Underestimation characteristics of TRMM 2A25 V7 near surface rain over and around the Meghalaya Plateau

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Utilizing our original tipping bucket raingauge network over Bangladesh and northeast India (Fig. 1), we have detected underestimation of the near surface rain in TRMM 2A25 V7 dataset over and around the Meghalaya Plateau. This underestimation was prominent especially in the monsoon season. Such underestimation of TRMM PR sensor was detected in other mountaneous areas also (Prat and Barros 2010; Wilson and Barros 2014; Terao et al. 2017).
In the present study, we further analyzed the characteristics of underestimation utilizing TRMM 2A25 V7 and raingauge dataset. In TRMM 2A25 dataset, rain type is defined for each ray to distinguish stratiform and convective rainfalls. We evaluated the contribution to the underestimation from different types of rainfall (Figs. 2 and 3) for two regions, Meghalaya and Sylhet-Barak areas, with different orographic situation. In these figures, we evaluated the averaged contribution ratio and their 95 % confidence intervals for each rain type. These confidence intervals were evaluated by the boot-strap method. The Meghalaya area is the hill area in India, and Sylhet-Barak area is the northeastern part of the Bengal Plain, which consists of both Sylhet Division in Bangladesh and Barak Basin in Assam, India.
Figure 2 shows that the underestimation has been highly contributed by stratiform rain over the Meghalaya Plateau. Averaged for the stratiform rain cases, rainfall intensity detected by raingauges was greater than 6 mm h^{-1}, with more than 50 % negative bias ratio. Most notable result was the high contribution of the no-rain detected cases. We detected tipping of raingauge more than 5 % out of TRMM 2A25 no-rain detected cases. For other areas, this ratio was much less than 0.5 %. Over the Sylhet-Barak area, underestimation was explained mainly only by the convective rain (Fig. 3). Thus, although the areas of underestimation in TRMM PR sensor were geographically adjacent to each other, the cause of the underestimation was largely different.
For near nadir cases, the clutter free bottom height (CFB height) of the ray tends to be lower. Therefore, we checked the impact of the angle of ray to check its impact on the underestimation (not shown), but we found no clear tendency.

Keywords: TRMM, PR, underestimation, northeastern Indian subcontinent

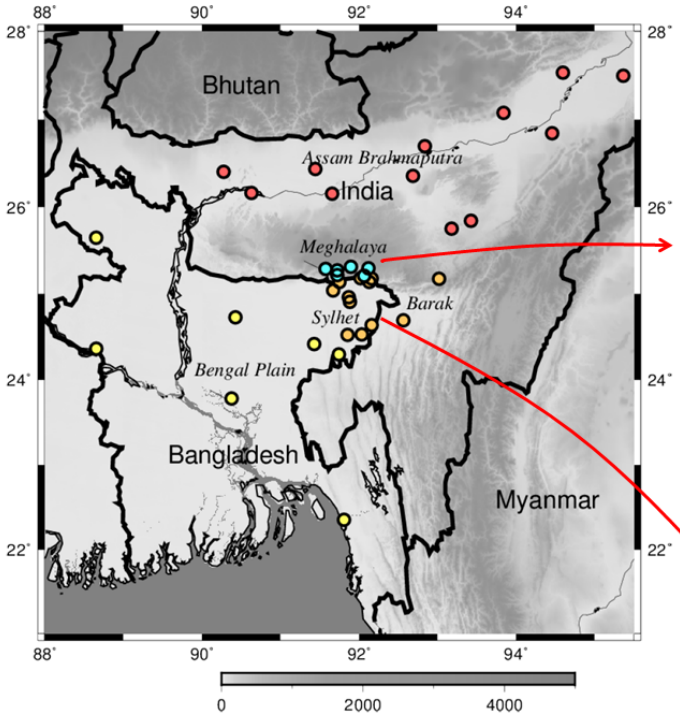

Fig. 1: Raingauge network

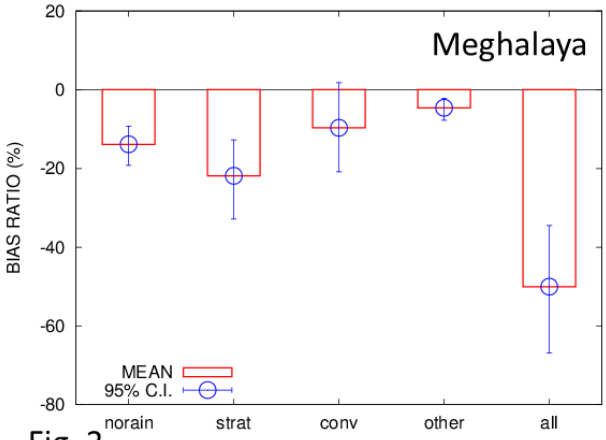

Fig. 2

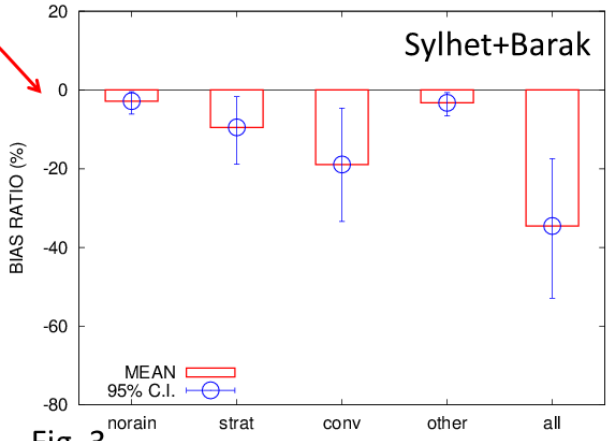

Fig. 3