

台灣中部 1999 年集集地震和早期地震中同震增長褶皺的古 地震證據

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摘要

1999 年集集地震沿著厚層的河積、沖積和崩積沉積物所覆蓋而未被辨識的車籠埔斷層跡破裂，造成了 95 公里長的地表破裂跡和斷層關聯褶皺崖。本研究以槽溝開挖和淺取岩芯鑽探結果描述兩個地點的斷層關聯褶皺崖特徵。槽溝顯示的構造與逆衝盲斷層上的三角剪切斷層擴展褶皺特徵一致。在全新世沉積物中觀察到的褶皺顯示出圓滑的褶皺樞紐、不整合、進覆構造(onlapped structure)以及不同時期前翼地層傾角改變等特徵。這些構造表示在連續的同震增長事件中，褶皺是透過漸進的翼部旋轉而成。增長地層(growth strata)顯示出在古土壤化育層上的不整合接觸面。根據隨地震事件生成的沉積物構造，揭示了三仙宮場址的三個古地震事件和釋迦場址的兩個古地震事件。整合兩個槽溝及先前的研究結果，推估三個古地震事件發生在 300-430、710-800 和 1710-1900 年前。另外根據兩個槽溝的資料估算出車籠埔斷層在三仙宮與釋迦場址的平均滑移率分別為 4.2 和 4.5 毫米/年。



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Paleoseismic evidence for coseismic growth-fold in the 1999 Chichi earthquake and earlier earthquakes, central Taiwan

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Abstract

The 1999 Chichi earthquake ruptured along previously unrecognized traces of the Chelungpu fault, because the traces were covered with thick-bedded fluvial, alluvial, and colluvial deposits. The earthquake created a 95-km-long surface rupture and associated fault-related fold scarps. This study focused on the fault-related fold at two locations, where the fold scarp is characterized with trench excavation and shallow cored boring results. The structural characteristics revealed by the two trench sites are consistent with a trishear fault-propagation fold growth above a blind thrust. Several characteristics of the fold observed in the Holocene deposits show smoothly rounded fold-hinges, unconformities, onlapped structure, and downward steepening of forelimb strata. Results from these structures suggest that the fold grows by progressive limb rotation of growth strata in sequential coseismic growth episodes. The growth strata show several unconformable contacts as indicated by paleosoil horizons developed on event horizons. Based on the syntectonic sedimentary structure, three events are revealed at the Siangong-Temple site and two paleoearthquake events on the Shijia site. Integration with the two trenches and the previous studies suggests the three paleoearthquake events occurred 300–430, 710–800, and 1710–1900 yr B.P. These data on the two trench sites indicate that the average slip rate is 4.2 and 4.5 mm/yr, respectively.

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