

E-TEST Einstein Telescope EMR Site, Cross-border groundwater model: conceptual model and first calibration

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The hydrogeological model developed within the framework of the E-TEST project has different objectives: (1) optimal positioning of the ET with respect to hydrogeological conditions, (2) groundwater inflow calculation for construction and exploitation phases, (3) assessment of impact of future ET on local aquifers. However the following challenges are identified: (a) construction a 3D hydrogeological model on the basis of an evolving and not finalized 3D geological model, (b) a complex geology, (c) use at regional versus local scales, (d) sparse data and lack of data in depth.

The aquifers likely to be impacted are (bottom to top): the Famennian sandstone aquifers, the aquifers of the Visean and Tournaisian limestones, Cretaceous aquifer, Paleogene aquifers.

On the basis of all available geological data a 3D geological model has been built using LEAPFROG ©. 4 main hydrogeological units have been used for providing first ranges of hydraulic conductivity values. North-South and West-East cross-sections in the modelled domain are shown. Conceptual choices for the regional 3D model are presented including boundary conditions, recharge conditions and pumping. For calibration in steady state, a sensitivity analysis was performed using 100,000 equiprobable distributed models generated by Monte Carlo simulations sampling stochastically within the logK values intervals of each hydrogeological unit. We used 1000 pilote points for smoothly varying K values. On the basis of results, the 10 best models (minimum RMS) are retained as starting conditions for PEST automatic calibration with 1516 pilote points (more pilote points in the top layers). Then 3 selected simulations with RMS < 15 m were kept for further developments. Results are shown in terms of calculated piezometric map in the modelled region.

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