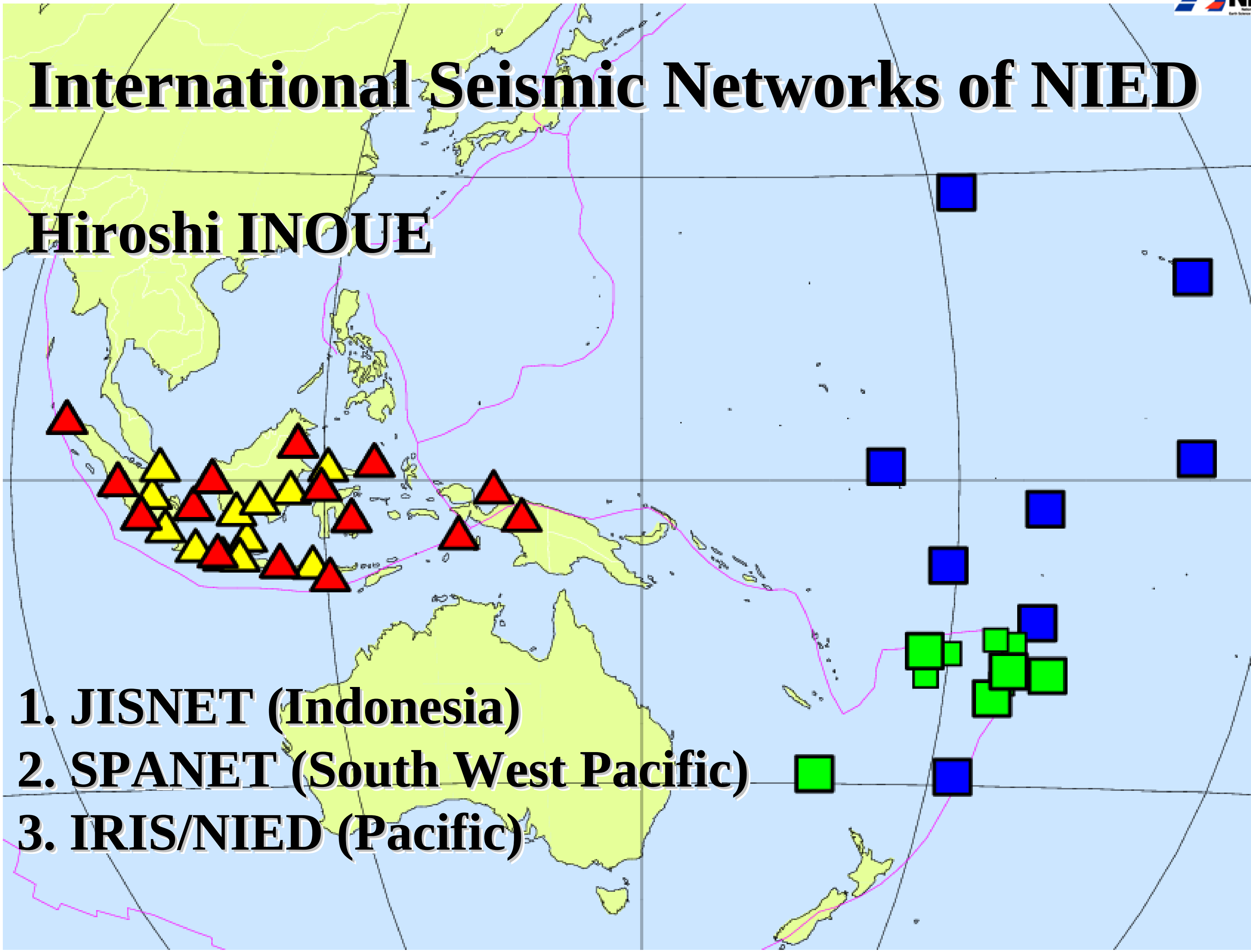
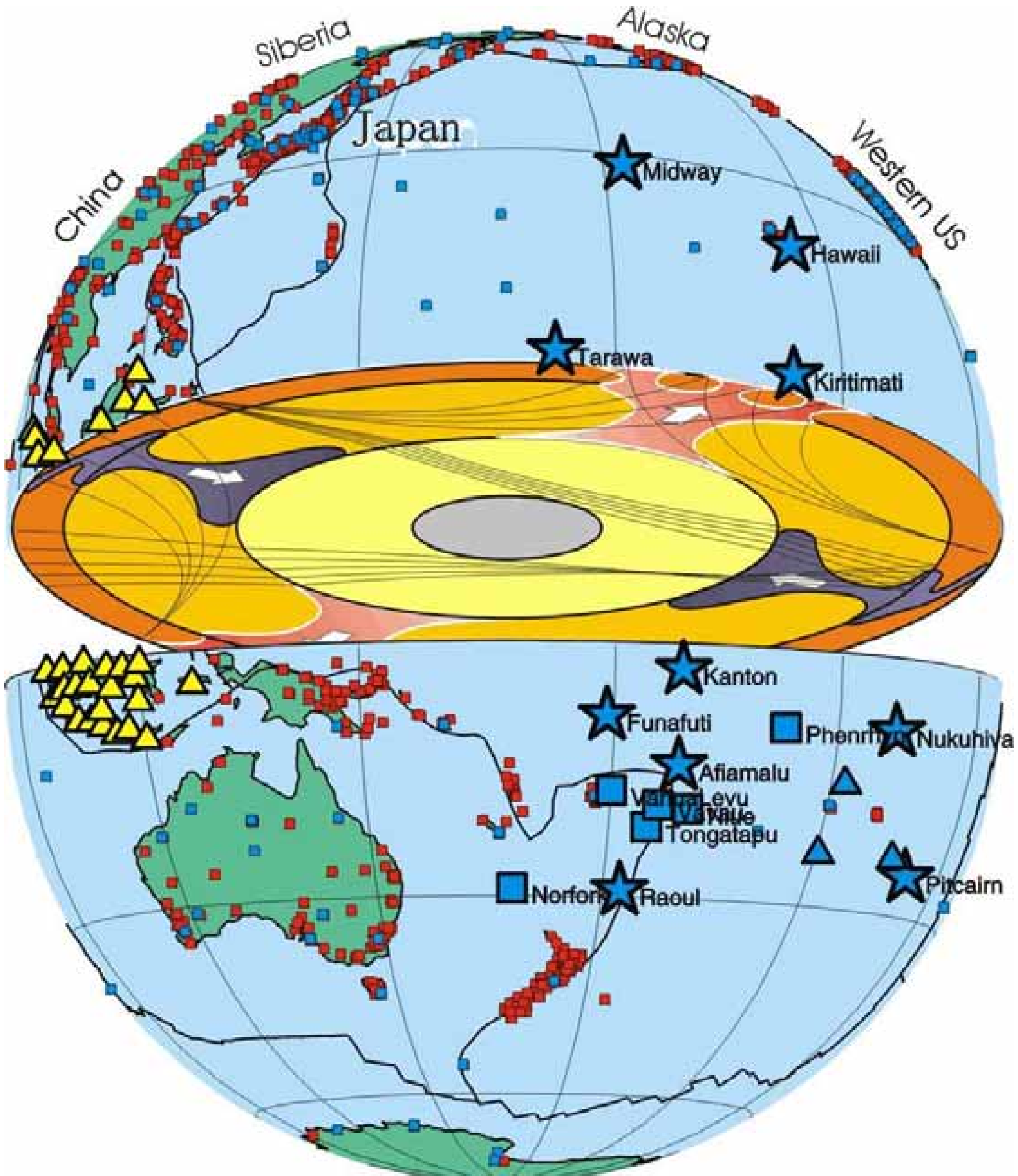
International Seismic Networks of NIED

Hiroshi INOUE



1. JISNET (Indonesia)
2. SPANET (South West Pacific)
3. IRIS/NIED (Pacific)

Broadband Seismic Networks of the Superplume Project
1996.4 - 2001.3



△ JISNET(GSJ/MRI)

□ SPANET(MRI)

☆ IRIS/NIED

In Collaboration with
Indonesia BMG
Fiji MRD, Tonga MLS
Cook Met, Niue Met,
Australia IPS and US IRIS

