Preliminary 3D groundwater flow modelling of Kamikita plain (Japan): long-term simulation of seawater intrusion

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Saltwater intrusion represents the migration and the mixing of saline water with freshwater coastal aquifers. The salinization of near-shore aquifers reduces the quality and quantity of usable freshwater, thus impacting coastal ecosystems and human populations.

Sea level variation and climate change are among the most influential factors affecting long-term evolution in saltwater intrusion, but their impact remains poorly investigated.

In this work, we present a 3D groundwater flow model of the Kamikita Plain (Japan) that simulates past and future sea level changes (-120 k to +10 k years) with a range of -120 to +20 meters.

For this purpose, we first created a detailed 3D geological model using geophysical surveys and borehole data. The computational domain accounts for both large-scale features such as regional fault, and local-scale heterogeneities such as low-permeable layer. Classic boundary conditions were defined, including recharge, evapotranspiration, rivers, lakes, and the ocean.

Our preliminary results depict the evolution of the seawater wedge in the Kamikita region. The coastal zone shows a rapid and pronounced response to saltwater intrusion, while the distal zone exhibits a small response to changes in sea level. Additionally, our results suggest that the accurate determination of long-term sea level change could be necessary to properly understand its current and evolving dynamics.

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