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The secondary hazard induced by seismic activity could be more threatening in karst mining area

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Carbonate karst covers over 40% of the land surface and a significant number of cities and population are located on the karst landscapes in Guangxi region, south china. With rapid urbanization in recent years, those cities located on the karst landscape have to face the threat of a growing number of potential karst geological disasters.

On the 16th of June 2013, a small magnitude, shallow-source seismic activity just occurred at a karst mining area, the Pingguo aluminum deposit. It is considered the biggest in South China and is a type of karst accumulation deposits. To July 29th, 1149 earthquakes were recorded, including thirty nine M1.0-1.9 earthquakes and 27 M2.0-2.9 earthquakes. The epicenters of shallow earthquake swarms occupied about 7×7Km. Most earthquakes took place at depths of 1-4 km. Focal mechanism solution of 11 earthquakes with ML＞2.0 shows that the pressure axis is dominant NW direction and the tension is NE direction.

No serious ground damage has occurred but it induced secondary geological hazard. The waste water and sludge leaked from the mining water reservoir, flushed into the downtown of Pingguo County that has more than 500,000 residents through the subsurface conduit system or channels. It generated a serious threat to the people's life in the downtown and risk to the underground water.

The activity of seismic swarm was located at the Youjiang Faulted Active Zone and the fault kinematics is controlled by the regional tectonic stress field with NW 300°compression and NE 30°extension. Permeability of tectonic fractures sealed by calcite and stylolites is less than 0.01mD. The localized intensive karstification occurred at the core of Yalang anticline and controlled by a local extension stress environment and hydrogeological condition.

The seismic activity in the study area was not strong enough to cause the collapse of sinkholes and destroy of ground buildings, but it suddenly changed the flow dynamics of ground water and result serious economic loss and environment risk because of the rapid diffusion of mining water through the underground caves or conduits. Its impact on the ground water in the karst area should be more serious than we expected.

The mining in the karst area may generate higher risk and more serious threat to the agriculture, fresh water source, rivers, underground water, environment and even the life of city. The area threated could be much bigger than we imagined. In the active seismic area, the earthquakes can trigger the occurrence of the disaster.

In addition to the geological investigation and reconstruction of tectonic stress field, geophysical exploration should be carried out to obtain the three dimensional geological structures, karst system,

flow dynamics underground and potential seismic activity. The assessment of risk should be more careful. Special approaches have to be undertaken in order to prevent seepage from reservoirs.