via regression. Please help clarify the table and numbers listed for the readers.

We now add the uncertainties for the coefficients in this table. The significant level is under the null hypothesis. Now p values are mentioned.

The table is now adjusted for a better read with explanation below the table. In Lines 308-310 in updated version, we add:

" The Logistic Regression is based on python module – Statsmodels. The p values for the regressed coefficients are smaller than 0.008 based on z-test. The uncertainties for each coefficient are represented by standard errors.*"

* Figure 4: In the tropics, the tropopause height is consistently about 16-17 km for most any definition of tropopause, dynamical or chemical, but the tropopause height in Figure 4 for the tropics shows about 12 km. Is this because the tropical band in the figure extends to +/- 25 degrees latitude and there is some higher-latitude subtropical influence? Or perhaps the vertical axis numbers are

mislabeled for the tropics? Your tropopause height comes from combining MERRA-2 lapse-rate plus PV surface, so in the tropics it should be coming from lapse rate which is about 16-17 km.

Thank you for pointing out this problem. We recalculated the mean tropopause height. The average is about 15.7 km within -25 – 25 degrees, and about 11.5 km between 25 – 60 degrees S/N latitudes. Since we do not mention the mean tropopause information, we just remove it from Figure 4.

* Line 414: Do you mean "variety" rather than "verity"?

Corrected. Thank you!

* Line 613: "times"

Corrected.

* Line 636: "area" – also in this sentence, could the future work include taking advantage of the long ~20 year records from TERRA/Aqua MODIS IR measurements to investigate climate-related decadal changes/trends in OT events?

Yes, the trend analysis of OT events is now under investigation and will be part of a separate manuscript.

* In the Summary is it possible to expand a bit to describe some general science implications originating from these new results?

In conclusion section (Lines 657-663 of updated version), we add some descriptions of general science implications.

"This study has displayed a comprehensive analysis of OT occurrences near globally for the first time using MODIS data. As MODIS has a fine spatial resolution (1 km) and provides about a two-decade stable climate record, results in this study are an important complement to the current OT climatology in the literature derived from GPM, GOES and AMSU-B (Bedka et al., 2018; Hong et al., 2008; Liu et al., 2020). This study also lays a foundation to understand the near global climatological distributions of hazardous thunderstorms, leading to valuable insights into intense updraft size distributions in deep convection over the globe."

* Do you have an OT dataset derived from this study that can be listed in the "Data availability" section?

We provide two datasets attached as Supplementary 2 and Supplementary 3. The first dataset was used to train and cross validate the Logistic Regression. The second dataset was used to manually validate the Logistic Regression. The datasets include the following information: longitude, latitude, time, OT flag, Tb11, Tb67 and tropopause temperature.

In Lines 672-674, we added:

"The dataset used for training and cross-validating Logistic Regression is available in Supplementary 2.

The dataset used for manually validating Logistic Regression (plot figure 6) is available in Supplementary 3."