“The Heart of Samoa”
Micro-seismic Monitoring Project
Serene Sunset: Virgin Cove, Sa’anapu, South Upolu. Southwest view of horizon overlying the Northern Tongan Subduction Arc (Photo: Christine Reitze 2012)
• Apia Station Hypocenters > 4 R.S.  1973 to 2003
Holocene Rift Zone: Recent Volcanism

- Geologic Mapping
- Soil Gas Survey
- Magneto Telluric Survey
- Core Drilling
- Thermal Gradient Survey
- Microseismic Monitoring
Figure 4: Proposed Casing and Cementing Design

- 14" conductor to 15 meters
- 9-5/8" casing inside 12.25" hole
- 3" casing inside of 8.75" hole Drilled into top of volcanics
- 3.5" tubing hung inside of 6.125" hole Option to perforate tubing

<table>
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<tr>
<th>Temperature °C</th>
<th>Structural Trend</th>
<th>Fractures</th>
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<td>0°-5° fractures associated with flow banding fractures consisting of 80°-90° fractures, cut by 55°-60°</td>
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<td>SMT = 27.7°C</td>
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- Cubic acicular crystals of calcite ± zeolite; crystal clusters
Deep Borehole Microseismic Exploration

- 100 x stronger than surface
- Passive listening island & region
- Magmatic or fracture location
- Economical
- Final confirmation low activity
- Longterm hazard warning?
DOWNHOLE MICROSEISMIC

• 100 TIMES HIGHER RECEPTION
seismic indicators for tsunamigenesis

- earthquake magnitude
- epicenter location
- fault rupture area
- amount of slip or thrust
- orientations of the fault plane
Figure 7: Southern Ta’u flank collapse \( \geq 30 \text{ km}^3 \). Red line depicts the scarp (\( \sim 1 \text{ km elevation} \)). (a) modeled landslide-tsunami propagation at 3 min; (b) modeled maximum tsunami flow direction. Black star in (a) and (b) represent Ta’u. (from Williams et al., 2012).
<table>
<thead>
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<th>Components</th>
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Figure 30: Time series and spectra of surface elevations at DART buoy water level stations. ——— (black), recorded data; ——— (red), computed data.
QUESTIONS ?