Modeling pit lake flooding after mine closure

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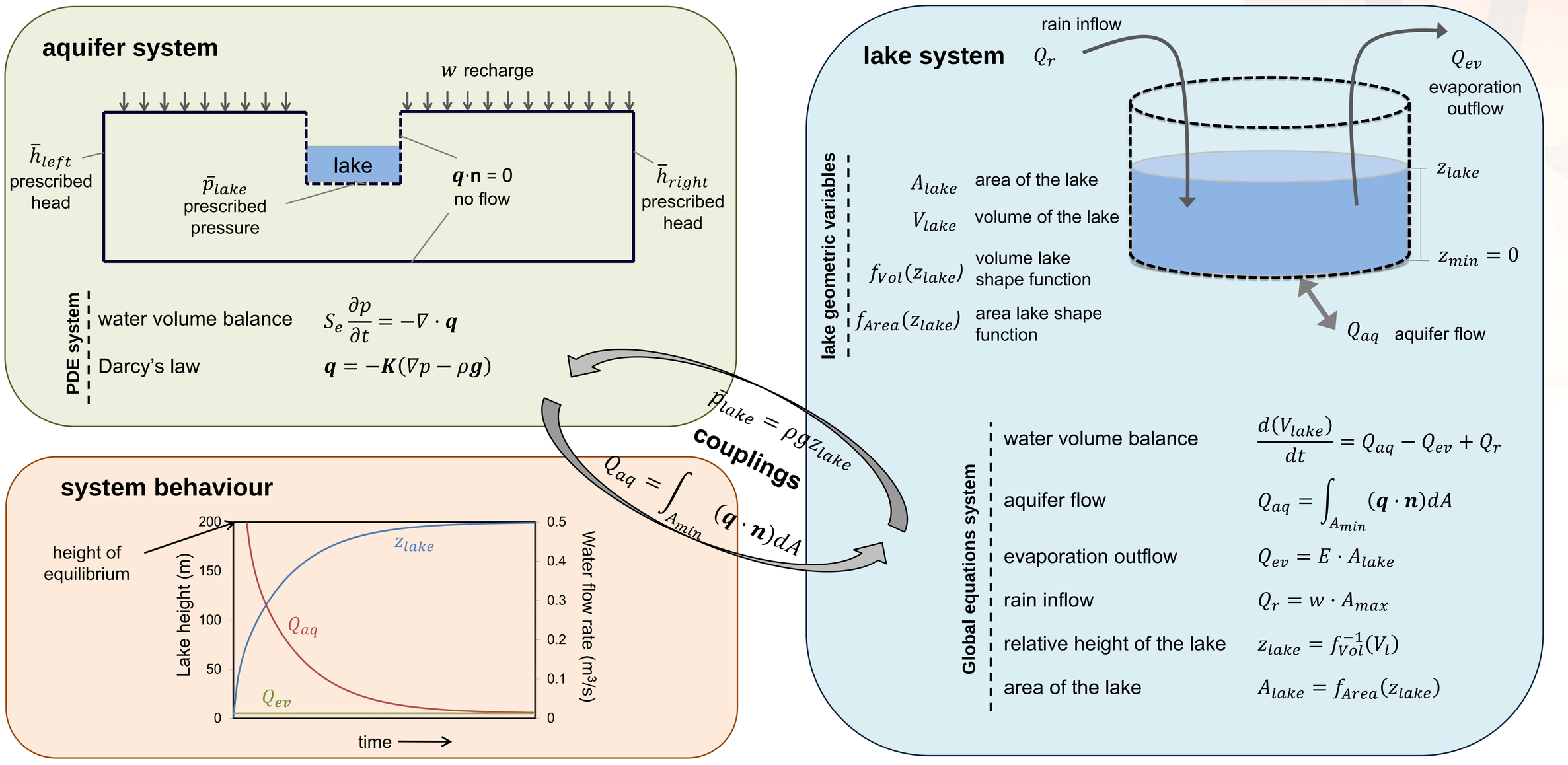
Introduction

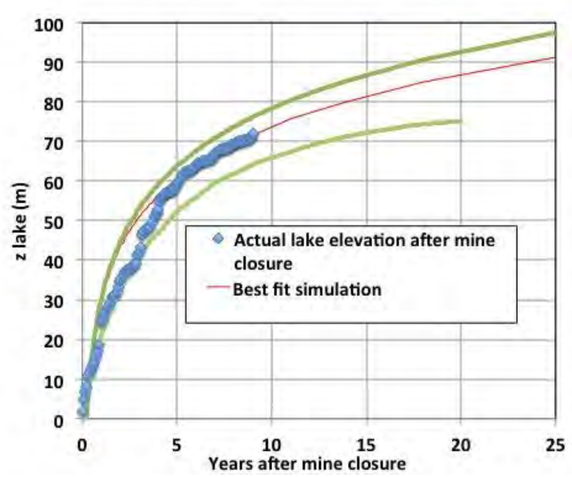
- Most of mining works, either on the surface or in the underground, demand continuous groundwater pumping in order to operate under dry conditions.
- When the mining activity stops, dewatering also stops and mining facilities begin to flood. Open pits will start flooding, quite quickly at the beginning but becoming slower as the water level in the pit lake rises.

