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Techniques for the estimation of hydrogeological parameters in a cluster of infiltration ponds

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Identifying the final fate of treated wastewater is sometimes a challenging task because not always receiving surface water bodies are available in the neighboring. Consequently, the water treatment agencies often resort to infiltration pond facilities for discharging effluents from the treatment plant. This technical solution is considered extremely favorable because it recharges the groundwater bodies, increasing the availability and improving the qualitative status of the natural reservoirs. The daily operation of such infiltration pond facilities is often based on heuristic rules simply aimed at discharging the treated water volumes. Nevertheless, the functioning of these infrastructures strongly relies on some hydraulic and hydrogeological features of the hosting site. The knowledge of parameters such as the average vertical and horizontal hydraulic conductivity in the area surrounding the basins would allow for optimizing the water flows to the groundwater. This study compares some techniques for modeling clusters of interconnected infiltration ponds with the aim of estimating the average values of the hydrogeological parameters involved therein. The overall inverse model is based on a dynamical system derived from mass balance and Darcy's law. Within this general computational framework, several techniques have been implemented and tested, such as different Kalman filter versions. It is worth highlighting that the considered model is intrinsically ill-conditioned, and the right-hand side of the ODEs system is discontinuous: these issues somehow affect the accuracy of the tested techniques. This study has been conducted on synthetic data, partially based on the results of a previous study.

Participation

In-Person

References

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Primary authors: Dr BERARDI, Marco (Consiglio Nazionale delle Ricerche, Istituto di Ricerca Sulle Acque, Bari, Italy); Dr DI LENA, Francesco M. (Consiglio Nazionale delle Ricerche, Istituto di Ricerca Sulle Acque, Bari, Italy); Dr MASCIALE, Rita (Consiglio Nazionale delle Ricerche, Istituto di Ricerca Sulle Acque, Bari, Italy); Dr PASSARELLA, Giuseppe (Consiglio Nazionale delle Ricerche, Istituto di Ricerca Sulle Acque, Bari, Italy)

Presenter: Dr DI LENA, Francesco M. (Consiglio Nazionale delle Ricerche, Istituto di Ricerca Sulle Acque, Bari, Italy)

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