QuakeFinder NEWS

A Humanitarian R&D Division of Stellar Solutions Inc

Third Quarter 2010

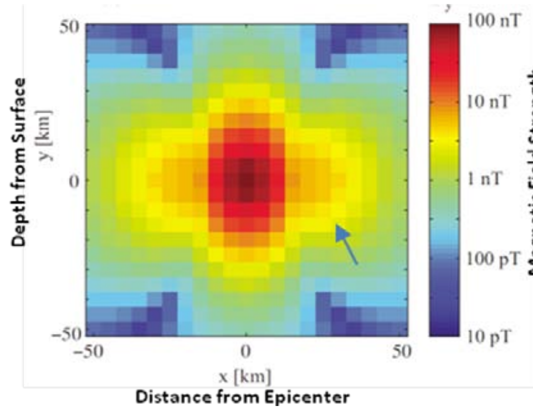
Research Summary:
Understanding how earthquakes generate electromagnetic signals is a challenge. This quarter, we added 2 more sites in southern California to try to "catch another earthquake" before it happens. We now have a mathematical model for the propagation of magnetic signals (below), and we have discovered that the direction of arrival of the magnetic pulses can be detected as a "cluster" pattern in the data (right). These represent very important progress in the quest towards understanding earthquakes and their pre-quake signals. Also, there is an excellent summary of our work just published in the September issue of National Defense. http://www.quakefinder.com/news/pdf/QF_article.pdf

New Sensors in Southern California

QuakeFinder installed 2 new sites, one at Ocotillo Ca. and one at Agua Caliente, Ca. (shown to the left) located near the Mexican border. These sites were placed to cover an area that is showing a migrating pattern of quakes after the M7.2 earthquake in Baja Ca. during April, 2010. We want to be within 15 km of any larger quake that may develop in the area so that we can determine if the same pulsation pattern and air conductivity activity exist prior to a large earthquake.

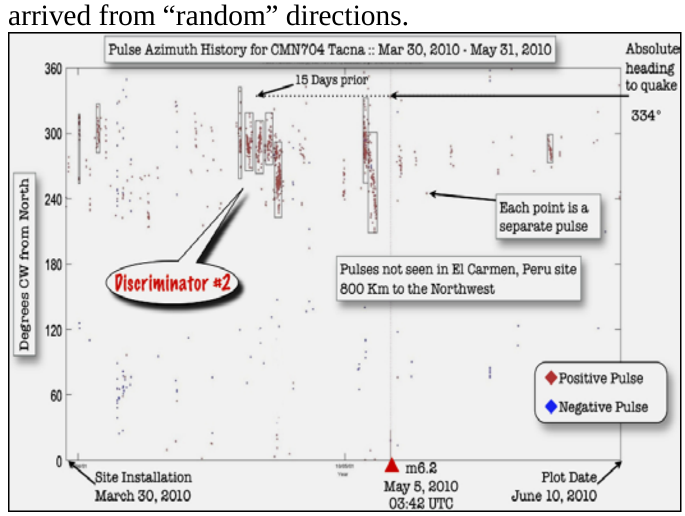
Science paper on the range of reception for magnetic pulsations

Dr. Jacob Bortnik (UCLA) used a relatively simple model of an underground current source, co-located with the earthquake hypocenter, to estimate the magnitude of the seismotelluric current required to produce observable ground signatures. Propagation equations were then used to model the underground system. The Alum Rock earthquake of 31 October 2007 was used as an archetype of a typical California earthquake, and the effects of varying the ground conductivity and length of the current element were examined. Results show that for an observed 30 nT pulse at 1 Hz, the expected seismotelluric current magnitudes fall in the range approximately 10–100,000 Amps. Also, the underground current required to detect an earthquake within a 30 km radius is much lower than previously thought, only on the order of a few thousand amperes (tip of the arrow above). See: http://www.quakefinder.com/news/pdf/Bortnik_etal2010_AnnGeo.pdf



Direction of Arrival of the magnetic pulsations

We discovered was that for both the 2007 Alum Rock M5.4 earthquake and the 2010 Tacna M6.2 earthquake, the magnetic pulse (uni-polar shapes) are consistent in both horizontal axes, and using a simple algebraic mapping of amplitude ratios to angles, we found that the pre-earthquake pulses form direction of arrival clusters, which we have termed "Azimuth Clusters." The figure below shows the emergence of these clusters about 2 weeks prior to the Tacna quake (outlined in boxes) and 1 day prior. During most of the remaining time, the pulses arrived from "random" directions.



These "clusters" add an additional discriminator (#2) that can allow much more definite statistical tools to be used for screening out false positives.

Please visit our website at www.quakefinder.com.
If you have any questions, or comments, please contact Tom Bleier at tbleier@quakefinder.com