

Category and Session Number: 9D

Preferred Mode of Presentation: Oral

Development of a new Soil Moisture Retrieval Algorithm using TRMM/TMI polarization ratio and NDVI

K. TANAKA, M. MOROHASHI, and S. IKEBUCHI

Water Resources Research Center, DPRI, Kyoto University

In this study, a new algorithm for retrieving surface soil moisture from TRMM/TMI data is proposed by utilizing the GAME-Tibet dataset. Based on the microwave transfer theory, low frequency (10.65GHz) is known to be sensitive to soil moisture, and this frequency is used for data analysis. Assuming that some soil physical parameters are prescribed, soil emissivity for each frequency and polarization can be derived from Fresnel's law and Dobson's formula¹, and it can be expressed by a function of soil moisture. The soil emissivities for each polarization ($\epsilon_{10H}, \epsilon_{10V}$) are calculated from the ground measured soil moisture data. Also, the Brightness Temperatures from TRMM/TMI ($T_{b,10H}, T_{b,10V}$) for the same period are prepared. Through the analysis of these values, the ratio of these two polarization values ($\epsilon_{10H}/\epsilon_{10V}$ and $T_{b,10H}/T_{b,10V}$) are found to be roughly expressed in power function.

$$\frac{\epsilon_{10H}}{\epsilon_{10V}} = \left(\frac{T_{b,10H}}{T_{b,10V}} \right)^{P_s} \quad P_s = aNDVI \quad (1)$$

Where, P_s is a time varying parameter to express the effect of vegetation phenology. Furthermore, the ratio $\epsilon_{10H}/\epsilon_{10V}$ itself is found to be a function of soil moisture. As a result, soil moisture can be retrieved from $T_{b,10H}/T_{b,10V}$ and P_s . In another words, parameter P_s is calibrated using the above relationship and ground observed soil moisture. Then, P_s is found to be expressed by a linear relationship with NDVI.

The above mentioned algorithm is applied to GAME-Tibet site. Although the algorithm is so simple, time series of TRMM/TMI retrieved surface soil moisture agrees well with ground measurement and model output (SiBUC offline simulation).

Keywords: Soil Moisture; TRMM/TMI; GAME-Tibet; NDVI; Polarization

References

- [1] Dobson, M.C. et al.: Microwave dielectric behavior of wet soil (part II), IEEE Transactions on Geoscience and Remote Sensing, **23**, 35-46 (1985).