Rotational motions observed during an earthquake swarm in April, 1998, at Offshore Ito, Japan.

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Abstract

We observed six components of grand rotational and translational motions in a near-source region with hypocentral distances less than 8km during an earthquake swarm in April, 1998, at Offshore Ito, Izu peninsula, Japan. The magnitudes of these events are ranging from 1 to 5. To check the reliability of our observation using MotionPack sensor, we installed 8301F sensor, which was an inertial angular displacement sensor with a higher sensitivity than MotionPack. The three 8301F sensors were mounted on a triaxial base, composing a triaxial angular sensor. The scale range of this sensor and the internal noise level are ±2 X 10^{-4} rad and 3 X 10^{-8} rad RMS, respectively. Figure 1 shows a comparison of rotational rates around vertical axis observed by MotionPack and by 8301F. The noise level of MotionPack is extremely higher than that of 8301F, however, the waveforms of these signal parts are quite similar to each other. This suggests that MotionPack records rotational rate correctly even though its high noise level. Accelerations, velocities, rotational displacements, and rotational rates, which excited by an earthquake with a magnitude of 2.4, are represented in Figure 2. The maximum rotational displacements around vertical axis are compared with the maximum velocities in Figure 3. We can recognize a linear correlation between these two measures. The waveforms of rotational motion around vertical axis are resemble with those of horizontal velocities, suggesting the linear correlation between maximum values of them. These rotational motions are about 100 times larger than those observed in Parkfield by Spudich and Fletcher (2007). The high levels of rotational motions are obtained at the low levels of acceleration (10^{-3}G) as shown in Figure 2. The wide range linear correlation suggests that the soil nonlinearity beneath the station can not explain the disagreement between our and Spudich's measurements.

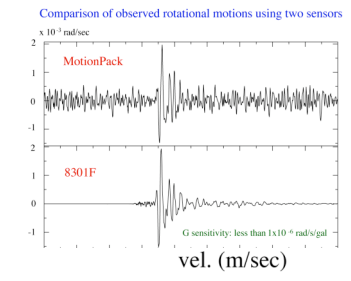

Fig. 1

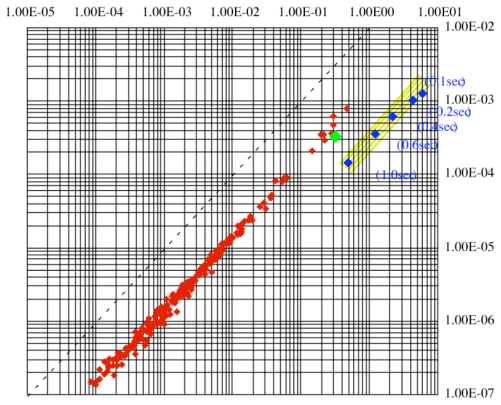

Fig. 3

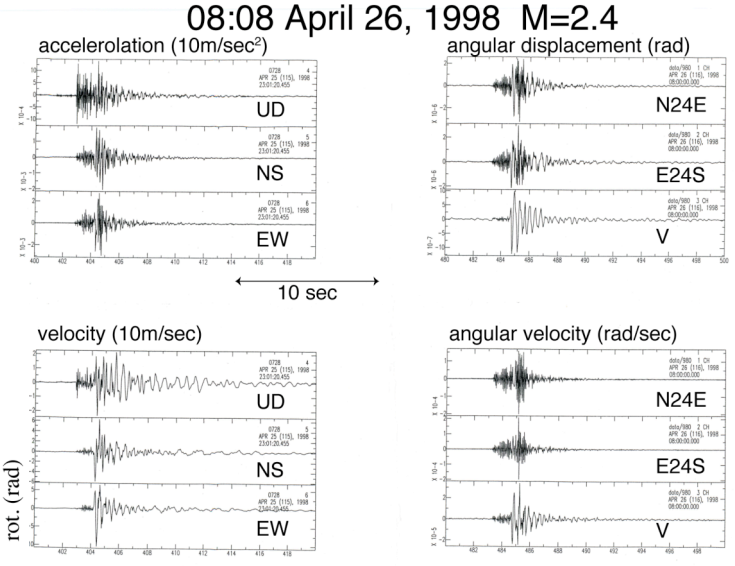

Fig. 2