

## The Fate of Groundwater on Southern Oahu, Hawai'i

R. B. King<sup>1</sup>, \*P. K. Kannberg<sup>2</sup>, A. Haroon<sup>2</sup> and D. Thomas<sup>2</sup>

<sup>1</sup>Scripps Institution of Oceanography, University of California - San Diego, La Jolla, CA, USA

<sup>2</sup>Hawai'i Institute of Geophysics and Planetology, University of Hawai'i, Honolulu, HI, USA

\*Presenting Author

---

### SUMMARY

There is ongoing debate about the hydrogeologic cycle on volcanic islands. The standard model of a simple freshwater lens floating on a deeper basal saltwater system is contradicted by recent offshore resistivity surveys. Improving our understanding of the fate of freshwater on volcanic islands will improve our ability to manage this inherently limited resource. On Oahu, groundwater is hypothesized to discharge in two ways: through surficial run-off, and through offshore submarine discharge. The unique volcanic geology of the islands allows lateral groundwater flow but inhibits vertical migration of groundwater into the overlying strata. This geology promotes a layered aquifer system and provides a pathway for groundwater to be transported long distances offshore.

Controlled source electromagnetics (CSEM), highly sensitive to strong resistors, are uniquely suited to the detection of resistive freshwater within conductive marine sediments, such as with offshore freshened groundwater. In November 2023, as part of a joint effort between the University of Hawaii and Scripps Institution of Oceanography, we conducted a CSEM survey on the southern coast of Oahu, Hawaii. Using the Scripps' surface-towed CSEM system "Porpoise", we surveyed 70 line-km using either a 400m or a 1000m receiver array, depending on operational constraints. Our initial results show that we can confirm that in some regions of the island, we see increased resistivity we associate with the presence of submarine freshwater. However, the lateral extent seems to be truncated by recent rejuvenation volcanism, with volcanic cones inhibiting water transport.

**Keywords:** Marine CSEM, Inversion, Coastal Groundwater

---