ACG09-13 会場:301B 時間:5 月 28 日 09:00-09:15

TRMM PR 冗長系切替の影響軽減データの作成について
Creation of TRMM PR data by minimizing the effect of the PR hardware change

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Precipitation observation by the Tropical Rainfall Measuring Mission’ s (TRMM’ s) Precipitation Radar (PR) has lasted for almost 17 years. On February 28, 2014, the core satellite of the Global Precipitation Measurement (GPM) mission was launched, and the GPM Dual-frequency Precipitation Radar (DPR) started providing precipitation data succeeding the TRMM PR observation. PR and DPR not only estimate precipitation accurately both over land and the oceans but also provide information to derive precipitation characteristics (e.g., rain top height and rain vertical profile). Homogeneity of long-term PR/DPR data will be essential to study the water cycle change related to the decadal climate variability. In this study, we aim to develop a precipitation climate data from 17-year PR data. The PR data have discontinuities in quality due to the boost of the TRMM satellite altitude in August 2001 and the PR hardware (H/W) change in June 2009. In this paper, PR data are adjusted to mitigate the discontinuity of the PR H/W change.

The observation of PR temporary stopped on May 29, 2009. The PR H/W changed from A-side to B-side and the B-side observation has started since June 19, 2009, which causes the drop of noise power. The difference in noise power between 2008 and 2010 is obtained as a decrease of 0.54 dBm. This change affects a minimum detection of weak rain by PR. In the current study, the B-side PR data are adjusted to simulate the data with the characteristics of A-side PR. The simulated data are created with the additional electric power of 0.54 dBm in level-1 PR power (1B21) product. The level-2 rainfall (2A25) product is produced from the 1B21 product via products of level-1 radar reflectivity (1C21), level-2 surface cross section (2A21), and rain characteristics (2A23). The simulated data are generated from June 2009 to December 2010 and quantitatively assessed for the PR H/W change.

The simulated data produce a decrease in rain frequency and tend to mitigate the discontinuity caused by the PR H/W change. Semi-global (35S-35N) precipitation amount derived from the simulated data in 2010 decreased by about 1 %, compared with the original data. Oceanic precipitation is uniformly decreased, while land precipitation regionally decreases and increases in spite of the decrease in rain frequency. Regional dependence of land precipitation change will be examined focusing on changes of path-integrated-attenuation and rain type classification.

キーワード: 熱帯降雨観測計画, 降雨レーダ, 気候データ
Keywords: TRMM, PR, Climate data