

台灣西南部 1 萬年以來近地表的活動變形帶特徵化研究- 以車瓜林斷層為例

報告者：丁權

指導教授：董家鈞 老師

報告日期：2023/01/13

摘要

活動斷層的近地表變形特性一直是工程地質的重要課題。以往研究對於活動線著墨較多，活動帶則較缺乏討論，而且單一調查並無法決定活動變形帶在時空變化的特性。因此，本研究以台灣西南部某鐵路場址為例，根據（一）詳細的工址監測資料來定義現代活動帶特徵、（二）藉由構造地形判釋結果與地表破裂來了解現代活動帶的側向分布狀況、（三）決定晚更新世至全新世的活動帶特徵—以密集排鑽岩心進行岩相分析，搭配古生物鑑定結果與碳十四年代來決定可靠的地層對比結果、並分析岩盤與沖積層中的剪切帶。（四）長期的活動帶時空變化特徵，分別以(1)絕對定年方法—以全球海水面、古環境深度、樣本高與碳十四定年推算抬升速率、(2)相對定年方法，以等時線逆推抬升速率。（五）提出活動帶演化模式，預測未來變形。

分析結果顯示：（一）由工址監測資料測地學計算短期抬升速率約 1.5 mm/yr，水平變形速率約 7 mm/yr，為走向滑移兼逆衝分量，現代的活動變形帶寬度約 275 公尺，共有三個變形斜率較大的區間。（二）構造地形判釋結果顯示場址以東地表並沒有顯著的線形，不過地表破裂或結構物異常狀況顯著，由調查結果顯示異常分布呈帶狀，推估現代活動帶分布可達 1.5 公里寬。（三）岩盤強烈剪切(厚層斷層泥)活動變形帶約 300 公尺，全新世地層為生長地層，亦受擾動與剪切。推估斷層角度超過 70 度。（四）絕對定年方法計算的長期抬升速率顯示跨斷層活動變形帶(上盤最大為 3.1 ± 1.1 mm/yr，下盤最小為 -0.29 ± 1.35 mm/yr)，但看不出更細緻的變化。而相對定年方法解析出萬年以來活動帶範圍與變形趨勢均現代一致，且 7000 等時線在 BH-12 與 BH-3 之間內有快速抬升情況。（五）車瓜林斷層長期（晚更新世至全新世）以及短期（現代）的活動變形帶均在相同位置變動，推測未來也會在相同範圍變形。

關鍵字：活動變形帶、車瓜林斷層、長期抬升速率

Characterization of shallow subsurface active deformation zone during the past 10 thousand years in alluvial plain area, southwestern Taiwan- a case of Chegualin fault

presenter : Chuan Ding

Advisor : Prof. Dong J.J. & Maryline Le Béon

Date : 2023/01/13

Abstract

Characterization of the deformation zone of active fault has been always the most important issue for engineering geology especially for site investigation. Because previous studies have more discussion on active line rather on active zone, and temporal and spatial variation of active zone might not be determined in detail by single method only, thus we want to use an excellent case where a railway site comes across the Chegualin Fault (CGLF) in Chianan alluvial plain, southwestern Taiwan to identify the characterization of the active zone in different time scales by integration results of extensive detail onsite monitoring data, geological data, biochronological data, and the comparison with short-term uplift rate and long-term uplift rate which calculated in both relative and absolute dating methods. Finally, a complete temporal spectrum and spatial characterization of the active zones of Chegualin fault active zone is proposed. Results: (1) Short-term uplift rate derived by on-site monitoring data shows the width of the modern active zone is about 275 meters. (2) Surface rupture traced along morphotectonics features show that there is no obvious lineation east of the site connected to previous reported fault scarp. However, the belt-like significant structural anomalies imply the distribution of the modern active zone can reach to 1.5 km width and 5.8 km long. (3) The deformation zone of bedrock is about 300m wide defined by highly sheared thick fault gauge, and the Holocene growth strata are also disturbed and sheared by active fault. The estimated fault angle exceeds 70 degrees. (4) The long-term uplift rate calculated by the absolute dating method shows the rate of 3.1 ± 1.1 mm/yr maximum in the hanging wall, and -0.29 ± 1.35 mm/yr minimum in the footwall. The relative dating method shows that the range and deformation trend since 10ka are consistent with modern active zone. Furthermore, the 7ka isochron line has a rapid uplift between BH-12 and BH-3. (5) The variation from long-term (late Pleistocene to Holocene) to short-term (modern) active zones of the Chegualin fault are always consist with same location, similar trend, thus and it is speculated that they will deform in the same way in the future.

Key word: active deformation zone, Chegualin fault, long-term uplift rate