Halite precipitation rates in the Dead Sea: Seasonal and spatial variations and their limnological and geological implications

Nadav G. Lensky (1), Ali Arnon (1,2), Ido Sirota (1,3)

(1) Geological Survey of Israel, Jerusalem, Israel (nadavl@gsi.gov.il), (2) Department of Geography and Environment, Bar Ilan University, Ramat Gan, Israel, (3) Institute of Earth Sciences, The Hebrew University of Jerusalem, Jerusalem, Israel

Halite precipitates from natural hypersaline brines when supersaturation is achieved. Negative water balance (evaporation > inflows) causes salinity increase and may cause continuous halite precipitation. The dependence of halite solubility on both temperature and salinity results in a complicated seasonal and spatial (depth) variations of halite precipitation in a stratified hypersaline lake. The seasonal thermo-haline stratification and the fluxes of heat, water and salt - dictates the spatial and temporal variations in the degree of halite saturation and the rate of precipitation. We present in situ observational data set from the Dead Sea, a hypersaline terminal lake in a negative water balance that actively precipitates halite. The data set includes the seasonal and depth variations of the following quantities: (i) halite precipitation rate, (ii) temperature, (iii) salinity, (iv) solubility, and (v) video documentation of active halite precipitation. We present the seasonal and depth variations of the above quantities along a year of observations. We discuss the seasonal variations of the atmospheric forcing – the heat and water fluxes, and the response of the lake – thermo-haline stratification and the precipitation of halite along the water column. We also discuss the role of diapycnal flux on the precipitation of halite and the salt fluxes. Geological implications on the lateral extent and thickness variations of evaporitic layers in evaporitic environments is also discussed.