TIDAL EFFECTS ON FRESH-SALINE WATER INTERFACE FLUCTUATIONS IN COASTAL AQUIFERS

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ABSTRACT

Sea tide fluctuations affect groundwater elevation at coastal aquifers, and it is well known that the water table amplitude decays with distance from the sea-shore. Therefore, changes in location of the interface between the fresh groundwater and the saline seawater are also expected. Indeed, Wang and Tsay (2001) have recently developed a theory describing these movements. This theory suggests that fluctuation amplitude of the interface depends on aquifer permeability, distance from the mean shoreline, recharge intensity, amplitude of water table fluctuation (which obviously depends on sea tide amplitude), as well as boundary conditions. Nevertheless, to the best of our knowledge, this phenomenon has neither been approved by field measurements, nor by laboratory ones. The objectives of this study are to measure and to characterize the fresh-saline interface fluctuations caused by sea tides. The Israeli coastal-plain aquifer, which mostly composed of sand and sandstone, includes several observation wells through which interface monitoring is plausible. Multi-level measurements of electrical conductivity were taken across the interface interval and its vertical motions were correlated with tidal fluctuations. This study defines the temporal and spatial changes of the interface as a function of aquifer characteristics.

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