

Simple Methods to Estimate Global Evapotranspiration from Satellite Visible and Thermal Infrared Observations and its long-term trend from 1982-2002¹

Kaicun Wang and Shunlin Liang

Department of Geography, University of Maryland, College Park, MD 20742, U.S.

A simple and accurate method is essential to estimate EvapoTranspiration (ET) from satellite remote sensed data. However, most existing methods suffer from high sensitivity to the errors of input data, such as land surface temperature (LST). Because satellite can only provide limited information pertaining to ET, a major task in the remote sensing of ET is to identify key factors influencing the processes involved and its parameterization from satellite data. Following this way, we developed several simple methods to estimate ET from satellite estimated surface net radiation, vegetation indices and LST by analyzing available long-term observations of ET (such as Atmospheric Radiation Measurement (ARM), and Ameriflux) [Wang, et al., 2006; Wang and Liang, 2008; Wang, et al., 2007]. The advantages of the methods includes their simplicity, low sensitivity to error of input data, and their capability in predicting long-term variation of ET. The methods have been validated using ground-based measurements and land model simulations of Global Soil Wetness Project (GSWP-2). Compared to ground-based measurements, daily ET has an accuracy of 12.8 W m⁻² (RMSE, 27%), and a correlation coefficient of 0.95. The method predicts long-term variation well, and the annual variation predicted by the method has a high correlation coefficient of 0.82. The methods were further used to estimate global long-term ET from available solar radiation measurements from Global Energy Balance Archive (GEBA). We found that global terrestrial ET increased by 0.112 W m⁻² yr⁻¹ from 1982 to 2002, or 2.25 W m⁻² (6% in relative value) over the 21 years, equal to 28 mm yr⁻¹ in water flux [Wang et al., 2009].

Corresponding author: Kaicun Wang

Kaicun Wang

Assistant Research Professor

Department of Geography, University of Maryland, College Park, MD 20742, U.S.

Email: kcwang@umd.edu

Shunlin Liang

Professor

Department of Geography, University of Maryland, College Park, MD 20742, U.S.

Email: sliang@umd.edu
