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Investigation of temperature and density profile of brine in evaporating salt pans at Palavi in north-western Sri Lanka

P.S. Hewageegama, C.D. Amarasekera, J.R.P. Jayakody and M.A. Punyasena
Department of Physics, University of Kelaniya.

Measurements of temperature and density variations with depth in salt pans having a stable salinity gradient are presented. The density variation of brine has been correlated to the temperature variation with depth. The convective and nonconvective zones were identified. Gradients in salinity and temperature in the nonconvective zone were observed. Temperature and salinity were observed to remain the same throughout the convective bottom layer of brine in the ponds.

The investigation has been extended to different ponds filled to different depths and storage periods of brine. A maximum temperature of around 55 ^{0}C was observed in the bottom layers while the surface remained as low as 29 ^{0}C. This is a consequence of positive salt-density gradient, which suppresses convection and allows a temperature gradient to develop downwards.

The temperature measurements of different ponds filled to different heights indicate that the convective bottom layer temperature of a pond will increase if the pond is filled with brine to a higher level. These results indicate that the large area deep salt pans with long term storage periods can be used as solar ponds to collect and store solar energy in addition to the usual salt production.

Based on our results we speculate that the bottom temperatures of these ponds could be increased to about 80 ^{0}C by filling the ponds to a height of about 1.5 meters. Thermal energy stored in the convective bottom layer of these ponds could be extracted for many applications. The moderate temperature desalination of seawater especially in the areas where fresh water is in short supply is identified as one of the promising applications of thermal energy stored in solar pond-salt pans.