Effects of Grid Discretization on Coastal Aquifer Models

Katie Li1, 3, Kaileigh Calhoun2, Mohammad Koneshlo1, Holly A. Michael1, 2
1. Department of Geological Sciences, University of Delaware, Newark, DE, 19716, USA
2. Department of Civil and Environmental Engineering, University of Delaware, Newark, DE, 19716, USA
3. Pomona College, Claremont, CA, 91711, USA

Introduction
Understanding coastal aquifer processes is imperative for management of freshwater resources, as 11% of seawater makes freshwater undrinkable. Seawater intrusion (SI), the landward movement of seawater, occurs globally, and is exacerbated by increased freshwater withdrawal and sea level rise.1 Submarine groundwater discharge (SGD), solute flux from the seafloor, is significant to both ocean chemistry and nutrients budgets.

Coastal aquifers are often represented with a layer of less dense freshwater overlying saltwater. In reality, the interface between the freshwater and saltwater is a mixing zone, which also gains complexity in heterogeneous systems.

Coastal aquifer flow model representation by Smith 2004. The freshwater-saltwater interface is not a separation of distinct layers, but a zone of diffusion.

Due to the large spatial and time scales of groundwater processes, numerical models are used to study these aquifers. However, they require significant computational time, especially in highly discretized grids with many cells. Thus, this study aims to use efficient computational methods to find the optimum grid discretization for a modeled aquifer.

Results 1: Patterns of Salinity

Results 2: Submarine Groundwater Discharge

Discussion

Conclusion

Acknowledgements

References


MFab, an open source software package by Theo Olsthoorn, was widely used in this study to process input and output files. Project funding was provided by the National Science Foundation, NSF EAR-1262312, entitled "Collaborative Research: REU/REIT site - Introducing Critical Zone Observatory science to students and teachers."