

Research Question

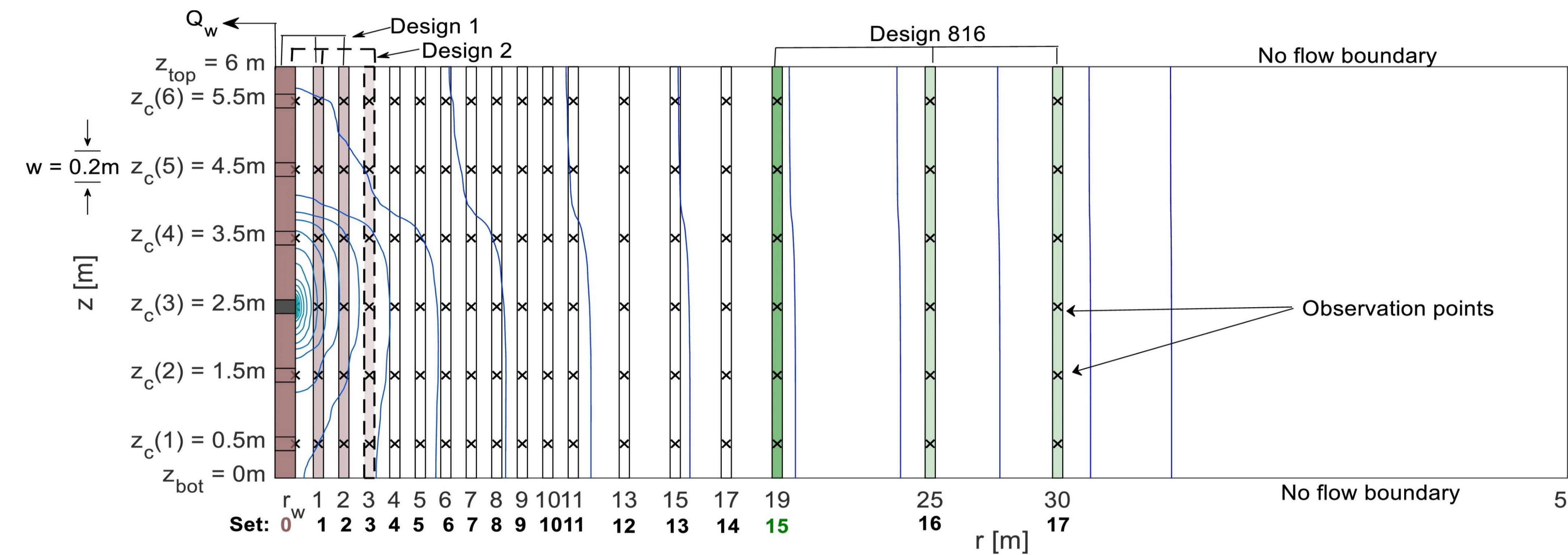
Fine layering in stratified aquifers causes hydraulic anisotropy.

- Should we estimate the effective anisotropy or try to resolve the heterogeneity?
- Which measurement design yields the most reliable estimates?

Facing the True Challenges in Model Selection and Optimal Design!

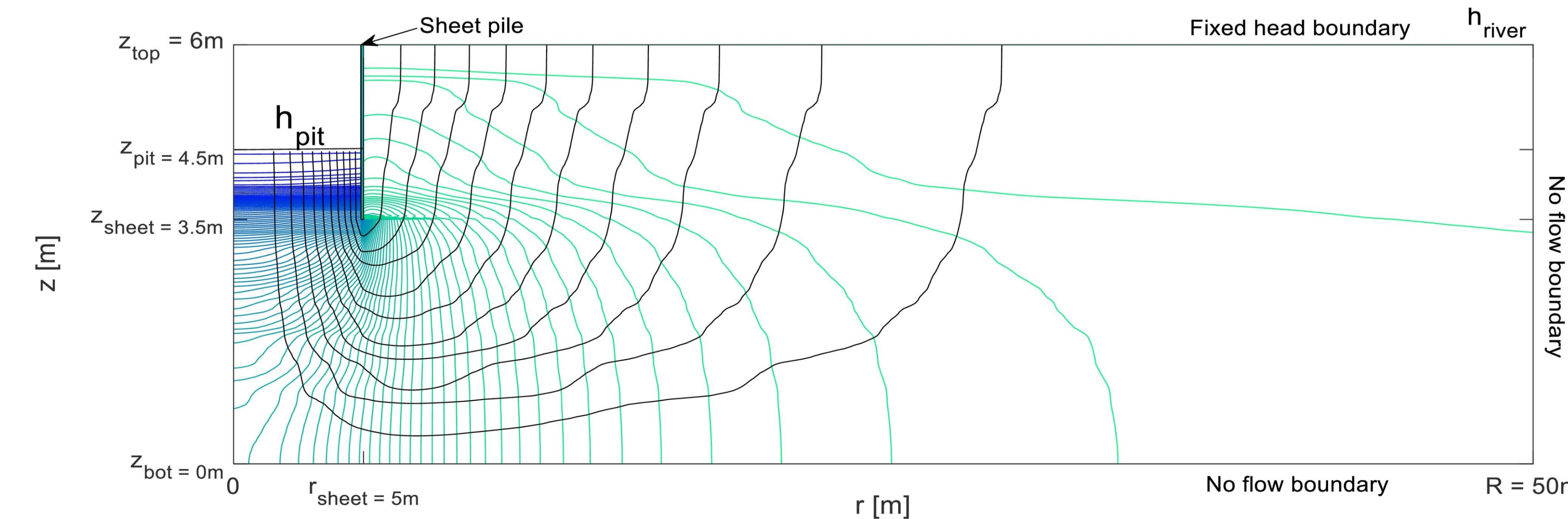
a) Estimating the fully upscaled hydraulic conductivity tensor

