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Supporting Information for

**Slip Distribution along the Chenghai fault from airborne LiDAR and tectonic implications for the 1515 Yongsheng earthquake, China**

Haomin Ji1, 2, Zhikun Ren1, 2\*, Xiaoxiao Zhu1, 2, Mingkun Bai1, 2, Guodong Bao1,2, Jinrui Liu1, 2, Guanghao Ha1, 2, Zhongtai He1, 2

1State Key Laboratory of Earthquake Dynamics, Institute of Geology, China Earthquake Administration, Beijing, 100029, China

2Key Laboratory of Seismic and Volcanic Hazards, China Earthquake Administration, Beijing, 100029, China

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Captions for Tables S1 and Table S4

Captions for Data Set A1

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**Introduction**

Figure S1 shows the process of the displacement measurement method. Figure S2 presents all topographic profiles. Figure S3 and S4 give the raw images to facilitate readers to identify the fault trace. Figure S5 gives the calculation results of the cumulative offset probability density based on the horizontal displacements along the S2 and S3 segments. Table S1 displays all horizontal displacement measurements along the Chenghai Fault. Table S2 shows the magnitude estimate of the Yongsheng earthquake in 1515 based on empirical formulas. Table S3 presents the slip rate of active faults in the Sichuan-Yunnan block revealed by the geodesy. Table S4 presents late Quaternary horizontal slip rate of active faults in the Sichuan-Yunnan block. Data Set S1 includes a kmz file of the mapped fault trace. Finally, all references in the Supporting Information are listed.

