New insights into structural controls affecting groundwater flow within an ocean island volcano, Mauna Kea, Hawaii
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amt and mt surveys conducted across the humu‘ula saddle of hawaii island in 2007 indicated the presence of high elevation groundwater within a broad section of the saddle region.

a continuously-cored test hole was drilled over one conductive feature to define the local hydrologic conditions and to confirm the presence of thermal activity at depth. a sequence of shallow perched aquifers, at local-ambient temperatures, were encountered, but were underlain by the regional water table showing considerably higher temperatures that increased with depth. at td, temperatures exceed 140 °c and the lower 700 m of the hole showed a temperature gradient of ~165 °c/km. recovered core showed fracture patterns consistent with high horizontal stresses as well as recovered occasional dike rock.

the high horizontal stress field and evidence for diking are consistent with recent gravity modeling that has suggested that hawaii island’s volcanoes are accompanied by much broader and extensive dike complexes than have been previously recognized.

the flinders’ et al. (2013) model of hawaii island suggests that significant intrusive activity has occurred through the central core of the island that may serve as a significant geothermal resource area.

preliminary analysis of additional follow-up mt surveys, have provided further support for the presence of both diking and a substantial thermal resource showing low-resistivity anomalies at and below sea level beneath the saddle region. more detailed analysis of these data is underway and we are collecting additional mt survey data to the north of mauna kea, in the waimea region, to determine whether there is evidence for both an elevated water table as well as thermal activity within that region as well.

conclusions
1. intrusive complexes associated with hawaii’s volcanism may be far more extensive, and are distributed more broadly, than has been previously recognized.
2. drilling and mt data indicate that the associated dike systems represent a significant and largely unexplored, geothermal resource.
3. the central location of these hydrothermal systems suggests that the fluid chemistry and evolution of these systems may be quite different from the known geothermal resource in lower puna on kilauea’s eastern flank.

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