

Abstract

Specialized groundwater and climate datasets are increasingly becoming publicly available, but they remain hard to use. Large language models (LLMs) can change this by letting anyone ask questions in plain English and receive answers that point to the right maps, numbers, and sources. We present a practical framework for using LLMs to improve the accessibility of groundwater and climate information. The framework integrates open geospatial standards to find the right data, explains results with citations, and adds rules to manage risks, such as mistakes in model output or misunderstanding uncertainties. We demonstrate the idea with a regional case in South Florida, where sea-level rise, coastal flooding, and saltwater intrusion create urgent questions for communities and water managers. Our example shows what works now, what must be governed carefully, and what needs more research. The approach can be adapted to other regions and data types, offering a path from "open data" to "open answers" that are understandable and actionable for diverse users.

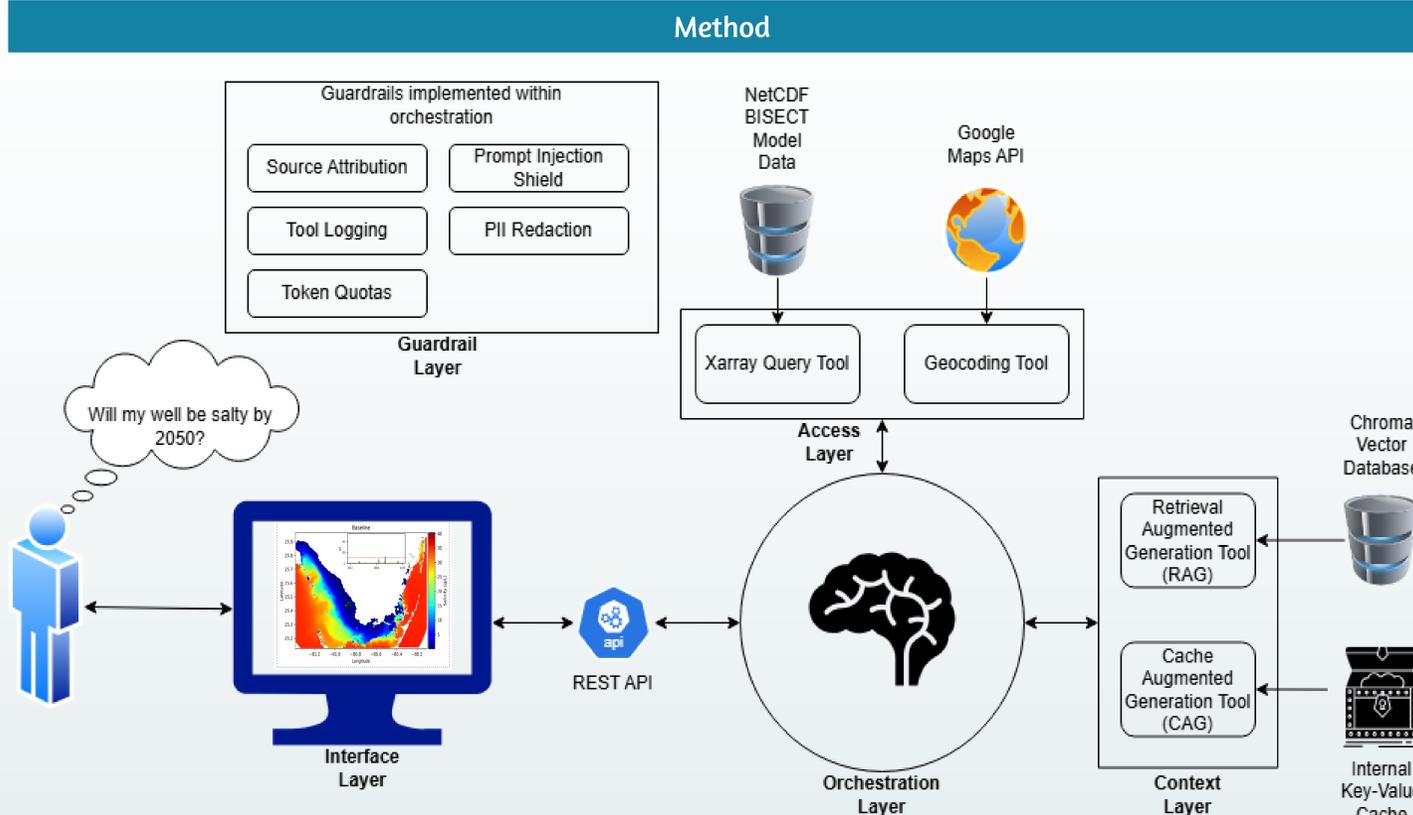


Figure 2. Hydrology agent architecture follows the ReAct pattern

Background

We extended the Biscayne and Southern Everglades Coastal Transport model (BISECT, Swain et al, 2019), an integrated surface water groundwater model for South Florida, to cover various climate scenarios (Gebremedhin et al., In-Review). This model provides projections for several measurable factors of local hydrology including salinity, depth, recharge and temperature.

