Geophysical Research Abstracts,
Vol. 10, EGU2008-A-09111, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-09111
EGU General Assembly 2008

Meteorological effects on the GTSM borehole strain measurement in western foothill, Taiwan

Y. T. Yeh (1), T. K. Liu (2), **M. Lee** (1,3), M. T. Gladwin (4)

(1) Dept. of Occupational Safety and Hazard Prevention, Chia Nan Univ. of Pharmacy & Science, Tainan, Taiwan, (2) Dept. of Geosciences, National Taiwan Univ., Taipei, Taiwan, (3) Central Geological Survey, MOEA, Taipei, Taiwan (richia2@ms18.hinet.net / Fax: +886-2-22305761), (4) GTSM Technologies Pty Ltd., Brisbane, Australia.

GTSM strainmeters have been deployed at 12 sites in western Taiwan under the auspices of Geological Survey of Taiwan since the end of 2003. The instrument clusters installed are also intended to supplement the earthquake-monitoring and crust deformation observations from the arrays of seismometers, continuous GPS and InSAR as part of a more integrated program for the observation of plate boundary tectonics of this region. The primary examples of events other than coseismic steps recorded by the strainmeter include slow earthquakes, aseismic creep events, triggered events, and offset events, etc. The earth tidal signals useful for in-situ calibration of the instrument response are clearly seen in all channels at each site. This fulfills the first requirement concerning instrument performance, i.e., with high sensitivity to the crustal strain, when strainmeter was selected as one of the major components in the integrated project.

The long-term stability of the instrument is the second requirement concerned. In the laboratory, the GTSM strainmeter has long-term stability of better than one nanostrain per year if the distressing is properly performed. In the field, one example of installation of a standard instrument in a relatively arid and stable tectonic region in Australia has demonstrated that a long-term stability of much better than 100 nanostrain per year, so that observation of long-term strain rates in tectonic regions larger than this will be robust. However, there is evident that dilatometers in Iceland have been strongly influenced by aquifer pore pressure change. If the rock surrounding the

borehole is inhomogeneous and anisotropic, the pore pressure change effect in the shear strain components could also be significant. Another meteorological effect to be considered is the influence of atmospheric pressure on measured strain. Effects from change of either pore pressure or atmospheric pressure must be understood if the tectonic strain is to be understood.

In addition to the threat of frequent earthquake shaking, Taiwan also suffered from serried typhoon attack during the seasons of summer and autumn each year. There have been 29 recorded typhoons attacked or swept this island since the first GTSM strainmeter was deployed in the end of 2003. Typhoons were usually accompanied by heavy rainfall and significant atmospheric depression which had left their effects on the continuously recorded strain data at each site. The atmospheric admittance of GTSM strainmeter is documented in about 0.5 nanostrain per millibar. Groundwater level change initiated by rainfall seems to be the major cause that is responsible for the observed strain anomalies. Although the co-site piezometer will enhance the risk of the more expensive strainmeter's fail due to a lightening strike, this program has deployed a piezometer at tens of meters above the co-site strainmeter at last nine sites, this will be able to use the pore pressure measurements to define repeatable strain responses to pore pressure change that can be used to correct the strain data.