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Study on the Late Quaternary Activity Characteristics and its Tectonic Geomorphology Response of the middle Segment of Dari Fault in the Northeastern Tibetan Plateau

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The middle segment of Dari fault located at Dari county, Guoluo Tibetan autonomous prefecture, Qinghai province. This fault is striking to NW. And it also is the most representative fault in the BayanHar block along the Northeastern Margin of Tibetan Plateau (Fig. 1). The middle segment of Dari fault shows a strong activity characteristics of Late Quaternary. And there are a co-seismic surface ruptures in the middle segment of Dari fault, which left by Dari M7³/₄ earthquake in Qinghai province at the March 14th 1947.

In the Sept 2011, by laying emphasis on typical surface ruptures and fault belts in the Dari area, we have measured the vertical and horizontal offsets on the middle segment of Dari fault by GPS and EDM. Based on the field work, we take some samples for thermal chronology dating in the typical area and key positions. According to the result of the dating, we can have a clear cognition about geometrical morphology, tectonic deformation pattern and activity characteristics of the middle segment of Dari fault in the BayanHar block. Based on ASTER GDEM V2 data, we take four watershed (Dariqu watershed, Angcanggou watershed, Kequ watershed and Xiaqu watershed) as research objects, using hypsometric integral, topographic fractals and SL index to analyze tectonic responses to uplift and strike slipping of the middle segment of Dari fault.

The results show:

(1) The surface rupture of Dari earthquake has fragile characteristics, with approximately N40° W striking, extending about 90km, and cuts varieties of terrain units.

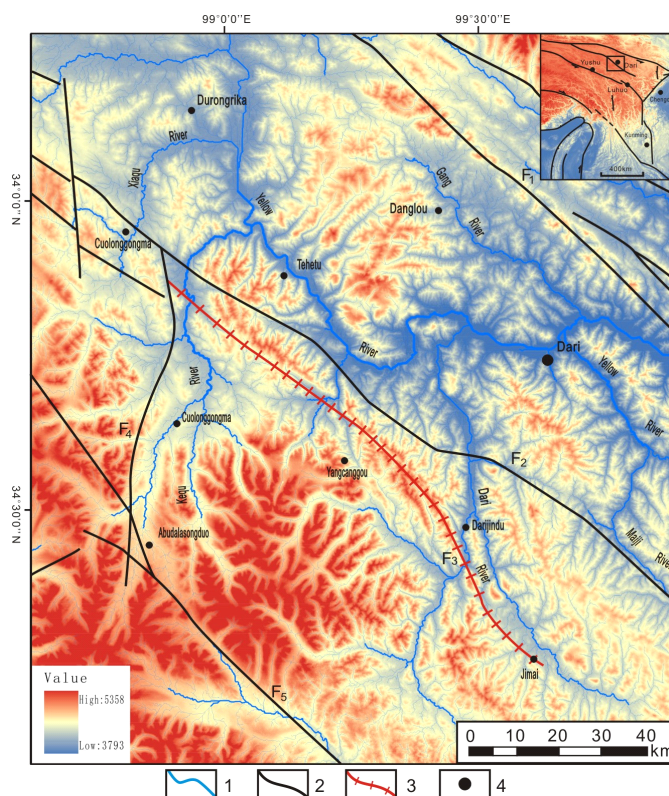


Fig.1 The surface rupture of Dari earthquake and major drainage pattern in the Dari area

1. River, 2. Fault, 3. Surface Rupture, 4. Town or Village, F1: Gande Fault, F2: Yeniugou Fault, F3: Dari Fault, F4: Sangrma Fault, F5: Abudasongduo Fault,

From SE to NW, It begin in the near of the southeastern Maji village, and end in the north of Sangrma village. The surface rupture of Dari earthquake is very complex, and made up by three segments, With an emphasis on the

