

## **Transient groundwater flow at the intertidal zone and its implications for groundwater chemistry**

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### **ABSTRACT**

Groundwater dynamics and geochemical fluctuations were measured in the intertidal zone over spring and neap tidal cycles at Waquoit Bay, Massachusetts, USA. Groundwater salinity, measured regularly during the summer of 2009, revealed a saline circulation cell that grew and waned with the lunar cycle. Bay water infiltration occurred mainly at high spring tides resulting in the development of a saline cell. The cell shrank as the tidal range was reduced until it finally disappeared. This behavior results in long residence times that were confirmed by a tracer test experiment. Chemical data were collected as the tracer moved along the cell to track chemical reactions. A density dependent flow model successfully captures the growing and waning cycle of the circulation cell. The formation of this saline cell results from the interaction between beach topography and the tidal amplitude. This model is used to analyze discharge patterns and calculate infiltration rates and residence times. These parameters are key to model the biochemical transformations and to quantify nutrient fluxes to the bay.