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Estimation of Daily Reference Evapotranspiration using Temperature Based Models and Remotely Sensed Data over Indian River Basin

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Reference evapotranspiration (ETo) is the most significant component of the hydrological budget. Accurate quantification of ETo is vital for proper water management, efficient agricultural activities, irrigation planning and irrigation scheduling. FAO Penman Montieth (FAO-PM) is the widely accepted and used method for the ETo estimation under all climatic conditions, but needs numerous inputs which are difficult to acquire in developing countries. In such conditions, temperature based models such as Hargreaves-Samani (HS) equation and Penman Montieth temperature (PMT) can be used, where only maximum and minimum temperatures are required. Spatial interpolation of meteorological parameters to calculate spatial variation of ETo results in inaccurate estimations at lowly densed weather stations. Hence, there is a necessity of simple and easy method to estimate spatial distribution of ETo. In this regard, remotely sensed data provides viable alternative approach to obtain continuous spatio-temporal ETo. In this study, we used temperature based ETo models with remotely sensed LST data to estimate spatio-temporal variation of ETo. Day and night LST (MYD11A1) data of the year 2010 for the Cauvery basin on a daily basis were obtained from MODIS sensor of Aqua satellite. Firstly, day and night land surface temperatures (LST) with HS and PMT methods were applied to estimate ETo. Secondly, maximum and minimum air temperatures were estimated from day and night LST respectively using simple linear regression and these air temperature data were used to estimate ETo. Estimated results were validated with the ETo calculated using meteorological data obtained from Automatic Weather Stations (AWS) by applying standard FAO-PM. The preliminary results revealed that, HS method with LST overestimated ETo in the study region. Statistical analysis showed PMT method with both LST and air temperatures performed better than the HS method. These two temperature based methods are often used for the point scale estimation of ETo, but seldom used on remotely sensed LST and air temperature data. Results indicated that PMT method with air temperature obtained from LST is appropriate method for the estimation of ETo when only temperature data is available in the study region.