

Mapping evapotranspiration using METRIC model over semi-arid region of D. I. Khan, Pakistan

Benazeer Iqbal^{1, 2}, Muhammad Ali^{1,2*}, Jabir Nazir^{1,2}

¹National Centre of Excellence in Geology, University of Peshawar, 25130-Peshawar, Pakistan

²GIS and Space Application in Geosciences Lab (G-SAG), National Centre for GIS and Space Applications (NCGSA)

*aliumarzai@uop.edu.pk

Mapping evapotranspiration (ET) is critical for hydrological modelling, efficient agricultural water management, runoff estimation, crop water requirement, and sustainable water budgeting under semi-arid conditions. ET can be measured through in-situ methods i.e., Pan evaporation, Eddy covariance, lysimeter, and Bowen ratio although these approaches are not capable to represent large geographical regions. Therefore, remotely sensed satellite imagery can thus give ET at large spatiotemporal scales. Remote sensing-based approaches are useful in regions like Pakistan, where ground-based ET data is scarce. In this regard, the main objective of this research is to model ET for semi-arid region in Pakistan using METRIC (Mapping Evapotranspiration with Internalized Calibration) model and Landsat 8 OLI/TIRS satellite data from 2013 to 2016. Ground-based pan evaporation data was provided by the National Agromet Centre Islamabad. This in-situ measured ET was then used for the validation of ET estimates through METRIC model. The results show that open water and green vegetation have high evapotranspiration rates whereas dry soil, barren ground, and residential areas had the lowest ET. The modelled ET shows a very good correlation with ground-based measured data in terms of Pearson’s correlation coefficient (0.87) with a very slight deviation in terms of RMSD (Root Means Square Difference) exhibiting value = 0.02. This research work demonstrates that the METRIC model has a significant potential for calculating spatio-temporal ET over large heterogeneous regions having less ground-based weather data.

Keywords: Evapotranspiration; METRIC; Landsat 8 OLI; Surface Energy balance