Geophysical Research Abstracts
Vol. 13, EGU2011-13129, 2011
EGU General Assembly 2011

Borehole Strainmeters and Natural Hazards

David Mencin (1), Selwyn Sacks (2), Alan Linde (2), and Michael Gladwin (3)

(1) UNAVCO, Boulder, CO, United States (mencin@unavco.org), (2) Carnegie Institution for Science, Washington DC, United States , (3) GTSM Technologies, Brisbane, Queensland, Australia

The first successful borehole strainmeters were originally developed at Carnegie and then deployed in Matsushiro, Japan over forty years ago, driven principally by the observation of coseismic strain steps and the possibility of detecting earthquake precursors. Subsequent successful designs were produced by Michael Gladwin at University of Queensland in 1984, H. Ishii at ERI in Japan and more recently in China. In the last ten years substantial networks have been deployed in the US, China and Taiwan with smaller networks in Iceland, Greece, Peru and Montserrat. The current worldwide deployment of borehole strainmeters numbers at nearly 300.

Borehole strainmeters have contributed substantially to the observation of the deformation of the earth at temporal scales previously not observable. Borehole strainmeters first discovered and detected slow slip events or slow earthquakes (Sacks et al. 1978), more recently recorded small asperity slow slip events unresolvable with other ground based geodetic techniques in the Cascadia subduction zone (Draggert, 2006), and made the first observations of tidal modulation of the strain rate during slow slip events (Hawthorne,Rubin, 2010).

Borehole strainmeters have also made important contributions to the observation of atmospheric and hydrologically driven deformation events in a wide range of scales including typhoon triggered slow earthquakes (Liu, Linde Sacks, 2009) and seiches in the Lake Yellowstone.

Borehole strainmeters have also been deployed in volcanic centers at Hekla, Long Valley, Monteserrat, Mt. St Helens and the Yellowstone Caldera making unique observations and directly contributing to Natural Hazard monitoring, including a successful short term warning for the 2000 eruption of Hekla.