ESTIMATING GROUND-LEVEL SOLAR RADIATION AND EVAPOTRANSPIRATION IN PUERTO RICO USING SATELLITE REMOTE SENSING

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Evapotranspiration (ET) is an important component of the hydrologic cycle. Quantification of ET is essential for proper irrigation scheduling and water conservation efforts. A technique is presented in which satellite solar insolation estimates are used to predict daily reference evapotranspiration (ET_o) using the Penman-Monteith (PM), Priestly-Taylor (PT) and Hargreaves-Samini (HS) methods for Puerto Rico. In addition to solar insolation, other meteorological variables (e.g., net radiation, soil heat flux, air temperature dew point temperature and wind speed) are estimated. As an example of the methodology, ET_o was estimated over Puerto Rico for March 5, 2009 using the three methods. The results indicated relatively close agreement between the methods.

A comparison between estimated and observed solar radiation is also presented for the period April 1 through June 21, 2009, which indicates a need for calibration of the solar radiation remote sensing product. As a practical example of the use of the methodology, the Hargraeves-Samani ET_o was estimated for a crop season. The crop evapotranspiration (ET) was estimated by multiplying the ET_o by a crop coefficient (K_c). The goal of the analysis, which considered five different vegetable crops and seven locations, was to determine the cumulative seasonal water consumptive use. Determination of the seasonal water consumptive use is valuable for determining water supply infrastructure for farms and irrigation districts. This research represents a preliminary step in the development of an ET_o product for PR. This product is a potentially valuable tool for conducting water resource studies and for supporting irrigation scheduling efforts.