Comparison of Two Methods for Determining Infrared Emittances of Bare Soils[1]

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29 July 1968

The recent note of Fuchs and Tanner (1968) raises a question relative to the accuracy of Buettner and Kern's (1965) method for determining infrared emittances of bare soils as compared to their method (Fuchs and Tanner, 1966). Since the accurate measurement of surface temperature by means of infrared thermometry requires good emittance data, and since such temperatures are essential to studies of evaporation from bare soil surfaces utilizing a Dalton-type equation (Conaway and Van Bavel, 1967), we felt it important that this question be resolved.

Our consideration of the theory involved in both methods did not indicate that either was markedly superior to the other. The discrepancy noted by Fuchs and Tanner (1968) between emittances obtained by Buettner and Kern with their "emissivity box" and those obtained from integrations of spectral emittance curves disappeared when the true spectral sensitivity of the infrared thermometer they used was included in the calculations. Thus, we concluded that we would have to compare the methods experimentally.

To accomplish this comparison, we acquired the apparatus essential to both methods and followed their outlined procedures to determine the infrared emittances of four bare soils. These procedures are described in detail in Fuchs and Tanner (1966) and in Conaway and Van Bavel (1966). Our results are presented in Table 1. Based upon this evidence, we conclude that both methods give essentially the same results, and that both are thus equally good.

[1] Contribution from the Soil and Water Conservation Research Division, Agricultural Research Service, U. S. Department of Agriculture.

TABLE 1. Emittances ϵ of four soils determined by the Buettner and Kern (BK) and Fuchs and Tanner (FT) methods with a Barnes IT-3 infrared thermometer. Each value is the average of 5 measurements.

Method	Silica sand $\epsilon \pm$std. dev.	Superstition sand $\epsilon \pm$std. dev.	Pine silty clay $\epsilon \pm$std. dev.	Adelanto loam $\epsilon \pm$std. dev.
BK	0.893±0.005	0.945±0.003	0.968±0.006	0.964±0.007
FT	0.893±0.005	0.952±0.008	0.963±0.004	0.969±0.007
BK—FT	+0.000±0.010	−0.007±0.011	+0.005±0.010	−0.005±0.014

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