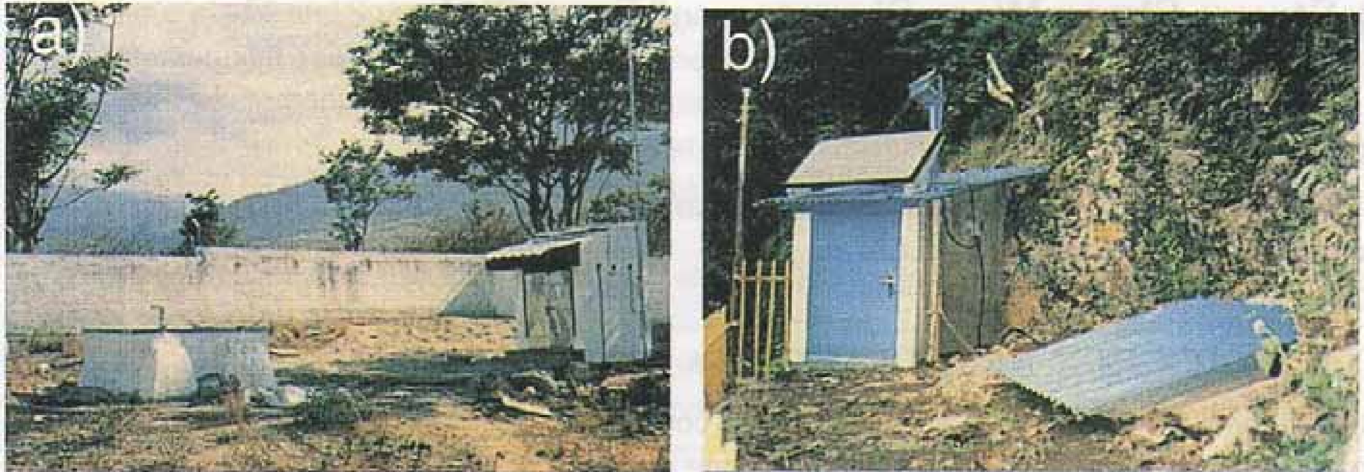
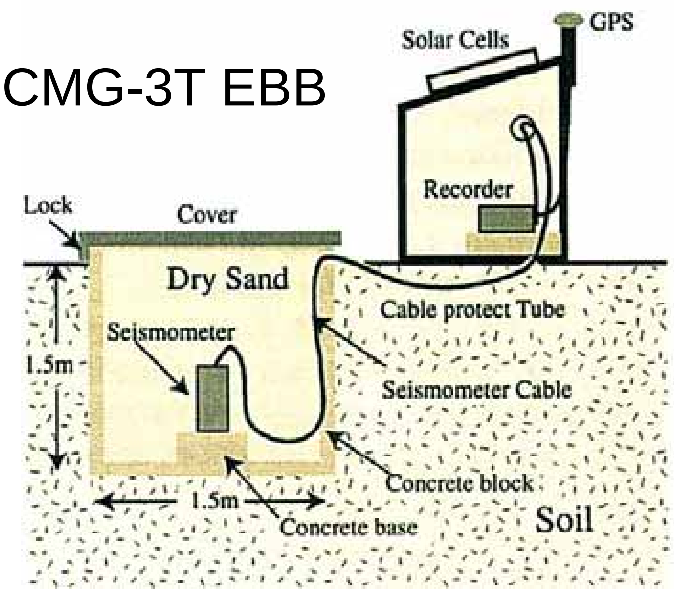
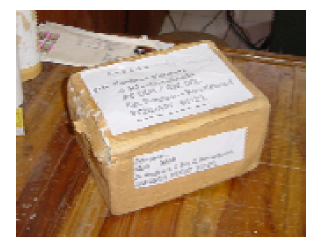


Figure 3. Site condition at a) PCI station and b) PPI station. A small building to install data logger and a roof of the seismic vault are seen. A solar cell is installed on the top of the building. GPS is installed on the top of a pole.

