QUAKEFINDER NEWS
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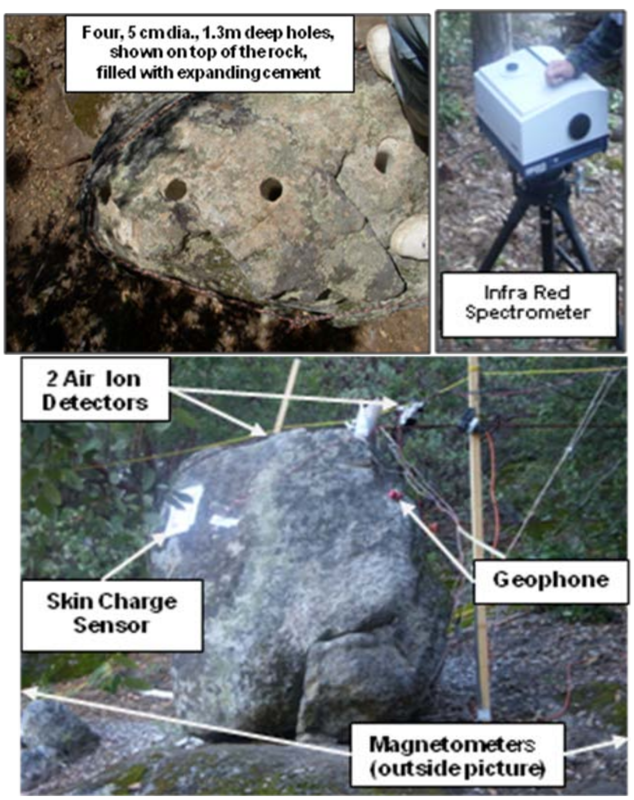
Understanding the physics of rock stress

Do rocks, under great stress, generate underground currents, magnetic field disturbances, air ions, and IR signatures? They do in laboratory experiments (ref. Dr. F. Freund, NASA Ames). We wanted to determine if they do the same on a larger scale. By luck, Tom Bleier just happened to have a "spare" 8 ton granite boulder on his property that had to be moved. QuakeFinder took the opportunity and collaborated with NASA (Freund) to drill holes in the rock, fill them with expanding cement, instrument the rock with approximately $300K worth of sensors, and measure what happened after 9 hrs of increasing stress in a controlled experiment. The pictures below and right show the results. The instruments did detect IR signatures in a specific wavelength (8-14um). Small cracks occurred and magnetic pulses were seen, and the rock generated both skin charges and small amounts of air ions. We lost a portion of the data just before the rock broke, but overall, the experiment was successful in showing the scaled up configuration worked. We are using this experience in our monitoring strategy by employing ground magnetometers, air ion sensors, and GOES geosynchronous satellite (and eventually MODIS low earth orbit satellite) IR images to detect anomalies and unusual "hot spots" prior to large California earthquakes.



The rock was instrumented and recorded during stressing


The rock finally broke into 4 major pieces after 9 hrs

Asia Oceana Geosciences Society (AOGS): Singapore

Quakefinder gave a presentation at the 2009 AOGS Conference on Aug 14th in Singapore, titled: "Multiple EM signals associated with California earthquakes". We again reported the magnetic pulses, air conductivity, and IR signatures observed prior to the 2007 Alum Rock M5.4 earthquake, but then looked back to see if any other earthquakes had the right type of instrumentation and whether they too displayed similar signatures. Parkfield (2004 M6.0 quake) had some data from a Berkeley magnetometer, 19km from the quake, and that data showed a series of magnetic pulses (smaller than Alum Rock) prior to the quake. We believe that the greater distance beyond our 15km instrument range, and high ground conductivity, influenced the signal amplitude. We tried to get GOES data prior to the Parkfield quake, but ran into difficulties getting the data. Hollister (1998 M5.0 quake) had a Berkeley magnetometer about 3 km from the quake, and it too recorded pulsations about 2 weeks prior to the quake. San Simeon (2003 M6.0 quake) did not have magnetometers close (the Parkfield magnetometers were over 60 km to the east), but QuakeSat did detect unusual 1-3 sec. magnetic pulsations three times during over flights during the 2 months prior to the quake in October and November of 2003. These additional events were supportive, but not conclusive yet. Now that we have more sensors in the field, we need large quakes to occur near those sensors to provide more proof.

More sensors installed:

QuakeFinder installed three more QF-1007 sensor suites in California (Petaluma, Gilroy, and Watsonville) during the summer. We also completed fabrication and testing of two more QF-1007 units and just shipped them to Peru. We will be installing them during October under a collaborative agreement with the Catholic University of Peru in Lima.