



Understanding the origin and distribution of salt and fresh water in the New Jersey shallow shelf

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During the Integrated Ocean Drilling Program (IODP) Expedition 313 to the New Jersey Shallow Shelf off the east coast of the United States three boreholes were drilled (Holes M0027A, M0028A, M0029A) 45-67 km offshore to depths up to 757 meters below seafloor. Tertiary aquifers were penetrated during drilling which contained saltwater. The respective underlying lowly permeable layers showed salt concentrations down to 5 g Cl/L. Onshore and coastal-near offshore investigations of the USGS showed the existence of fresh water in all tapped aquifers. They suggested that fresh water could be available more than 100 km offshore (Cohen et al., 2010).

Using the density-driven flow model SEAWAT-2000 we test our hypothesis that freshwater aquifers were built when the sea level was lower (Vail et al., 1977). Rising sea levels resulted in higher hydraulic heads which caused salt water to intrude into the aquifers from the margins of the shelf. The salt water diffused from the aquifers into the lowly permeable layers causing the Cl concentration to still be low. The present situation appears to be a function of the interplay of recharge from onshore outcrops of the aquifers and the salt water intrusion from the margins of the shelf. In addition, the deeper layers of the system are influenced by evaporates (Miller et al., 1994), where diffusive profiles can be found.

References:

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