

## Letters to the Editor

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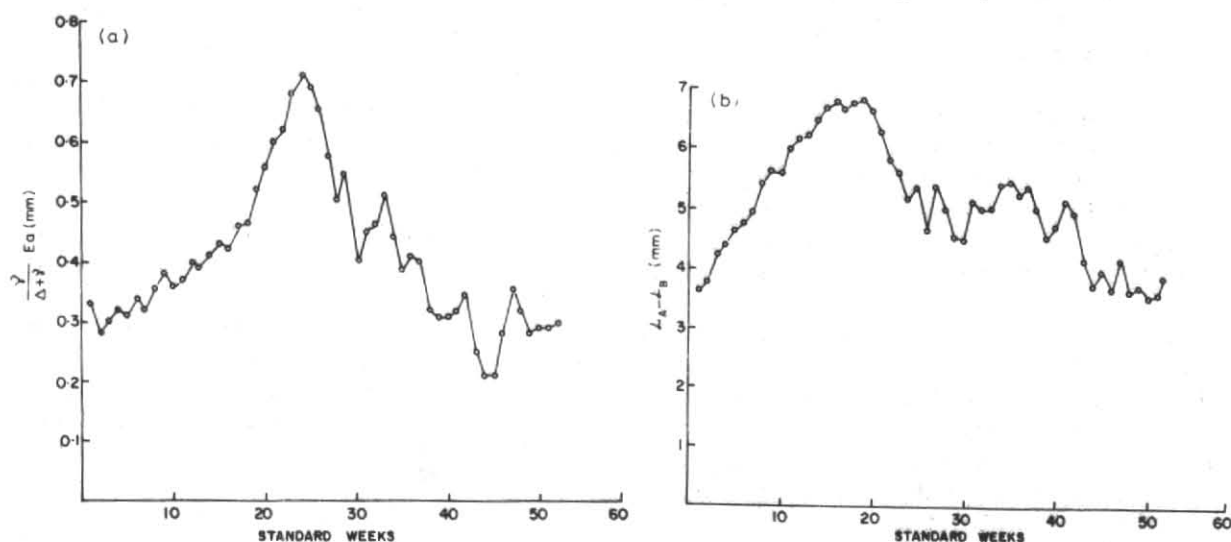
### RELATIVE CONTRIBUTIONS OF ENERGY AND AERODYNAMIC TERMS TO POTENTIAL EVAPOTRANSPIRATION AT MADRAS

1. The concept of potential evapotranspiration (PET) on the basis of energy balance and aerodynamic approaches was given by Penman (1948). Penman has considered a comprehensive range of meteorological factors, such as, radiation intensity, temperature, humidity and wind in estimating PET. A number of workers (Rao *et al.* 1971, Khambete and Biswas 1984, Venkataraman *et al.* 1984) have estimated potential evapotranspiration in different regions of India. But studies on the relative contributions of energy and aerodynamic terms, which are the essential components of potential evapotranspiration, are scanty. In this paper an attempt has been made to observe the variation of energy term and that of aerodynamic term separately in all the standard weeks throughout the year over Madras. Besides, relative contributions of energy and aerodynamic terms towards the potential evapotranspiration are also assessed.

2. The site selected for the present study is the Meenambakkam Observatory, Meteorological Office, Madras. The average wind speed during the preceding 24 hours calculated from the

anemometer reading at 0830 IST in the morning was used in the present study. Temperature and humidity were recorded at 0730 and 1430 IST everyday. The duration of sunshine for a day was obtained from sunshine recorder. Total daily radiation at the top of the atmosphere was estimated from the data given in Smithsonian Meteorological Tables. These data are then used to find out the components of PET by the Penman formulae. Ten years' data (1981 to 1990) are used for this study.

3. Fig. 1(a) depicts the mean daily energy term for each standard week throughout the year. The value of the energy term increases steadily from 1st to 19th week (1 January to 13 May) and afterwards decreases upto 30th week (23 to 29 July) which is due to the premonsoon thunderstorm activity and subsequent onset of southwest monsoon over Madras. From 30th to 38th week (23 July to 23 September) its value does not exhibit a definite trend. But after 38th week its value decreases upto 48th week (26 November to 22 December) and thereafter almost remains constant during rest of the weeks. From the second fortnight of September till the end of December, the formation of thunder cloud is a general feature over Madras. So largest decrease of energy term after 38th week may be due to the formation of clouds which restrict the incoming solar radiation to intercept with the water surface during this period.



Figs. 1 (a & b). Weekly mean (a) energy and (b) aerodynamic values in different standard weeks

4. The mean daily aerodynamic term which is calculated from the data of wind speed and actual and saturation vapour pressure for each standard week is shown in Fig. 1 (b). Aerodynamic term increases from 1st to 26th week (25 June to 1 July) afterwards it shows almost decreasing trend upto 45th week (5 to 11 November) except from 31st to 33rd week (30 July to 19 August) when it shows an increasing trend. It has been observed that the actual vapour pressure over Madras increases after 26th week. The increase of actual vapour pressure ultimately reduces the vapour pressure gradient after 26th week. Thus, the overall decrease of aerodynamic term after 26th week is due to the reduction of vapour pressure gradient and subsequent appearance of weak westerlies and weak easterlies in the morning and afternoon respectively in the southwest monsoon season and weak westerlies in the month of October. The increase in aerodynamic term after 45th week is mainly due to the strengthening of easterlies in the active northeast monsoon season.

5. In each standard week, contribution of energy term of PET is much higher than that of aerodynamic term. Ranges of energy and aerodynamic term throughout the year are 81.9 to 96.0 percent and 5.8 to 12.2 percent respectively. Besides, march of mean daily energy term and mean daily

PET for each standard week throughout the year is almost same. This indicates that energy term is the main contributing factor for PET over Madras throughout the year and contribution of aerodynamic term is negligible.

#### References

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