- Simulate quasi steady-state radial symmetric groundwater flow to a partially penetrating well
- Successive water extraction in six different depths
- Observe the corresponding drawdown in various radial and vertical distances



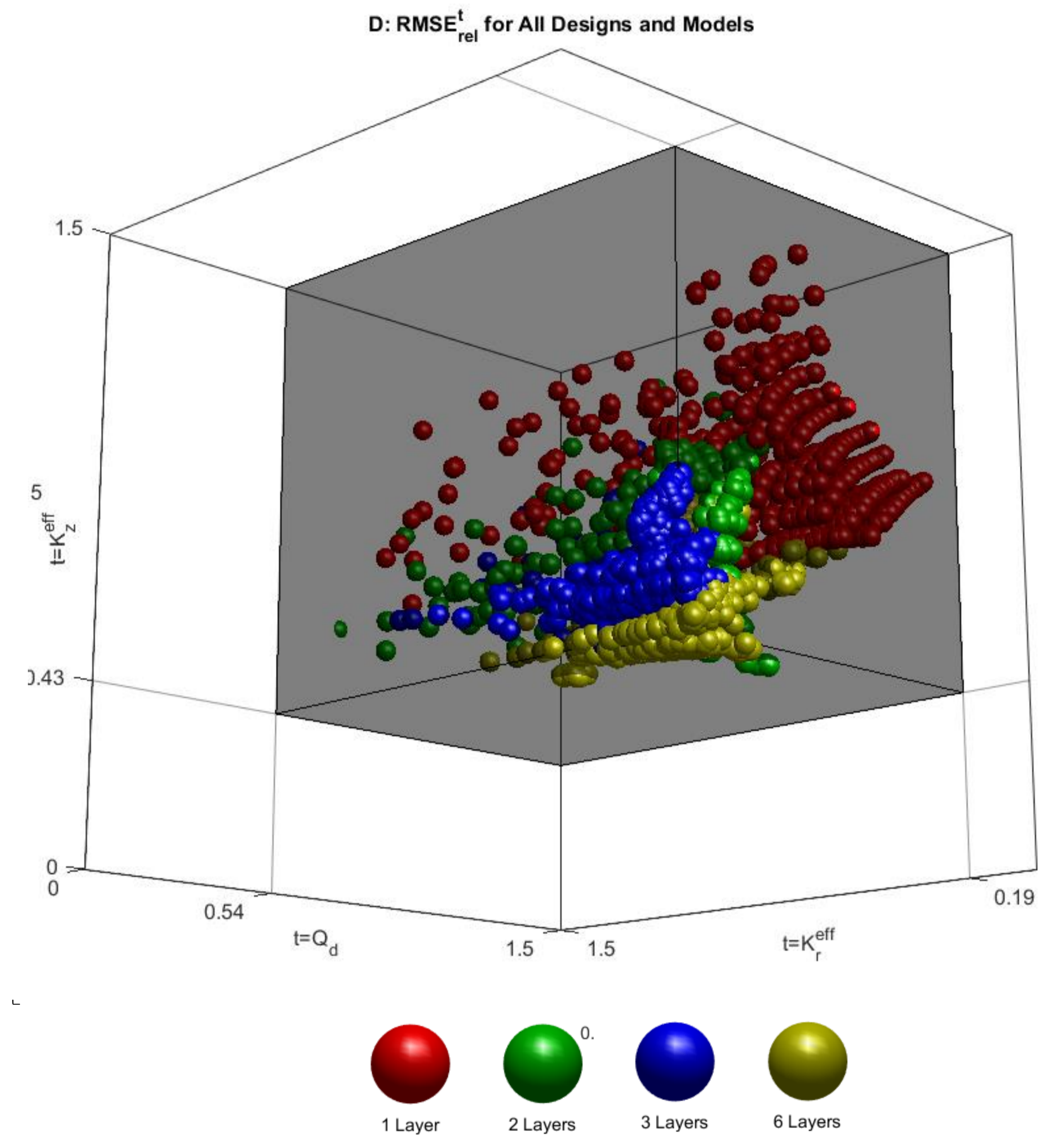
b) Predicting the pumping rate needed to dewater a construction pit within a large river

- Perform the hydraulic tests described in a) to guide the design of dewatering a cylindrical construction pit within a large river



Multi-objective optimization

Consider relative prediction errors of all possible model and measurement design combinations → **3'264 choices**



Conclusions

- Model candidate of highest complexity performs best in meeting true measurements in model calibration
- Joint optimization reduces prediction uncertainty of parameters at lower experimental costs
- Not including the design can deteriorate model performance
- Optimal Design and selected model depend on the target parameter

Hydraulic Conductivity Field

