

***Interactive comment on “Validation of INSAT-3D
sounder data with in-situ measurements and other
similar satellite observations over Indian region”
by M. Venkat Ratnam et al.***

Anonymous Referee #1

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**Peer Review
Atmos. Meas. Tech. Discuss.
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“Validation of INSAT-3D sounder data with in-situ measurements and other
similar satellite observations over Indian region”
by Ratnam, Kumar and Jayaraman

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Overview

This paper is a straightforward paper on validation of atmospheric profile retrievals from the INSAT-3D geostationary satellite infrared sounder. Because accurate atmospheric profile retrievals from a geostationary sounder are important environmental data records (EDRs) of use to weather forecasting, and because validation of EDRs supports broader calibration/validation of the sensor radiances, this paper is appropriate for eventual publication in *AMT*. However, below are suggestions/comments and questions that should be addressed before publication.

General Comments

1. There are problems with English usage/style throughout the manuscript. These are not limited to grammatical errors alone, but include sentence construction, incorrect definite/indefinite article usage, inconsistent tense usage, etc. I do not have time to go through and correct all these problems, so I leave it to the Authors and/or Copy Editor to do this.
2. The Authors choose to present their water vapor validation results in terms of RH, but they do not indicate why that is. RH involves both water vapor and temperature, and thus errors may result from errors in temperature in addition to moisture. The Authors may want to consider presenting their results in terms of mixing ratio, specific humidity, layer abundance, etc., or otherwise provide rationale as to why they use RH.
3. A bit more detail is required from the Authors on relevant technical methodologies that were employed. Examples include:

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- Mention that both temperature and water vapor profiles are used for calculation of the RH.
- Specifics concerning the space-time radiosonde collocation criteria and/or methodology are needed. What are the collocation distances in terms of space and time?

Specific Comments, Suggestions and Questions

- Lines 107–109: In discussion of the retrieval algorithm, the Authors needs to also make specific mention of the cloud mask / cloud clearing algorithm that is being used. Also, the Authors should provide some indication of the corresponding yield of their product (after cloud masking/clearing).
- Line 114: $\pm 2\sigma$ of what?
- Line 119: “high altitude resolution” — what does this terminology mean?
- Lines 128–129, 240–241, 261–262: Interpolating high resolution radiosonde measurements to the sparse pressure levels of the INSAT-3D is not a good way of doing this — among other things, the radiosonde has fine scale structure information in it that may be erroneously aliased or missed in a simple interpolation to a sparse sampling interval. The Authors should see Nalli et al. (2013) for more information on this (see bibliographic information below). While it is not required that the Authors employ the approach in the reference cited, they should nevertheless employ a more rigorous approach than simple interpolation.
- Lines 206–207: The Authors should specifically state how they are calculating RH in this paper. They don’t need to provide the equation, but they need to make it clear that they are using both temperature and water vapor profiles.

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- Lines 230–231: The Authors should cite some of the prior validation work that was done for other sounder systems (e.g., AIRS, referenced in the paper, and GOES) . To do this, they can simply extend this sentence to read: “It is well known that the most common and widespread in-situ instruments for providing accurate profiles of T and RH are radiosondes, and these are typically employed for satellite sounder validation (e.g., Fetzer et al., 2003; Xie et al., 2013; Nalli et al., 2013).” Bibliographic information for these papers is provided below.
- Lines 251–254: Do you know where these moisture biases are originating from? Is this an artifact of using RH instead of specific humidity, etc.? (Per General Comment #2 above).
- Lines 266–267: Authors should provide reason why they only go up to 300 hPa for RH.
- Line 283: What is meant by “fractional difference” in T? The figure shows the mean difference.
- Lines 290–291: “However, positive bias... (shown as standard deviations)...” doesn’t make sense. Standard deviations do not measure systematic error.
- Lines 294–296: “Most striking feature to be noticed is the consistent positive bias of 1% (2 K) in T...” — I do not see this in the figure.
- Lines 297–298: “Standard deviations show dry bias...” — again, this doesn’t make sense to me — how do standard deviations show systematic error?
- Lines 298–300: Do the Authors have any ideas of what causes the “huge dry bias in RH”?
- Lines 319–321: The Authors should provide some explanations as to what’s may be leading to these findings.

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- Line 331: “integrated relative humidity” — what is that?
- Line 390: “below 25°N” is this due to observing geometry? The Authors should provide a reason.
- Line 411, References: The Authors should include the references provided at the bottom of the review.

Technical Corrections

- Line 25 (and elsewhere in the paper): “12 UTC” — please include the corresponding local time when it is germane to the discussion (i.e., in this case the authors emphasize that these are evening soundings, thus we need to know the local time to appreciate what specific time in the evening).
- Lines 138–139: The local equator crossing times for Aqua are 01:30 and 13:30 local time (LT), *not* UTC.
- Line 200: I recommend simply deleting this section header — it isn’t necessary.
- Line 225: With the above deletion of the previous section header, this section header now becomes 3.1, and the section header on Line 256, originally mislabeled as 3.2, can remain 3.2.
- Lines 244–245: The sentence “White patches. . .” may be deleted as it is already stated in the Figure caption.
- Line 301: Section header should be 3.3 (not 3.2).
- Line 302: Replace “measured” with “retrieved”.

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- Lines 313–314: Delete sentence “Note that the differences that are. . .” since this is already mentioned in the figure caption.
- Line 383: Replace “shows high correlation values” with “were well correlated”.
- Lines 512–513: The figure caption is missing the text describing subplot (b).

References

- Fetzer, E., et al., 2003: AIRS/AMSU/HSB validation. *IEEE Trans. Geosci. Remote Sensing*, **41** (2), 418–431.
- Nalli, N. R., et al., 2013: Validation of satellite sounder environmental data records: Application to the Cross-track Infrared Microwave Sounder Suite. *J. Geophys. Res. Atmos.*, **118**, 1–16, doi:10.1002/2013JD020436.
- Xie, H., et al., 2013: Integration and ocean-based prelaunch validation of GOES-R Advanced Baseline Imager legacy atmospheric products. *J. Atmos. Ocean. Tech.*, **30** (8), 1743–1756, doi:{10.1175/JTECH-D-12-00120.1}.

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