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Short Comminucation

Variability and long-term trend in pan evaporation in semi-arid region of Bundelkhand

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Climate change is likely to alter the evapo-transpiration rate and crop water productivity (Thomas, 2008; Mo *et al.*, 2007) in general and degraded agro-ecosystems like Bundelkhand region in particular. Long term analysis of rainfall data at Jhansi revealed that its rainfall had decreased by 319.5 mm over the period of 76 years from 1068.4 mm with the rate of 4.2 mm per year (Palsaniya *et al.,* 2016 and Rai *et al.,* 2014). Evapotranspiration is an important input for determining the length of crop growing period and choice of crops and for assessing water requirements (Kesava Rao and Wani, 2011). Long term trend analysis at Ludhiana revealed a decreasing trend (Kingra, 2015). Here, an attempt has been made to analyse the long term mean, variability and trend in pan evaporation using 25 years (1991-2015) data obtained from the agro-meteorological observatory, situated at CR farm, IGFRI, Jhansi (25° 27' N, 78° 37' E, and 271 amsl.).

Mean monthly pan evaporation along with different statistics and trend analysis are presented in Table 1. The mean annual evaporation rate was highest during the month of April to July in the range of 201.8 ± 62.2 to 330.9 ±36.8 mm. High degree of variability in pan evaporation was found during the month of July (CV=30.8 %) followed by September (22.5 %) and August and June (22.3 %). During the month of November to February, the mean monthly evaporation was almost below 100 mm. Mean annual evaporation of 1963.7 ± 143.1 mm with lower (CV=7.3 %) variability.

Trend analysis indicated a decreasing trend during January to May with a rate ranging between 0.16 to 0.67 mm year^{-1} (Table 1). However, the trends were not statistically significant except in February and March. The significant ($P<0.05$) decreasing trend corresponds to a decrease of 16.7 and 15.7 mm, in February and March respectively over the period of 25 years. Further it was observed that PE is increasing significantly ($P<0.05$) with a rate of 1.84, 1.34, 2.02, 0.50 and 0.53 and mm year^{-1}, during the months of August, September, October, November and December, respectively. The trend corresponds to an increase of 46.0, 33.5, 50.5, 12.75 mm and 13.25 mm for the respective months over the period of 25 years (1991-2015).

Table 1: Mean monthly pan evaporation along with regression equation.

Month	Mean (mm)	TrendAnalysis	R^2 (%)
January	75.4	y= -0.16x + 77.6	0.8 N/S
February	95.5	y= -0.67x + 104.9	24.8*
March	154.1	y= -0.63x + 164.8	14.5*
April	309.0	y= -0.44x + 317.6	1.4 NS
May	330.9	y= -0.352x+331.1	1.4 NS
June	293.3	y= 0.71x + 271.8	1.7 NS
July	201.8	y= 0.86x + 180.1	4.3 NS
August	112.6	y= 1.84x + 85.5	41.8*
September	122.3	y= 1.34x + 100.7	33.3*
October	147.5	y= 2.02x + 117.0	48.8*
November	82.4	y= 0.50x + 74.9	19.4 *
December	61.8	y= 0.53x + 53.6	28.4 *
Annual	1963.7	y= 5.86x + 1872.	16.3*

*Significant at 5 % significance level; NS: Not significant.

Mean annual PE also showed increasing trend with a rate of 5.86 mm year^{-1} and it corresponds to an increase of 146.5 over the period of 25 years. Such studies are of great significance for studying the impact of climate change on rate of evaporation and crop water requirements, which can help in the management of limiting water resources and sustainability of crop production under changing climatic conditions.

REFERENCES

Kesava Rao A.V.R and Wani, S.P. (2011). Evapotranspiration paradox at a semi-arid location in India. *J. Agrometeorol.,* 13 (1): 3-8.

Kingra, P.K. (2015). Trends and variability in pan evaporation at Ludhiana. *J. Agrometeorol.,* 17 (2): 271-272.

Mo, X.G., Lin, Z.H. and Liu, S.X. (2007). Climate change impacts on the ecohydrological processes in the Wuding river basin. *Acta Ecolog. Sinica*, 27 (12):4999-5007.

Palsaniya, D. R., Rai, S. K., Sharma, P., Satyapriya and Ghosh, P. K. (2016). Natural resource conservation through weather based agro-advisory. *Current Sci.*, 111(2): 25 July.

Rai,S.K., Kumar, S., Rai, A.K., Satyapriya and Palsaniya, D.R. (2014). Climate change variability and rainfall probability for crop planning in few districts of central India. *Atmosph. Climate Sci.*, 4:394-403.

Thomas, A. (2008). Agriculture irrigation demand under present and future climate scenarios in China. *Global Planet. Change*, 60(3-4):306-326.

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