Different kernel functions due to rainfall response from borehole strainmeter in Taiwan

Chih Yen Chen (1,2), Jyr Ching Hu (2), and Chi Ching LIu (3)

(1) Central Geological Survey, MOEA, Taiwan (zychen@moeacgs.gov.tw), (2) National Taiwan University, Geosciences, Taiwan , (3) Institute of Earth Sciences, Academia Sinica, Taiwan

In order to realize reasons inducing earthquakes, project of monitoring of the fault activity using 3-component Gladwin Tensor Strainmeter (GTSM) has been initiated since 2003 in Taiwan, which is one of the most active seismic regions in the world. Observed strain contains several different effects within including barometric, tidal, groundwater, precipitation, tectonics, seismic and other irregular noise. After removing the response of tides and air pressure on strain, we still can find some anomalies highly related to the rainfall in short time in days. The strain response induced by rainfall can be separated into two parts as observation in groundwater, slow response and quick response, respectively. Quick response reflects the strain responding to the load of falling water drops on the ground surface. A kernel function shows the continual response induced by unit precipitation water in time domain. We split the quick response from data removing tidal and barometric response, and then calculate the kernel function by use of deconvolution method. More, an average kernel function was calculated to reduce the noise level. There are five of the sites installed by CGS Taiwan were selected to calculate kernel functions for individual sites. The results show there may be different on rainfall response in different environmental settings. In the case of stations site on gentle terrain, kernel function for each site shows the similar trend, it rises quickly to maximum in 1 to 2 hrs, and then goes down near to zero gently in period of 2-3 days. But in the case of sites settled side by the rivers, there will be 2nd peak of function when collected water in the catchment flows along by the sites related to the hydrograph of creeks. More, landslides will occur in some sites in hazard of landslide with more rainfall stored on, just like DARB in ChiaYi. The curve of kernel function will be controlled by landslides and debris flows.