Synthetic problem



Application case

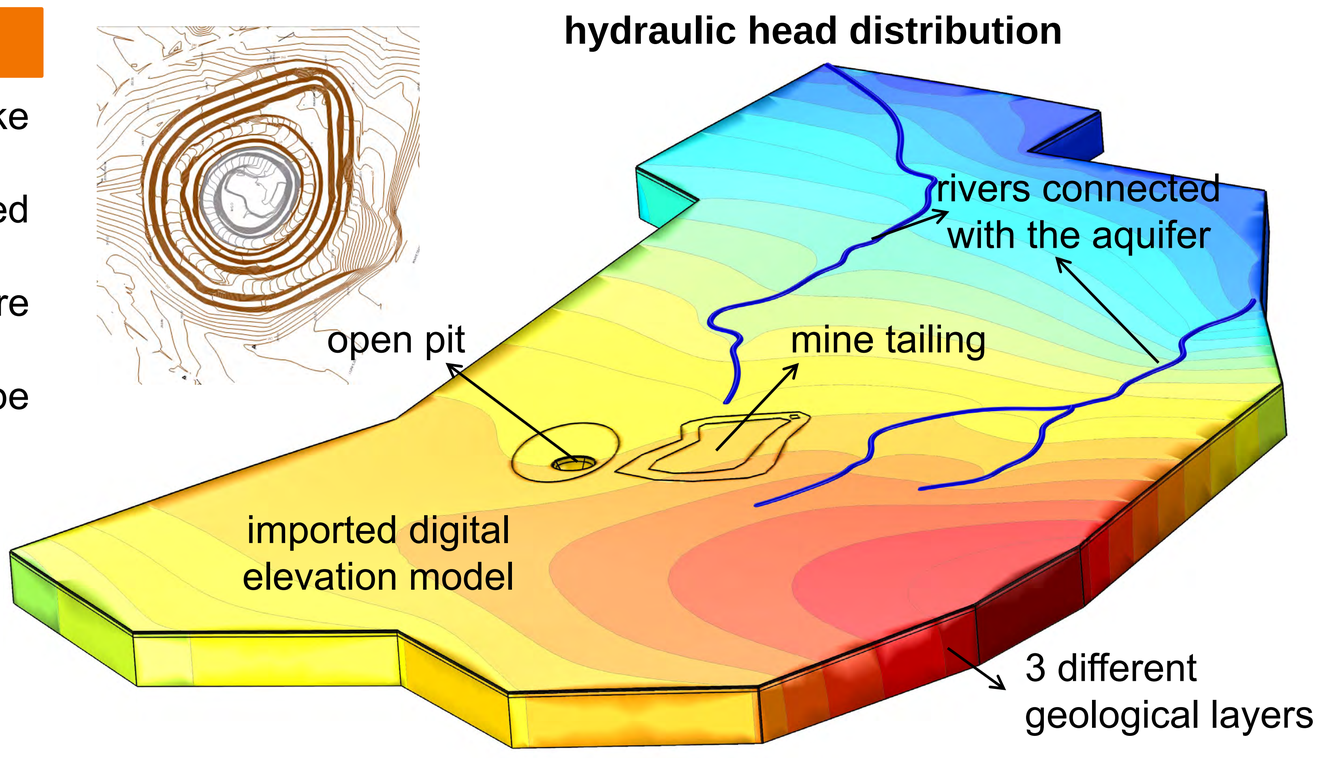
- The described methodology has been applied to a real case of an ancient open pit mine abandoned for 10 years.
- A kilometric 3D groundwater flow model including two main rivers has been built .
- Transient simulation has been performed for 25 years to reproduce the dewatering and the pit lake generation.
- The dewatering flow rate as well as the lake rise obtained fit the field data.



Sensitivity analysis (green lines) has shown permeability and storativity as most critical parameters for an accurate prediction.

Benefits

- Groundwater flow can be simulated coupled with the pit lake dynamics under transient flow conditions
- Evaporation, rain and other sources and sinks can be added in the lake water balance.
- Flow rate for dewatering and the lake height after closure can be estimated.
- The time to generate a creek (if any) and its flow rate can be predicted.
- Predicts the lake and groundwater flow relationship: flow-through or permanent sink.
- It can be useful for lake and downstream groundwater water quality issues.



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