551.573 : 551·467 : 551.521

A NOTE ON THE VARIATION OF EVAPORATION WITH SALINITY AND TEMPERATURE

The effect of salinity on evaporation has been a well established factor. The vapour pressure of a water body under given conditions is determined by its temperature. When a solute is dissolved in water, the vapour pressure of the latter is reduced. Within the limits of usual concentrations, the effect of soluble solids on rate of evaporation will depend on the amount of material in solution. This effect has been verified by many workers in the field (Rohwer 1933; Lee 1927; Adams 1934; Bonython 1939). An attempt is made here to make a comparative study of rates of evaporation of natural waters in the laboratory.

Four waters representing a wide range of salinity content are selected : Sea water (A), Tank water (B), Well water (C) and Tap water (D). Samples from each water are collected in 1-litre size clean polythene bottles and the measurements of the same are completed within 72 hours of collection.

The electrical conductivity of the samples are determined in the laboratory at a constant temperature of 25°C with the help of the Philips conductivity bridge of the type GM 4249/01, which is only a Wheatstone bridge in principle. Four glass jars of 10 cm height and 4 cm diameter are taken and filled to 1 cm below surface with the four waters. The jars are transferred to the hot oven with a temperature control. The initial height of the waters in jars is noted. The temperature is set to the required degree and time is noted. After four hours the heights of water levels in the four jars are observed. The difference in height in each sample is noted which is the total evaporation in depth units (mm) for four hours. The evaporation per hour is determined.

Fig. 1 shows the increase of evaporation with electrical resistivity at a given temperature. As the salt content of the water decreases resulting in an increase of resistivity, the evaporation rate is found to be increasing. This rate of increase of evaporation per ohm cm resistivity of water at a given temperature per hour, which is termed as gradient, is also found to increase with temperature. However, the variation of evaporation with temperatures for a given sample (Fig. 2) is gradual and smooth. The increase of evaporation is steeper at higher temperatures, namely 55°C and 65°C and is gentle at low temperatures, 35°C and 45°C. The details of evaporation are given in Table 1 along with the gradients.

The gradient of evaporation for different waters at 35°C (the usual normal temperature in the field

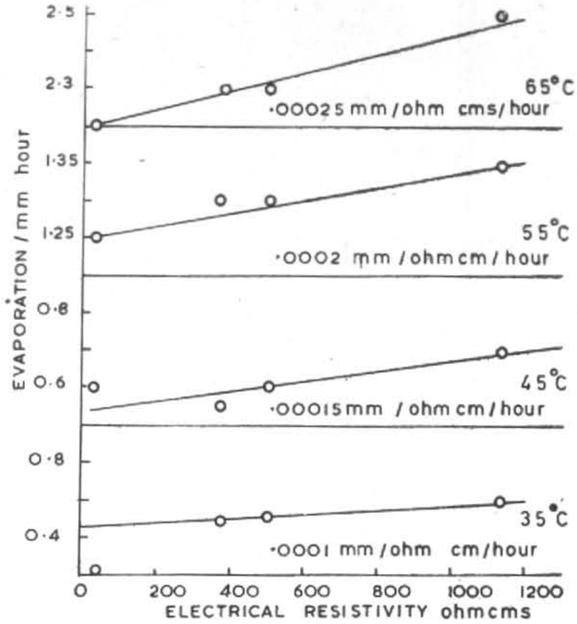

Fig. 1. Variation of evaporation with electrical resistivity

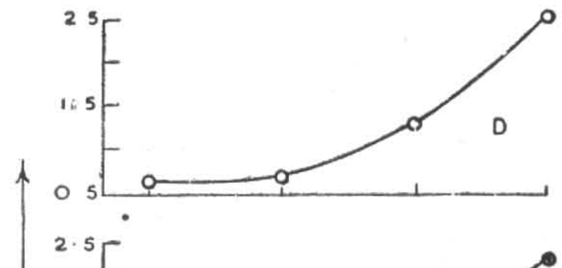

Fig. 2. Variation of evaporation with temperature for different waters

TABLE 1

Water sample	Resistivity in ohm cm	Evaporation (mm) per hour at			
		35°C	45°C	55°C	65°C
A (Sea Water)	32	0·23	0·57	1·25	2·2
B (Tank Water)	362	0.5	0·55	1·3	2·3
C (Well Water)	500	0·51	0.6	1·3	2·3
D (Tap Water)	1130	0·6	0·7	1.35	2·5
Gradient mm/ ohm cm/hr		0.0001	0·00015	0.0002	0·00025

conditions) is .0001 mm/ohm cm hour The natural waters generally vary in electrical resistivity from 100 ohm cm to 4000 ohm cm (the latter being that of rain water). Hence in a particular region we can expect a divergence of 0.4 mm/hr or 9.6 mm/day among different kinds of waters. It should, however, be realised that the other atmospheric conditions such as humidity, wind speed and the length of the day also play an important role in controlling the evaporation process *in situ* and so the laboratory observations, with a single variable, temperature, help in understanding the process to a limited extent only.

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