

Earthquakes Caused by Unbending Subducted Slab Off Southwest Taiwan

Shu-Kun Hsu¹, Chien-Hsin Chang², Mei-Yi Ho², Wen-Bin Doo¹, Chung-Liang Lo¹
and Yen-Che Liao¹

1. Institute of Geophysics, National Central University, Taiwan

2. Central Weather Bureau, Taiwan

Abstract

On Tuesday, 26 December 2006, an earthquake of $M_w = 6.9$ occurred off Hengchun peninsula, Taiwan. The main shock and aftershocks have caused damage on land of southern Taiwan. The earthquake took place in an area that was less expected to have a big earthquake. In this study, we have collected 136 aftershocks and examined the tectonic context of this earthquake sequence. The earthquakes occurred in the azimuth of about N310 and coincide with the slope of a low Bouguer gravity anomaly zone. The orogen of Taiwan is formed by the collision between the Eurasian Plate and the Philippine Sea Plate. The uplift of the Taiwan orogen has induced a considerable loading on the east-dipping Eurasian Plate. The low Bouguer anomaly zone surrounding the western and southern Taiwan reflects the loading effect on the Eurasian Plate. 2D gravity modeling perpendicular to the general trend of the aftershocks indicates that the earthquakes mainly occurred in the uppermost mantle. Because the main shock is a tensional earthquake as shown by focal mechanism and the hypocenters of main shock and aftershocks are located beneath the crust, we suggest that the earthquakes off Hengchun peninsula are caused by the unbending effect of the subducting Eurasian slab. An interpretation for the unbending source is that the subducting plate off southwest Taiwan contains a transitional crust of ca. 12 km thick in the Eurasian continental margin; in contrast, the overriding plate contains a significant portion of high P velocity structure below the Hengchun peninsula. The similar crustal densities of both the subducting and overriding plates may cause resistance of subduction on the east-dipping Eurasian plate and occasionally induce unbending earthquake events.