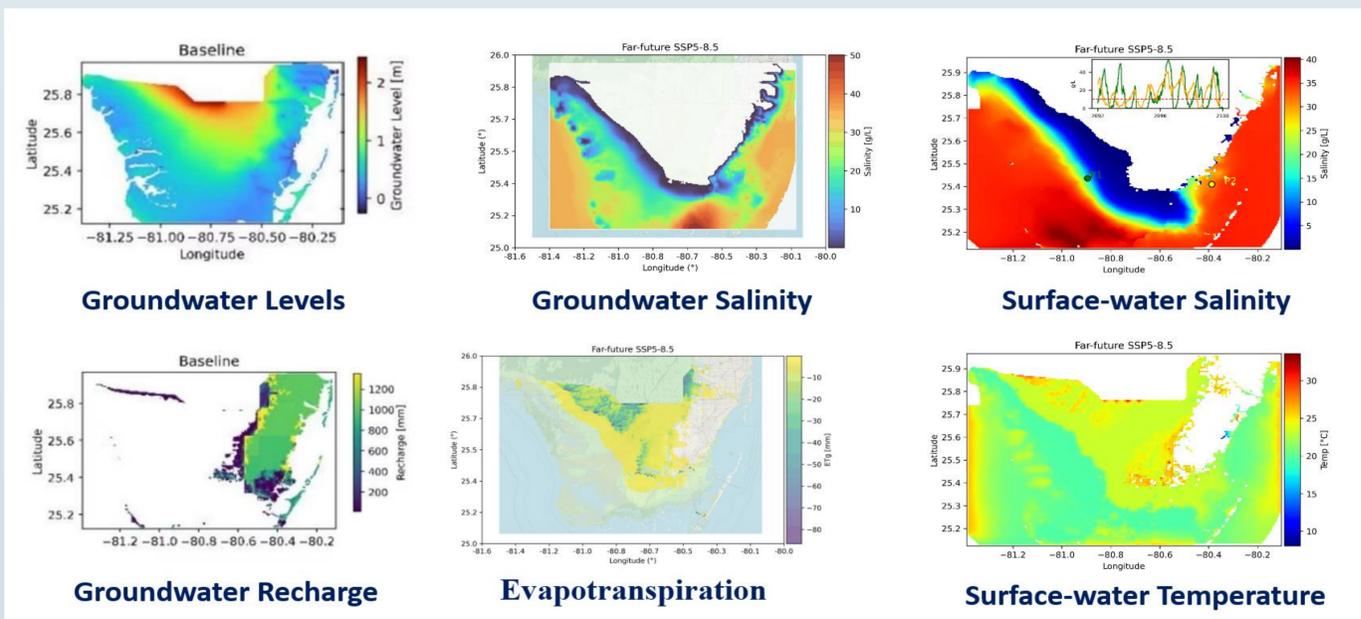


Figure 1. Model outputs are critical for diverse stakeholders in South Florida

Method

Preliminary Results (Continued)

Quantitative Analysis: Time series data

Prompt: Plot the sea surface salinity projections produced by the BISECT model at these coordinates: northing of 2808000, easting of 509720.

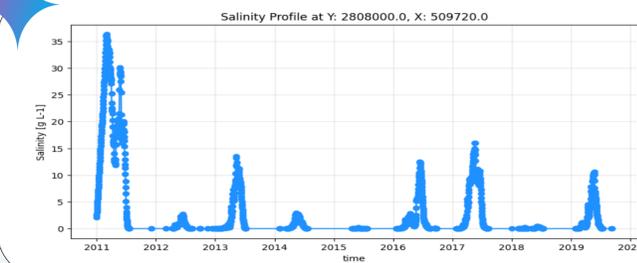


Figure 4. Generated time series

Qualitative Analysis with Sources

Prompt: Briefly explain one goal of the BISECT paper in simple terms, cite sources.

One of the main goals of the BISECT model is to act as a tool for researchers to explore how changes in the water system of South Florida could impact its coastal ecosystems. Specifically, the model was designed to simulate the movement of both fresh and saltwater to see how things like sea-level rise and new water management strategies could change the saltiness of the coastal waters (page 3).

Figure 5. Generated text responses

Conclusion

Large Language Models successfully bridge the technical gap for lay users by making sense of complex scientific data, enabling natural language queries about critical climate resilience questions in South Florida.

Pending challenges:

- How to guarantee consistent source attribution?
- Who is responsible for errors in AI-mediated advice?
- How do we simplify complex results without making inaccurate or misleading explanations?

Tech Stack



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Preliminary Results

Quantitative Analysis: Geospatial data

Prompt: Generate a map overlay graph, showing salinity in South Florida On June 4th, 2017.

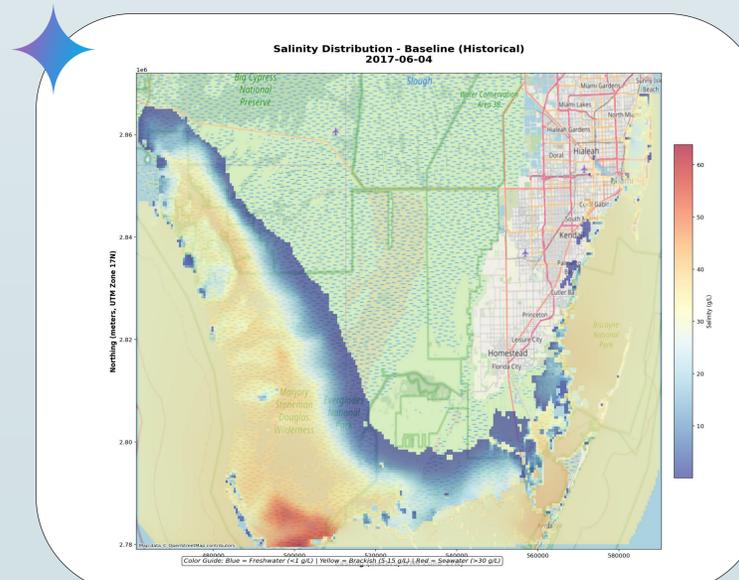


Figure 3. Generated map overlay