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Agricultural and Forest Meteorology 68 (1994) 113–115

AGRICULTURAL AND FOREST METEOROLOGY

Reply

Comment on the paper 'Daily pattern of dew-point temperature in a semiarid climate'

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(Received 18 May 1993, revision accepted 9 August 1993)

The similarity between the diurnal patterns of monthly mean dew-point temperatures for April in Niamey, West Africa and Patancheru, India is striking The small diurnal variation in vapour pressure relative to the vapour pressure deficit is similar in both locations

Although the error in estimating daily mean vapour pressure deficit from two spot readings of humidity is small in the example given by Culf et al (1994), in India this is not always so for indiviual days (as opposed to monthly means) To illustrate this I have compared daily mean vapour pressures from the automatic weather station at the ICRISAT Center (readings every 5 min) with means from spot readings at 07 15 and 14 15 h The difference between the two, expressed as a percentage of the mean daily vapour pressure deficit, was computed between May 1981 and October 1985 for each day in the analysis of Butler (1992) This gave the distribution of the error in calculating mean daily vapour pressure deficit from two spot readings of humidity (Fig 1) Overall, the mean error for the whole period was close to zero, but on individual days the error commonly exceeded 10%

Another effect of diurnal oscillation of the dew-point temperature is to increase the amplitude of vapour pressure deficit, even though the daily mean estimate assuming constant vapour pressure is similar to the actual mean An extreme example of this effect is illustrated in Fig 2 where the assumption of constant vapour pressure reduced the vapour pressure deficit amplitude to less than 60% of the true value, but daily mean values agreed to within 0 6%

The amplitude of vapour pressure deficit is of particular importance in assessing the effect of humidity on certain plant pathogens, where the relative humidity needs to exceed a critical value for processes such as infection and sporulation For this, daytime and night-time values have to be considered separately The daily range of vapour pressure deficit may also affect crop water-use efficiency For example, when comparing the water-use efficiency of various crops, Tanner and Sinclair (1983) gave

SSDI 0168-1923(94)02110-R

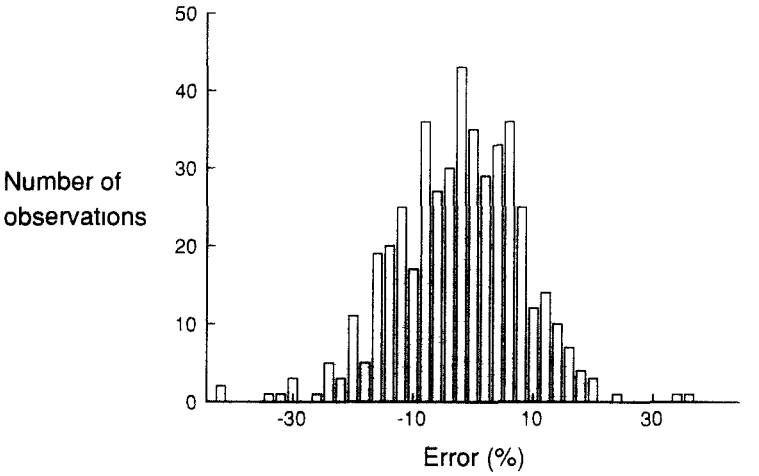

Fig 1 Frequency distribution of errors in daily estimates of mean vapour pressure deficit at ICRISAT Center, using the average of two spot readings to obtain the vapour pressure Actual mean vapour pressure was obtained from wet and dry bulb readings every 5 min with an automatic weather station Values were computed for 460 days between May 1981 and October 1985

increased weight to vapour pressure deficit when net radiation was positive This again requires separation of day and night values

In summary, it appears that mean vapour pressure deficit can be estimated satisfactorily by assuming a constant daily vapour pressure over periods of, say, 1 month or more However, the assumption can lead to substantial errors on individual days For some applications the effect of diurnal changes in absolute humidity on the daily

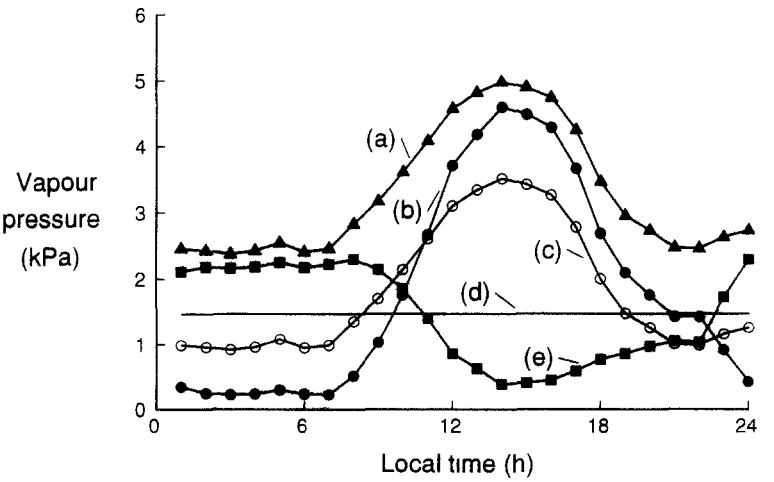

Fig 2 Hourly mean values of (a) saturated humidity, (b) measured vapour pressure deficit, (c) vapour pressure deficit estimated assuming the constant vapour pressure in (d) and (e) measured vapour pressure The constant vapour pressure (d) is the mean of the 07 15 and 14 15 h spot readings

amplitude of vapour pressure deficit is important Then measurements or estimates of hourly humidity are needed

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