

Observations of Rotational Ground Motions from Local Earthquakes in Taiwan

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ABSTRACT

This lecture describes the efforts of observing rotational ground motions from local earthquakes in Taiwan, where the deployments and operations of instruments in the field have been undertaken by C. C. Liu and C. F. Wu. The first successful attempt was carried out in southeastern Taiwan, but it ended after about 2 years. The second attempt started in April, 2007 and is now in operation. The third attempt is now in the deployment stage at an active fault site in southwestern Taiwan, where a repeat of the 1906 Meishan earthquake (M 7.1) is expected.

At the Houtzshan (HGSD) station, Taiwan, a six-channel digitizer (Model Quanterra Q330) was used to collect seismic data from two sets of sensors: (1) a three-component Guralp CMG-3TD broadband velocity seismometer (installed down hole at 100 m depth), and (2) a triaxial eentec/PMD Model R-1 rotational transducer (installed at the surface). Data are continuously sampled at 100 samples/s and at 24-bit resolution. After the R-1 rotation transducer failed at the end of 2005, another R-1 was deployed in early 2006, but it failed also.

Nevertheless, several hundred local earthquakes were observed by both sets of sensors from December 7, 2004 to April 30, 2005, and from August 1, 2005 to December 31, 2005. Peak rotation velocity of about 1 milli-radian/s was observed for several earthquakes of magnitude of about 5 at about 30 km. These results are puzzling because they are about 2 orders of magnitudes larger than that expected from theoretical considerations or obtained from the UPSAR array at Parkfield in California.

In April, 2007, a six-channel accelerograph (Model K2 by Kinemetrics) was deployed at the HGSD station. It has a built-in 3-component accelerometer, and an external triaxial eentec Model R-1 rotational transducer. Both sensors are installed at the surface. In addition, a six-channel digitizer (Quanterra Q330) is used to record two other co-located sensors: an accelerometer (Episensor by Kinemetrics), and a short-period seismometer (L-4A by Mark Products).

Another site at the Meishan fault in southwestern Taiwan has been chosen for observing both translational and rotational motions. A 32-element accelerometer/seismometer array is now being deployed, along with a six-channel K2 accelerograph (with an accelerometer and a R-1 rotational transducer), and a six-channel Tokyo Sokushin accelerograph (with an accelerometer and an external G-3 broadband seismometer that is capable to function at up to 2 g acceleration).

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