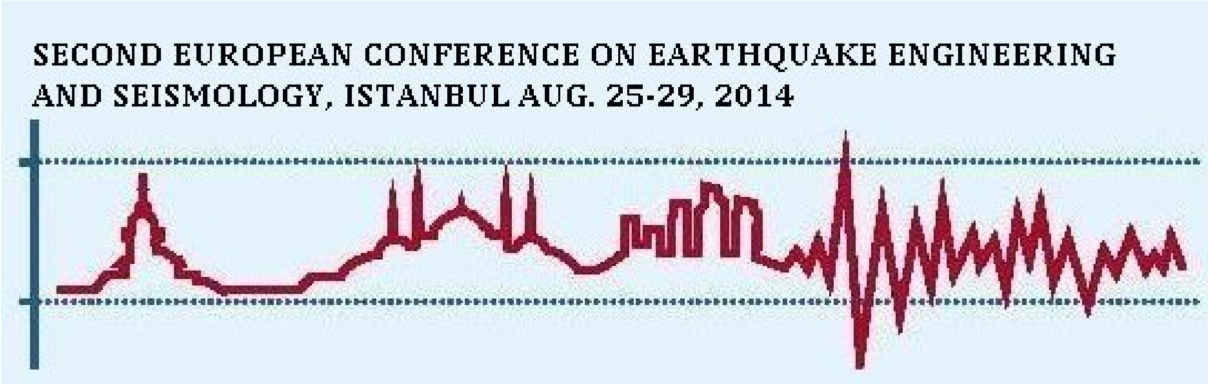

COMPARISON BETWEEN WENCHUAN AND LUSHAN EARTHQUAKE SEQUENCE ON LONGMENSHAN FAULT ZONE, CHINA

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On May 12, 2008, Wenchuan *M*8.0 earthquake occurred on the central segment of the Longmenshan fault zone (LFZ) in eastern Tibet. The coseismic rupture propagated northeastward unilateral about 240 km along the central-northern segment of the LFZ (Xu et al, 2009; Zhang et al, 2010), and the long-axis of its aftershock area extends about 350 km. Nearly 5 years later, on April 20, 2013, Lushan *M*7.0 earthquake occurred on the southern segment of the LFZ, ~90 km away from the epicenter of the Wenchuan *M*8.0 earthquake. This event was inferred as a blind-reverse earthquake without clear surface rupture (Xu et al, 2013). The long-axis of the aftershock area is only about 60 km, much shorter than that of the Wenchuan earthquake.

Among all of the aftershocks of the Wenchuan earthquake, 49 were determined to be of magnitude equal to and above *M*5.0, including 8 with magnitude equal to and above *M*6.0. The largest one is Qingchuan *M*6.4 earthquake on May 25, 2008. Activity duration for the $M \geq 6$ aftershocks lasted about 3 months, and about 3.5 years for the $M \geq 5$ aftershocks. Even until present, the moderate aftershocks with *M*4 still occurred occasionally. In contrast, only 4 $M \geq 5$ aftershocks were observed after the Lushan mainshock, with a largest *M*5.4 one within the first 3 days. $M \geq 4$ aftershock activities lasted less than 1 month, which means both the number and magnitude of the moderate and strong aftershocks of the Lushan earthquake sequence are much lower than those of the Wenchuan earthquake. The decay coefficient *p*-value derived from the aftershock catalogue with magnitude $M \geq 3$ for the first month is 1.37 for the Lushan sequence, higher than *p*-value 0.92 for the Wenchuan sequence. All of these above inferences indicate the rapid decay of the Lushan sequence.

Focal mechanism solutions of the $M \geq 4$ earthquakes derived from near-field waveform inversion demonstrate different features for the two sequences. Focal mechanism of the Wenchuan mainshock shows that it was a thrust faulting event with significant strike-slip component. For its $M \geq 4$ aftershocks, thrust and strike-slip features are the two dominant types, but the proportion of different type aftershocks varies with time on different segments of the Wenchuan aftershock area, especially on the southern and northern segments (Yi et al, 2012). Dip-slip and strike-slip motions are dominant faulting behavior for the central segment and NW-striking Lixian branch, respectively. However, on the southern segment, dip-slip aftershocks are more than those in strike-slip in the early stage before Aug. 31, 2008, and slightly less than those in strike-slip in the later stage. Meanwhile, for the northern segment, the proportion of aftershocks in right-lateral strike-slip is higher than that in dip-slip with strike-slip component in the early stage, but it is less than that in dip-slip in the later stage. The significant variation of the proportion of different type aftershocks on the southern and northern segments may be resulted from readjustment of faulting behavior on both ends of the seismogenic fault zone. Variation of the fault plane strikes and dominant orientations of P-axes are significant on different segments, as shown in rose diagrams. Dominant P-axis orientation is NWW on the southern segment, NEE on the central segment and NW-striking Lixian branch, and NWW and NEE on the northern segment, which is in good accordance with the NW orientation of the regional stress field and

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NE of the Wenchuan earthquake rupture, respectively. We suggest that the aftershock activity was both influenced by regional stress field and local stress field from the Wenchuan mainshock. For the Lushan mainshock, focal mechanism analysis indicates that it is a pure thrust faulting event, and the dominant type of its $M \geq 4$ aftershocks is thrust, only three aftershocks of strike-slip type were observed. Relatively small difference between the strikes of the fault planes of the aftershocks and that of the mainshock for Lushan sequence reveals a relatively simple seismogenic structure. NW-SE orientation of dominant P-axis is consistent with regional stress field, which demonstrates that Lushan aftershock activity is mainly controlled by regional stress field. Meanwhile, spatial distribution of focal depths derived from waveform inversion displays very shallower $M \geq 5$ aftershocks with depth less than 5 km at the southern end and northern end of the Wenchuan aftershock area. For the Lushan sequence, the focal depths are between 8 km and 19 km, and no very shallow aftershocks occurred. Relatively narrow aftershock area suggests the Lushan earthquake is resulted from local stress release.

The southern segment of the LFZ is located in the increasing area of Coulomb stress due to Wenchuan earthquake (Parsons et al, 2008; Toda et al, 2008; Wang et al, 2009). Most of Lushan aftershocks occurred within the stress increasing area since 2008 Wenchuan earthquake (Yi et al, 2013). We conclude that the loaded stress from Wenchuan earthquake on the southern LFZ is one of the main factors responsible for Lushan earthquake occurrence.

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