CMG-3T EBB

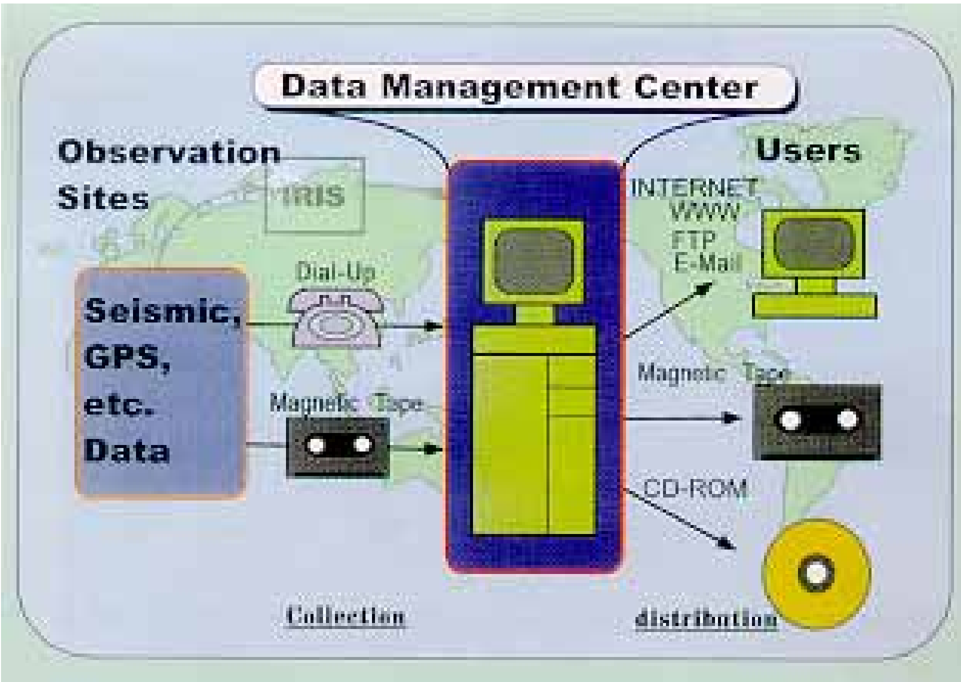


Datamark
LS-8000WD

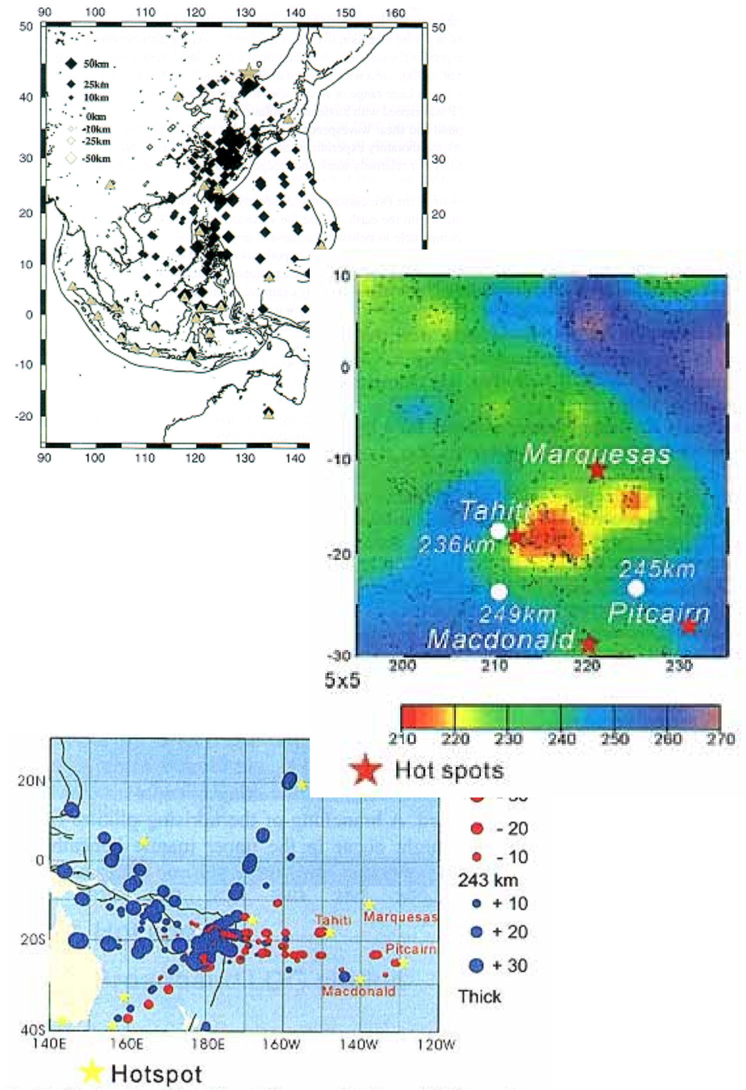


Data
Collection
By Post

Data Management

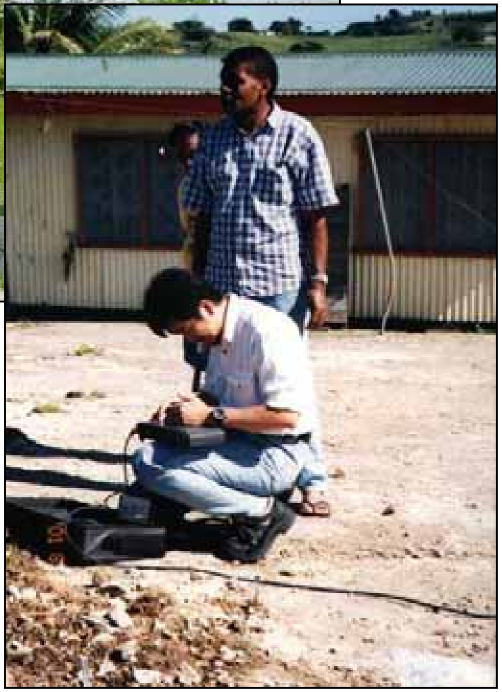


Research Output

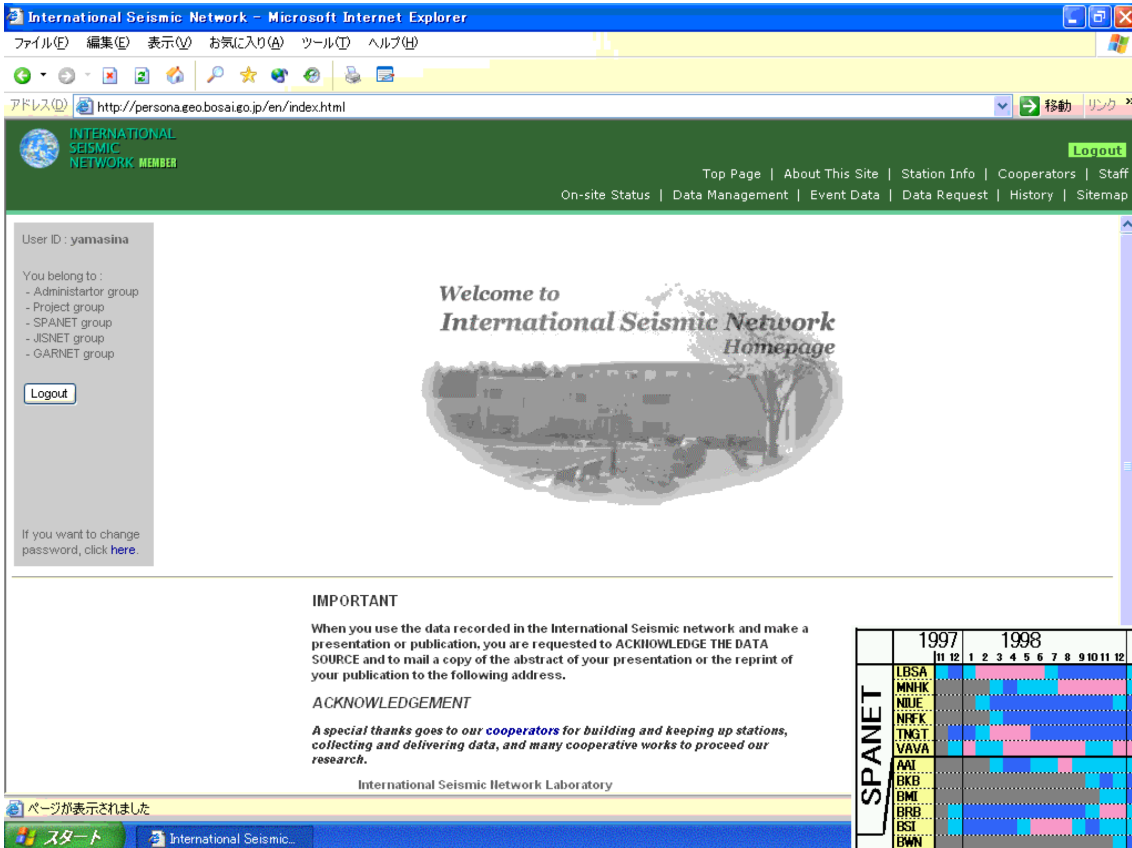


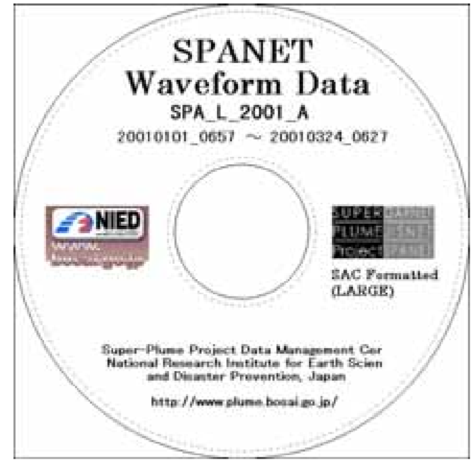
Project ended in March 2001

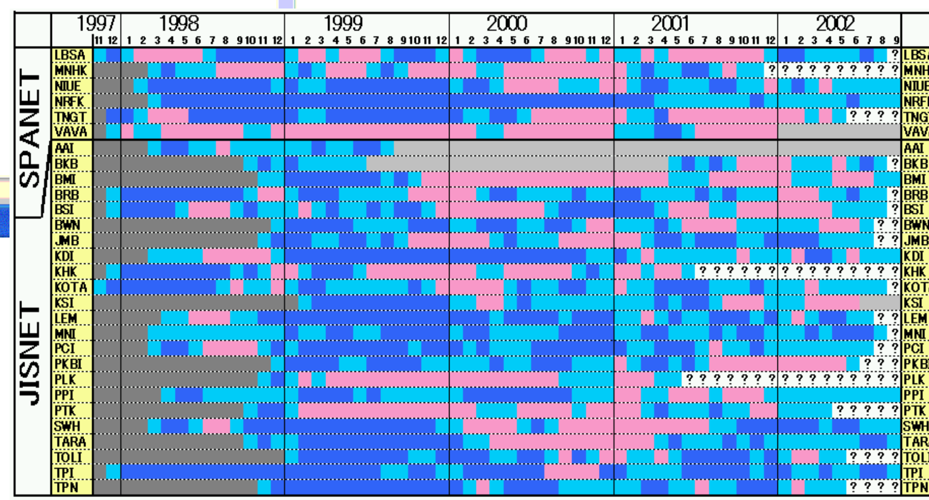
NIED took over the operation in April 2001



