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Hydrological Signals with Borehole Strainmeters: Hydrogeodesy

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Both anthropogenic and natural hydrological geodetic signals are a significant source of short term strain transients measured in the Plate Boundary Observatory (PBO) borehole strainmeter network. While these signals are generally treated as noise and modeled and extracted in an effort to observe tectonic strain transients, they represent a unique and interesting signal. They can provide a signal with which to orient and possibly calibrate the instruments. The PBO borehole strainmeter network has been used to make land based observations of crustal loading induced by the tsunamis created as a result of the 2010 M8.8 Chile earthquake and 2009 M8.1 Samoa earthquakes, local strain transients induced from atmospherically driven seiches in Lake Yellowstone on the Yellowstone caldera, and postseismic strain transients in the Anza network of strainmeters related to the 2010-04-04 M7.2 Baja earthquake which correlate to a change in pore pressure measured at the same location. Anthropogenic signals have been observed at the Pathfinder sites (B082 and B089) as a result of pumping at a nearby man-made lake. These signals could be used to study how strain perturbations change with distance from the source. Local pumping and irrigation occurring about 1.5 km from B011 has been used to orient the strainmeter.