

Seismic Observation of Thailand

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1. Observation Network and Instrument

The first seismic station of Thai Meteorological Department (TMD) was installed at Chiangmai (CHG) in 1963 by the U.S. Government in order to study the global seismicity and detect the nuclear test but now it has been upgraded to Global Seismic Network (IRIS/GSN, CHTO) and after that the old seismic network of TMD was installed, there are 13 analog seismic stations which have wave format in paper and 5 digital stations including strong motion accelerometers being operated to present. The location of all stations is show in Fig. 1 and the detail of the system is shown in Table 1.

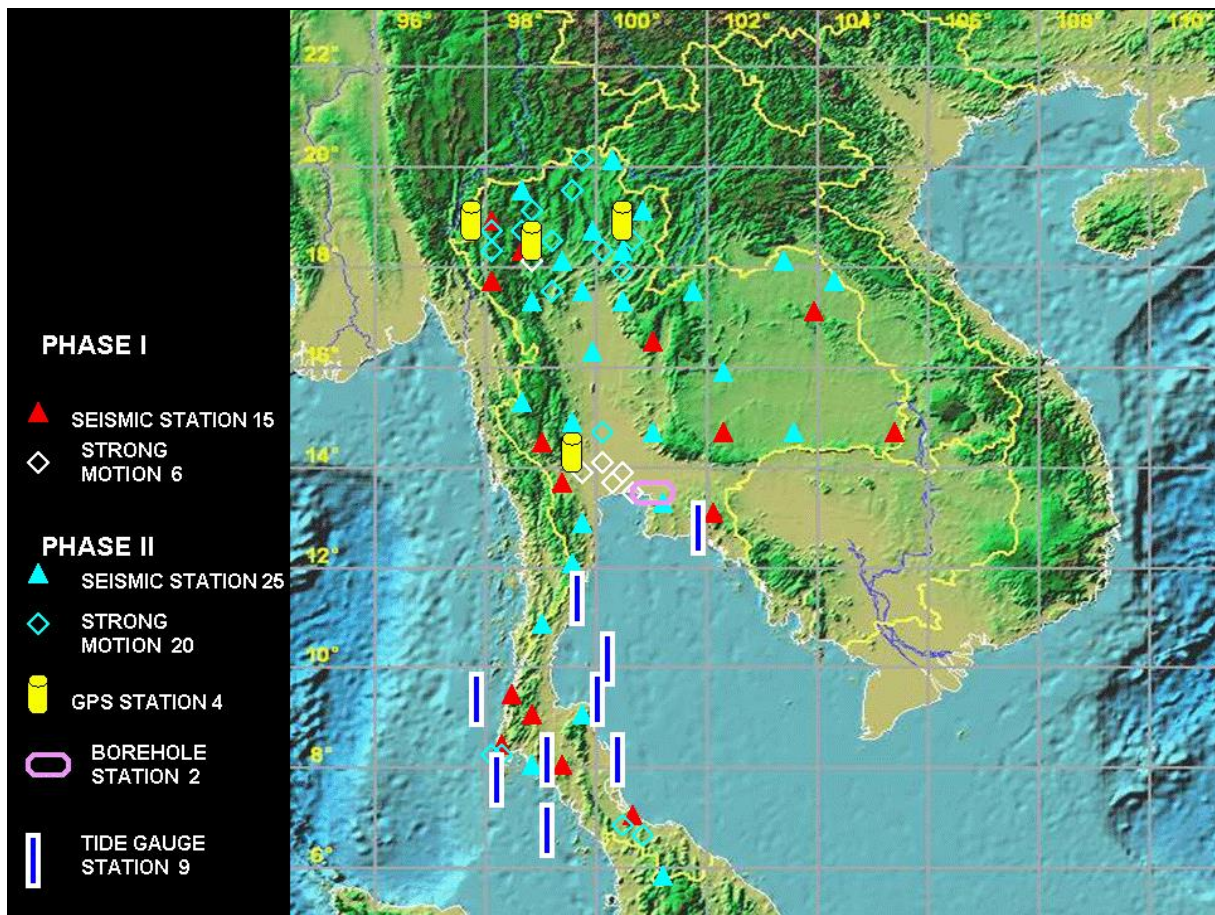


Figure 1. The location of Seismic, Strong motion, Borehole, GPS and Tide Gauge stations in Thailand.