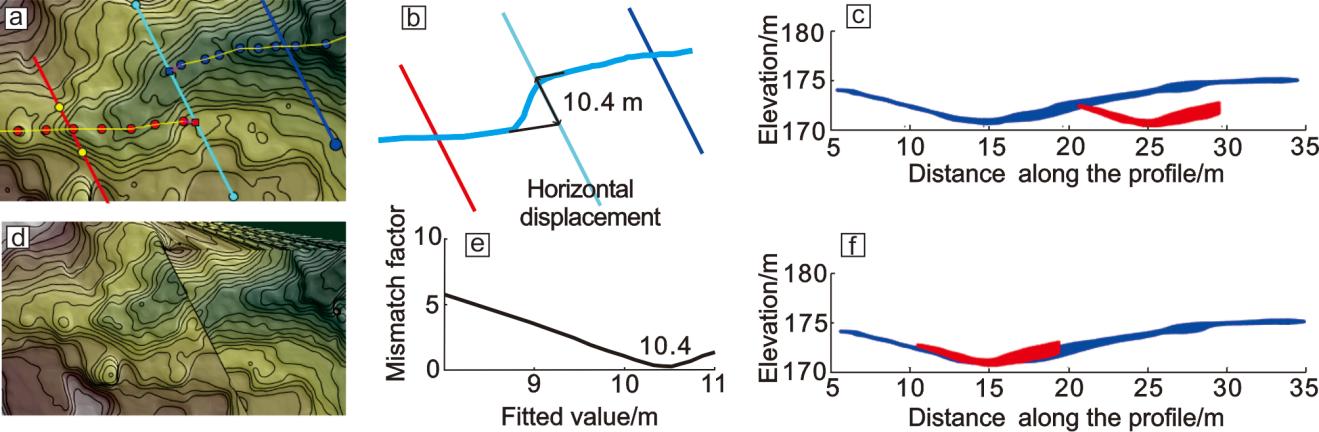
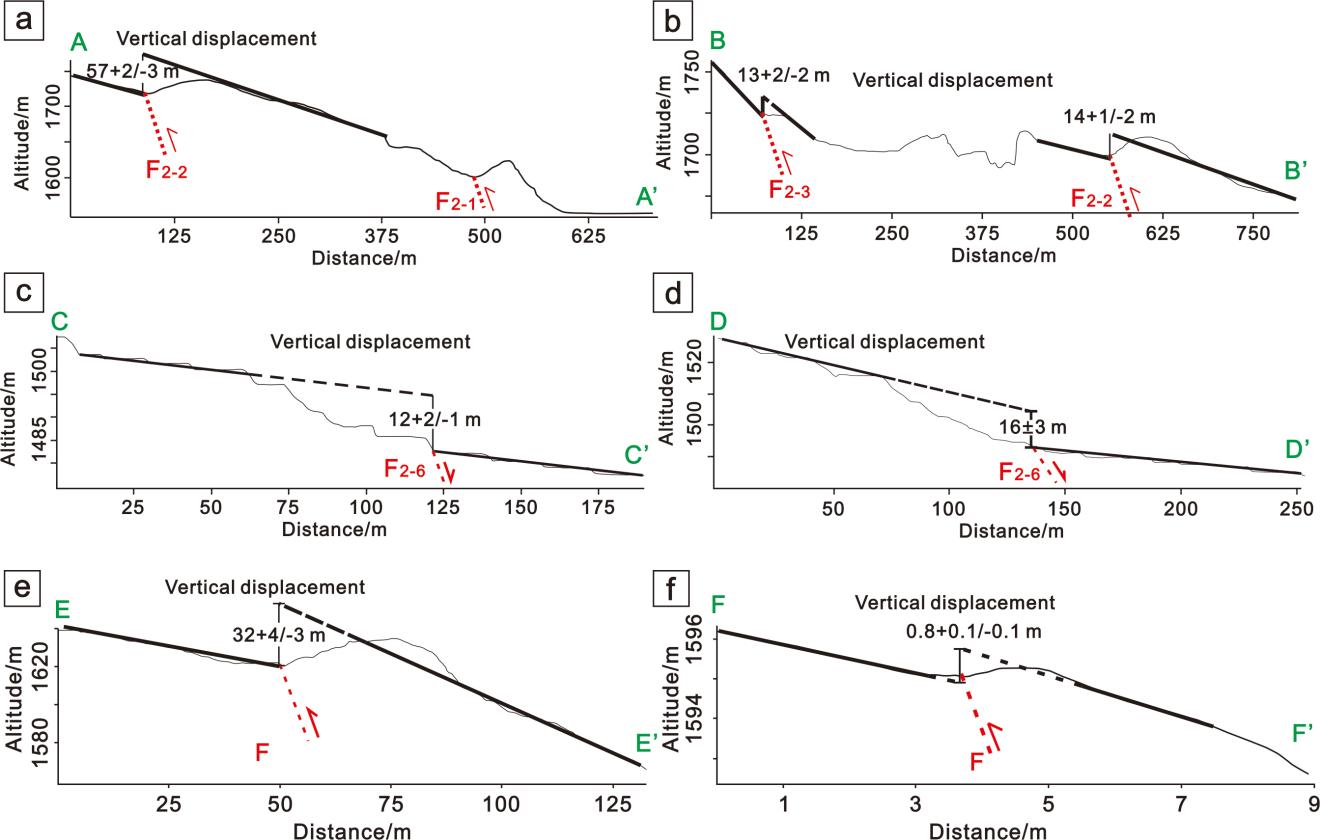


Figure S1. Displacement measurement method based on high resolution DEM data



**Figure S2**. Topographic profiles. The locations of AA’ and BB’ are shown in Fig. 5a; the locations of CC’ and DD’ are shown in Fig. 6a; the locations of EE’ and FF’ are shown in Fig. 7d