Continued Data Management

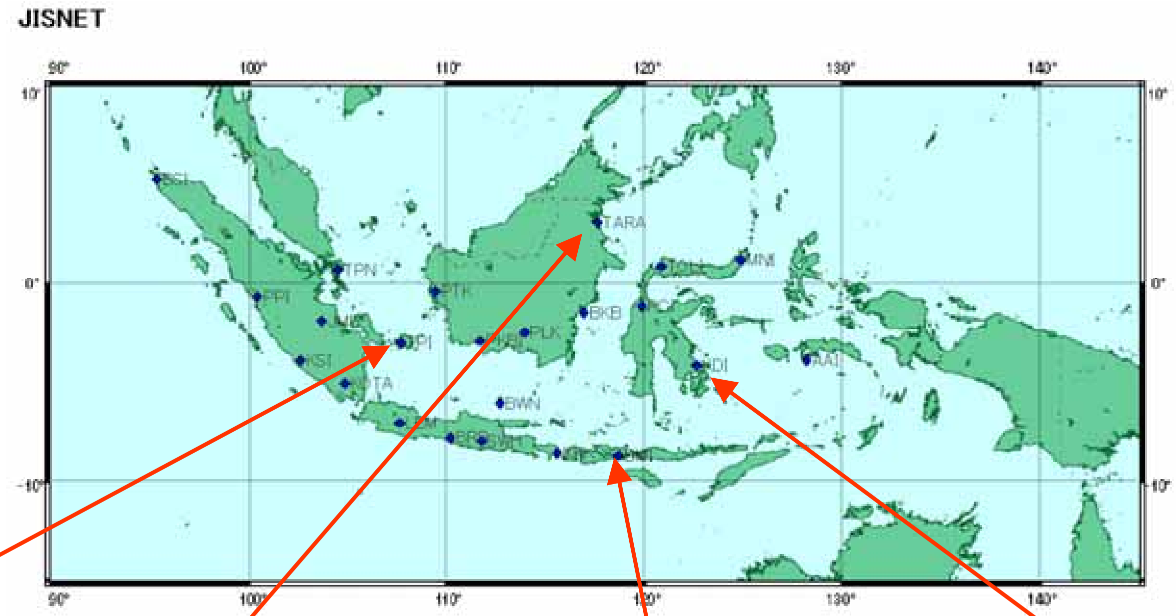


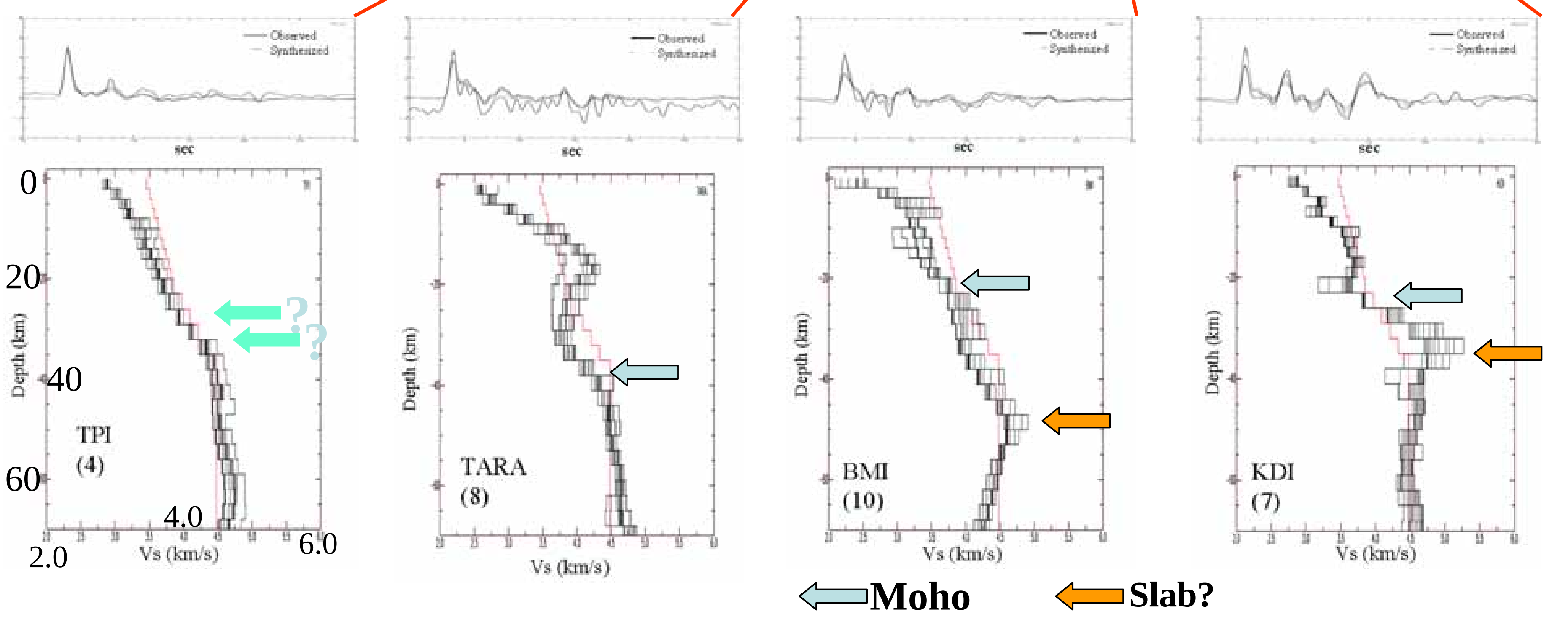




Data Avialability

Crunst and Upper Mantle Structure by Receiver Functions





After 4th Earth Observation Summit in Tokyo, April, 2004

D
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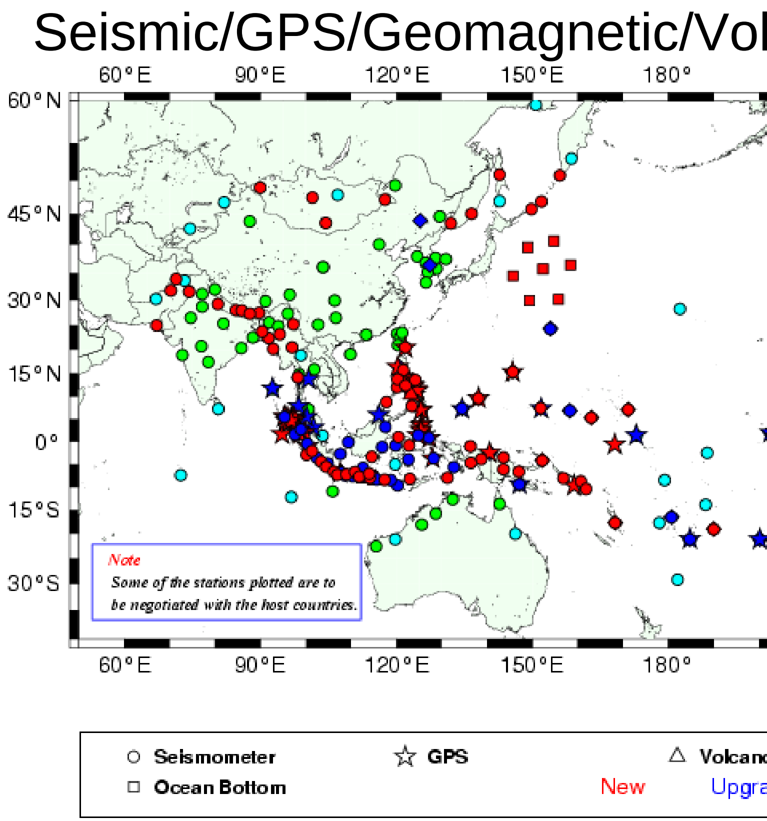
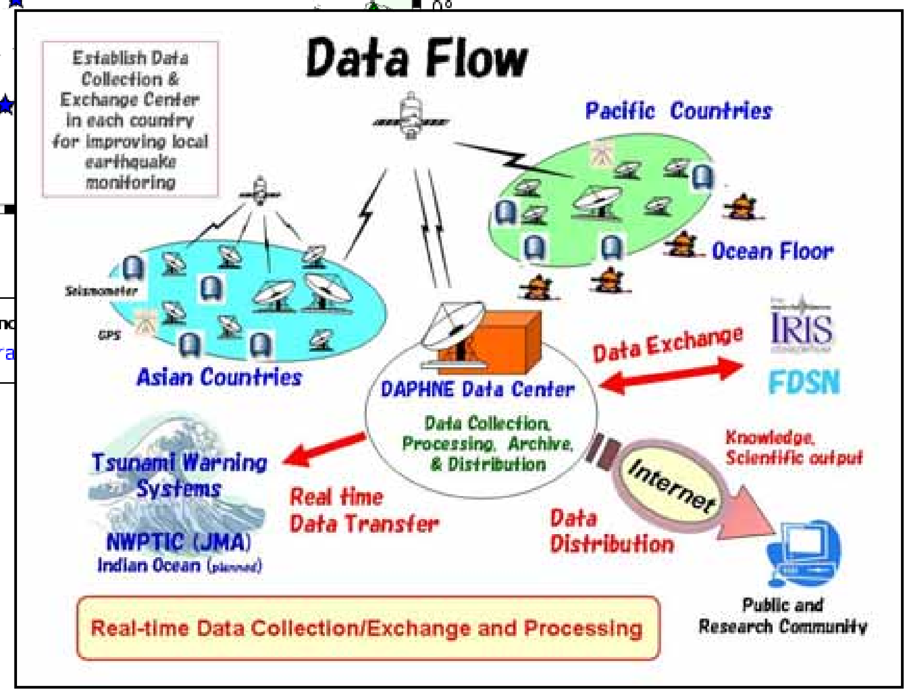
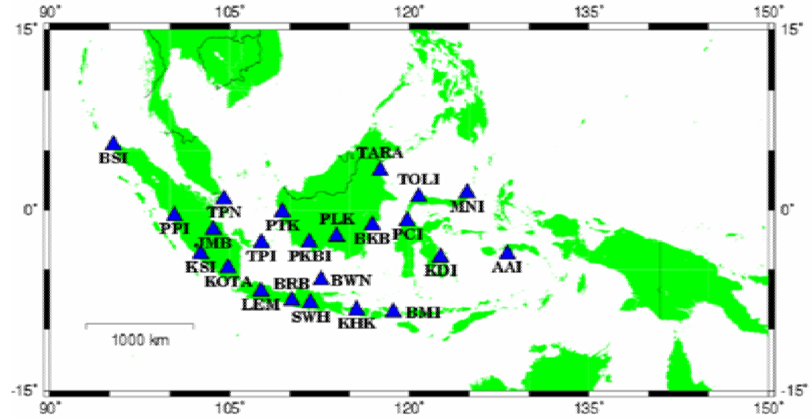


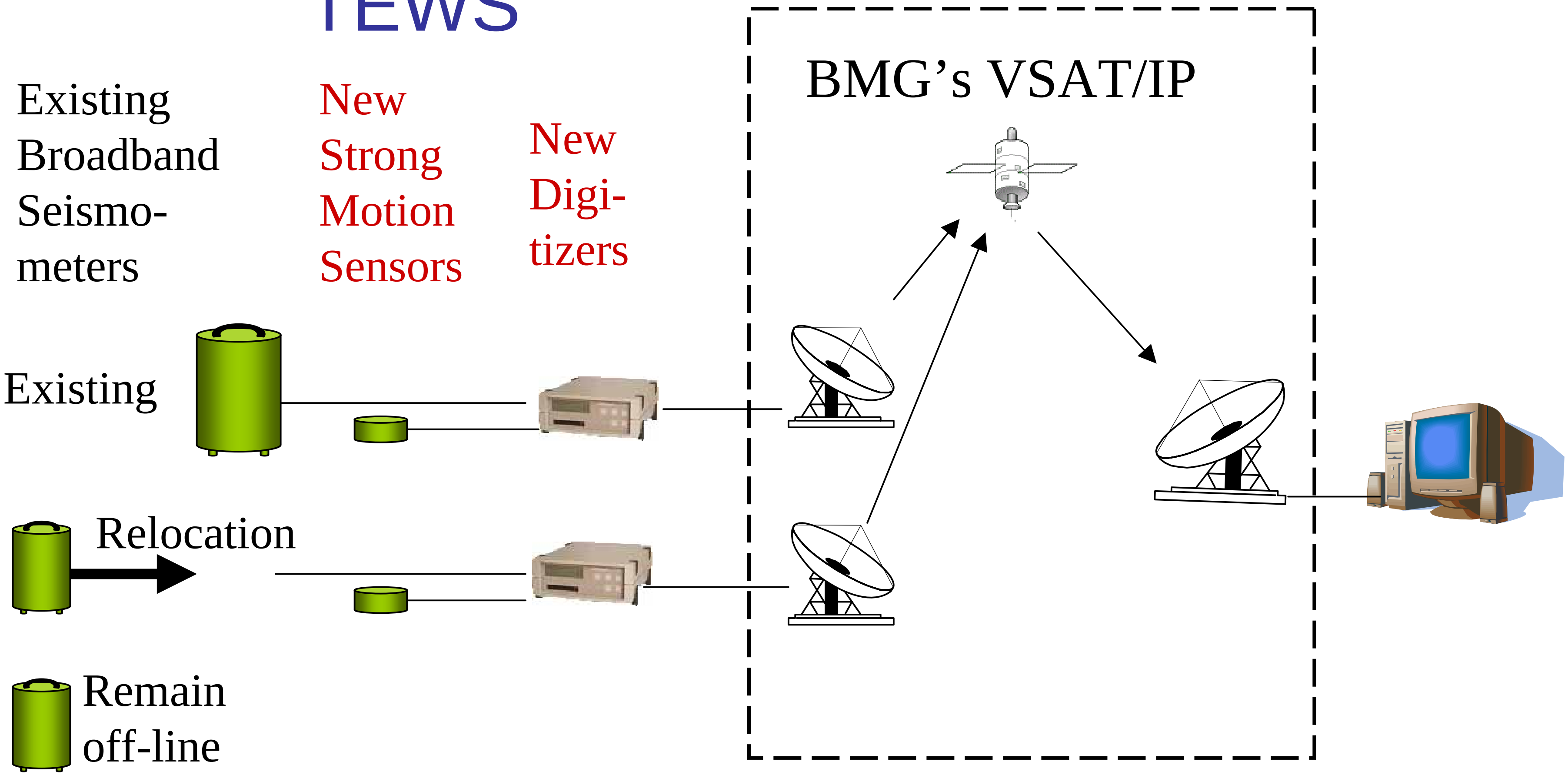
Proposed in 2004 to seek 2005- budget for Feasibility Study



