# Are the conventional telemetry seismic networks suitable for receiving ACROSS signal?

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Feasibility study was made for the use of the nation-wide seismic networks, which are widely available in Japan, to receive signals of ACROSS (Accurately Controlled Routinely Operated Signal System) vibrators for the purpose to detect the temporal variations in propagation property of elastic wave. We examined the use of two nation-wide seismograph networks, Japan University Seismograph Network (JUSN) and HINET (High Sensitivity Seismograph Network Japan). The former has been established in the earthquake prediction program by national universities. The latter is being established the Japanese government to achieve the uniform detectability for the earthquakes in Japan. Continuous waveforms recorded by all of the stations in both networks are being broadcasted via a satellite system which enables us to receive them in real time at anywhere in Japan. Most of the stations in the networks use delta-sigma-type digitizers which synchronize to GPS clocks. They seem to provide excellent specification to meet the requirement of ACROSS system, which send signals with excellent stability.

We made a long-term experiment in which ACROSS sources in Tono (Gifu pref. Central Japan) were operated. The signals for both of the networks are received at Nagoya University via satellite telemetry system in real-time. In this experiment data of eleven days-long were stacked for the stations around Tono within the distance of about 120In the experiment a sinusoid of 25Hz which is generated by a force of 10^5 N are used for transmission. The results show that the amplitude of the signal is almost inversely proportional to the square of the distance, resulting from both geometrical spreading and attenuation. Therefore the signal-to-noise ratio (SNR) simply depends on the noise level at the station. We obtained SNR of about 10 at KTJ (Kamitakara Kyoto Univ.) which locates more than 100km from Tono.

We checked the width of the spectral peaks of ACROSS signal and the inherent noise of the systems. For all the stations we obtained a spectral peak in a single component of 25Hz, indicating that the sampling clocks are accurate enough for receiving ACROSS system with high S/N. Although the noise level for the stations in HINET are lower than that of JUSN in general, HINET includes coherent sinusoidal noise in every one hertz and relatively large sinusoidal noise in every ten hertz, both of which can be detected only by stacking but should be removed for the case of ACROSS. The coherent noise in HINET is prominent for the station with very low noise such as IZMH (Izumi, Fukui prefecture). There the noise peaks at every ten hertz are about 50 times larger and those at every one hertz are about 5. Though the phases of the noise are rather stable, ACROSS may need to shift its frequency not to overlap the coherent noise.