Rain/no-rain classification methods over land using statistical database

Shinta SETO

National Institute of Information and Communications Technology
4-2-1 Nukui-kita-machi, Koganei 184-8795, JAPAN
Phone: +81-42-327-6806, Fax: +81-42-327-6666, E-mail: seto@nict.go.jp

One of the goals of the Global Precipitation Measurement (GPM) project, the successor to the Tropical Rainfall Measuring Mission (TRMM), is to produce a 3-hourly global rainfall map using several spaceborne microwave radiometers. It is important, although often difficult, to classify radiometers' observations over land as either "rain" or "no-rain" because background land surface conditions change significantly with time and location. In this study, a "no-rain" brightness temperature database was created to infer land surface conditions using simultaneous observations by TRMM microwave imager (TMI) and precipitation radar (PR) with a resolution of one month and $1^\circ \times 1^\circ$ (latitude-longitude). This study proposes new rain/no-rain classification (RNC) methods that use the database to determine the background brightness temperature. Our proposed RNC methods and the RNC method which is developed for the GPROF (Goddard profiling algorithm, the standard rain rate retrieval algorithm for TMI) are applied to all TMI observations for the entire year 2000, and the results are evaluated against the RNC made by PR as the "truth".

Our first method (M1) simply uses the average brightness temperature at 85 GHz vertical polarization (denoted as TB (85 V)) under no-rain conditions as the background brightness temperature at 85GHz vertical (denoted as TBe (85 V)). Our second method (M2) uses a regression equation between TB (85 V) and TB (22 V) under no-rain conditions from the database. TBe (85 V) is calculated by substituting the observed TB (22 V) into the regression equation. The ratio of accurate rain detection by GPROF to all rain occurrences detected by PR was 59%. This ratio was 57% for M1 and 63% for M2. The ratio with the weight of the rain rate was 81% for M1 and 86% for M2, while it was 80% for GPROF. These comparisons were made by setting a threshold using a constant coefficient k0 to make the ratio of false rain detection to all "no-rain" occurrence detected by PR almost the same (approximately 0.85%) for all three methods. Further comparisons among the methods are done and the reasons of the differences are investigated.

Seto, S., N. Takahashi, T. Iguchi, 2005: Rain/no-rain classification methods for microwave radiometer observations over land using statistical information for brightness temperature under no-rain conditions. *J. Appl. Meteor.*, accepted.