Seismic ACROSS transmitter installed at Morimachi

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A new seismic ACROSS transmitter was installed at Morimachi in the western Shizuoka prefecture March, 2006 (at the end of fiscal year 2005) by MRI. Seismic profiling experiment with explosion sources was conducted in this region in 2001 and an indication was noted for a clear reflection phase from the upper boundary of the Philippine Sea plate [Iidaka et al., 2003]. This place is one of the appropriate sites to monitor the temporal variation of the reflected wave from the expected fault plane of the coming Tokai earthquake. The transmitting station has been regulated by repeated test operations since right after installation, and the tests of routine transmission have been started from August, 2006. We will introduce the Morimachi ACROSS station and also the preliminary results obtained so far.

The main feature of the new transmitter is higher seismic wave energy release at low frequency by introducing such a mechanism that allows an optional addition of a large eccentric moment. A sinusoidal force of 20 tonf (=2x10∗∗5 N) in half amplitude is generated at 15 Hz with an eccentric mass with a moment of 20 kgm. An addition of optional mass with 62 kgm leads to the frequency down to 7.5 Hz to generate the same 20 tonf. In other words, the generated frequency can be brought down to 3.75 Hz, if the generated force is suppressed to 5 tonf. The low frequency operation is beneficial for long distance transmission with smaller wave attenuation and also for eliminating the effect of small scale wave scatterers along the wave path.

ADSL line is drawn to the Morimachi transmitter station and links to the MRI using Group-VPN. Web cameras are also installed to monitor visually the station. Operation log (phase of the eccentric mass, the temperature of the coolant and lubricant, etc. recorded at every one second) is automatically retrieved to MRI once a day for checking the operational condition of the station.

The level of ACROSS signal transmitted from Morimachi transmitter was examined by using the Hi-net data. The signal can be recognized well from the raw time sequential data at the nearest Hi-net station, N.MRIH, at a distance of 2.9 km. The time segments of 200 sec data acquired are stacked at each Hi-net station for about a month (= 2.4x10∗∗6 sec). The noise level is then suppressed to ˜1/1000, and the transmitted signal is clearly recognized at all the stations less than 80 km in distance, whereas some deviation can be seen with the distance greater than 40 km due to the crustal structure and/or attenuation.

The detection of very small temporal variation of the underground structures demands the higher stability of whole measurement system or the correction of the temporal variation in the transmitting characteristics due to environmental variation such as rain fall. Accelerometers are installed on and in the bedrock coupler, and also in a borehole of 20 m depth located at 5 m away from the transmitter. These accelerometers are expected to provide information to eliminate the effect of source disturbance in signal transmission.