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Wide distribution of earthquake precursors-evidences from the two strong earthquakes in Inner Mongolia, China

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What's the meaning of earthquake precursor? In recent years, most of the seismologists hold the view that an earthquake precursor must be related to the sauce of the coming earthquake and the earthquake must happen after the precursor. In China, after nearly forty years' earthquake prediction practice, some seismologists believe that earthquake precursor is a broad conception that focuses both on the temporal process of earthquake preparation and spatial process, not only on the source region. Earthquake cases study in China shows that before many earthquakes, significant anomalies were observed not only in and near the epicenter, but also in regions far away from the epicenter with distance far longer than the rupture scale of the earthquake. We call the anomalies in the epicenter region as "source precursor" and those far away from the epicenter as "field precursors"(Ma Zongjin, 1980). In other words, earthquake precursors are far more complicated than we can imagine.

As we know, the rock mechanic tests have shown that before the failure of the rock, swarms of AE have been recorded, and these micro-cracks distributed in patterns, not only in source area, but also in regions away from the source region(Ma Jin, et al., 1996). Abnormal electrical and magnetic signals have also been recorded(Hao Jinqi et al., 2003) in the test. Numerical simulation results also show that before the failure of one of the spring-blocks system, accelerated stress increase could happen in other spring-blocks far away from this one(Geng Luming et al., 1993; Zhang Guomin et al., 1994; 1995; 1996), which could give the explanation of earthquake precursor far away from the epicenter.

In this paper, we give the evidences of field precursors before two earthquakes in the Inner Mongonia, China. These two earthquakes occurred successively in the rectangular region with the latitude between 43 to 46 degree north and longitude between 116 to 121 degree east in the Inner Mongonia, China. One is Balin M5.9 earthquake(43.9°N, 119.7°E) on August 16, 2003, another is Dongwuzhu(45.4°N, 118.2°E) M5.9 earthquake on March 24, 2004. None earthquake stations have been established in the circle region with radius of 150 km from the epicenters, so we don't know what happened in and near the epicenters, but many abnormal changes have been observed in stations of north China with distances from 150km to 700km, such as earthquake swarms, fault level, water level, electrical signal, etc. These observatory facts prove that earthquake precursors distribute widely. The mechanics of this phenomenon is discussed in this paper.