

Numerical modelling applied to the understanding of groundwater flow and mass-transport in south portugal – a perspective of regional hydrogeological problems affecting groundwater status

Summary

Numerical tools were developed to investigate some of the main groundwater management issues identified in the Algarve region (south Portugal). Two study areas are considered as case-studies, one consisting of the Querença-Silves aquifer which focuses on water balance issues, the other consisting of a set of aquifers in contact with the Ria Formosa coastal lagoon, with focus on the Nitrate Vulnerable Zone of Faro and the evolution of nitrate contamination in groundwater. Groundwater flow and mass-transport numerical models were developed to assess groundwater management issues identified in the study areas. Different types of scenarios have been simulated and analyzed, which take into account changes in land-use leading to different contamination input, changes in groundwater abstraction, mitigation scenarios, with particular focus for simulation of Managed Aquifer Recharge schemes and climate change effects. The use of numerical models was shown to be a powerful tool not only characterize hydrogeological problems, but also to predict the evolution of the current observed conditions under different scenarios.

One of the main outcomes of the modelling showed that the nitrate contamination in the nitrate vulnerable zone of Faro is a persistent issue, which is a result of agricultural practices in the past. The current applied solutions rely on the adoption of good agricultural practices, but this was shown not be enough to achieve compliance within the Water Framework Directive. Groundwater remediation is one of the most difficult tasks in environmental clean-up, especially when it comes to large areas. Therefore, an ensemble of solutions, some local, some more regional, including land management measures, should be considered in order to attain a significant reduction of time in achieving good quality status of groundwater bodies. Together with the time-series analysis, the implemented models allowed to have a better understanding of the aquifer dynamics in terms of flow and mass-transport.

Keywords

Coarse recycled concrete aggregate, structural concrete, resistance models, model uncertainty, reliability analysis.



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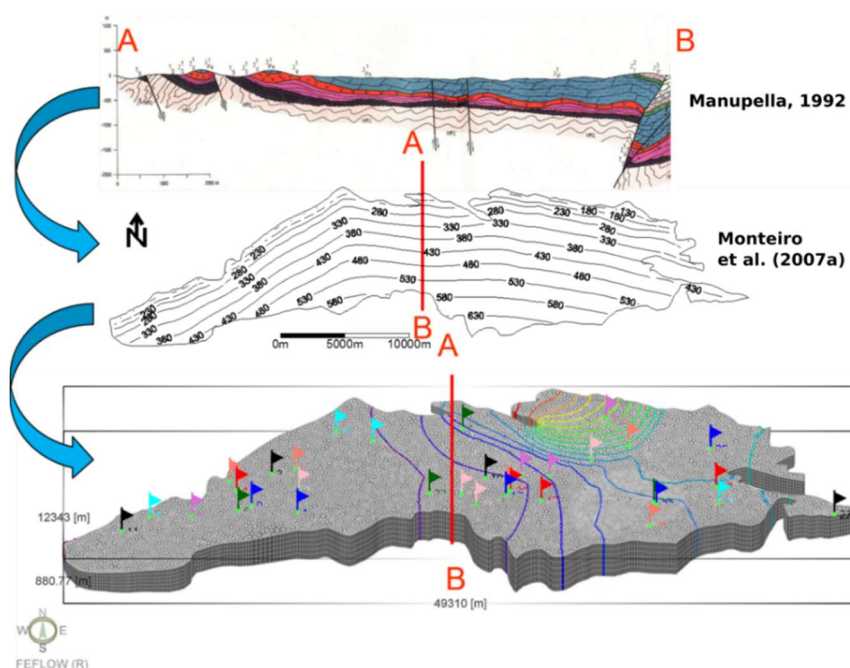
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Development steps of the 3D geometrical mesh of the Querença-Silves aquifer model.