

Broadband Array in Taiwan for Seismology (BATS): The current status and future development

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Summary

The Broadband Array in Taiwan for Seismology (BATS), which was composed of 17 permanent stations spanning an area of Taiwan and its surrounding islands, has been established by the Institute of Earth Sciences (IES), Academia Sinica, Taiwan since 1995. Currently, the BATS has continuously collected high-resolution waveform data generated from local and distance earthquakes. All the real-time data streams from various sets of instrumentation are handled with the USGS Earthworm system. By using this seismic processing system, we can easily proceed for data archiving, earthquake location, and waveform viewing. In addition to regular forwarding waveform data to FDSN, we have also adopted a networked data distribution system (NINJA, *Takeuchi et al., 2002*) that is developed by the Ocean Hemisphere Project (OHP), Earthquake Research Institute, Tokyo University, Japan to provide an on-line access to the BATS waveform data. Users can extract both BATS and OHP broadband seismic data through a NINJA application or

alternatively visit either the website of Data Management Center of IES (DMC-IES) or OHPDMC to send their data request at one time. The DMC-IES is also responsible for obtaining the Centroid Moment Tensor (CMT) solutions for felt earthquakes occurred in the Taiwan region by inverting the BATS waveform data. Interested readers can subscribe the quick BATS CMT reports in BATS website at <http://bats.earth.sinica.edu.tw>. After 2003, the BATS merged the seismic waveform data from the Central Weather Bureau (CWB) broadband stations and archived on DMC-IES. By the end of 2004, including the 30 CWB broadband stations, 47 stations will be operated under BATS. Under uniform station qualification, new surface and downhole stations will be installed to enhance the station coverage and density. In the year of 2004, two downhole stations have been built. Under the possible funding supported by the National Science Council, CWB and Academia Sinica, the number of BATS stations will be continuously increased in the near future. Furthermore, since the real-time data processing technology is getting more stable and flexible, we are planning to exchange some of our data with any of the FDSN partners in a real-time manner in the near future.



<http://bats.earth.sinica.edu.tw>

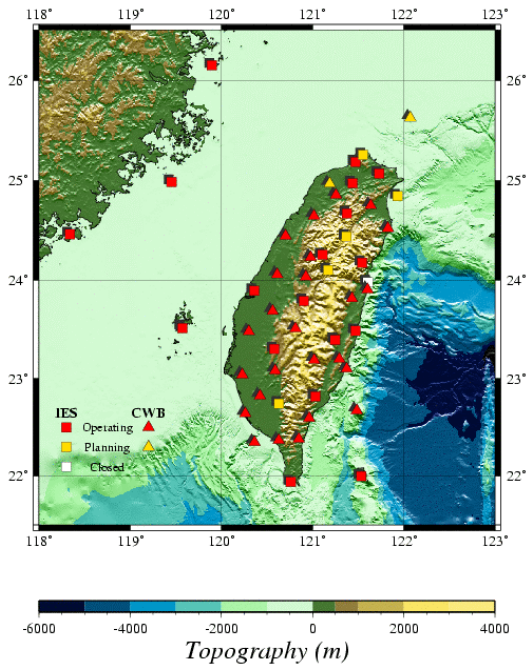


Figure 1. The BATS stations deployed by IES (square symbols) and CWB (triangle symbols). IES stations are equipped with STS-2/STS-1 sensors, whereas the CWB stations are equipped with Guralp CMG-3ESP or 40TD. Yellow symbols indicate stations that are under construction. Including one GSN station (TATO), the total number of broadband stations installed in Taiwan region could be as many as 48 by the end of 2004. (see <http://bats.earth.sinica.edu.tw/Station/> for more information)

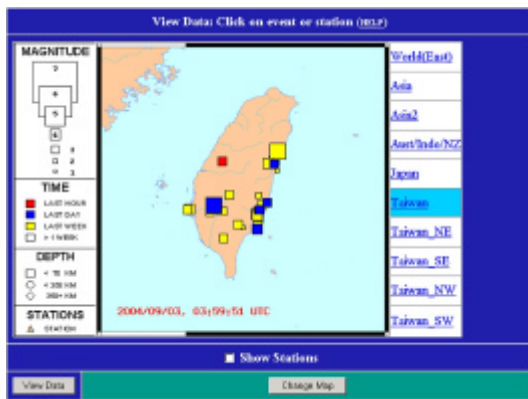


Figure 2. The real-time BATS data streams are processed via Earthworm system, which is developed by USGS, for earthquake automatic location, data archiving, waveform viewing, and data extraction.



<http://bats.earth.sinica.edu.tw>

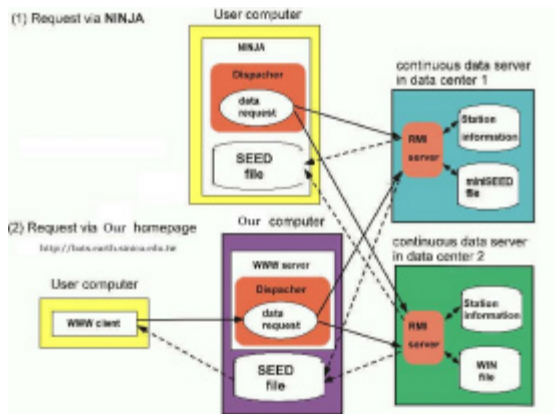


Figure 3. We adopt the on-line interface developed by OHPDMC, ERI, Tokyo University, Japan to distribute BATS waveform data. Users can collect both OHP and BATS waveform data via this data distribution system without knowing where the data is exactly archived. (see *Takeuchi, et al., SRL, 2002*)

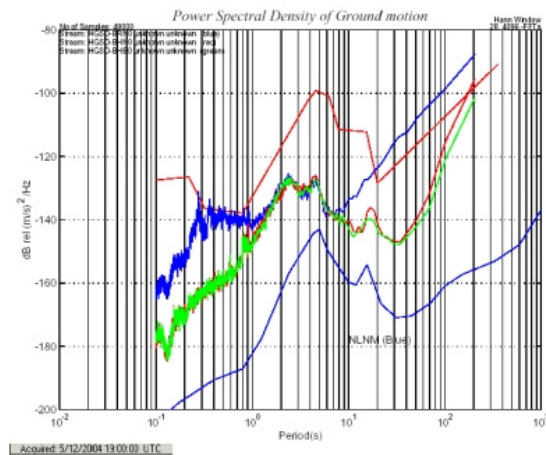


Figure 4. Seismic noise at the station HGSD of BATS (Eastern Taiwan) as compared to the new global seismic noise model of Peterson (1993). Ground motion power noise spectra measured at the surface and at 100 m below the surface are shown as blue and green lines, respectively.