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Evidence for Active Normal Faulting in Northern Taiwan and its Seismogenic Implications

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In contrast to other parts of the Taiwan orogenic belt, the northern Taiwan region is considered to undergo regional tectonic extension since ∼0.4 Ma following previous contractional tectonic phases. The extensional tectonics may lead to destructive normal faulting earthquakes threatening the populated Taipei region. However, mapped active faults in the region are still under debate due to lack of clear geologic or historic evidence; thus, further evaluation of the tectonic activities is necessary. Based on recent LiDAR-derived DEM, geologic and geodetic observations, consistent evidence for regional extensional deformation is found in northern Taiwan. We uncovered fracture patterns and branches of normal faults possibly extending from the Shanchiao normal fault into the Tatun volcanic region. We also found topographic evidence for normal faulting preserved in densely-covered forests in mountainous regions. A series of fresh topographic offsets is found within a wide zone suggesting that the effect of extension is distributed rather than localized in one single fault in the Oligocene strata of the Hsuehshan Range. Sag ponds or dammed lakes are commonly present, which further supports active and pervasive normal faulting activities. In addition, lake sediment studies indicate regional subsidence in the Lanyang Plain area at a rate comparable or higher to that of the Taipei Basin. As indicated by the well-preserved surface ruptures under forests and the long-term subsidence rates, these findings suggest that the northern Taiwan may likely produce destructive normal faulting earthquakes with shallow hypocenters even though recent GPS and seismicity observations reveal only modest tectonic activities in the region.