Rain/No-rain Classification Methods over Land for TMI and AMSRE

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New rain/no-rain classification (RNC) methods for over land microwave radiometers were developed and have been applied in GSMaP algorithms. RNC is important especially over land, where the variability of surface brightness temperature is high both in time and space.

A new method refers land surface brightness temperature database which was prepared by means of simultaneous observation with PR. Brightness temperature data under "no-rain" conditions judged by PR is statistically summarized for each 1 by 1 degree grid box and for each calendar month. The first method (M1) refers the average and standard deviation of TB(85V) (μ and σ, respectively) and judges "rain" if observed TB(85V) is lower than μ-k_0*σ, otherwise judges "no-rain" (k_0 is a constant). The second method (M2) improves M1 to explain the diurnal change in physical temperature by means of observed. TB(22V). Generally, M2 shows better performance than the RNC used in the standard algorithm of TMI (GPROF_TMI). GSMaP_TMI employs M2 and shows smaller bias error in monthly rainfall amount estimates than GPROF_TMI, which underestimates the rainfall over the Sahel in summer.

These methods can not be directly extended for other radiometers, which do not have precipitation radars on the same platform and cover up to high latitudes. Therefore, we developed another method to do without precipitation radar. In this method, it is assumed that the probability distribution of TB(85V) obeys Gaussian distribution with parameters μ and σ. As the effect of rainfall is to decrease TB(85V), the right half (high temperature side) of probability distribution function of "all" the brightness temperature data can be regarded as a result only from "no-rain" data. By fitting Gaussian distribution to the right half, μ and σ can be obtained. M1b refers these parameters and judges same as M1. As a test, the method is applied for TMI, and it is found that M1b is not so worse than M1. M1b sometimes give high false alarm ratio when the assumption of Gaussian distribution is not appropriate, then it requires to use snow and desert masks together. The modified version of M1b is incorporated into GSMaP_AMSRE. We are planning to apply this method to other microwave radiometers and sounders.