Preface to the Focus Section on the 20 April 2013 Magnitude 6.6 Lushan, China, Earthquake

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The 20 April 2013 Lushan earthquake (moment magnitude M_w 6.6, surface-wave magnitude M_s 7.0) ruptured part of the southern segment of the Longmenshan fault zone in western Sichuan, China. The Longmenshan fault zone is a tectonic boundary that separates the rigid Sichuan basin to the east and the eastern Tibetan plateau to the west. The Lushan earthquake was a typical thrust event initiated at a relatively shallow depth of about 12 km. Although this earthquake did not produce obvious surface ruptures, it still caused strong shaking around its epicenter and resulted in more than 200 deaths or missing persons, more than 10,000 injuries, and huge economic losses.

Nearly five years before this earthquake, a more devastating thrust event, the 12 May 2008 M_w 7.9 Wenchuan earthquake, occurred ~90 km to the north and ruptured ~300 km northeastward along the northern-central segment of the Longmenshan fault zone. Since the Wenchuan earthquake, intensive geophysical and geological studies have been carried out in the Longmenshan fault zone and adjacent regions to better understand the cause of the Wenchuan event and its impacts. Several studies suggested an increased seismic-hazard potential in the southern segment of the Longmenshan fault zone due to the stress changes induced by the Wenchuan earthquake. The occurrence of the Lushan earthquake hence provides a great opportunity to test various models or hypotheses about earthquake interaction in intraplate settings and to re-evaluate seismic hazards in the Longmenshan fault zone and other active fault zones of the eastern Tibetan plateau.

This focus section of *Seismological Research Letters* includes a selected set of eight original technical papers that address the following scientific questions related to the Lushan earthquake:

- What are the seismological and geological aspects of the Lushan earthquake and its aftershock sequence?
- Is the Lushan earthquake an expected or unexpected event in this tectonically active region after the 2008 Wenchuan earthquake?
- How does the seismic hazard change after the occurrence of the Wenchuan and Lushan earthquakes?
- Is there any correlation between the Lushan and Wenchuan earthquakes?

The first three papers focus on the seismological aspects, including the locations and source mechanisms of the mainshock and aftershocks, kinematic rupture model, and characteristics of strong ground motions. Han *et al.* determine the focal mechanisms of the mainshock and two large aftershocks with $M_w > 5$ using local and global seismograms. In addition, they relocate the aftershock sequence using the Hypo2000 method with hybrid 1D velocity models for absolute locations and the double-difference location method with a 3D velocity model and waveform cross correlations for more-accurate relative locations. Zhang *et al.* relocate the hypocenter of the mainshock using the near-field strong-motion data and then invert for the mainshock kinematic rupture model using joint strong-motion and teleseismic data. Xie *et al.* investigate spatial characteristics of the mainshock near-field vertical and horizontal strong ground motions, estimate the attenuation of near-source ground motions with distances on different site classes, and compare the observed strong-motion spectra with those from the 2008 Wenchuan earthquake. The fourth paper, by Chen *et al.*, summarizes major faults and their activities in the central and southern segments of the Longmenshan fault zone and identifies the blind-thrust fault that ruptured during the Lushan mainshock. It also includes a detailed comparison with the 2008 Wenchuan earthquake.

The remaining four papers concentrate on interaction between the Wenchuan and Lushan earthquakes. Liu *et al.* use both the Coulomb stress change and seismic moment deficits to evaluate the change of earthquake hazards on some major faults along and adjacent to the Longmenshan fault zone due to the Wenchuan and Lushan earthquakes. Along the same line, Parsons and Segou discuss the issues of forecasting larger aftershocks from stress changes due to the mainshock and from the observed spatiotemporal clustering of postmainshock activities. In addition, they evaluate the aftershock forecast capability for other comparable continental earthquakes by analyzing the correlations among the maximum stress change, the highest aftershock magnitude, and the highest aftershock activity. The paper by Wang *et al.* focuses on the extent to which the Lushan earthquake was triggered by the 2008 Wenchuan earthquake. These authors calculate coseismic and postseismic Coulomb stress changes caused by the 2008 Wenchuan earthquake and compare these changes with the tectonic stress that has accumulated since the Wenchuan earthquake. Their stress calculation is based on a 3D viscoelastic model constrained by seismic profile data and updated Global Positioning System (GPS) postseismic observations, as well as improved fault geometries and slip distribution of the Wenchuan earthquake. The final paper, by Jia *et al.*, investigates whether the Lushan earthquake is an aftershock of the Wenchuan earthquake from a statistical

 doi: 10.1785/0220130184

viewpoint by analyzing the background seismicity using the Epidemic Type Aftershocks Sequence (ETAS) model and a stochastic declustering method. In addition, these authors calculate the Coulomb stress changes induced by the Wenchuan earthquake to understand whether the dramatic change in background seismicity in the Lushan region is the result of the Wenchuan earthquake.

The eight papers included in the focus section cover several important aspects of the Lushan earthquake and its possible correlation with the 2008 Wenchuan earthquake. These selected papers advance our knowledge of the Lushan earthquake itself and promote future studies about seismic hazards in the Longmenshan fault zone and its adjacent regions.

ACKNOWLEDGMENTS

We thank all the authors for their valuable contributions to this focus section and all the reviewers for their timely and constructive comments to the original manuscripts. We would also like to thank the previous editor-in-chief Jonathan Lees for providing initial guidance and the SRL Managing Editor Mary George and the production staff for their help during various stages of this effort.

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