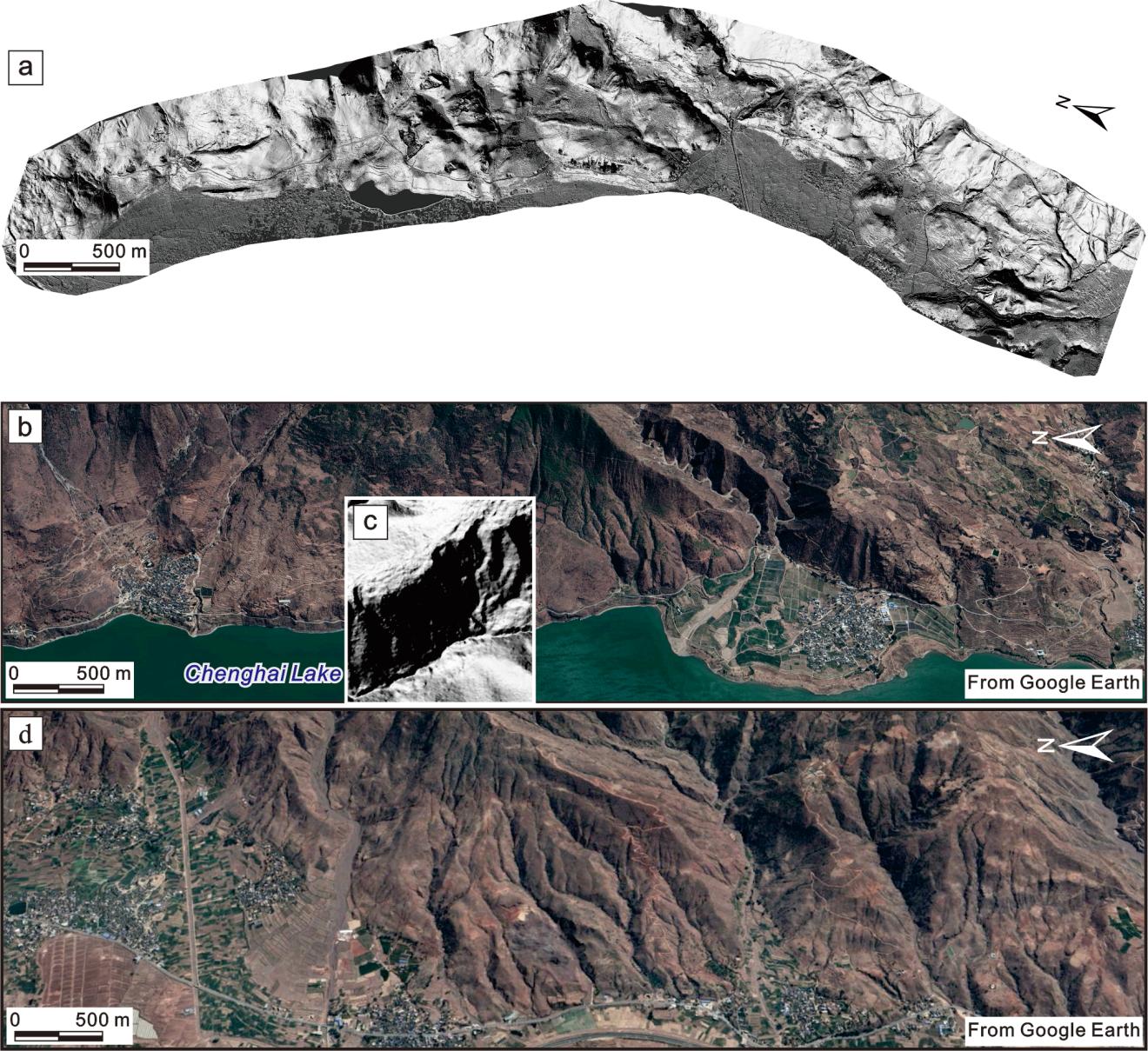
