

2018 花蓮地震再活動的米崙斷層之古地震研究

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摘要

古地震研究是目前地震預測研究中最直接的研究方法，藉由了解古代地震發生的時間，來推估地震發生的週期與機率。槽溝開挖地下斷層剖面的古地震研究方法，即是透過構造與地層之截切關係結合地層定年結果，來推測斷層活動的年代。1951 年 10 月及 2018 年 2 月 6 日於花蓮市外海分別發生規模 7.3 及規模 6.4 的地震，並造成房屋損害與人民的傷亡，這兩起地震事件之共通點在於皆造成米崙斷層沿線出現地表破裂。本研究主要針對米崙活動斷層於 2018 花蓮地震而產生之地表破裂來進行槽溝開挖，以探討槽溝內沉積層中所記錄之古地震事件。槽溝開挖位置位於米崙斷層沿線一處之地表破裂跡，結果顯示主斷層以 80 度向東傾，而分支斷層也分別以 36 度、56 度及 70 度向東傾，從槽溝剖面中可觀察到分支斷層下盤之沉積層有被褶曲之情況，以及楔形崩積層的堆積。將剖面逐步回復與剝除沉積事件並配合定年的結果，可推得過去可能有至少五次的地震事件，分別為：(1)西元 2018 年；(2)距今 380-0 年前；(3)距今 686-380 年前；(4)距今 2184-1396 年前；(5)距今 3232-2630 年前。由於剖面缺少指標層，因此難以推估斷層滑移量及滑移速率，未來將利用鑽井資料與槽溝進行地層比對，以期能推估斷層滑移量與滑移速率。

Paleoseismic study of Milun fault reactivated by the 2018 Mw 6.4 Hualien earthquake rupture in Eastern Taiwan

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Abstract

Paleoseismic study is an effective way for earthquake prediction. Earthquake recurrence interval and seismic probability can be estimated by knowing the ages of paleo-earthquakes. The methodology of trenching across a fault trace or suspected fault scarp for paleoseismic study is used to derive the ages of activities of fault by dating results of strata and the relationship between structures and strata in trenches. There were two destructive earthquakes occurred offshore of Hualien city in October, 1951 and in February 6th, 2018, respectively. The 1951 earthquake with magnitude 7.3 and 2018 earthquake with magnitude 6.4 have something in common that ground ruptures appeared on the Milun fault trace and resulted in casualties and damage on buildings.

Two sites on the 2018 earthquake ground ruptures have been excavated for the paleoseismic study on the Milun fault. The excavated walls reveal that the Milun main fault dips 80° to the east, and three branch faults exist in its footwall and dip 36° , 56° , and 70° to the east, respectively. The strata in the footwall are folded, and two colluvial wedge deposits are found. Combining the restoration and stripping of strata on the walls with dating results, five paleo-earthquake events associated with the Milun fault are resolved: (1) 2018 event (2) 380-0 yr BP (3) 686-380 yr BP (4) 2184-1396 yr BP (5) 3232-2630 yr BP. It's hard to estimate the fault slip and slip rate because of no key bed on the walls. Drilling boreholes may be one way to solve the problem.