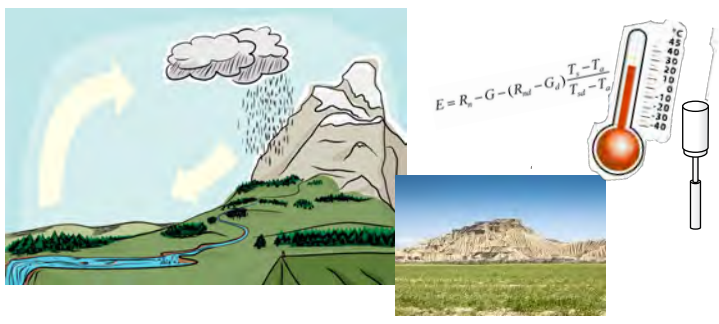
Measuring Multi-scale Evapotranspiration by Thermal Remote Sensing and Three-temperatures Model

— Theory, Verification, and Application

Language: English
Admission free

DATE: 21th Jan. 2014 at 15:00 -17:00

VENUE: meeting room, #7A Bldg., 7F



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Remotely measuring evapotranspiration (ET) and separating its two components, soil evaporation (E) and vegetation transpiration (T), have been challenges for ET study and application. In this study, a three-temperatures model (3T model) based on thermal remote sensing is developed, verified, and applied for ET estimation under a multi-scale condition. There are two sub-models in the 3T model: soil evaporation sub-model and vegetation transpiration sub-model. E and T can be separately estimated by these two sub-models, and then ET can be obtained to put E and T together. One of the most significant advantages of the 3T model is that only a minimum amount of data are required. The necessary parameters are net radiation, soil heat flux, surface temperature (dry soil and drying soil), and air temperature for E estimation, while it is net radiation, surface temperature (canopy and reference canopy), and air temperature for T estimation. Verifications and applications were carried out by using ground and space based thermal remote sensing, varying from leaf scale (a few square centimeters) to catchment scale (over 10 thousand square kilometers). Verifications were carried out by comparing the estimated results with the measured ET from weighing lysimeter, Bowen ratio, Penman-Monteith, eddy covariance, and water budget. Results show that the approach of "3T model + thermal remote sensing" is a reliable and practical way for remotely measuring ET. Especially in arid and semi-arid regions, the method performs better. Therefore, it can be applicable for irrigation water management, water and energy budgets monitoring, thermal environment monitoring and evaluation, and other applications.

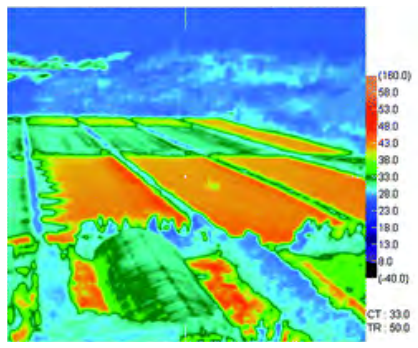

image of thermal remore sensing

Guo Yu Qiu *biography*

Obtained his Ph.D. from Tottori University, Japan, in 1996. Served as an Assistant and Associate Researcher in the Chinese Academy of Science from 1987-1992 and Researcher in the National Institute of Agricultural Engineering (Japan) from 1996-1999. Since 1999, he has gone through the ranks of Researcher, Associate, and Full Professor of the National Institute for Environmental Studies (Japan), University of California at Davis, Tottori University, the University of Tokyo and Beijing Normal University. He is currently a professor at Peking University's Shenzhen Graduate School. He has directed more than 10 Ph.D. and Master's students. His research areas include environmental and energy informatics, eco-hydrology, urban hydrology and water resources, bioenergy, and energy efficiency. He has published more than 40 papers in peer-reviewed international scientific journals, 40 papers in peer-reviewed Chinese scientific journals, and made more than 40 presentations at international conference. He teaches courses in Environmental Ecology, Eco-hydrology, Urban Hydrology and Water Resources, Bio-resource and Ecology.

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