QUAKEFINDER NEWS

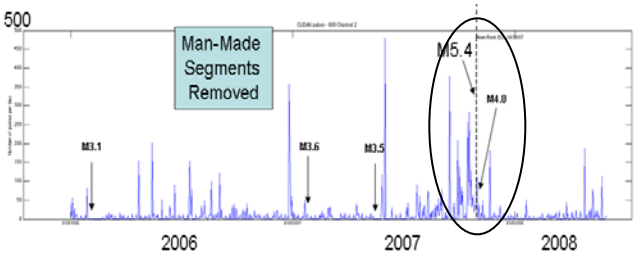
Second Quarter 2008

A few words from Tom Bleier

We continue analyses of data from the Oct 30, 2007 Alum Rock earthquake. One of our most sensitive instruments is located 1.3mi from the quake epicenter at the East Milpitas site. It is necessary to take a long term view of the data, thus over 2 years of Ultralow Frequency (ULF) magnetometer and air conductivity data has been analyzed to see if the signals seen were unique. This is the generalized summary and later this month the detailed analyses will be submitted for peer review in a formalized paper.

Magnetometer data discovery

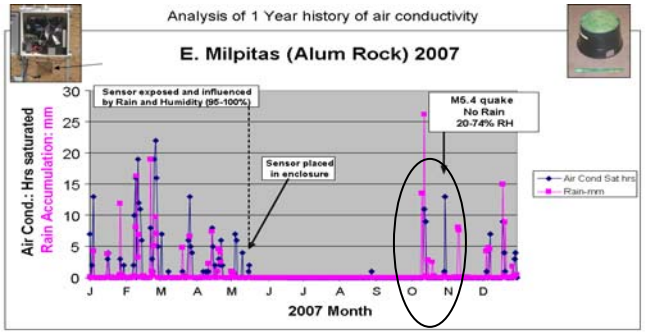
Our East Milpitas site has 3 magnetometers and the daily data encompassing 2+ years has been examined. Initial thoughts were the quake signal would show a continuous "rumble" at 0.01 Hz, similar to the signal reported 2 weeks prior to the Loma Prieta M7.0 quake. The Loma Prieta ULF data was recorded as 30 minute averages, so one could not see the detailed signal structure. Today computer memory is more affordable, and we were able to store all of the data, and for the first time, able to see the actual waveforms. We discovered the signal was actually a series of pulsations with very high magnitudes (20x normal) and the pulses were relatively long (2-15 sec.) compared with shorter lightning pulses. These pulsations happened infrequently all year, but increased significantly in the 2 weeks prior to the quake. The long term plot below shows the pulse counts per day from 2006 to 2008, with all the local quakes noted. Note the ULF increase in summer '07 and then a peak near the quake in late October '07.



To keep the plot focused only on geomagnetic signals from the earth, several data segments with known man-made noise in the area (tractor work near the site) were removed. Simultaneous pulses did not appear at any of the other QF sites, so these pulsations could not be caused by solar storm activity, and must be local in origin.

Air Conductivity data

Many of our sites feature a simple air conductivity instrument, including the East Milpitas location. We were testing a theory by F. Freund at NASA AMES, which states increased stress imminent to the quake may release a flood of positively charged particles (called p-hole carriers) which cause currents and corresponding magnetic field disturbances. In addition, the p-holes quickly migrate to the surface and cause increased air conductivity (similar to an Ionic Breeze, only with positive ions). Since the instrument data can be contaminated by heavy rainfall, we plotted a year of the data below. Red is mm of rainfall and blue is time (hrs) that the sensor saturated. Note the correlation between rain (>95% RH) and saturation during the rainy season, but it's quiet in summer.



The day before the quake, there were clouds, but no rain at the site (50-90% RH max.). The black arrow shows the 12 hr saturation period at night and early morning prior to the actual quake. Since precipitation was not responsible, another nearby source created these charged particles in the air.

Satellite Infrared Data

NASA JPL noticed the GOES weather satellite observed something abnormal in Oct '07. Every night, the ground cools down after the sun sets. However, a large area near the future quake in Alum Rock appeared to be getting warmer at night. This "apparent heating" was discovered in rock stressing experiments by NASA (Freund) and is a direct result of these charged particles being neutralized in the air.

These simultaneous three discoveries are very significant, and we will be looking for more cases where these phenomena occur prior to future earthquakes in California.