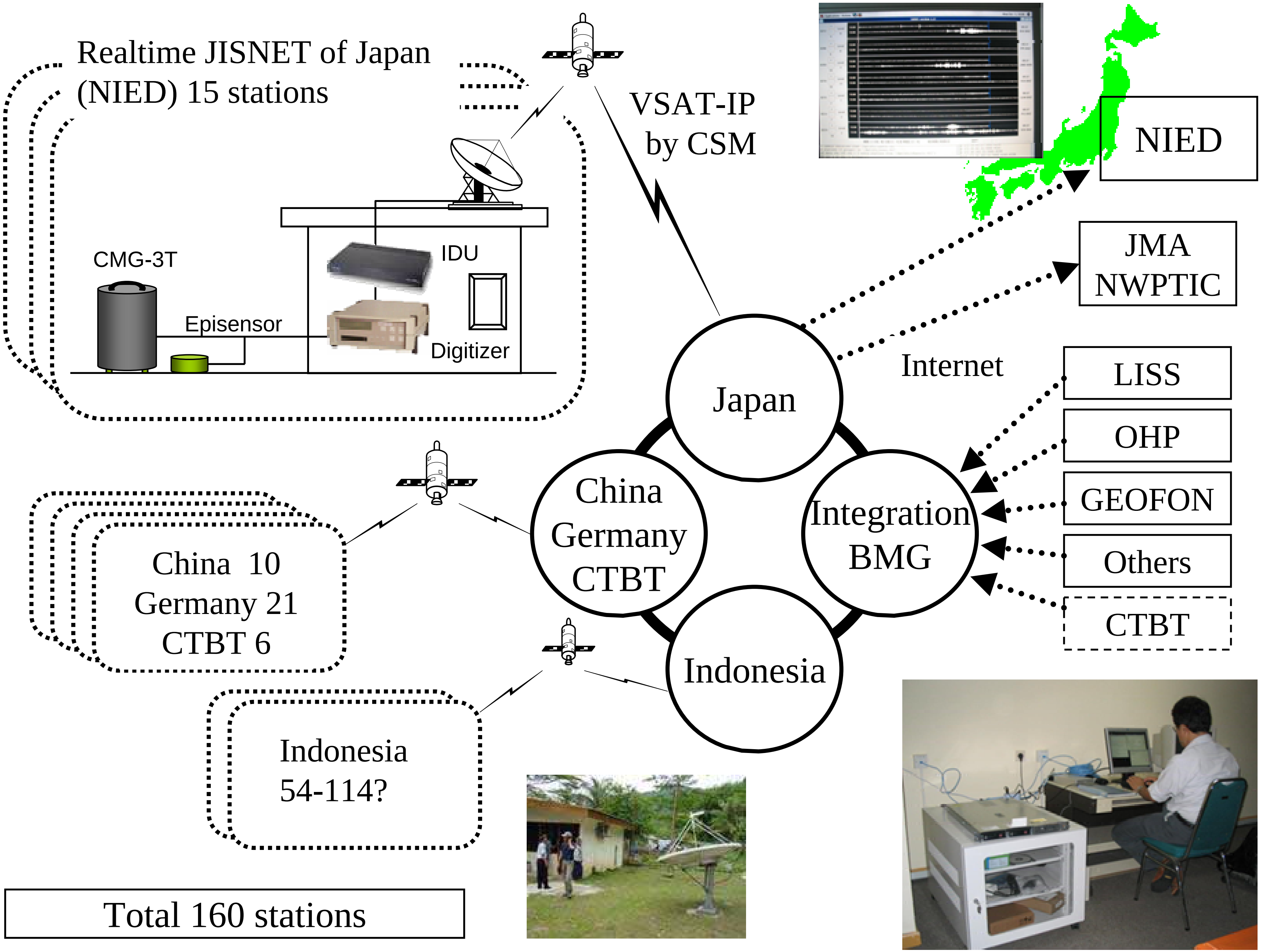
December 26, 2004,
Great Sumatra Earthquake
Occurred.

Off-line JISNET to On-line in DAPHNE Feasibility Study as a quick contribution to Indonesian TEWS

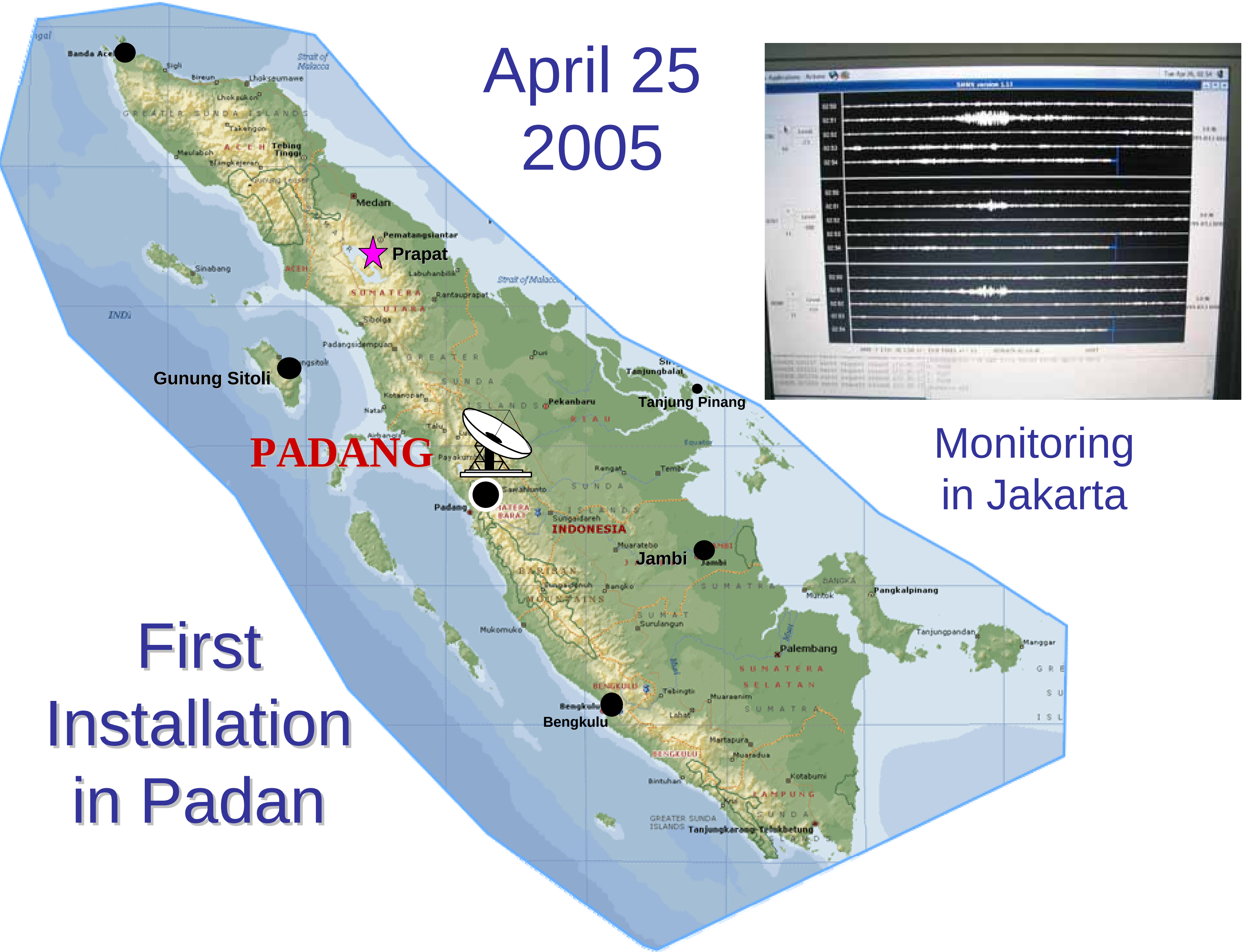




Banda Ache Geophysical Station of BMG


Realtime JISNET of Japan
(NIED) 15 stations
VSAT-IP
by CSM
NIED
JMA
NWPTIC
CMG-3T
IDU
Episensor
Digitizer
Internet
Japan
LISS
OHP
GEOFON
Others
CTBT
China
Germany
CTBT
Integration
BMG
Indonesia
China 10
Germany 21
CTBT 6
Indonesia
54-114?
Total 160 stations