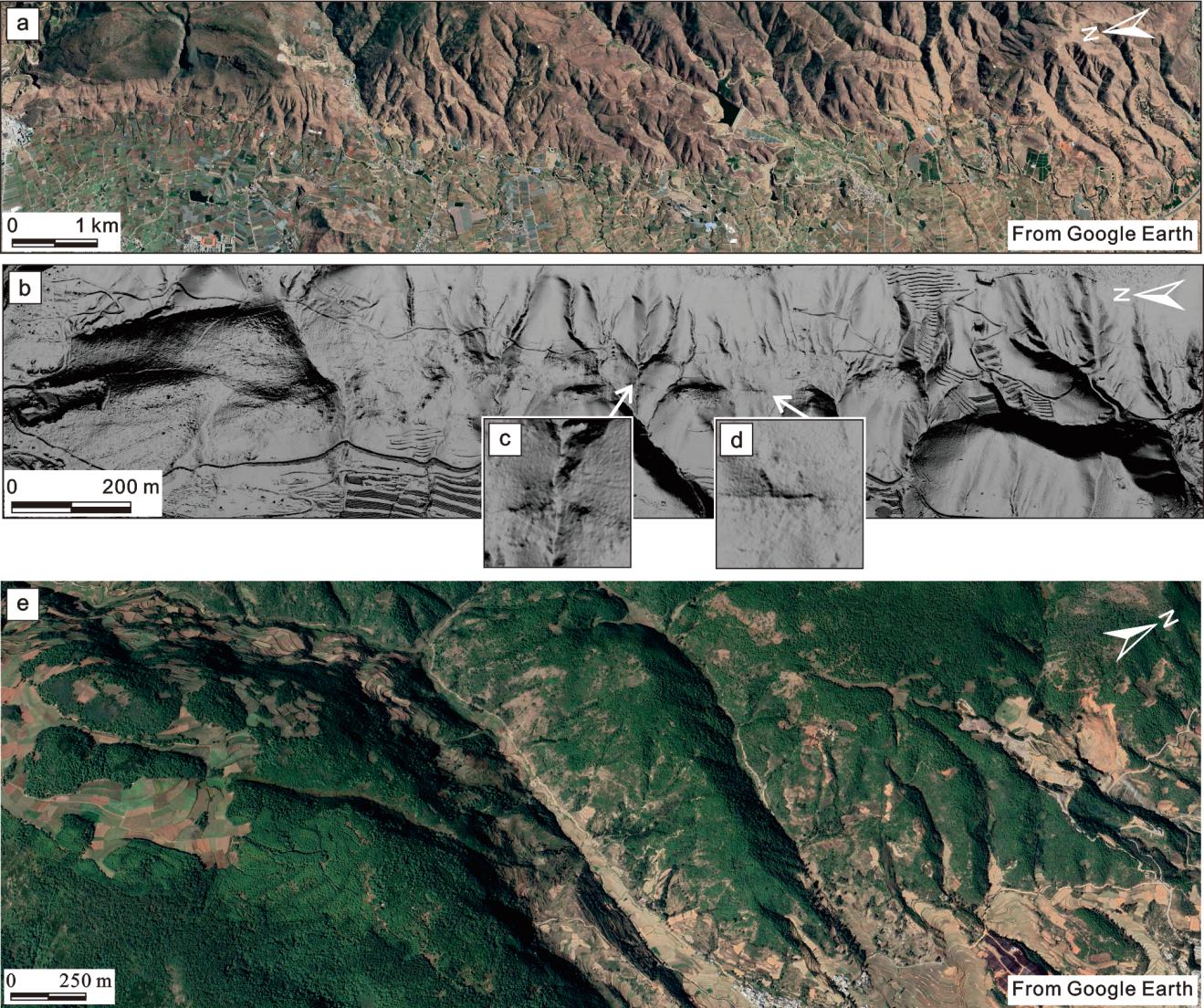


