SHORT COMMUNICATIONS

LAYERING OF THERMOCLINE IN THE WESTERN EQUATORIAL INDIAN OCEAN

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DURING the first Indian cruise of ORV SAGAR KANYA in July-August 1983 a few XBT (expendable bathythermograph) records were collected along 52°E. They showed well-defined layers in the thermocline between equator and 2°S (figure 1). The vertical temperature profiles depict a well-mixed layer *a* and sharp thermocline *b* and *d* interleaved by a near isothermal layer *c*. The thickness of the layer *c* increased from about 20 m at the equator to about 90 m at 2°S. This near-isothermal layer in the thermocline was observed up to 650 km west of 52°E along the ship's track with varying thickness (only the westernmost profile is shown in figure 1). Though relatively thick step structures in the thermocline are reported for certain oceanic regions, the layer *c* observed at 2°S, 52°E could be the thickest ever reported in the tropical oceans.

Several factors are known to contribute to the formation of layers in the thermocline such as intense solar heating of deep mixed layer followed by mixing in the top column, double diffusion, internal wave breaking and advective layering[1-3]. The layer *c*

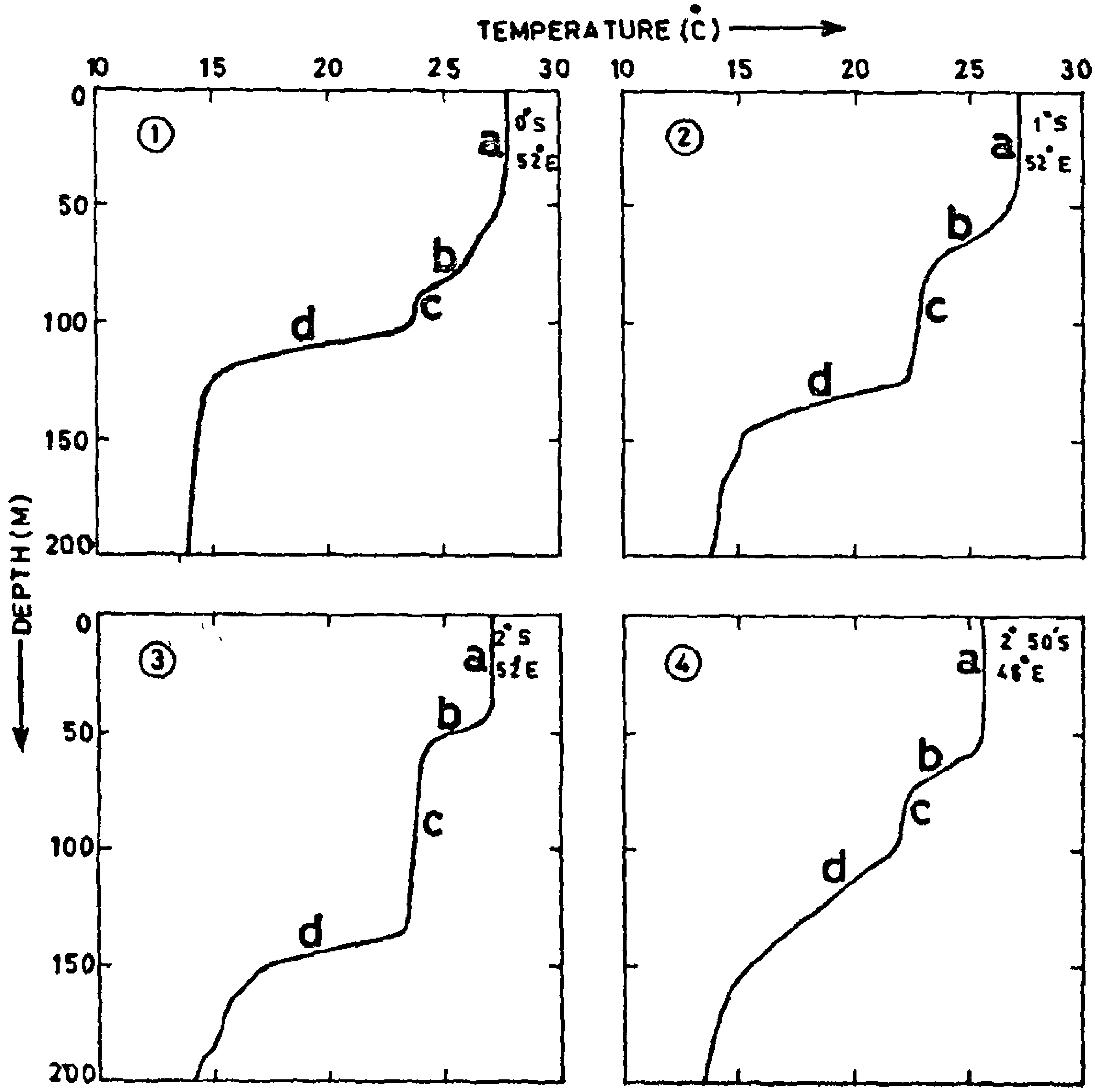

Figure 1. Vertical profiles of temperature at selected stations in the western equatorial Indian Ocean during August 1983 (latitude and longitude are marked in each profile).

at 2°S extends up to 140 m and its temperature is below 24°C. On an annual cycle the deepest surface mixed layer in the study area[4] is 80 m with surface temperature well above 25°C. Hence this layer in the thermocline is unlikely to be generated by intense heating of a deep mixed layer followed by mixing in the top column. The unusually large thickness of layer *c* and its presence in a relatively large area suggest that the observed features might not have resulted from double diffusion (the superposition of warmer and saltier water over colder and less saltier water leads to the formation of layers due to differential molecular diffusion of heat and salt) or internal wave breaking as the layers formed due to these mechanisms are usually small (not exceeding 26 m[1]). The layering of thermocline in the western equatorial Indian Ocean appears to have been by advective layering, which is one of the least studied phenomena in the sea[1].

