Salt water intrusion in the groundwater system of Noord-Holland, The Netherlands: A Numerical Study

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ABSTRACT

Salt water intrusion is investigated in a coastal groundwater system in the northern part of the province Noord-Holland, The Netherlands. Density dependent groundwater flow is modeled in three-dimensions with MOCDENS3D (Oude Essink, 1998). This computer code is a version of MOC3D (Konikow et al., 1996) that has been adapted to simulate transient density-driven groundwater flow. Results from the model suggest that in this Dutch hydrogeologic system a severe and irreversible salinisation is already occurring. Within a few tens to hundreds of years, the salinity of the shallow aquifer is estimated to increase substantially. This salinisation process is a result of human activities such as the reclamation of the low-lying areas during the past centuries. Without changing the present boundary conditions, seepage into the low-lying areas will decrease slightly because of predicted increases in groundwater salinity. However, the rate in salt load through the Holocene aquitard into the low-lying areas will increase significantly due to an increase in salinity in the shallow aquifer. In addition, a relative sea level rise of 0.5 meter per century will intensify the salinisation process, causing an enormous increase in salt load in all low-lying areas in this part of The Netherlands.

References


Keywords: 3D numerical modeling, variable-density flow, MOCDENS3D, salt water intrusion, Noord-Holland, relative sea level rise

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