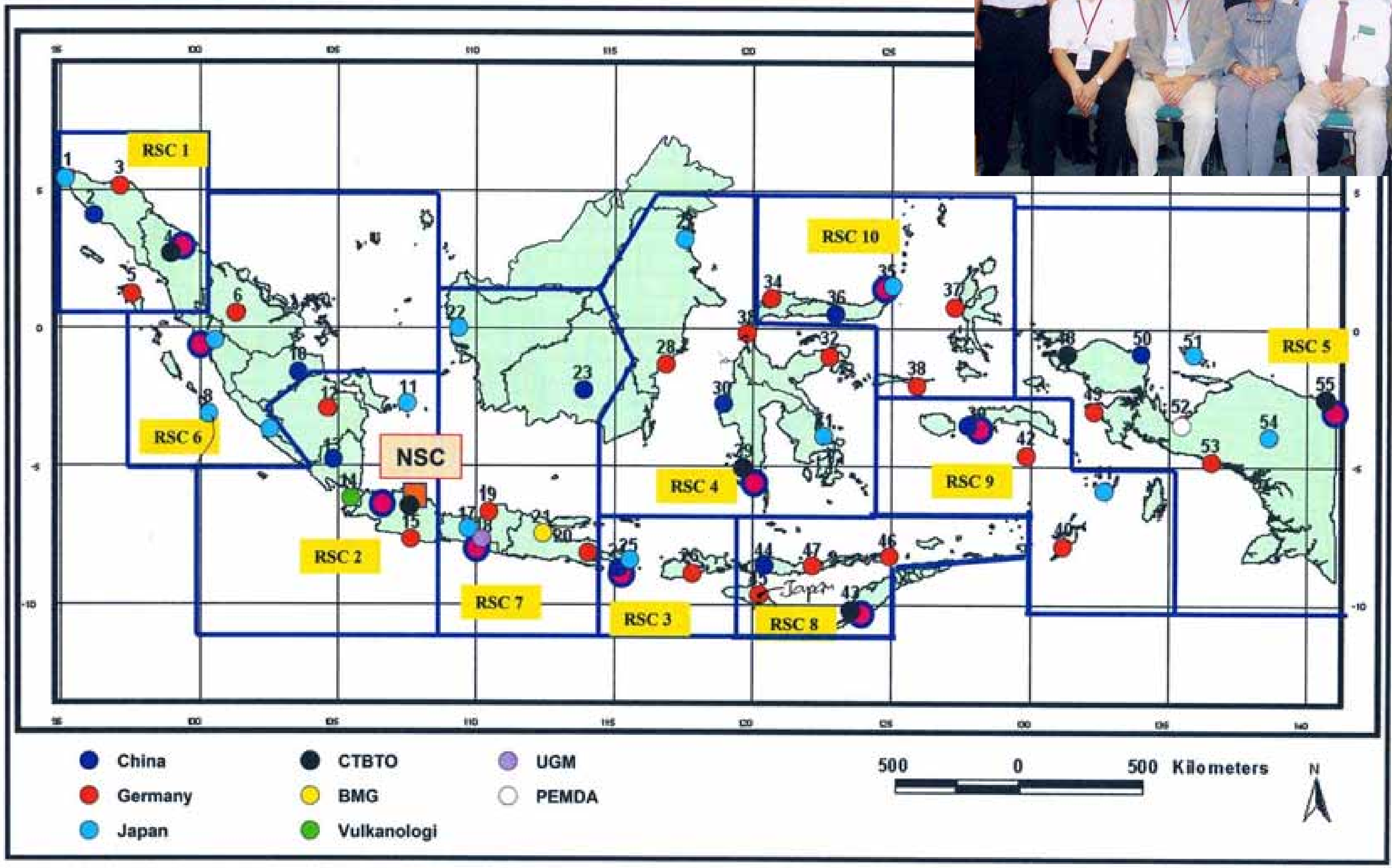
April 25 2005

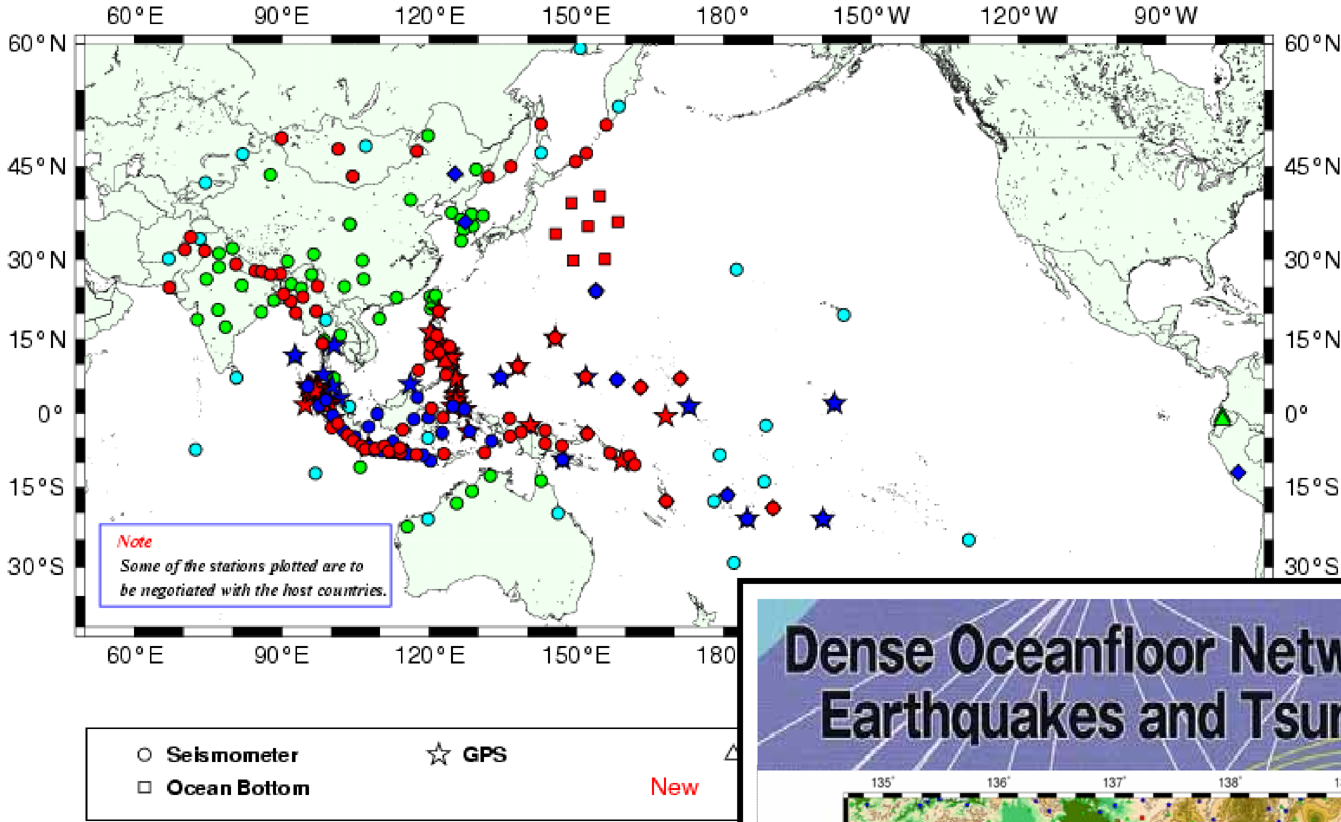


Monitoring in Jakarta

First Installation in Padan

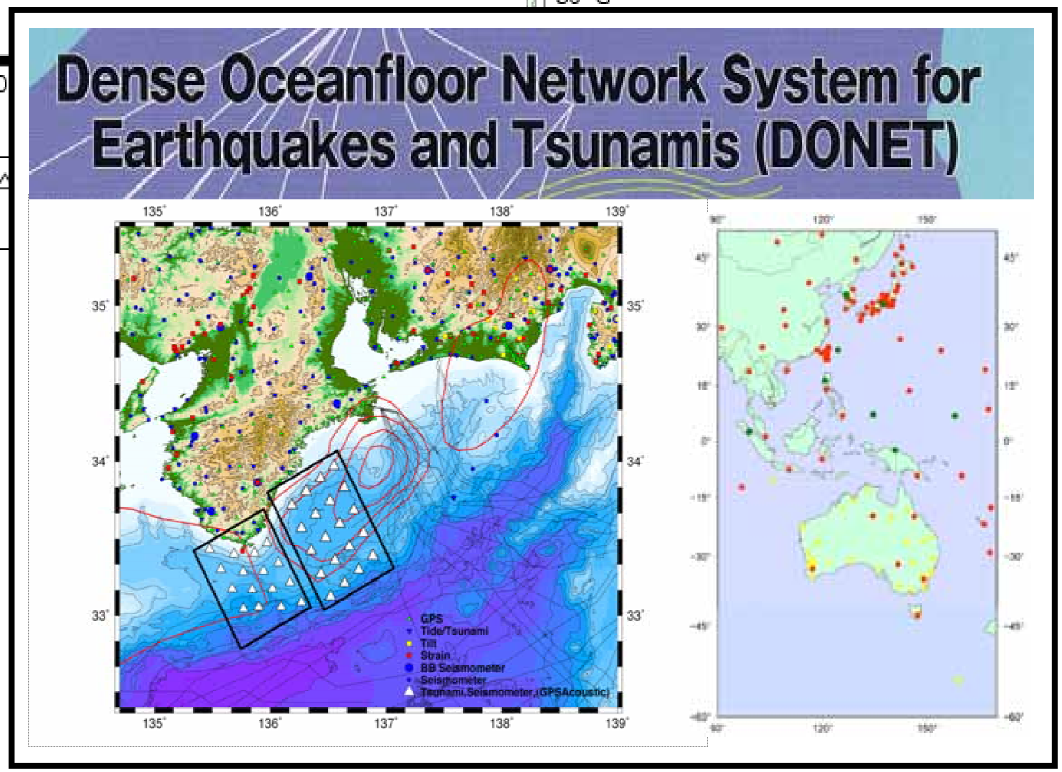
BMG/GFZ/CEA/NIED/LDG Coordination Meeting, June 2005





