Global Precipitation Map Produced by Using Satellite Remote Sensing: Development, evaluation, and application into hydrology

Shinta Seto

IIS, University of Tokyo

Recently, many research groups are developing global high-resolution precipitation products (HRPP) by using several microwave and infrared space-borne sensors with supplement information such as rain gauges. In this presentation, we introduce development, evaluation, and application of HRPPs, especially GSMaP. GSMaP, one of HRPPs, has been developed by a Japanese research group supported by JST/CREST. It is assumed that TRMM/PR, the first space-borne precipitation radar in the world, is absolutely right for the development of retrieval algorithm for GSMaP_TMI (a product of GSMaP, produced by using TRMM/TMI only). Consequently, the GSMaP_TMI gives very close monthly rain rate estimates with TRMM/PR. However, compared with other HRPPs, it is found that GSMaP_MWR (produced by using TRMM/TMI and other microwave radiometers) gives lower estimates of precipitation. The underestimation is also recognized by the validation and inter-comparison of river discharge simulated by semi real-time terrestrial water cycle simulation system (called Yesterday's Earth). Now, we should recognize that the current standard algorithm of TRMM/PR underestimates rain intensity over land.

The underestimation can be partly explained by rainfall-induced change in actual backscattering cross sections ($^{0}_{e}$). In the standard algorithm, surface reference technique (SRT) is used for attenuation correction and adjustment of the drop size distribution (DSD) model. The SRT assumes that $^{0}_{e}$ is same under rain and under no-rain. However, it is not a valid assumption, because the increase of soil moisture induced by rainfall can increase $^{0}_{e}$ over land. The ignorance of this effect leads to the underestimation of rain intensity.