Replies to short comments

At the outset thank Mr. B. Guha for reading our manuscript and suggesting comments.

Comment: (a) The article title highlights aspect of the variability of vertical structure of precipitation with sea surface temperature (SST). However, the authors explore the relationships between the SST and other variables such as AOD, CER ice and CER liquid, total column water vapour etc. that may not directly represent the vertical structure of precipitation.

Reply: *The generation and growth of clouds and precipitating systems depend on the triggering mechanisms (over Oceans, it is primarily SST) and ambient dynamical and thermodynamical environment (Houze et al., 2015). Changes in SST have the potential of altering the type of precipitating system and the vertical structure of precipitation (Oueslati and Bellon 2015). Besides the SST, vertical structure can be modified by aerosols (or CCN, mostly at the cloud formation stage) and thermodynamics of the ambient atmosphere. For instance, recent studies have shown the impact of surface aerosols (PM_{10}) in altering the vertical structure of precipitation (Gao et al., 2018 and references therein). We, therefore, need to understand the observed variations exist at the cloud formation stage or manifested during the descent of precipitation particles to the ground. The cloud effective radius (CER for water) (depend on aerosols and TCWV) is a good proxy to understand the cloud microphysical processes. While, vertical velocity, winds, stability parameters are considered to depict the ambient atmosphere, which can alter the vertical structure of precipitation. All these parameters are considered in the present study to understand the vertical structure of precipitation over AS and BOB.*

Comment: (b) The figure 1 shows the regions considered in this study with background colour representing the mean SST during SWM period over AS and BOB. It is clearly evident that the regions of interest depict significant spatial heterogeneity in the SST (_ 2 degrees C). In such a scenario, (in the figures 4, 5 and 6) I think the standard deviation should be present in those figures.

Reply: *We wish to inform the reviewer that the segregation of SST data into different bins (26° to 31°C with 1 interval) is done not by averaging the spatial data, rather using 1° X 1° gridded data. Therefore, there is no need to average the SST data. Instead, we provided standard deviation/standard error of mean values for CER, AOD, TVWV and vertical profiles of Z in the revised manuscript.*

Comment: (c) I would recommend to use MODIS level 2 data products for AOD, CER-ice and CER-liquid for exploring the relationships between different variables. Further, the authors have not mentioned from where the total column water vapour data was obtained. Even the combined uncertainty from different sources of data (e.g., TRMM, MODIS and ECMWF Interim Reanalysis) was not accounted for when establishing the relationships.

Reply: *The total column water vapor data are taken from the ERA-Interim reanalysis and this information is included in the revised manuscript. The spatial resolutions of MODIS level-2*

and ERA-Interim SST are different. Thus, to know the values of AOD and CER at different SSTs, again the MODIS level-2 dataset needs to be regridded. Instead of regridding, we have used equal spatial lengths MODIS level-3 and SST datasets.

Comment: (d) It would be nice if the authors establish the mechanism on why the contrasting relationships were observed over BOB and AS. The authors shall note that SST depends on other factors such as turbidity of the sea water and sea surface albedo, which in turn depend on other variables including wind speed and chlorophyll concentration. While the authors have ignored these essential variables, the relationships with AOD, CER ice, CER-liquid and total column water vapour alone cannot provide the variability in SST in the regions of interest.

Reply: *We do agree that SST over open Oceans depends on many factors. But our interest is not to show how precipitating systems alter the SST over the AS and BOB. Rather, we focused on the variation of vertical structure of precipitation (in terms of precipitation top height and intensity) with SST over the AS and the BOB and the factors responsible for the variations in the vertical structure over both these oceans.*