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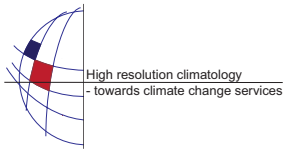

Quantitative precipitation climatology over the Himalayas by using Precipitation Radar on Tropical Rainfall Measuring Mission (TRMM) and a dense network of rain-gauges

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Quantified grid observation data at a reasonable resolution are indispensable for environmental monitoring as well as for predicting future change of mountain environment. However quantified datasets have not been available for the Himalayan region. Hence we evaluate climatological precipitation data around the Himalayas by using Precipitation Radar (PR) data acquired by the Tropical Rainfall Measuring Mission (TRMM) over 10 years of observation. To validate and adjust these patterns, we used a dense network of rain gauges collected by the Asian Precipitation—Highly Resolved Observational Data Integration Towards Evaluation of Water Resources (APHRODITE Water Resources) project (http://www.chikyu.ac.jp/precip/). We used more than 2600 stations which have more than 10-year monthly precipitation over the Himalayan region (75E-105E, 20-36N) including country data of Nepal, Bangladesh, Bhutan, Pakistan, India, Myanmar, and China.

The region we studied is so topographically complicated that horizontal patterns are not uniform. Therefore, every path data of PR2A25 (near-surface rain) was averaged in a 0.05-degree grid and a 10-year monthly average was computed (hereafter we call PR). On the other hand, for rain-gauge, we first computed cell averages if each 0.05-degree grid cell has 10 years observation or more. Here we refer to the 0.05-degree rain-gauge climatology data as RG data.

On the basis of comparisons between the RG and PR composite values, we defined the parameters of the regressions to correct the monthly climatology value based on the rain gauge observations. Compared with the RG, the PR systematically underestimated precipitation by 28–38% in summer (July–September). Significant correlation between TRMM/PR and rain-gauge data was found for all months, but the correlation is relatively low in winter. The relationship is investigated for different elevation zones, and the PR was found to underestimate RG data in most zones, except for certain zones in February (250–1000m), March (0–1000m), and April (0–1500m).

We depicted the adjusted precipitation climatology based on the TRMM/PR composites. The monthly composite patterns of the TRMM/PR for the 10 years show that the southern foothills of the Himalayas always have a clear rain band, with clear dry areas north of the Himalayas. The double rain bands along the Himalayas are clearly shown, and a rain band with a high maximum appeared in the area of Bhutan (around 27°N, 90°) in summer monsoon season. Little precipitation is observed on the Himalayas or Tibet at elevations higher than 4800 m. In the summer monsoon season, precipitation over the Tibetan Plateau increases, especially in the east. In the winter season (November–March) in particular, more precipitation is seen west of the Himalayas (north India) and very dry areas are observed to the north.

Improvement of the APHRODITE's daily grid precipitation analysis by using this climatology will be shown.