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Prediction of fault instability based on seismic activity time-space evolution and strain energy——Taking western section of Southern Tienshan as example

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The goal of earthquake prediction is to find origin time, location and magnitude according to precursor observation, but short-term prediction is a world puzzle which is still in initial stage. The experimental results indicate fault instability is a transmission process of each section from individual activity to collaborative activity and there is collaborative phenomenon existed in meta-instable stage before fault instability. The meta-instable stage is the last stage of fault instability which only occupied a short period including meta-instable and instable stage. Recognition of this stage will make preparation for judgment of final stable stage. How to find stress concentration part among each part which caused dynamic explosion before stress released is a key point for finding location of strong earthquake. Tienshan is the most active and complex region in modern crustal movement. The energy fully released in western section of Southern Tienshan after Atushi earthquake with Ms8.3, 1902, after 1944 there were series of strong earthquakes happened such as: Wuqia earthquake with Ms7.0,1944,Wuqia earthquakes with Ms7.0,1955,Jiashi earthquakes with Ms6.8,6.7,6.4,1961,Wuqia earthquake with Ms7.3,1974,Kashi earthquake with Ms7.1,1985,Jiashi earthquakes with Ms6.0,1997-1998 and Wuqia earthquakes with Ms6.8,6.5,6.2,2008. The average interval of energy releases which equals to magnitude of Ms 7.0 is about eleven years including the shortest six years and the longest thirteen years while deviation is about 18%-45%. The strong earthquakes happened before and after Jiashi earthquakes in 1961 which provide observation and research condition for strong earthquakes activity in western section of Southern Tienshan. A recent strain release in western section of Southern Tienshan is Wuqia earthquake with Ms6.8, 2008 and happened on Kazkeaerte fault. Another earthquake with Ms 7.1 happened on Kazkeaerte fault in 1985, twenty-three years before Wuqia earthquake with Ms6.8, 2008 according to history record. The author using collaborative stage of fault activity to find beginning of meta-stable stage and finding location of strong earthquake through accumulation and release of each section on Kazkeaerte fault. The results showed: 1. distribution of earthquakes with Ms 4.0 on Kazkeaerte fault extended to both direction from center through projection of earthquakes happened on Southern Tienshan which started from April, 2002 to June, 2008. The seismic activity on middle section of Kazkeaerte fault appeared quietness during this period. 2. By making comparison of strain release on Kazkeaerte fault with other fault in Southern Tienshan: The strain energy of western section in Southern Tienshan always stayed in accumulation stage since 2003, only Kazkeaerte fault begun smoothly released from 2007 but other section of Kazkeaerte fault including causative fault of earthquakes with Ms 6.8 released rapidly since 2003 until main shock happened; There is obvious locked segment with high stress accumulation on active fault before strong earthquake happened which provide decision method of meta-stable location on fault.