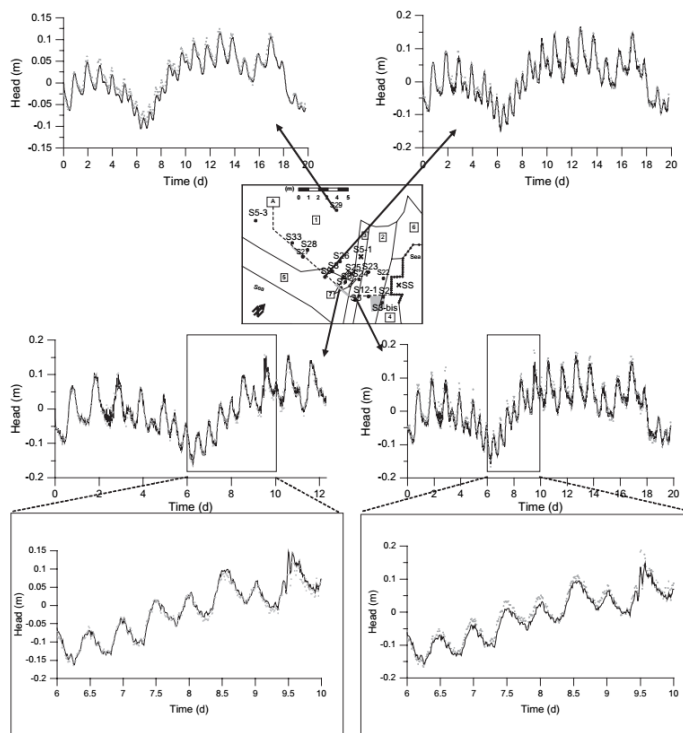


Inverse Modeling of Coastal Aquifers Using Tidal Response and Hydraulic Tests

Client: Consejo Nacional de Seguridad Nuclear (Spain)

Keywords: Pumping/injection tests, model calibration, contamination, geostatistics, tidal response test



Calculated (lines) vs. measured (circles) tidal response vs. time.

Summary: Remediation of contaminated aquifers demands a reliable characterization of hydraulic connectivity patterns. Hydraulic diffusivity is possibly the best indicator of connectivity. It can be derived using the tidal response method (TRM), which is based on fitting observations to a closed-form solution. Unfortunately, the conventional TRM assumes homogeneity. The objective of this study was to overcome this limitation and use tidal response to identify preferential flowpaths. Additionally, the procedure requires joint inversion with hydraulic test data. These provide further information on connectivity and are needed to resolve diffusivity into transmissivity and storage coefficient. Spatial variability is characterized using the regularized pilot points method.

Actual application may be complicated by the need to filter tidal effects from the response to pumping and by the need to deal with different types of data, which we have addressed using maximum likelihood methods. Application to a contaminated artificial coastal fill leads to flowpaths that are consistent with the materials used during construction and to solute transport predictions that compare well with observations. We conclude that tidal response can be used to identify connectivity patterns. As such, it should be useful when designing measures to control sea water intrusion.