New Discovery of Earthquake Surface Rupture in the Wenshan Fault

NIE Guanjun¹,²*, HE Sheng¹,², LI Bingsu¹,² and PAN Lili¹,²

¹ Earthquake Administration of Guangxi Zhuang Autonomous Region, Nanning, Guangxi 530022, China
² Guangxi academy of engineering shock prevention, Nanning, Guangxi 530022, China

Abstract: Southwestern China act in the place where the South China block, Sichuan-Yunnan block and Indochina block converge, it is one of the active and complex tectonic regions in China (Ding et al., 1991). The Wenshan Fault developed in the southwestern-most portion of the South China block (Fig. 1), is strongly influenced by the interactions of the three blocks. The earthquake surface rupture discovered in this paper is located on the northwest segment of the Wenshan Fault (Fig. 1b and c). It developed in semi-consolidated/consolidated gravel beds (U1) in flood plain of an ancient river. Four ruptures correspond to four paleoseismic events respectively, can be identified in the outcrop, we named them R1 through R4 form old to young. R1 is the oldest and largest rupture, it is more than 25m long, about 2.3m wide at the widest part, and wide above and narrow below (Fig. 2). R1 is a tension-shear rupture with 2.7m left-lateral strike-slip displacement. It was filled with unconsolidated red gravel-bearing clay (U2) which was rolled into the R1 from the surface after the rupture occurred. R2, R3 and R4 are approximate parallel developed in the red gravel-bearing clay (U2), they occurred after R1 was healed by clay filling (Fig. 3). R2 and R3 are characterized by left lateral strike-slip, while R4 is characterized by right lateral strike-slip. The top of the outcrop is covered with gray clay (U3) and a layer of black humus soil (U4). R2 cut into U3 but not U4, R3 and R4 both cut into U4 and produced fissures on the surface.

Fig. 1. Location maps for the Wenshan fault (a, modified after Replumaz and Tapponnier (2003)) and its earthquake surface rupture (b), and the panoramic photo of the rupture (c).

Fig. 2. The overhead view of the main body of rupture R1 (a) and corresponding sectional drawing (b).

* Corresponding author. E-mail: 120279026@qq.com

© 2019 Geological Society of China
The latest rupture R4 may be caused by the 2005 Wenshan M5.3 earthquake, which caused a large number of building collapses and damages, and its epicenter is less than 6km away from the ruptures (Jiang et al., 2014). The characteristics of the earthquake surface ruptures indicate that several destructive earthquakes have occurred in the northwest segment of Wenshan fault since late Quaternary. The Wenshan Fault is a Holocene active fault, and its Holocene activity is dominated by left-lateral strike-slip, occasionally by right-lateral strike-slip. GPS data show that the movement speed of Sichuan-Yunnan block is much faster than that of South China block (Liu et al., 2007). The Wenshan Fault is just located ahead of the rhombic tip of the Sichuan-Yunnan block (Fig.1a and b), is strongly influenced by the Sichuan-Yunnan block. The earthquake surface ruptures R1, R2 and R3 may be caused by the left-lateral movement of the fault block on the southwest side of the Wenshan Fault, which happened southeastward extrusion pushed by the Sichuan-Yunnan block.

**Key words:** earthquake surface rupture, wenshan fault, sichuan-yunnan block, extrusion

**References**

**About the first author**
NIE Guanjun, male, born in 1987 in Suizhou City, Hubei Province; doctor; graduated from University of Chinese Academy of Sciences; engineer of Earthquake Administration of Guangxi Zhuang Autonomous Region. He is now interested in the study on active fault and regional tectonic evolution.

Email: 120279026@qq.com; phone: 0771-2863605, 18172383758.

**About the corresponding author**
NIE Guanjun, male, born in 1987 in Suizhou City, Hubei Province; doctor; graduated from University of Chinese Academy of Sciences; engineer of Earthquake Administration of Guangxi Zhuang Autonomous Region. He is now interested in the study on active fault and regional tectonic evolution.

Email: 120279026@qq.com; phone: 0771-2863605, 18172383758.