



## RELOCATION OF THE 2011 $M_s$ 5.8 YINGJIANG EARTHQUAKE SEQUENCE IN YUNNAN PROVINCE, CHINA

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One earthquake with magnitude of 5.8 occurred on 10 March 2011 in Yingjiang country, Yunnan, China. The earthquake caused 25 deaths and 134 serious injuries. Before and after this earthquake, there were thousands of foreshocks and aftershocks occurred in the seismic zone. In order to better understand the temporal and spatial distribution of the whole earthquake sequence, we collected the arrival times from Yunnan digital seismic network and the Tengchong volcano broadband seismic instruments during 1 January to 31 December 2011. Using these arrival times, we relocated all earthquakes including the foreshocks and aftershocks using absolute location method (Klein, 1978) and double-difference location algorithm (Waldhauser and Ellsworth, 2000). The location results by Hypo2000 absolute location method were considered as the initial value of double-difference location algorithm, which can avoid deviation caused by velocity model, seismic stations distribution, quality of arrival times, etc.

728 hypocentral parameters of the Yingjiang sequence with magnitude greater than 2.0 have been precisely determined, including 313 foreshocks and 414 aftershocks. Figure 1 showed the epicenters of relocated foreshocks, earthquakes dominantly occurred along the Dayingjiang Fault (DYJ) in ENE direction. It can be clearly seen that small earthquakes extended eastward about 6km along the Dayingjiang Fault but deepened in depth (Figure 3a). Around 97.9° E longitude had an intensive area of small earthquakes.

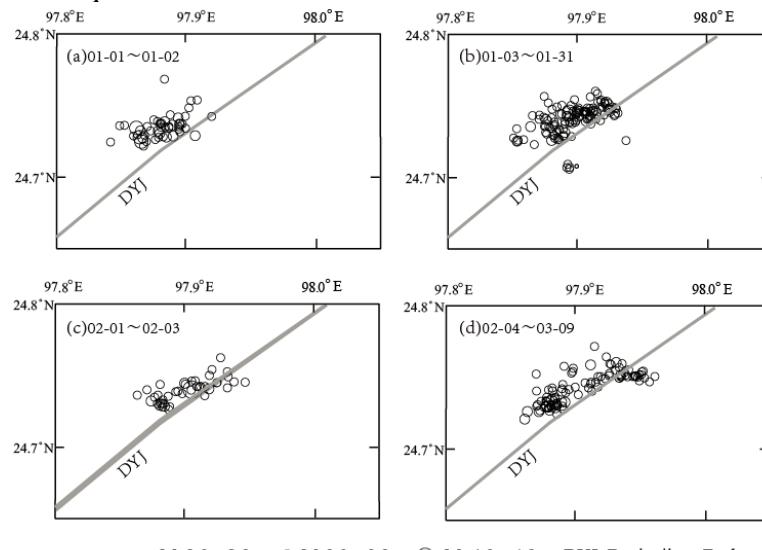


Figure 1. Distribution of the relocated foreshocks at different times, the periods of earthquakes were shown on the upper-left corner.

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After the 10 March 2011  $M_S 5.8$  Yingjiang mainshock, most of the aftershocks further extended eastward along DaYingjiang fault, rest of them moved along the SSE direction (Figure 2), which is quite different from the foreshock seismicity. These results indicate that the Yingjiang mainshock may have ruptured a conjugate fault system with two different orientations, the ENE trending DaYingjiang fault and a SSE trending blind fault. In addition, there was a sparse section along the Dayingjiang fault around  $97.9^\circ$  E longitude, which happened to be the intensive area of foreshocks. This possible mean that the Dayingjiang fault had ruptured completely around  $97.9^\circ$  E longitude after thousands of foreshocks occurred, so the aftershocks jumped the intensive section into the further east of the fault and brought serious damages to the Yingjiang country which located at the eastern of the mainshock.

