

空載雷射掃描於大屯火山地區發現之活動伸張構造

Active Extensional Structures Discovered by the Airborne LiDAR Mapping in the Tatun Volcanic Region, Taiwan

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Complex tectonic deformation is present in northern Taiwan where the Philippine Sea plate is subducting under the Eurasian plate and the Okinawa trough is opening to the east. The Tatun volcanic region and the Taipei metropolitan basin are considered the products resulted from such complex tectonic environment. Furthermore, contractional deformation was prevailed in the earlier stage, as evidenced by several major thrust faults truncating the Tertiary strata. However, the expected nowadays extensional deformation is not fully characterized, for example, the Shanchiao fault bounding the western Taipei basin and its northern extension into the Tatun volcanic region. Based on industrial seismic profiles, it appeared that several well developed normal faults reactivated pre-existing thrust faults offshore northern Taiwan. These normal faults likely extend into the land where the Tatun volcanics erupted through and covered on the Tertiary strata. It is our intentions to better inspect the deformational pattern existing within the Tatun volcanic region where forests dominate on the surface making field investigation difficult. In this study we apply high-resolution airborne LiDAR-derived digital terrain model to characterize possible joints, fractures, and faults in the Tatun volcanic region. The LiDAR-derived DTM was processed so that bare ground is revealed using virtual removal of forests. The derived 2-m DTM was then examined to map out topographic features possibly resulted from the linear geologic structures. We discovered clear distribution and pattern of the joints and fractures in the Tatun volcanic region for the first time. The mapped structural patterns reveal strong evidence for regional extensional deformation in northern Taiwan, especially within the Tatun volcanic region. We also uncovered branches of normal faults extending possibly from the Shanchiao fault into the Tatun volcanic region. The discovered normal fault, perhaps active, cut across flat regions with averaging 3.3 meters in displacement. A field outcrop was found which contains fault gouge and striations indicating normal and strike-slip in motion. This further supports that the extensional deformation is young and an ongoing process in northern Taiwan, and that the region may produce significant earthquakes through such mechanism.