

Interactive comment on “Retrieval of convective available potential energy from INSAT-3D measurements: comparison with radiosonde data and its spatial-temporal variations” by Uriya Veerendra Murali Krishna et al.

Anonymous Referee #2

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Comments on ‘Retrieval of convective available potential energy from INSAT-3D measurements: comparison with radiosonde data and its spatial-temporal variations’ by Uriya Veerendra Murali Krishna et al., (Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2018-203>)

This paper presents the temporal and spatial distribution of convective available potential energy (CAPE) estimated using INSAT-3D measurements. Initially, these CAPE estimates are compared with that estimated using ERA-Interim reanalysis and the radiosonde measurements obtained from 20 stations that are distributed across India.

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Statistical analysis has been made to get confidence on the estimated CAPE values. Finally, the diurnal and seasonal variability in the CAPE is also presented at different geographical locations.

In general, paper is well written and contains significant original contribution. Authors have fully taken advantage of the high spatial and temporal measurements available from INSAT-3D to investigate the diurnal and season variability of CAPE. However, there are few mistakes and sometimes interpretation is missing at some instances without proper literature survey which demands careful editing or re-writing the sentences. Below are the some of the issues which authors need to take care before rendering judgment on the manuscript. Authors are strongly encouraged to revise and re-submit this manuscript.

Major comments:

There are few studies where global measurements of CAPE are available using GPS RO observations (Santhi et al., 2014). Since no observations are there to validate the CAPE at high spatial resolution, small analysis can be made how INSAT-3D estimated CAPE match with GPS RO measured CAPE, particularly over the ocean. Qualitative comparison can also be made.

To the best of my knowledge, INSAT-3D data will not be available during the cloudy times. Since there are two monsoon seasons (SW and NE monsoon) over Indian region, huge data gaps are expected during these two seasons. While making composite analysis at both spatial and temporal scales, results are expected to be biased. How the authors have taken care this issue need to be discussed.

It is mentioned (Line 101) that 'They observed that the INSAT-3D measurements compare better with GPS sonde observations at middle levels (from 900 hPa to 500 hPa)'. In this case how it is going to affect the estimates of CAPE need to be discussed. Further, how large bias observed in water vapor measurements from INSAT-3D is going to affect the CAPE estimates need to be discussed in detail.

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Do authors have any explanation why there is a consistent positive (negative) bias (most of the cases) in CAPE values measured by INSAT-3D (ERA-Interim)?

Do authors have any explanation why no variation is seen for large spatial grid in Fig.6 during pre-monsoon?

Introduction is too long without focus. It can be cut to 50% while retaining only relevant information. Diurnal and high spatial resolution studies only need to be highlighted.

Minor comments:

Line 142: It is mentioned that radiosonde data has been taken from University of Wyoming website. Note that this is not the quality checked data. Instead, it will be better to use data from IGRA2.

Line 155: It was mentioned that the resolution of the data utilized is $0.75^\circ \times 0.75^\circ$ from ERA-Interim and $0.25^\circ \times 0.25^\circ$ from INSAT-3D. How this different spatial resolutions grids are taken care while comparing the CAPE estimates.

Line 282: It is mentioned that 'The estimated CAPE is divided into four categories: weak instability ($<500 \text{ J kg}^{-1}$), moderate instability ($501\text{--}1500 \text{ J kg}^{-1}$), strong instability ($1501\text{--}3000 \text{ J kg}^{-1}$), and extreme instability ($>3000 \text{ J kg}^{-1}$).' Do you have any scientific justification to choose these thresholds? You may provide suitable reference.

Line 338: It is mentioned that 'These regions are: the Arabian Sea (AS; $8\text{--}20^\circ\text{N}$, $65\text{--}72^\circ\text{E}$), Bay of Bengal (BoB; $8\text{--}20^\circ\text{N}$, $80\text{--}90^\circ\text{E}$), South Peninsular India (SP; $8\text{--}20^\circ\text{N}$, $72\text{--}80^\circ\text{E}$), Central India (CI; $20\text{--}25^\circ\text{N}$, $73\text{--}82^\circ\text{E}$), North India (NI; $25\text{--}35^\circ\text{N}$, $73\text{--}80^\circ\text{E}$), and Northeast India (NE; $24\text{--}29^\circ\text{N}$, $90\text{--}96^\circ\text{E}$).' Is there any scientific justification to choose these latitude longitude grids? You may provide suitable reference.

Line 411: It is mentioned that several interesting features are noticed. 'The weak instability is predominant during the winter season, the moderate instability is higher during the post-monsoon, the strong instability is more during the monsoon period and the extreme instability is higher during the pre-monsoon months.' Note that these things

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are well known to the scientific community.

It seems INSAT-3DR is being launched as a follow up of INSAT-3D. Did you tested how CAPE behaves between these two instruments?

Figure 1 caption: It is better to shift the latitude and longitude along with the name of the station to the running text rather keeping lengthy figure caption.

Figure 8: There are white patches over Tibetan high and also over the central India in few panels. Hope the reasons for the data gaps at these two places is not the same?

Additional references:

Diurnal and long-term variation of instability indices over a tropical region in India R Chakraborty, G Basha, MV Ratnam Atmospheric Research 207, 145-154, 2018

Global morphology of convection indices observed using COSMIC GPS RO satellite measurements YD Santhi, MV Ratnam, SK Dhaka, SV Rao Atmospheric research 137, 205-215, 2014

Diurnal variability of stability indices observed using radiosonde observations over a tropical station: Comparison with microwave radiometer measurements MV Ratnam, YD Santhi, M Rajeevan, SVB Rao Atmospheric Research 124, 21-33, 2013

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2018-203, 2018.

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