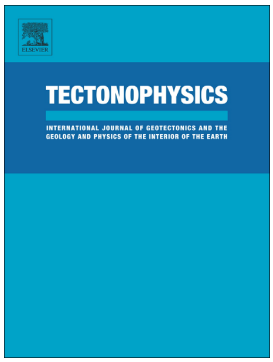

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Detecting rock uplift across southern Taiwan mountain belt by integrated GPS and leveling data

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Abstract

Rock uplift on the Earth surface is a key observation for studies of tectonics and geodynamic processes. Geodetic measurements from Global Positioning System (GPS) and leveling are able to track vertical deformation over a wide range of spatial and temporal scale. Taiwan mountain belt is subject to a rapid uplift rate of 20 mm/yr as revealed by GPS and leveling measurements in previous studies. The extremely high rates motivate us to analyze a set of newly processed GPS and leveling data along a NW-SE transect across southern Taiwan by considering the effects of the earthquake-related deformation as well as hydrological and surface processes. Our estimates of rock uplift rates from GPS and leveling are from -12 to +14 mm/yr across the southern Central Range of Taiwan. Vertical velocity changes on the small spatial scale are primary related to fault locking in the seismic cycle. The large spatial feature showing the mean uplift rate of 6 mm/yr between the eastern Central Range and the frontal thrust faults can be explained by a large-scale pop-up structure assuming the depth of 15-20 km in the orogenic wedge and the horizontal shortening of 30 mm/yr. Our results draw attention to carefully study geodetic vertical deformation in the mountain belts and seek relevant causes.

Keywords: GPS, leveling, rock uplift, hydrology, landslides, surface processes