Very few subsurface current measurements are available for the western equatorial Indian Ocean for this observational period. Measurements along 55°E in August 1963 revealed a subsurface eastward core beneath a westward[5] flow near 2°S. However, in June 1975 and 1976 the surface flow was also easterly with a persisting eastward core[6]. Climatological surface current charts show an eastward flow[7] but synoptic scale meanders are common in this area[5]. Although it is difficult to infer the nature of surface and subsurface currents with the present data, the unusually thick layer *c* in the thermocline suggest currents moving in opposite directions in the upper 150 m water column. Layering in the thermocline due to advection is postulated[2] and subsequently verified from observations. Federov[1] observed that the isothermal steps in the thermocline coincide with maximum values of vertical current shear in a depth slab where currents move in opposite directions. The hydrodynamic instability caused by large vertical shears leads to the creation of mixed layers. Thus layers in the thermocline might have been generated by currents moving in opposite directions and resulting strong vertical shears.

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DISTRIBUTION OF POTASSIUM AND CHLORIDE IONS DURING POLLEN-PISTIL INTERACTION IN MAIZE

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MANY aspects of the function of mineral ions in the pollen-pistil interaction of higher plants remain to be elucidated. There is a well-proven requirement of boron and calcium ions for pollen germination and tube growth of many species[1]. Heslop-Harrison[2] showed by cytochemical techniques and energy dispersive X-ray analysis that the stigmas of grasses contain a small quantity of calcium but are rich in potassium. The most likely function of potassium in the stigma is a major component of the osmoticum which maintains turgidity of the stigma over the period of flower opening. The accumulation of potassium and chloride could contribute about 60% of the osmotality of the expressed sap from mature, turgid stigmas of the grass *Pennisetum americanum* L. (Leeke)[3]. However, the distribution of these ions in different zones of the pistil following pollination has not been studied. In the present communication, this aspect was investigated during pollen-pistil interaction in maize.

Unpollinated and pollinated silks were harvested as required from plants of the field-grown maize, *Zea mays* L. cv. J 1034. Potassium and chloride ions were located histochemically[4,5]. The observations were made on pollen, unpollinated silks and on three regions of the pollinated silks, viz. apical, middle and the basal.

The mature pollen grains of maize showed an intense histochemical reaction for potassium distributed uniformly throughout the cytoplasm and the