Numerical modeling of saltwater intrusion in North-Western Germany

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ABSTRACT

Saltwater intrusion is a problem that occurs at coastal aquifers and may intensify due to climate change and sea level rise. Unsustainable groundwater extraction can lead to upconing while inundation leads to groundwater salinization from the top. The area of interest is located in North-Western Germany between the rivers Ems and Weser at the German Bight of the North Sea. This area has partly (salt marsh) been made available for human use by installing dikes and drainage measures. The coastline, now defined by dikes, is not an indicator of the saltwater-freshwater interface. Most likely, anthropogenic factors as well as past inundation processes before dike installation have a major influence on the present-day extent of saltwater intrusion. To quantify factors with the largest influence on saltwater intrusion, a numerical model was built. The discretization in x- and y-direction was chosen to be 500 m. The vertical extent was 160 m and discretized into 2 m thick computational layers, thereby incorporating all relevant hydrogeological features within the study area. The first aim of the model was to replicate the present-day piezometric head distribution and the current extent of salinization. In the future, scenarios will be used to assess potential impacts of climate change, as well as adaptation measures.

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