Figure S3. Raw images for interpretation figures in the body content. a: Fig. 5a; b, c: Fig. 5d, e; d: Fig. 6f



**Figure S4**. Raw images for interpretation figures in the body content. a: Fig. 7c; b, c, d: Fig. 7d, e, f; e: Fig. 8c

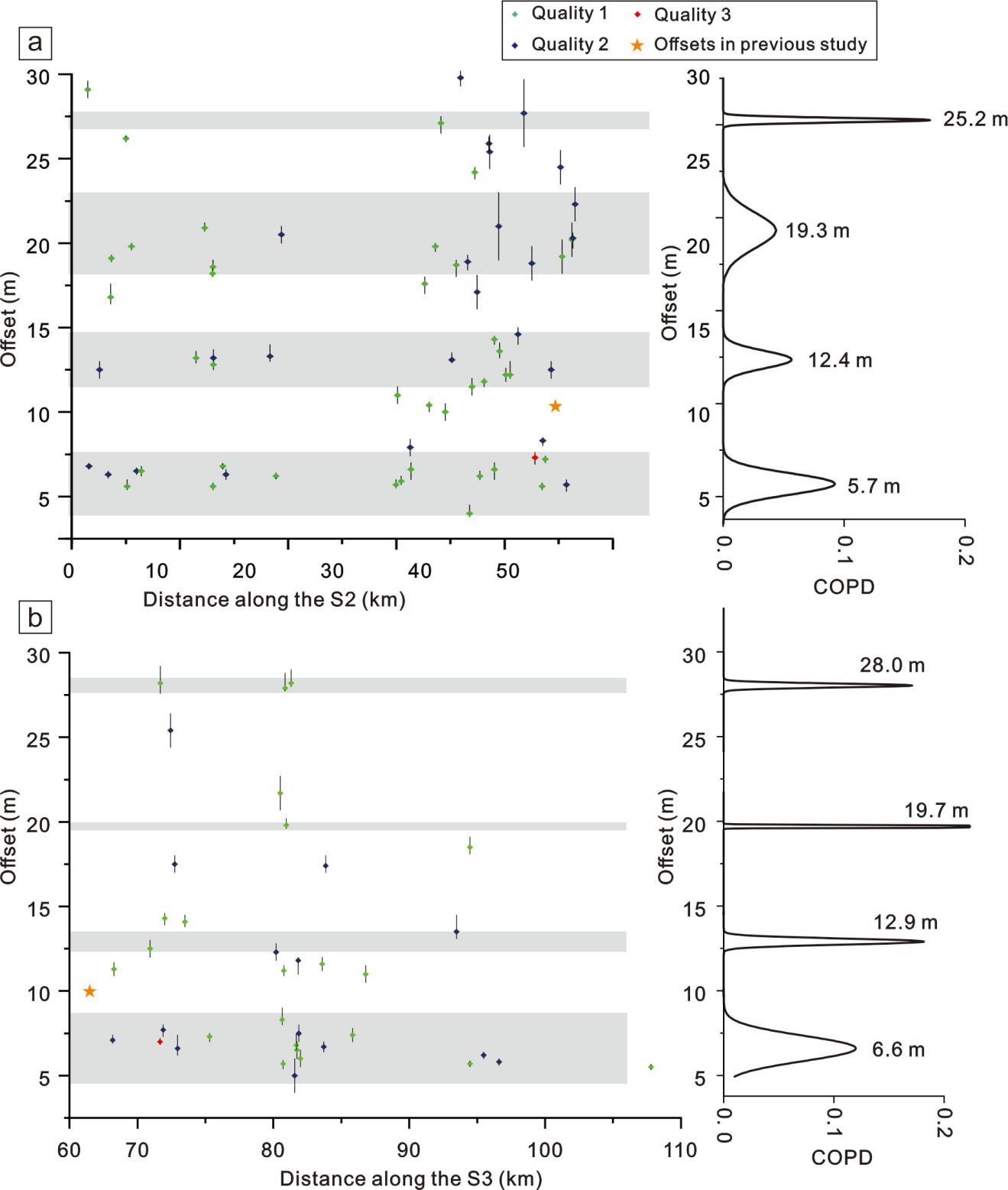


Figure S5. Cumulative offset probability density (COPD) plot of the horizontal displacements on segment 2 (a) and 3 (b) of the Chenghai Fault in the range of 0–30 m