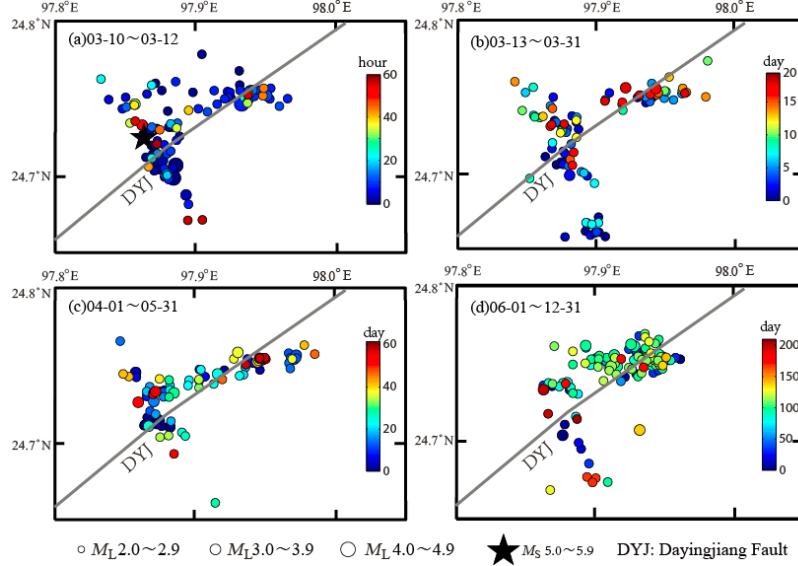


Figure 2. Distribution of the relocated epicenter of aftershocks and their temporal change at different times, the periods of earthquakes were shown on the upper-left corner.

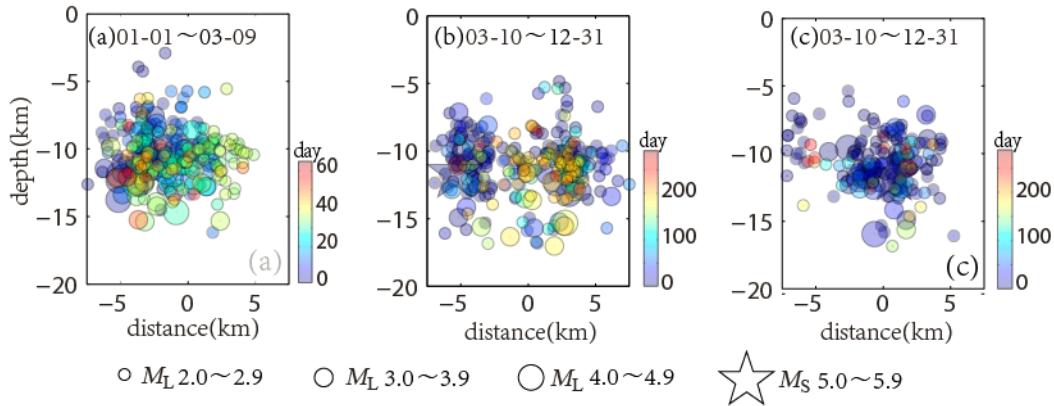


Figure 3. Cross sections of focal depth along the strike direction(a, foreshocks), aftershocks the strike(b, aftershocks) and dip(c, aftershocks) direction of Dayingjiang fault.

Focal depth of foreshocks and aftershocks along cross sections of the strike and dip direction of Dayingjiang fault were showed in Figure 3. Most of small earthquakes occurred at  $8 \sim 13$ km depth, which mean the foreshocks and aftershocks centred on the mainshock with 11.7km focal depth.

According to recent geological and geomorphologic research (An *et al*, 2009), Dayingjiang fault can be separate into three segments: north eastern segment (located at Lianghe basin), middle section (located at Yingjiang basin) , south western segment ( from edge of Yingjiang basin to Bhamo, Burma ). The  $M_S 5.8$  Yingjiang earthquake occurred just at the joint region of middle and north eastern segments. Dayingjiang fault was dislocated by some blind faults at the joint segments, so some small earthquakes migrated to the SSE direction in this case. Modioliform dislocations were found at the joints of segments, which mean the medium of joints were so broken that even mid-size earthquake like  $M_S 5.8$  Yingjiang earthquake can cause serious damages.

## REFERENCES

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