Geophysical Research Abstracts
Vol. 21, EGU2019-3924-2, 2019
EGU General Assembly 2019

Developing a spring thaw classification algorithm based on AMSR-E brightness temperature data in the Central Tibetan Plateau

Yi Tang and Wenjiang Zhang

Sichuan University, College of Water Resource & Hydropower, State Key Laboratory of Hydraulics and Mountain River, Chengdu, China (ytangscu@stu.scu.edu.cn)

Changes in the soil freeze/thaw (F/T) dynamics in the Tibetan Plateau (TP) will exert significant influences on regional hydrology and terrestrial ecosystems. Microwave remote sensing shows great advantages in detecting soil F/T dynamics due to its sensitivity to soil water (both its quantity and phase change) and its potential to provide "all-weather" observations. In this study, we developed an algorithm using AMSR-E (Advanced Microwave Scanning Radiometer Earth Observation System) brightness temperature (T_b) data to detect spring thaw onset in the Central Tibetan Plateau (CTP). We assumed T_b at lower frequencies is more sensitive to changes in soil F/T status, while T_b at higher frequencies is subjected more to scattering effects due to surface snow cover, vegetation and atmosphere conditions. Therefore, the standard deviation of brightness temperature at 6 GHz and horizontal polarization (STD_{6H}) was used to detect soil F/T status, and a scattering index based on higher frequencies was used to constrain the scattering effects of snow cover on STD_{6H}. The algorithm was calibrated and validated using surface ground temperature and daily minimum air temperature data in the CTP. Results showed that the algorithm had a mean bias of 3.7$\sim$17.6 days and RMSE of 7.5$\sim$19.7 days, and showed a better performance over a previous method based on the standard deviation index of AMSR-E T_b of all frequencies, which had a mean bias of 8.3$\sim$41.2 days and RMSE of 13.4$\sim$27.6 days. In the study area, spring thaw occurred later with increasing latitude at a rate of $\sim$4.33 day deg^{-1} ($p<0.005$). However, further work is needed over more extensive area with diverse surface conditions in the TP.