Geophysical Research Abstracts
Vol. 15, EGU2013-6331, 2013
EGU General Assembly 2013

Non-Seismic Pre-Earthquake Phenomena and their Effects on the Biosphere

Friedemann Freund (1) and Viktor Stolc (2)

(1) SETI Institute, Mountain View, California, United States (friedemann.t.freund@nasa.gov), (2) NASA Ames Research Center, Moffett Field, California, United States (viktor.stolc-1@nasa.gov)

Earthquakes occur when tectonic stresses build up deep in the Earth and reach the threshold of catastrophic rupture. During the build-up of stress, long before rupture, processes occur in the Earth crust that lead to the activation of highly mobile electronic charge carriers.

One remarkable property of these charge carriers is that they are able to flow out of the stressed rock volume into surrounding rocks. Such an outflow constitutes an electric current, which generates electromagnetic (EM) signals. If the outflow occurs in bursts, the EM signals will consist of short EM pulses. If the outflow is continuous, the currents are likely to fluctuate, generating EM emissions over a wide frequency range. Only the ultralow and extremely low frequency (ULF/ELF) waves can travel through kilometers of rock and reach the Earth surface. These ULF/ELF emissions can last for hours or days. In a companion poster we report on their effects on crucial biochemical reactions in living organisms.

Another remarkable property of the outflowing charge carriers is that they are (i) positively charged and (ii) highly oxidizing. When they reach the Earth surface from below, they build up microscopic but very steep electric fields, strong enough to field-ionize air molecules, i.e. rip an electron off air molecules. As a result the air above the epicenter of an impending major earthquake often becomes heavily laden with positive airborne ions. Medical research has long shown that positive airborne ions cause changes in the stress hormone level in animals and humans. Therefore, positive airborne ions are a likely cause for unusual reactions among animals and humans.

When the outflowing charge carriers cross from rocks into water, they oxidize the water to hydrogen peroxide. This process, plus oxidation reactions involving dissolved organic compounds in the ground water, are likely candidates for causing behavioral changes, even death, among aquatic animals.