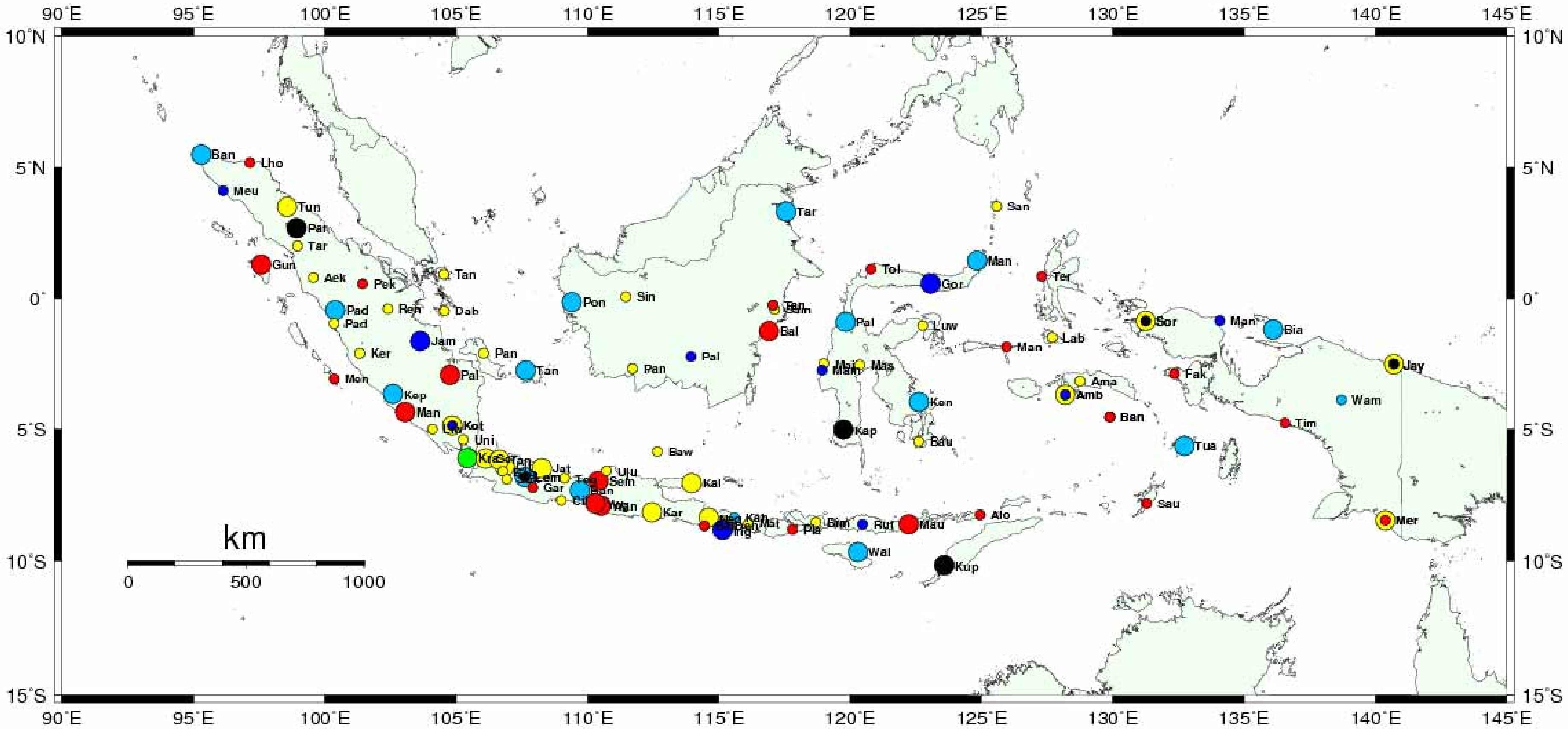
DAPHNE was not fully funded,

but a small part of it has been funded under DONET project by JAMSTEC.



Indonesian Broadband Seismic Network

As of December 26, 2006

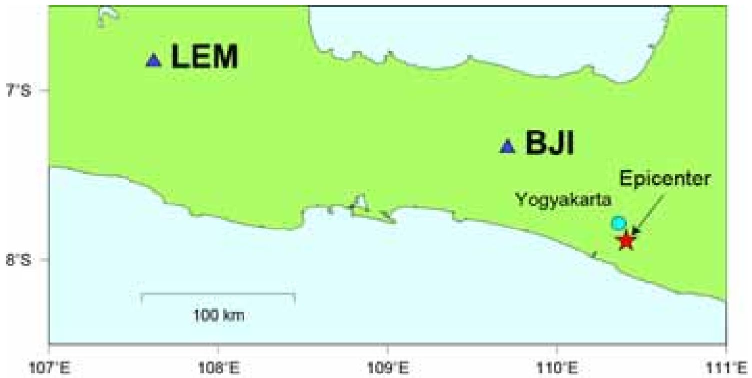


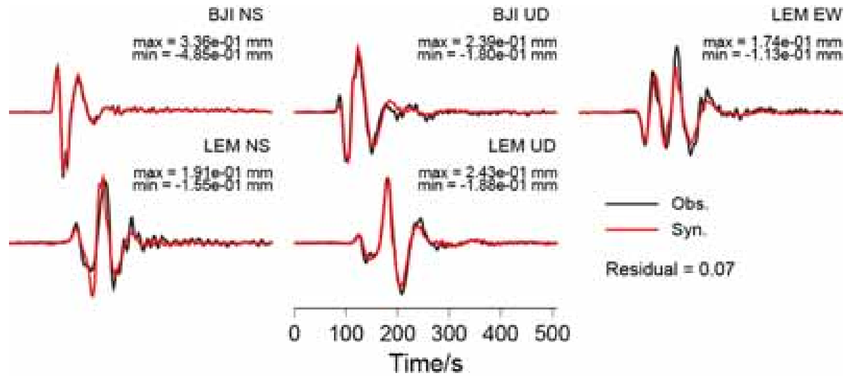
●	Japan (NIED) (14 run + 2 plan = 16)	●	Indonesia (BMG) (14 run + 30 plan = 44)	●	Germany (GFZ) (8 run + 16 plan = 24)
●	China (CEA) (3 run + 7 plan = 10)	●	CTBTO (3 run + 3 plan = 6)	●	Indonesia (VSI) & Germany (BGR) (1 run)

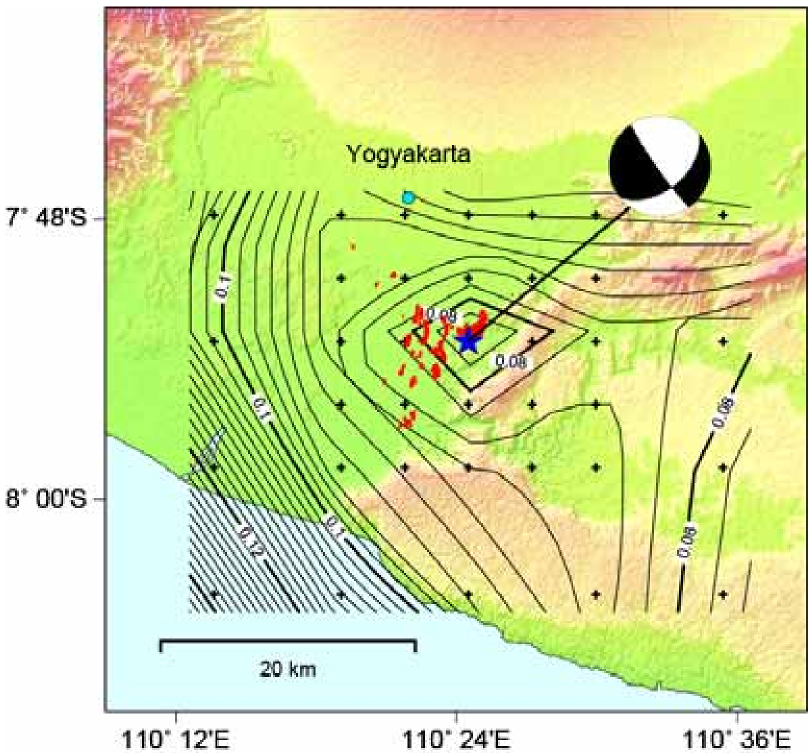
Total : 43 run + 58 plan = 101 stations

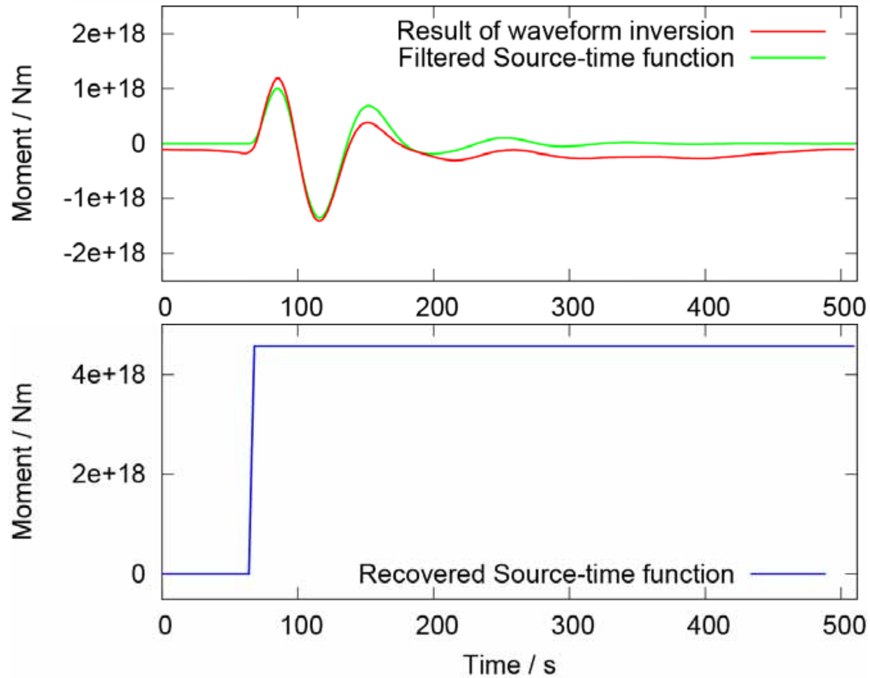
(As of December 26, 2006)

