Keynote Address I

Spatial Estimation of Evapotranspiration Using Satellite Imagery From Regional to Global Scales

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Introduction

Global population increase has resulted in an urgent need to improve the management of natural resources, such as land, water, and energy. Sustainable use of limited resources is important in the agricultural sector, as agriculture is a primary user of land and water. In the world, 69% of fresh water is used for agriculture, 21% is used for industry, and 10% is used for domestic purposes (Clarke and King, 2004). Understanding evapotranspiration (*ET*) from land is valuable, especially in agriculture. Reference (or potential) *ET* determines crop and irrigation water demands, and it is basic information of water resource planning. Actual *ET*, which is controlled by weather, soil, and surface conditions, is strongly related to crop growth and yield. At the basin scale or larger scale, such as that of a large irrigation district, *ET* is important information for the planning and management of water resources because it represents the consumptive use of water.

Satellite remote sensing is a powerful tool for the estimation of actual *ET* and both its spatial and temporal variations. According to Biggs et al. (2016), satellite-based *ET* estimation methods can be categorized into three groups: (1) vegetation-based models including the method proposed by Nagler et al. (2009) and the MODIS MOD16 *ET* estimation algorithm (Mu et al., 2011), (2) radiometric land surface temperature-based models such as SEBAL (Bastiaanssen et al., 1998), METRIC (Allen et al., 2007a,b), ALEXI (Anderson et al., 1997), and SSEB (Senay et al., 2007), and (3) scatter plot or triangle methods including the methods proposed by Moran et al. (1994), Roerink et al. (2000), and Nishida et al. (2003). The ideal location for applying such techniques might be areas of irrigated agriculture in arid and semiarid regions, because the low probability of