After 2004, TMD has installed a new automatic digital seismic monitoring system. The system detail as show below:

- 40 seismic stations will be installed throughout the country which compose of 2 Phase

Phase I (15 stations, 8 SP., 7 BB.), the sensor from Nanometric company (Trillium40S, Trillium120S), digitizer is Taurus, data acquisition is NAQS and communication by internet IP network(ADSL, IP Star).

Phase II (25 stations, 15 SP., 10 BB.), the sensor from Geotech company (S-13J/3, KS-200M), digitizer is SMART-24, data acquisition is SmartGeohub and communication by internet IP network(ADSL, IP star). The detail show in Table 2.

- 26 strong motion stations will be deployed throughout the country in urban area.
 - 1 Broadband Borehole and a borehole accelerometer will be set up to study site amplification causing by soft soil underneath Bangkok.
- 4 GPS stations will be installed to study an abnormal behavior of stress and Displacement of continent before, during and after earthquake.
- 9 tide gauge stations (4 in Andaman sea, 5 in Gulf of Thailand)

Table 1. Detail of automatic digital seismic stations

Seismic Sta List	Station Code	LAT	LON	velocity sensor	accelerometer	Digitizer	Company	Data acquisition software
Chantaburi Sta.	CHBT	12.7526	102.3297	Trillium120 sec	TSA 100	Taurus	Nanometrics	NAQS
Chiangmai1 Sta	CMMT	18.8128	98.9476	Trillium120 sec	TSA 100	Taurus	Nanometrics	NAQS
Khaolaem Dam Sta	KHLT	14.797	98.5893	Trillium 40 sec	TSA 100	Taurus	Nanometrics	NAQS
Nakonrachasima Sta.	KRDT	14.5905	101.8442	Trillium 40 sec	TSA 100	Taurus	Nanometrics	NAQS
Mae Hongson Sta	MHIT	19.3148	97.9632	Trillium120 sec	TSA 100	Taurus	Nanometrics	NAQS
Maesarieng Sta	MHMT	18.1764	97.931	Trillium 40 sec	TSA 100	Taurus	Nanometrics	NAQS
Phetchabun Sta	PBKT	16.5733	100.9687	Trillium120 sec	TSA 100	Taurus	Nanometrics	NAQS
Phuket Sta	PKDT	7.892	98.335	Trillium 40 sec	TSA 100	Taurus	Nanometrics	NAQS
Raning Sta.	RNNT	9.3904	98.4778	Trillium 40 sec	TSA 100	Taurus	Nanometrics	NAQS
Songkhla Sta	SKLT	7.1735	100.6188	Trillium120 sec	TSA 100	Taurus	Nanometrics	NAQS
Srinakarind Sta	SRDT	14.3945	99.1212	Trillium120 sec	TSA 100	Taurus	Nanometrics	NAQS
Suratani Sta.	SURT	8.9577	98.795	Trillium 40 sec	TSA 100	Taurus	Nanometrics	NAQS
Ubonrachatani Sta	UBPT	15.2773	105.4695	Trillium120 sec	TSA 100	Taurus	Nanometrics	NAQS
Sakolnakorn Sta	SKNT	16.9742	103.9815	Trillium 40 sec	TSA 100	Taurus	Nanometrics	NAQS
Trang Sta.	TRTT	7.8362	99.6912	Trillium 40 sec	TSA 100	Taurus	Nanometrics	NAQS
Phitsanulok Sta.	PHIT	17.189269	100.416499	SP -S13-1HZ	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub
Sukhothai Sta	SUKH	17.482143	99.631013	SP -S13-1HZ	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub
Uttaradit Sta.	UTTA	17.744258	100.554083	SP -S13-1HZ	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub
Phrae Sta.	PHRA	18.498912	100.229325	(BB)KS2000M 120sec	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub
Lampang Sta.	LAMP	18.522614	99.632246	SP -S13-1HZ	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub
Nan Sta.	NAN	19.283535	100.911631	SP -S13-1HZ	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub
Payao Sta.	PAYA	19.360284	99.869172	SP -S13-1HZ	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub

