Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2018-638-RC2, 2018

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Variability of vertical structure of precipitation with sea surface temperature over the Arabian Sea and the Bay of Bengal as inferred by TRMM PR measurements" *by* Kadiri Saikranthi et al.

Anonymous Referee #4

Received and published: 4 December 2018

Title: Variability of the vertical structure of precipitation with sea surface temperature over the Arabian Sea and Bay of Bengal as inferred by TRMM PR measurements Authors: Saikranthi et al. Recommendation: Rejection

Scientific significance: Fair Scientific Quality: Poor Presentation Quality: Poor

This study investigated the variability in the vertical structure of precipitation as a function of sea surface temperature using TRMM precipitation radar measurements. I think the paper lacks focus, inadequate analysis, and insufficient literature review. The in-

tent of the paper digresses at some point by incorporating the aerosol/cloud radiation analysis without a context jumbling both convective dynamics and radiative impacts of aerosols on clouds. Given the scope, the section with aerosol and radiation properties are redundant. Most of the analysis lacks context. Overall, the quality and the content of the present paper is poor.

Comments on Introduction: Introduction lacks discussion on how Arabian sea and Bay of Bengal regions are distinctly different in its background state, which would help them explain the further analysis on convective profiles. Though the authors have claimed to have studied the "causative mechanisms" of SST with the vertical structure of precipitation in the introduction, no suggestions based on the analysis performed have been discussed in the later sections. Mere correlation doesn't explain the causality, which needs carefully controlled model experiments with a rigor to assess the confounding factors controlling the SST and precipitation relationship.

Comments on the analysis: Given the non-linear influence of sea surface temperature on the variability of precipitation structure, it would be an oversimplification to look at the influence of SST on the mean structure of radar echoes. It would have been interesting to classify the mean structure further into different cloud types (e.g., shallow/congestus/deep/) and assess the variability of these populations in terms of factors (e.g., winds, stability) that are co-associated with SSTs. There are no insights been provided on why the differences in the variabilities of vertical structure exist between AS and BOB. It is important to investigate if more variability over the AS is due to fluctuations in the winds/SSTs or both. From figure 2, it is evident that AS region has more seasonality in term of air-sea variables compared to BOB. Given the influence of more variables, merely analyzing indirect relationships of precipitation structure with SSTs would be futile. One way to analyze is to look at the variability of large-scale parameters (e.g., stability, vertical velocity, wind speed) for a given SST, and look at the cloud population in terms of these co-associated variables. By doing so, one would prioritize the combination of factors that lead to different convection type. SST influence on the

clouds is of the first order, however, it is also important to show the temporal variation, highlighting the seasonal evolution of cloud types collocated with SSTs and other variables.

In its entirety, the quality of the scientific analysis is insufficient, lacking depth and focus. At this moment, I don't see the presentable quality and content of the paper is ready for publishing. Hence, I have to reject the paper in its present format. I hope the authors would consider revising the paper with the proposed suggestions and resubmit the paper once its ready.

Specific comments:

1. The stability measure (LTS) used here is appropriate for stratiform clouds, which may not be appropriate for convective clouds in these regions. One may use static stability profiles instead.

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