Groundwater flow and saltwater intrusion modelling in the Continental Terminal (CT) aquifer near the Saloum inverse estuary in Senegal

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The Saloum River hypersaline estuary (Senegal) is an 'inverse estuary' showing a salinity increasing from the river mouth towards inland. This salinization process is mainly driven by a net loss of freshwater due to intense evaporation. In this context, interactions between the river and the surrounding aquifer of the Continental Terminal (CT) may lead to local and progressive salinization of this groundwater main resource for water supply. Our study, based on available data and new measured data in 2012 and 2013, is focused on the southern part of the Saloum basin. It confirms that the groundwater resource is threatened by local saltwater intrusions in the vicinity of the Saloum River and along the western coastal part of the aquifer. For a long term water resources management, it is thus essential to predict the future evolution of this process in a context of increasing groundwater pumping rate together with climate variability and changes.

A groundwater flow model is developed using MODFLOW. Starting from a conceptual steady-state situation corresponding to the CT aquifer state in 1973 before development of pumping, a transient calibration of the groundwater flow model is performed on data from 1974 to 2012. Despite the low number of measured data, the model can be considered as the current best assessment tool for future predictions. Using the particle tracking technique (MODPATH), a first assessment of the saltwater intrusions in the aquifer is simulated (neglecting the density effect on the hydraulic conductivity) confirming the measured data. Results, for an increased pumping of 20% in 2050 combined with different climatic scenarios, are useful to assess how the saltwater intrusions will evolve in the next years.

Key-word: Groundwater modelling – Saloum – Inverse estuary – Salt water intrusion - Climate change

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