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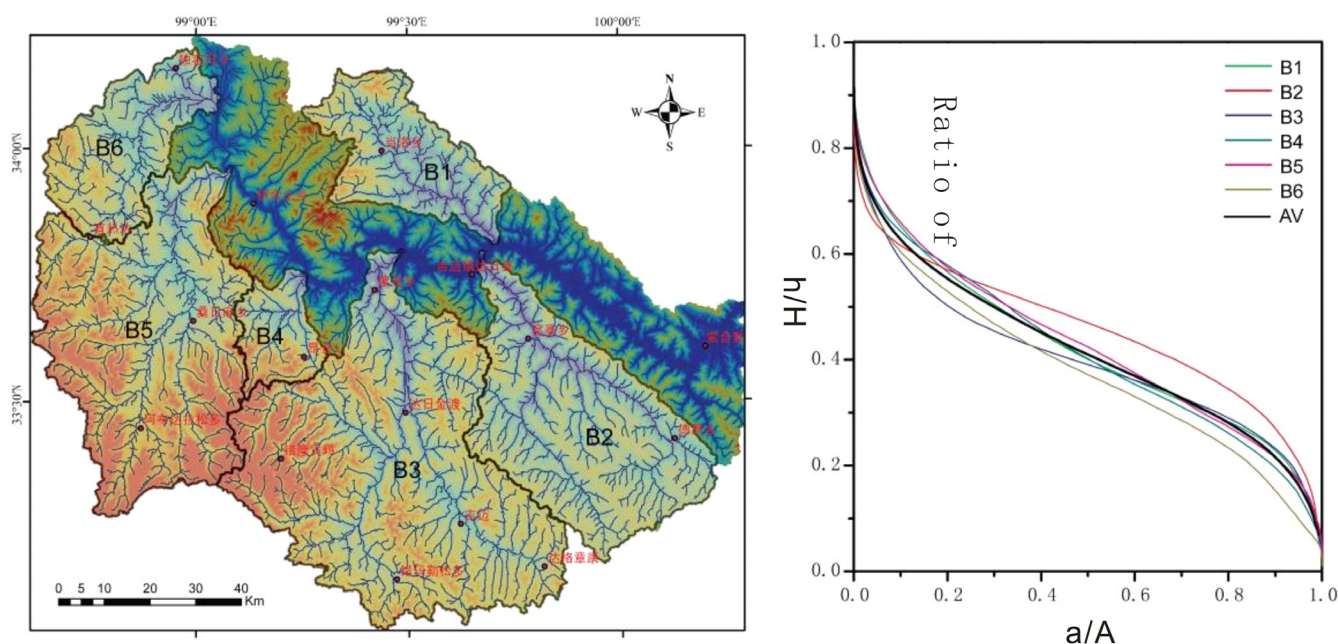


Fig.2 The distribution of secondary watershed and the feature of hypsometric integral (AV) (LIANG Mingjian, et al., 2013)

