Journal of Agrometeorology 19 (3) : 288-289 (September 2017)

Short Comminucation

Long term rainfall variability assessment using modified Mann-Kendall test over Champua watershed, Odisha

A. K. PRABHAKAR[1*], K. K. SINGH[1], A. K. LOHANI[2] and S. K. CHANDNIHA[2]

[1]Department of Civil Engineering, National Institute of Technology, Kurukshetra, India

[2]National Institute of Hydrology, Roorkee, India

**Corresponding author E-mail: ajayprabhakar2@gmail.com*

The rainfall variability analysis is quite useful in deciding the cropping pattern according to the water availability.Goswami *et al*.,(2006) found both the frequency and magnitude of extreme rain events in rising trends, and moderate events showed the decreasing trend in the frequency of rainfall in most part of central India in monsoon seasons. Decreasing trend are also found in winter, pre-monsoon and post-monsoon season (Dash *et al.,*2007). Patra *et al.,*(2012) have found the insignificant declining trends of annual and monsoon rainfall in Odisha state. Present study highlights the watershed level rainfall variability and trend analysis for the Champua catchment area Keonjhar district of Odisha using 113 year (1901-2013) of rainfall data. The long term annual average rainfall of the catchment is about1425mm and Kendujhar district is about 1,505 mm. Agriculture is the main source of livelihood for most tribal community living over the study area.

The monthly rainfall obtained from India Meteorological Department has been converted into yearly and seasonal pattern i.e., pre-monsoon (March–May), monsoon (June–September), post-monsoon (October–November), and winter (December–February).Rainfall series was examined for homogeneity using standard normal homogeneity test (SNHT).Mann Whitney Pettit test was used to detect the possible break point in time series (Pettitt A, 1979) for each watershed of Champua basin.Modified Mann Kendall (MMK) tests, a non-parametric test was used for detection of monotonic trends in persistent data. Magnitude of trend has been calculated by Theil-Sen's estimator and positive and negative values represents the increasing and decreasing trend respectively (Mann 1945; Kendall *et al*. 1975).

The standard normal homogeneity test (SNHT) and Mann Whitney Pettit (MWP) have been used for finding out most probable change point. The two test indicates 1946 is the most probable change point in rainfall series for Champua watershed (Table 1).MMK and Theil Sen slope estimator test(s) are presented in Table 2. The entire study divided into before the change point 1901-1946, after the change point 1947-2013 and whole series 1901-2013. As per annual and monsoon time series during 1901-2013, it was noticed that the decreasing trend over study area. Further, it was also found increasing and decreasing rainfall trends, before and after the change point respectively.

Table 1: The MWP test and SNHT test for Watershed (1901–2013).

Test	P value	Year	Trend
Pettit's Test	0.044	1946	*Ha*
SNHT Test	0.121	1946	*Ho*

H_0, H_a represents homogeneous and heterogeneous series at significance level of 5% respectively

Table 2: The Sen's slope and MMK test for Champua watershed

Time Scale	Sen's Slope			MMK		
	1901-1946	1947-2013	1901-2013	1901-1946	1947-2013	1901-2013
Annual	7.62*	1.87	-0.83	2.78s	0.98	-1.05
Pre-Monsoon	-0.54	0.69	0.20	-0.80	1.52	1.10
Monsoon	6.65*	0.60	-0.83	4.33*	0.55	-1.63
Post-Monsoon	1.81	0.01	0.10	2.94*	0.03	0.47
Winter	-0.18	-0.02	-0.21	-0.31	-0.17	-2.18*

'*' represent the 5% level of significance level

ACKNOWLEDGEMENT

The authors are thankful to the India Meteorological Department for providing the rainfall data used in the study.

REFERENCES

Dash, S. K., Jenamani, R. K., Kalsi, S. R. and Panda, S. K. (2007). Some evidence of climate change in twentieth-century India. *Clim.change, 85*(3): 299-321.

Goswami, B. N., Venugopal, V., Sengupta, D., Madhusoodanam, M. S. and Xavier, P. K.(2006). Increasing trends of extreme rain events over India in a warming environment. *Sci.,* 314:1442–1445.

Kendall, M.(1975)a: Multivariate analysis. Charles Griffin.

Mann, H. B., (1945). Nonparametric tests against trend. Econometrica.*J. Econom. Soc*., 245-259.

Patra, J. P., Mishra, A., Singh, R. and Raghuwanshi, N. S. (2012). Detecting rainfall trends in twentieth century (1871–2006) over Orissa State, India. *Clim. Change*., 111(3-4): 801-817.

Pettitt, A. (1979). A non-parametric approach to the change-point problem. *Appl. Stat.,* 126-135

Received : April 2017; Accepted: June 2017