# Experiment of Rain Retrieval over Land Using Microwave Surface Emissivity Map Derived from TRMM TMI and JRA25

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Rain estimation over land area is necessary for monitoring disasters like flood or management of fresh water. But the precision and accuracy of the estimate are less than that over the ocean. So, an improvement of rain estimation over land area is needed. GPM (Global Precipitation Measurement) mission will bring us 3-hourly microwave radiometer's data over global region. Therefore, it becomes to be more important. Rain estimation over land is mainly based on scattering signal of high frequency, because strong land microwave radiation hides rain signal and it is difficult to obtain exactly land surface properties due to the large variations. Therefore, we are developing a data-set of global land surface emissivity of 9 Tropical Rainfall Measuring Mission (TRMM) Microwave Imager (TMI) channels calculated from TMI brightness temperature (TB) and atmospheric profile data of Japanese 25-year Reanalysis Project (JRA-25) for the region identified as no-rain by TRMM Precipitation Radar (PR). For the evaluation of the instantaneous land surface emissivity data-set, some characteristics of global monthly emissivity maps, for example, dependency of emissivity on each TMI frequency or each local time or seasonal/annual variation are checked. Moreover, these data are classified based on JRA-25 land type or soil-wetness and compared. Histogram of polarization difference of emissivity is similar to that of TB and mostly reflects the variability of land type or soil-wetness, while histogram of vertical emissivity shows a small difference. Next, by interpolating this instantaneous data-set with Gaussian function weighting, an emissivity over neighboring rainy region is derived and the interpolated emissivity is assessed by running radiative transfer model using PR rain profile and comparing with observed TB. Thus, it is confirmed that these values have a possibility to be used for the rain estimate. Now, we are investigating whether the use of them improves the rain estimate. Preliminary rain retrieval from the emissivities for some frequencies and TBs is evaluated based on PR rain profile and TMI rain rate. Moreover, another method is tested to estimate surface temperature from two emissivities, based on their statistical relation for each land type and soil-wetness. The surface temperature is compared with JRA-25 surface temperature.