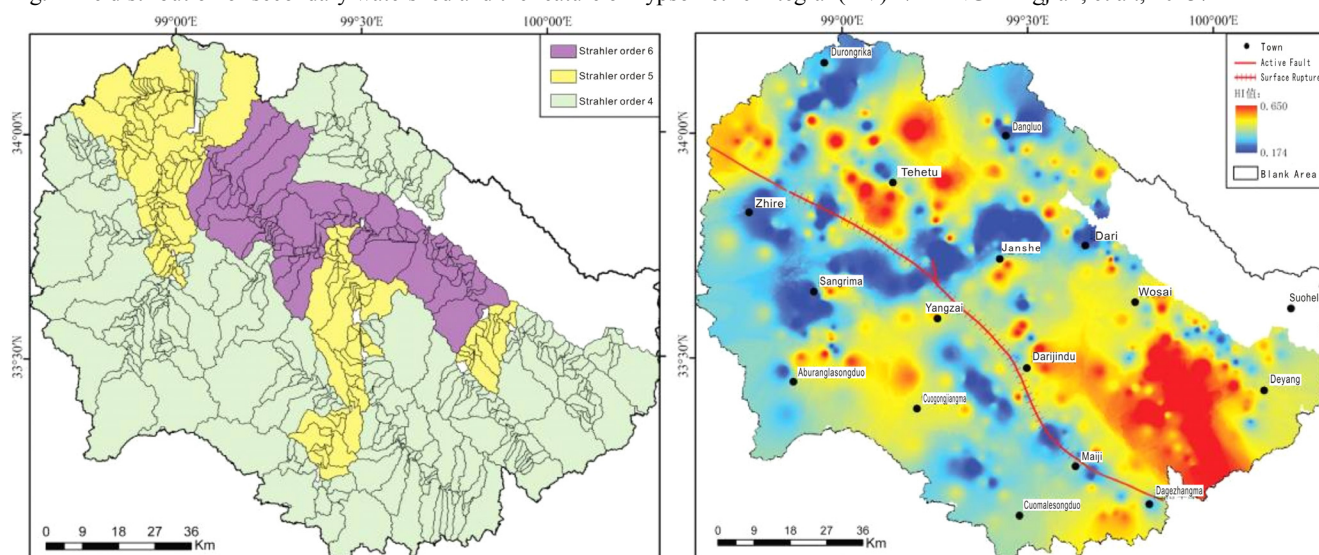


Fig.3 The distribution of secondary watershed and the feature of integral value(Hi) (LIANG Mingjian, et al., 2013)

geomorphic features of the surface ruptures, In the southeastern segment, the pattern of the surface rupture shows as a series of tensile cracks, like “broom” or “feather”. In the middle segment, the pattern of the surface rupture dipped at high angles, characterized by sinistral strike-slip and thrust-nappe, with an average vertical offset of 0.5-1 meters and an average horizontal offset of 2-4 meters(Tab.1). In the northwestern segment, the surface rupture is disappeared in the mountain which striking to NE (fig. 1).

(2) By studying SL index for the four watershed (Dariqu watershed, Angcanggou watershed, Kequ watershed and Xiaqu watershed) , which shows on a feature of upper convex morphology. So we have an

opinion that the morphotectonic features in the Dari area is at a imbalance stage, which controlled by the uplift of the middle segment of Dari fault.

(3)Based on the result of hypsometric integral (AV) and the integral value(Hi) for the four watershed (Dariqu watershed, Angcanggou watershed, Kequ watershed and Xiaqu watershed) . It shows a feature of “S” (fig. 2). According to Davisian geographical cycle theory, the morphotectonic features is at the “maturity” stage. The distribution of secondary watershed basins’ low value is consistent with the area of quaternary fault basins and valley basins along the middle segment of Dari fault, which reflect to the result of tectonic subsidence and erosion, and the distribution of secondary watershed

Table 1 Datas of surface rupture in Dari area

Number	Location		Elevation	Vertical Offset(m)	Horizontal Offset(m)
DR001	N33°16.538'	E99°36.775'	4269m	1.1	—
DR002				1.5	—
DR003				0.8	—
DR004	N33°28.02'	E99°27.869'	—	—	3.3
DR005	N33°28.172'	E99°27.889'	4230m	1.0	2.7
DR006				—	—
DR007	N33°41.612'	E99°12.341'	4299m	—	5.3
DR008	N33°42.419'	E99°11.043'	43363m	—	3.7
DR009	N33°42.546'	E99°10.808'	43356m	—	4.1
DR010	N33°42.679'	E99°10.327'	4347m	—	3.3
DR011	N33°43.348'	E99°9.481'	4406m	—	4.2
DR012	N33°43.444'	E99°9.286'	4405m	—	4.1
DR013	N33°43.621'	E99°9.011'	4408m	—	3.6

basins' high value is reflected to the change of structure and the difference of lithology in the Dari area(fig. 3).

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Key words: Dari Earthquake; Surface Rupture; Active faults; Tectonic Geomorphology; BayanHar Block; China