

The response of the Mediterranean and Dead Sea coastal aquifers to sea level variations

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ABSTRACT

The present study examines the response of groundwater systems to changes in the Mediterranean Sea and Dead Sea levels. The Mediterranean Sea is expected to rise at a rate of about 1 cm/yr and the Dead Sea level is declining at a rate of about 1 m/yr. A comparison is given herein between the response of their adjoining coastal aquifers to their levels changes.

A significant response is observed in the Dead Sea coastal aquifer, exhibited both in the drop of the water levels as well as in the location of the fresh-saline water interface. The response depends mainly on the distance from the sea and the hydraulic conductivity of the near shore sediments. No such effect is yet observed in the Mediterranean coastal aquifer, as expected from the small level change.

Numerical simulations, using the Feflow software, show that the effect of future sea level rise will depend of the specific configuration of the aquifer and its connection to the sea. An important factor is the coastal topography next to the shoreline, whereby a slope of 2.5‰ is expected to yield a shift of the interface by 400 m whereas a vertical slope will yield no shift. Reduced recharge due to climate change or over exploitation of groundwater also enhance the inland shift of the interface.

The simulations show that global sea level rise will not increase significantly the extent of inland subsurface seawater intrusion into many coastal aquifers, resembling the Israeli coastal aquifer with a topographic slope of >1%. On the other hand, huge flat deltas and lowland islands are more vulnerable to significant sea water intrusion.

