

Interactive comment on “Effect of tropical cyclones on the tropical tropopause parameters observed using COSMIC GPS RO data” by S. Ravindra Babu et al.

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Comments of the manuscript entitled, ‘Effect of tropical cyclones on the tropical tropopause parameters observed using COSMIC GPS RO data’ by Babu et al., submitted to plausible publication in ACP.

This paper deals with the effects of tropical cyclone on tropopause characteristics. The authors have presented a detail analysis of the tropopause characteristics using seven years of COSMIC data. The variation of tropopause height and temperature during the passage of the tropical cyclone from the climatological mean is presented in this paper.

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This study is very important, in principle, since detail knowledge of the tropopause characteristics during the passage of tropical cyclone is very crucial for understanding the water vapour budget of the lower stratosphere, which have significant effects on global warming.

The article is well written and contains significant original material. I recommend for publication in ACP with some minor revision.

General Comments : (1)The tropopause height/temperature derived during the passage of tropical cyclone is subtracted from the climatological mean tropopause height to show the variability associated with cyclone. How do author account for the day-to-day variability of the tropopause? Authors can mention in their manuscript. I also suggest taking the mean tropopause height for 5-6 days, one week before and after the passage of cyclone and then subtract it from the tropopause height/temperature obtained during cyclone in order to understand the variability. (2)During tropical cyclone, enormous amount of water vapour is pumped from lower troposphere to the upper troposphere, even up to the lower stratosphere. The temperature derived in COSMIC has assumption of water vapour profile from model. During cyclonic condition, how accurate is the temperature derived in COSMIC data? It can be discussed in the manuscript.

Specific Comments :

Page-2 L-4/8 : ‘In the present study, high verti-.....’ Authors can mention the value of ‘high vertical resolution’ (is it 100 m or 200 m) and accuracy of temperature measurements.

L-12/14 : ‘From all the TCs events, we generate the mean cyclone.....’ Mean tropopause height can be mentioned. How author accounted for the inter-annual variability?

L-17/18 : ‘However, as the distance from cyclone eye.....’ Author can mention the

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distance in km instead of degree (50) throughout the manuscript.

L-19 : 'Lowering of CPH (0.6 km) and LRH (0.4 km) values with coldest CPT and LRT (2–3 K).....' Since authors mentioned that CPH is lower by 0.6 km and LRH by 0.4 km, it is essential to provide the vertical resolution and accuracy of the COMIC measurement.

L-23/25 : 'These changes in the tropopause parameters are expected to influence the water.....' Change in the tropopause characteristics can influence UTLS region much more than mentioned in this abstract. Here a general statement is enough to convey the message (Holten et al., 1995)

Page-3 L-14/15 : 'This will change the thermal and chemical structure of.....' This sentence is repeated. Delete this sentence.

L-18 'There is a possibility that TCs lift and cool the tropopause more than other meso scale.....'. I do not agree with this statement. Is there any study reported so far that TC lift and cool the tropopause more than MCS? If so, please provide reference in the manuscript.

L-23/24 : 'Most of these exchanges take.....' The sentence is not clearly conveying the meaning.

Page-4 L-2/5 : 'However, the availability of Global.....' There are many studies on tropopause characteristics using COSMIC. Provide few references in the manuscript.

Page-5 L-5/10 : 'COSMIC GPS RO is a constellation of six microsattellites.....' Which set of COSMIC data were downloaded?

L-18/19 : 'The vertical resolution.....' I have a doubt on 200 m vertical resolution. Because there are many new algorithms implemented on GPS RO techniques which provide better vertical resolution (e.g. Full spectral inversion, See Kuo et al., 2004).

Page-7 L-10/13 : 'In order to estimate the effect of TCs on the tropopause....' It will be

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better to provide the climatological map of tropopause similar to that of Fig.2b.

L-17 : 'It is named as low pressure when.....' Write once the equivalent of knots in m/s.

Page-9 L-2/3 'Though it is difficult to draw.....' CPH/LHR is higher/lower relative to what? It should be mentioned.

Page-10 L-7/11 : 'These different variations.....' There may be equal contribution from wind shear associated with tropical cyclone (e.g. Das et al., 2012). How authors accounted the wind shear during the interpretation of results?

Page-11 L-20/22 : 'Cyclone centered – composite of averaged.....' How accurate is the water vapour measurement during cyclonic disturbances when humidity is very high and thermal structure changes significantly? These aspects can be discussed in the manuscript.

References :

Kuo, Y.H., et al., 2004, Inversion and Error Estimation of GPS Radio Occultation Data, J. Meteo. Soc. Japan, 82. 1B, 507-531.

Das, S. S., K. N. Uma, and S. K. Das (2012), MST radar observations of short-period gravity wave during overhead tropical cyclone, Radio Sci., 47, RS2019, doi:10.1029/2011RS004840.

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