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Estimation of barometric pressure response in borehole strainmeter with typhoon events in Taiwan

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Taiwan is located in an active collisional boundary of Philippine Sea plate and Eurasian plate in a convergence rate of ∼82 mm/yr, which results in high frequent seismicity and destructive big earthquakes. In order to monitor the strain change from pre-slip events, 13 Gladwin Tensor Strainmeters (GTSM) were installed in a depth of ∼200 m in western Foothills of Taiwan since 2003. The previous studies demonstrated that the broad environmental signs of barometry, rainfall, tide and groundwater should be calibrated to detect the tectonic signal. The previous study from borehole strainmeter of PBO in western US suggested that the strainmeter gauge time series were divided into records of approximately 60 days, overlapping when possible by 30 days. In order to determine the barometric pressure response of each gauge, the gauge outputs and atmospheric pressure data were band-pass-filtered to exclude frequencies outside the 4–6 day band. The results showed that sixty day records had a good correlation between the atmospheric pressure and the strainmeter gauge time series. Due to the climatic characteristics of annual rainfall could reach to 2500 mm in Taiwan, the long duration of gauge time series will be distributed by rainfall signal. Thus we suggest to divide the gauge time series records of approximately 30 days, overlapping when possible by 5 days. A good correlation of between the atmospheric pressure and the strainmeter gauge time series were identified by using a band-pass-filtered to exclude frequencies outside the 3–7 day band. In addition, we can use the linear regression from gauge time series and barometric drop due to the before the typhoon events with no interference of rainfall events. The average atmospheric pressure response coefficients of the strainmeters are about -0.14∼-0.38 μstrain/KPa.