ASSESSMENT OF SATELLITE BASED EVAPOTRANSPIRATION PRODUCTS AT REGIONAL SCALE OVER LANDSCAPE OF PAKISTAN
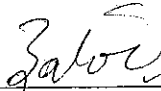
by

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2017-MS-HPE-1

A THESIS

presented to the university of engineering and technology, Lahore

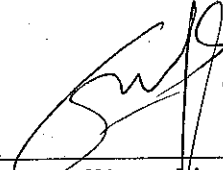in partial fulfillment of the requirements for the degree of

Master of Science

in

HYDROPOWER ENGINEERING

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ABSTRACT

Satellite based Evapotranspiration (ET) products are being used at a global scale for ET estimation and mostly providing a reliable opportunity in in-situ data-sparse region. Global Land Data Assimilation System version-2.1 (hereafter GLDAS), Global Land Evaporation Amsterdam Model version-3.3b (hereafter GLEAM) and Moderate Resolution Imaging Spectroradiometer version-16A2 (hereafter MODIS) are currently used state-of-the-art satellite ET products. They provide widely and continuously available datasets with large spatio-temporal coverage. Availability of accurate & reliable ET information is a prerequisite for many hydro-meteorological applications such as water resource management, irrigation scheduling, crop yield estimation, and drought predictions; hence, this research work was carried out to evaluate the accuracy and applicability of MODIS, GLEAM & GLDAS in diverse regions of Pakistan. ET estimates obtained from these products were compared with gauge data on monthly temporal scale, and seasonal (spring, autumn, summer, and winter) scale in four diverse climatic zones using six performance metrics namely root mean square error, standard deviation, correlation coefficient, index of agreement, Nash-Sutcliffe efficiency and statistical bias. The results showed that (1)-GLEAM provided significantly better ET estimates as compared to other products in the dry regions as well as in hilly and mountainous terrain of Pakistan. (2)- Seasonal analysis resulted that GLEAM was also best suitable product in case of spring, summer & autumn, whereas MODIS provide better agreement in case of winter. On the other hand, GLDAS was ranked 2nd in case of all seasons. (3)- By considering zones based analysis it was noted that GLEAM performed better as compared to other ET products in all zones, whereas GLDAS & MODIS ranked 2nd and 3rd respectively. (4)- The overall performance of GLEAM is very convincing and it was concluded that it can be a feasible satellite product for most of the areas of Pakistan. Furthermore, error component (systematic and random) estimation in satellite products can be step further for evaluation of GLDAS & GLEAM.