**Table S1.** Distribution of the coseismic displacement along the Chenghai fault

**Table S2.**  Magnitude estimate of the Yongsheng earthquake in 1515

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Equation** | **a** | **b** | **Calculated SRL** | **Reference** |
| SRL = a + blogDco | 1.46 | 0.86 | 138 km | Wells and Coppersmith, 1994 |
| **Equation** | **c** | **d** | **Calculated magnitude** | **Reference** |
| M = c + dlogSRL | 5.92 | 0.88 | 7.77 | Deng et al., 1992 |
| 5.16 | 1.12 | 7.51 | Wells and Coppersmith, 1994 |
| 5.303 | 1.181 | 7.78 | Ran, 2011 |
| **Equation** | **e** | **f** | **Calculated magnitude** | **Reference** |
| M = e + flogAD | 7.13 | 0.68 | 7.74 | Deng et al., 1992 |
| 6.83 | 0.97 | 7.59 | Wells and Coppersmith, 1994 |
| 6.996 | 0.854 | 7.67 | Ran, 2011 |

**Table S3.** The slip rate of active faults in the Chuandian block revealed by the geodesy

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Active fault** | **Horizontal Slip Rate（mm/a）** | **Method** | **Reference** | **Active fault** | **Horizontal Slip Rate（mm/a）** | **Method** | **Reference** |
| Xianshuihe fault | 10-11 | GPS | Shen et al., 2005 | Xiaojiang fault | ~7 | GPS | Shen et al., 2005 |
| 8.9-17.1 | GPS | Wang et al.，2008 | 9.4 ± 1.2 | GPS | Wang et al.，2008 |
| 11.8 -14.5 | GPS | Wang et al., 2020 | 13.2 ± 0.2 | GPS | Wang et al., 2020 |
| 9-12 | InSAR | Wang et al.，2009 | Lijiang-Xiaojinhe fault | ~3 | GPS | Shen et al., 2005 |
| 12.2-13 | GPS | Wang W. et al., 2017 | 5.4 ± 1.2 | GPS | Wang et al.，2008 |
| 12.7-15.9 | GPS | Wang Y. et al. 2017 | 4.3 | GPS | Wang et al., 2020 |
| 9-12 | InSAR | Ji et al., 2020 | Litang  fault | 4.4 ± 1.3 | GPS | Wang et al.，2008 |
| 8-10.2 | GPS | Zheng et al., 2017 | 3.1 ± 0.8 | GPS | Wang et al., 2020 |
| 10-15 | InSAR | Zhang et al., 2019 | Nanhua-Chuxiong fault | 4.2 ± 1.3 | GPS | Wang et al.，2008 |
| 8.1-11.1 | InSAR | Qiao and Zhou, 2021 | 2.1 ± 0.8 | GPS | Li et al., 2020 |
| 7.67-9.13 | Gravity and GPS | Li et al., 2019 | Shiping-Jianshui fault | 1.7 ± 0.7-2.2 ± 0.8 | GPS | Li et al., 2020 |
| 14.4 | GPS | Gan et al., 2007 | 4.2 ± 1.3 | GPS | Wang et al.，2008 |
| 7-10.3 | GPS and InSAR | Jiang, et al. 2015 | Qujiang fault | 2.8 ± 1.4 | GPS | Li et al., 2020 |
| 11 | GPS | Loveless and Meade | Red River  fault | 0.8 | GPS | Wang W. et al., 2017 |
| Anninghe-Zemuhe fault | 4.4-6.2 | GPS | Wang W. et al., 2017 | <2 | GPS | Shen et al., 2005 |
| ~7 | GPS | Shen et al., 2005 | 0.4-1.5 | GPS | Wang et al.，2008 |
| 5.1 ± 2.5 | GPS | Wang et al.，2008 | 1.3 ± 0.4-4.2 ± 1.0 | GPS | Wang et al., 2020 |
| 4.7 ± 0.7-5.3 ± 0.4 | GPS | Wang et al., 2020 | 1.4 ± 0.4 | GPS | Li et al., 2020 |
| Daliangshan fault | 6 | GPS | Wang W. et al., 2017 | Lancangjiang fault | ~2 | GPS | Shen et al., 2005 |
| 6.3 ± 0.5 | GPS | Wang et al., 2020 | Jinshajiang fault | 1.9 ± 0.8 | GPS | Wang et al., 2020 |

**Table S4.**  The slip rate of active faults in the Chuandian block revealed by the geological research

Data Set S1. A kmz file of the mapped fault trace based on the LiDAR-DEM.

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