Seismic Sta List	Station Code	LAT	LON	velocity sensor	accelerometer	Digitizer	Company	Data acquisition software
Chiangrai Sta.	CRAI	20.228927	100.373434	(BB)KS2000M 120sec	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub
Chiangmai2 Sta.	CMAI	19.932477	99.04526	(BB)KS2000M 120sec	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub
Tak Sta.	UMPA	16.20572	98.86035	(BB)KS2000M 120sec	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub
Prachuab Sta.	PRAC	12.47263	99.79288	(BB)KS2000M 120sec	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub
Uthai Sta.	UTHA	15.558565	99.445133	SP -S13-1HZ	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub
Phetchaburi Sta.	PHET	12.91331	99.62675	SP -S13-1HZ	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub
Pattaya Sta.	PATY	12.923188	100.865694	SP -S13-1HZ	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub
Nakonsritamarat Sta.	SRIT	8.59549	99.60196	(BB)KS2000M 120sec	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub
Surathani Sta.	SURA	9.16634	99.62945	(BB)KS2000M 120sec	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub
Chaiyaphum Sta.	CHAI	15.9018	101.9864	SP -S13-1HZ	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub
Nongkai Sta.	NONG	18.06346	103.1457	(BB)KS2000M 120sec	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub
Nakornpanom Sta.	PANO	17.1476	104.6122	(BB)KS2000M 120sec	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub
Khomkaen Sta	KHON	16.33778	102.823	SP -S13-1HZ	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub
Nakonayok Sta.	NAYO	14.31523	101.3209	(BB)KS2000M 120sec	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub
Surin Sta.	SURI	14.7688	103.5529	SP -S13-1HZ	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub
Srakaew Sta.	SRAK	14.012	102.0425	SP -S13-1HZ	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub
Loei Sta.	LOEI	17.50928	101.2644	(BB)KS2000M 120sec	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub
Krabi Sta.	KRAB	17.482143	99.631013	SP -S13-1HZ	1 ACC-PA23	Smart24R	Geotechs	Smartgeohub
BangkokBB_BH_low	TMDB	13.6684	100.606756	KS2000BH		Smart24R	Geotechs	Smartgeohub
Bangkok_acc_BH_high	TMDA	13.6684	100.606756		hhn,hhe,hhz	Smart24R	Geotechs	Smartgeohub
Bangkok_acc__BH_low	TMDA	13.6684	100.606756		lhn,lhe,lhz	Smart24R	Geotechs	Smartgeohub

2. Relation with the international monitoring system (IMS)

The International Monitoring System (IMS) comprises a network of 321 monitoring stations and 16 radionuclide laboratories that monitor the earth for evidence of nuclear explosions in all environments. The system uses four verification methods, utilizing the most modern technology available.

- Seismic, hydro acoustic and infrasound stations are deployed to monitor the underground, underwater and atmosphere environments, respectively.

- Radionuclide stations can detect radioactive debris from atmospheric explosions or vented by underground or underwater nuclear explosions.

There are 2 stations locate in Thailand which are utilized for verification in IMS. First station is seismic station array type installed at Chiangmai (CMAR or PS41) which belongs to Hydrographic Department. This seismic station has been in operation with high performance for decades. The other is radionuclide station (RN65) which will be planned to be deployed at Kasetsart University

Nakonpatom province (central part of Thailand). Office of Atoms for Peace will responsible for this radionuclide station.

Chiangmai (CHTO) which belongs to Thai Meteorological Department is a key auxiliary seismic station for IMS due to the excellent quality of BB borehole sensors and low ground noise.

After Great Sumatra Earthquake, CTBT/IMS will support seismic data in near real-time in order to manage earthquake and tsunami in Indian Ocean to the countries affected. Thai Meteorological Department will receive seismic data from IMS's stations through VPN connection and via internet. This implementation for setting up the hardware and software will finish soon. Seismic data from stations in Indian Ocean and remote stations will considerably help Thailand for rapid earthquake determination and urgently distribute tsunami warning messages to the risk area.

3. Future plan

National Accelerograph Network and GPS Network will be set up within next 3 years (2011-2012). More 29 stations of accelerograph and 20 GPS stations will be installed throughout the country. To increase more seismic data which will be used for real-time determination TMD had signal the agreement with CTBT/IMS to link data to TMD seismic monitoring system.