A study of temperature and salinity variations with depth in salt pans at Palavi in the North-Western region of Sri Lanka

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ABSTRACT

This work present measurements of temperature and density variation with depth in salt pans having stable salinity gradient. Measured 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 constant 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. In this work, salt pans were studied as salt-gradient solar ponds where collecting and storing of solar energy are possible.

The result obtained with the experimental laboratory pond constructed to study the effect of the thickness of nonconvective layer on bottom temperature show the requirement of having a convective layer of optimum thickness to obtain higher temperatures at the pond bottom. On the basis of our investigation the introduction of nonconvective gradient zone of optimum thickness will give higher bottom temperatures than those recorded in this work. 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.

Based on the results obtained from this work, large area deep salt pans with long tern storage periods can be used as solar ponds to collect and store solar energy in addition to the usual salt production. Thermal energy stored in the convective bottom layer of these ponds could be extracted for many applications. The 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.