

Strong motion record at the station IWTH25 for the Iwate-Miyagi Nairiku earthquake

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The 2008 Iwate-Miyagi Nairiku earthquake (M_w 6.9, M_{jma} 7.2) produced strong shaking throughout northern Honshu, Japan with severe damage of buildings and extensive landslides. The shallow event occurred in southwestern Iwate prefecture (39.03°N , 140.88°E , depth 8 km) on June 13, 2008 at 23:43:45 GMT (JMA, 2008). This earthquake produced relatively high-frequency ground motions, which resulted in large values of PGA (peak ground acceleration). Station IWTH25 of KiK-net, located 3 km southwest of the epicenter, produced one of the largest strong-motion values of PGA (4278 cm/s^2 for the vector sum of the three components) ever recorded.

The surface acceleration record at the station IWTH25 shows an asymmetric amplification in the vertical components (Aoi et al., 2008). The upward vertical acceleration is much larger than the downward direction, although in the borehole record

at a depth of 260 m at the same site, the upward and downward accelerations have symmetric amplitudes. On the other hand, the horizontal components do not show this asymmetric effect. This difference between the surface and borehole recordings for the vertical component implies a strong non-linear amplification.

In this presentation, we will analyze these records and provide an explanation for the asymmetric amplification in the vertical acceleration. We interpret the large upward spikes in acceleration as slapdown phases, which are also typically observed in near-field recordings of nuclear explosion tests. The large upward acceleration is produced when a near-surface layer separates from the sublayer then returns, striking the separation surface. This effect is seen in a number of strong-motion records that have larger upward than downward accelerations. If we assume the near-surface layer returns to the original level, the separation gap is roughly 1 to 12 mm.

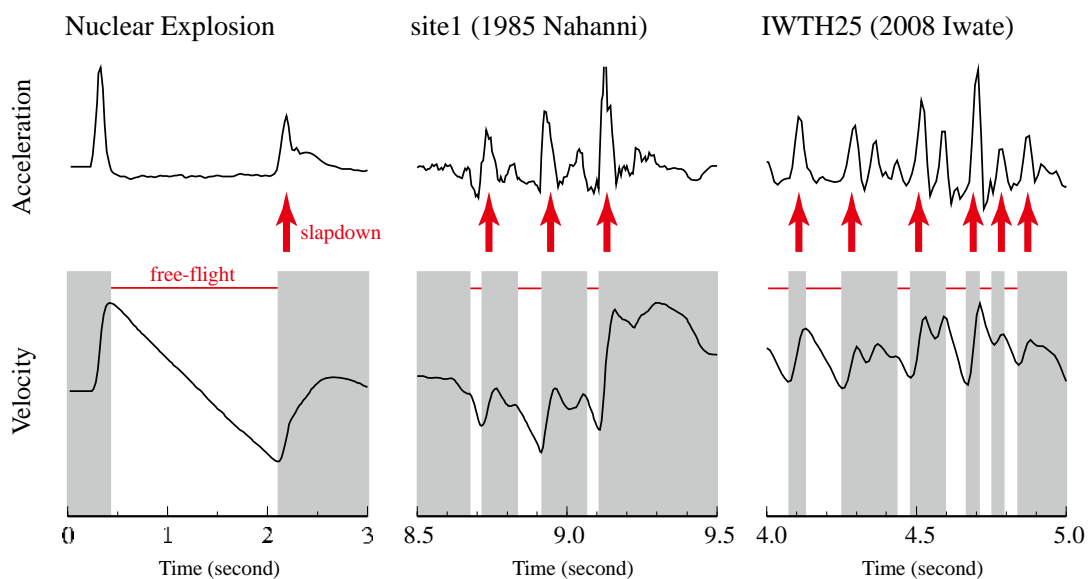


Figure 1: Slapdown phase observed in the record of the nuclear explosion, site1 during the 1985 Nahanni earthquake, and IWTH25 during the 2008 Iwate-Miyagi Nairiku earthquake.