# SPATIOTEMPORAL VARIATION OF POTENTIAL EVAPOTRANSPIRATION IN IRAQI KURDISTAN REGION

Khalil K. Hamadamin[1] Lecturer
Dawod R. Keya[2] Lecturer
Ali M. Rasheed[3] Lecturer
T. H. Karim[4] Professor

[1]Dep. of Dam and Water Resources, College of Engineering, Salahaddin University, Erbil, Iraq; E-Mail: khalil.hamadamin@su.edu.krd
[2]Khabat Technical Institute, Erbil Polytechnic University, E-Mail: dawod.keya@epu.edu.iq
[3]Department of Soil, Faculty of Agricultural Sciences, University of Sulaimani, Erbil, Iraq; E-Mail: ali.rashid@univsul.edu.iq,
[4]Soil and Water Department, College of Agriculture, Salahaddin University, Erbil, Iraq; E-Mail: solavtariq@yahoo.com
Corresponding Author's e-mail: dawod.keya@epu.edu.iq

## ABSTRACT

Potential evapotranspiration is a key factor in hydrological and meteorological studies and its spatiotemporal variations are of great significance for agricultural water use planning, irrigation system design and management. The monthly and annual ET0 values were calculated by Penman-Monteith formula. The calculations were based on the available meteorological data of 31 meteorological observation stations recorded during the last two decades in Iraqi Kurdistan region and the surrounding borders. The spatiotemporal variations of ETo were examined by using parametric and non-parametric tests, and ArcGIS spatial analysis. Despite the increase of temperature in the study area only 3 stations out of 31 stations exhibited significant increasing trends in annual ETo. On the contrary, three stations exhibited decreasing trends. Among the study months, July offered the highest number of stations with significant trends. The results obtained using MK and other parametric non-parametric tests (linear regression, Pearson correlation, Kendall's $\tau_b$ and Spearman's rho test) indicate that the analogous values of Mann–Kendall (MK) and other tests. The analysis also revealed that the change in wind speed was responsible for trends in ETo. Pettitt test indicated that the jump in annual ETo occurred during the period from 2005 to 2009.

**Keywords:** Spatiotemporal variations of ETo, detection of trend, abrupt change, Parametric and non-parametric tests.

## INTRODUCTION

Spatial and temporal variations of reference evapotranspiration ($ET_o$) are useful for regional agricultural and water resources management as well as required in most distributed hydrological modeling (15). Changes in distribution of water resources with the climatic change have a profound impact on human life, production and ecological environment, which have drawn the attentions of academic and local government's attention (8); (19); (20).

ElNesr et al. (4) stated that potential evapotranspiration is of particular importance as a climatic parameter to detect climatic changes because it combines changes in many other climatic parameters including temperature, radiation, humidity and wind speed.

Investigating the variations of $ET_o$ is not critical only for managers implementing water efficient irrigation practices, but also for offering information for regional hydrologic processes (9). Their results indicated that on a seasonal and annual scale, $ET_o$ for the upper reach of Heihe river basin of China showed increasing trends from 1960 to 2010 and both increasing and decreasing trends were observed for the middle and lower reaches. In most parts of Iran, it was

# Indian Ecological Society

College of Agriculture
Punjab Agricultural University, Ludhiana – 141 004, INDIA
e-mail: indianecologicalsoceity@gmail.com
Web site: http://www.indianecologicalsociety.com


(Official Publications: **Indian Journal of Ecology**)


Dr. A.K. Dhawan
Managing Editor


No.: IES/IJE 812-21-6011
Dated: 21.01.2021

Mr Khalil K. Hamadamin
Dep. of Dam and Water Resources, College of Engineering
Salahaddin University, Erbil, Iraq
E-Mail: khalil.hamadamin@su.edu.krd

**Subject: MS 812-21 entitled "Spatiotemporal Variation of Potential Evapotranspiration in Iraqi Kurdistan Region "**

MS No-812-21

Dear Mr Khalil K. Hamadamin

The manuscript entitled "**Spatiotemporal Variation of Potential Evapotranspiration in Iraqi Kurdistan Region**" Khalil K. Hamadamin, Dawod R. Keya, Ali M. Rasheed and T. H. Karim is accepted for publication in **Indian J Ecology 48(18): 2021.**

Thank for your interest in the Journal and the Society

Prof A K Dhawan


Phone/Fax No. +911614629027; Cell:098141 10675