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Mechanism of generating the earthquake cloud just before shallow great earthquakes

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[1]None

Earthquake clouds as well as radio noise have been observed before great earthquakes. It has become possible qualitatively to explain the mechanism of generating the clouds, as one week before S Hyogo Pref. Eq. (1995/01/17 M:7.2), we observed a small tornado-like cloud, a horizontally trailing streak-like cloud and the density increase of radioactive Radium (Ra) and Radon (Rn) in the spring water and surface air, in the source area, simultaneously.

The tornado-like cloud extended vertically from the source surface up in the sky, though strong wind was blowing then. The cloud must be generated by the current between the surface and ionosphere, whose potential is about 400kv, along the track of cosmic ray showers, like the cloud in Wilson cloud chamber does, and the current density increases by Pinch Effect, when the conductivity on the source surface becomes locally tentatively high, that is induced by the density increase of Ra and Rn.

It is difficult for the tornado-like cloud to be generated by vertically rising Rn and aerosols, because both are blown by wind. The cloud must be generated by the current of electrons and ions along the vertical line, which has minimum resistance between the surface and ionosphere, and which is consecutive tracks of cosmic ray showers. Because both probabilities are very low of occurence of earthquake clouds and of sudden increase of Rn density, the probability is infinitely close to zero that they happen simultaneously at the same source surface.

The current between the surface and ionosphere is pulsating, so it radiates wide band radio-waves, i.e., precursory seismic electric fields.

The mechanism of generating the horizontally trailing streak-like cloud must be as follows: In the low atmosphere on the source region, aerosols are charged by radiation from Ra and Rn, which dissolve into pore water in the source region. The positively charged aerosols stay near the surface, but the negatively charged ones ascend upward by the Coulomb force acting on the charge in the electric fields between the earth and ionosphere. Because the fields decrease as height increases, the ascending aerosols stop at the height where the upward Coulomb force balances with downward gravity force. Where the field strength on the surface is 100V/m, the mass of an aerosol that contains one electron is about 1.63×10^{-16}g, and the size is about 1.5 micro-meters. At the height of 1.5km, 3km, 5km, the strength is about 25V/m, 16V/m, 9V/m, and the size is about 0.93, 0.81, 0.66 micro-meter, respectively, which are within the observed size of aerosols. Because the aerosols are charged, cloud is generated as the core of water drops. If wind is blowing then, the cloud horizontally trails and becomes streak-like. Then the source region will be on the wind.

Ra and Rn are generated by decay of Uranium (U) that exists in crystal boundary. If micro-cracks run in the source, U, Ra and Rn dissolve into pore water that mixes in spring water.

DEMETER micro-satellite has observed the anomalous electric fields before and after the earthquakes whose magnitude is larger than 4.8 and depth is shallower than 8km. The reason the fields are not observed where the depth is deeper than 8km will be that in the region deeper than 8 km pore water is rare, which is consistent with our model. The anomalous fields were not observed after deep S Ibaraki Pref. Eq. (2004/10/06 M: 5.7, Depth: 66km), that is also consistent with our model. Before this Eq. the fields were observed, whose mechanism will be as follows: In the source region, the resistance changes when micro-cracks occur before earthquakes, the earth-current, which is induced by local cell in the crust, changes, the current induces alternative magnetic fields as the current is pulsating current, and these magnetic fields induce the electric fields on the surface.