

Response to the Referee #2

Paper entitled: 'Potential of INSAT-3D Sounder Derived Total Precipitable Water Product for Weather Forecast', this study showed validation of the INSAT-3D satellite derived product total precipitable water (TPW) dataset with radiosonde (RS), NOAA derived TPW, rain measured by rain gauges and one case study using Global Navigation Satellite System (GNSS). This work has done with different temporal scales and area with statistics. Study represents the capability of INSAT-3D sounder derived product and benefits for weather forecasting. Interesting to see that applying of GSICS correction to the sounder retrievals has impacted in the improvement of TPW products. INSAT-3D is geostationary satellite with first time sounder payload facility, keep in mind with this regard, this paper work is contiguous idea within the scope of Atmospheric Measurement Technique Journal. I recommend for publication but the following points have to illustrate my concern:

Referee's comment: Give full abbreviation of IMDPS in abstract and PB section 2.2.

Authors' response: This has been corrected from line no. 16 to 17 and 106 to 107.

Referee's comment: In section 2.4, Is GSICS is providing any coefficients? Author should provide clear information about this.

Authors' response: Yes. GSICS coefficients generated and corrections applied by Space Application Centre (ISRO), Ahmedabad. The corrections of GSICS coefficients are routinely applied at IMDPS, New Delhi for derivation of the products of INSAT-3D satellite and TPW is one of such product. Refer line no. from 140 to 148.

Referee's comment: In section 3., Has 50km square area been considered?

Authors' response: We have considered 50 km around the area from the Radiosonde Station place. In this methodology, each RS was paired with closest INSAT-3D retrievals and patterned according to criteria suggested in Fuelberg and Olson (1991). The collection criteria for INSAT-3D retrievals with RS data are based on absolute distance between the position (latitude and longitude) of the RS and the INSAT-3D retrievals has been considered as 0.5 (50 km). This will minimize the differences arising from horizontal gradients (Line no from 172 to 179).

Referee's comment: In section 4.1, comparison of INSAT-3D and RS at daily, monthly and subdivisional scale then why is not promising over northern Indian region as comparison of southern region of India?

Authors' response: The comparison of INSAT-3D and RS over northern Indian region shows correlation coefficient of 0.87 which is comparable to that over southern region of India (i.e. 0.92). There is, indeed, very small difference between the observed correlation coefficient over these two regions. This difference could be attributed to number of points under consideration, averaging effect and uncertainty in the satellite retrieved TPW. (Refer line no 248 to 250, table 3)

Referee's comment: In section 4.2, Comparison of spatially distributed INSAT-3D TPW with Actual Rainfall observation, there should be more detail about the figure 6 that how it has constructed?

Authors' response: We use the mean TPW of INSAT-3D sounder while comparing with the rainfall/rain rate following the Wu et al 2003 . Rainfall accumulated over a given day is compared with mean TPW of that day, if sky found to be clear over that day. When water vapor reaches to its saturation level in the troposphere, it becomes conducive for occurrence of rain. The higher TPW is expected prior/around the event of rain and vice-versa. Thus, the positive association between TPW and rainfall is obvious. Yes, since only clear-sky TPW is under consideration, there won't be one-to-one correspondence with rainfall. It is the limitation of this comparison.

Referee's comment: In section 4.3, A case study of INSAT-3D TPW with ground base GNSS TPW has been showed. For the justice of this research (prior to the eventINSAT-3D TPW can be considered as a precursor for mesoscale activity), author should give other case study too. It is strongly recommended that author should give one more case study of similar weather event.

Authors' response: As suggested by the reviewers, two more case study of thunderstorms has been included (refer line no from 275 to 304) in the modified manuscript. It can be seen that most of the thunderstorms analysis have good signature prior to the occurrence of weather events. This can be mentioned here that, IMD (Forecasters, FDP Storm,http://nwp.imd.gov.in/fdp_now/) is regularly utilizing these data in pre-monsoon season for nowcasting services over the Indian region. However, It was evident that during monsoon season due to the straticumulus clouds over land region, the TPW sometime under/over estimating the actual rainfall. The orographic and

coastal region moisture (due to sea breezes) also not very well picked up by sounder derived TPW because of its coarser resolution. Therefore, along with other meteorological parameters (e.g., CAPE, CINE and other indices), higher TPW can be taken as one of the precursors during thunderstorm events can be utilized for studying such events.