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A typical locally triggered seismicity in Southwest of China, following the large rainfall event of June 2010

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A intensive rainfall occurred from June 27 to June 30 2010 in the Linyun and Fengshan, southwest of China, large area became waterlogging. Before that, a serious drought situation continued for several months in this region. Following the large rainfall, a earthquake swarm with thousands events occurred in boundary area of Lingyun and Fengshan, where maximum precipitation appeared. There are 2739 earthquakes been recorded since June 28 to 15 July, among of them, 41 events with magnitude from M_L2.0 to M_L2.9, 3 events with $M_L \geq$3.0, the maximum event is M_L3.2 occurred in 1 July. There is a obvious spatio-temporal correlation between swarm and large rainfall, the highest seismicity is a little delay to the maximum precipitation of the rainfall in time. The shallow karst tectonic consists of carbonatite rock materials is prolific in large area around the epicenter, the epicenter is located at the crossing area of NW faults with the NE faults. The fault slacking zone is the preferential channels for the fluid intrusion. Earthquakes concentrate in a cluster and the focal depths are shallow. The size of earthquake distribution (radius) and focal depths are smaller than 1.6km for 63% earthquakes, 2.5km for 88% earthquakes and 3.4km for 98% earthquakes. The seismic phase analysis on relative large earthquakes show that the fluid has been concerned with the swarm activity, and it also show some features of karst collapse. Due to the quick migration of fluid along the fault surface, it seems that the small earthquakes distributed along the fault, but the focal mechanism solution of relative large earthquakes does not support the guess that the swarm is resulted from the fault movement, in another words, there is no relationship between the swarm activity and the tectonic movement. The U-D first motions of most earthquakes, recorded by the field seismic sensor in the epicenter area, are down direction and the ratio of down direction is more large for more small earthquakes, this means that most of small earthquakes maybe produced by the karst collapse or crack closure. The results of quantitative detection based on ETAS model show that the fluid triggering action is very strong on the swarm activity, meanwhile the earthquake self-generation is also strong. According to the 1-D diffusion equation, the temporal variation of pore pressure in different depths, coursed by the fluid intrusion, has been simulated, it pointed out that the increment of pore pressure caused by the fluid intrusion is the major mechanical reason of the swarm. The potential mechanism of the Lingyun-Fengshan swarm has been proposed in the final.

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