May 26, 2006 Central Java Earthquake (Mw6.4)









$M_0 = 4.63 \times 10^{18}$ Nm
$M_w = 6.4$

Depth=10km
(strike, dip, rake)
= (145, 85, 220)

EOS November 7, 2006

Java

cont. from page 493

Fig. 1. Collapsed junior high school building in Bantul, south of Yogyakarta, destroyed by the shaking of the Java earthquake.

and slip direction were performed. Source-time functions of the moment-tensor components in the frequency domain were estimated by a method similar to that used by *Auger et al.* [2006] for each set of strike, dip, and rake angles. Project scientists also conducted a spatial grid search to find the best fit source location.

For the waveform inversion, the observed waveforms were band-pass filtered between 50 and 100 seconds to minimize the effect of complexities of the rupture process. The standard Earth model ak135 [*Kennet et al.*, 1995] was used to calculate synthetic seismograms. An initial grid spacing of 10 kilometers adopted for the source location search was then reduced to five kilometers in the area around the best fit source location. At each location, strike, dip, and rake angles were searched in 15° steps, which was reduced to 5° steps at the best fit source location.

The best fit source was approximately 10 kilometers south-southeast of Yogyakarta at a depth of 10 kilometers below sea level, immediately below the area of extensive damage (Figure 2a). The estimated focal mechanism indicates that this earthquake was caused by compressive stress in the north-south direction and that strike-slip motion was dominant. Figures 2c and 2d show the estimated source-time function and waveform fits, respectively. The estimated moment magnitude (M_w) was 6.4. The observed waveforms were well reproduced by the best fit source model. The residual distribution (Figure 2a) indicates, however, that the resolution of the source location

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TRANSACTIONS
AMERICAN GEOPHYSICAL UNION
The Newspaper of the Earth and Space Sciences

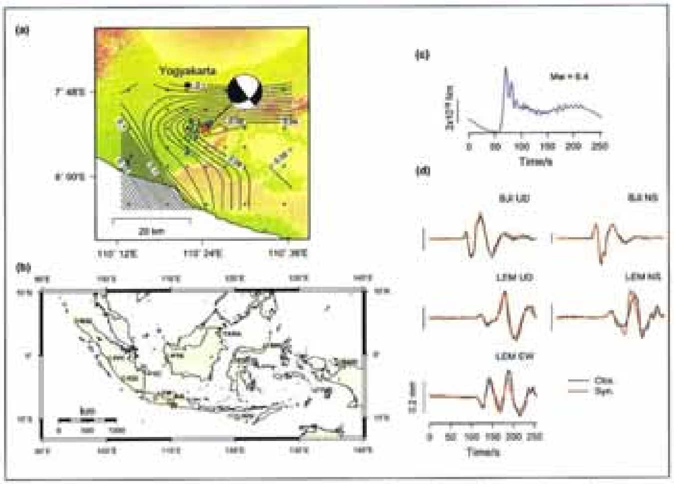
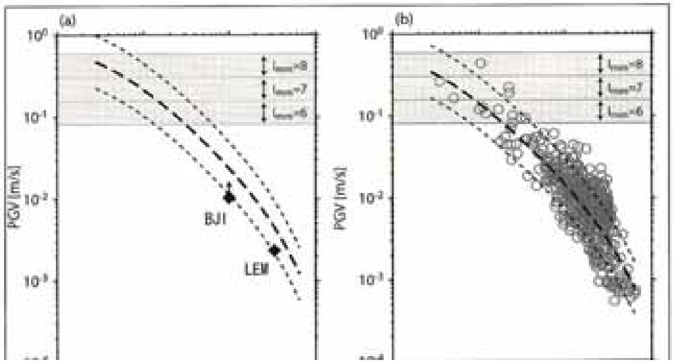


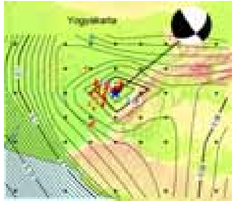
Fig. 2. (a) Source location and focal mechanism of the Java earthquake, superimposed on a map showing the areas of extensive damage caused by the Java earthquake (blue areas) according to the investigation conducted by UNOSAT. A star indicates the best fit source location (7.89°S, 110.41°E, 10 kilometers below sea level). The focal mechanism corresponds to fault and auxiliary planes (strike, dip, rake) = (145°, 85°, 220°) and (51°, 50°, 353°). Crosses indicate trial source locations for the spatial grid search, and contour lines show the residuals of the waveform inversion. (b) Locations of seismic stations of Realtime-JISNET. (c) Source-time function estimated by waveform inversion. The moment release from this earthquake was estimated to be 5.7 × 10[18] *newton meters, corresponding to a moment magnitude (M_w) of 6.4. Since this study used band-pass filtered seismograms, the direct current component of the source-time function was not recovered. (d) Waveform fits obtained by the inversion. Black and orange lines indicate observed and synthesized seismograms, respectively. Vertical bars at the left of each seismogram indicate amplitude of 0.2 millimeters. UD stands for up-down, NS for north-south, and EW for east-west.*



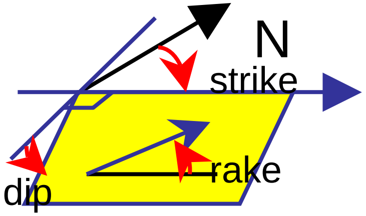
Method of Source Mechanism Analysis

Assuming pure double couple point source

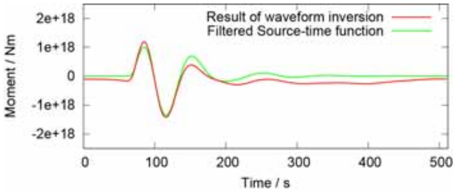
Loop for centroid location x, y, z
(5 km interval)



Loop for dip, strike, rake
(5 degrees intraval)



Waveform inversion for source time function in frequency domain



$$\tilde{\mathbf{d}}(\omega_k) = \tilde{\mathbf{G}}(\omega_k)\tilde{\mathbf{m}}(\omega_k) \qquad k = 1, \cdots, N_f$$

↑

Number of channels x Number of moment components
=> faster than time domain inversion

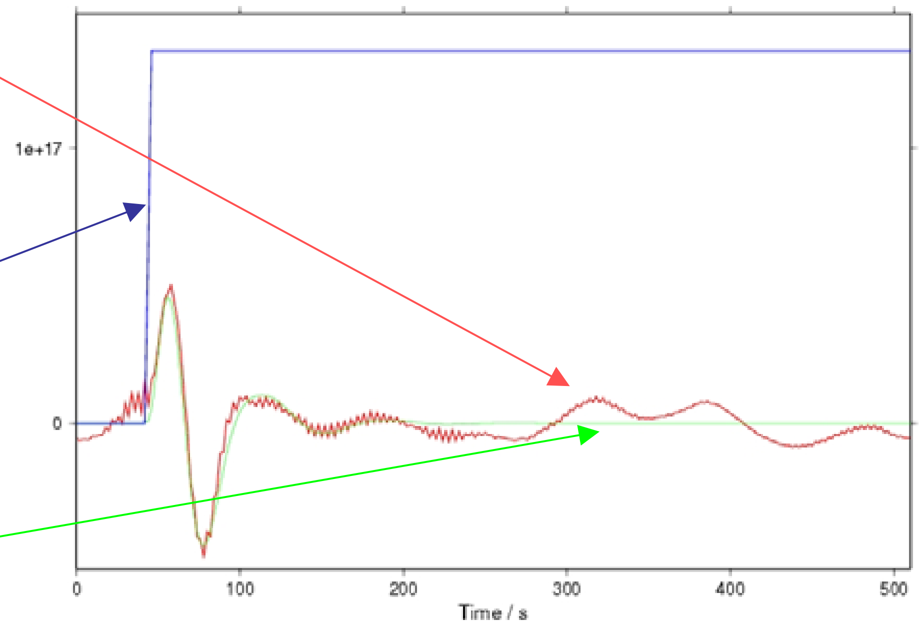
Nakano et al (2006)

Recovery of source time function $m_d(t)$ by finding best-fit superposed filtered ramp functions $s(t)$ to the inverse Fourier transform of $\tilde{m}(\omega)$

$$\tilde{m}(\omega) \xrightarrow{IFT} m^f(t). \quad (\omega_1 < \omega < \omega_{Nf})$$

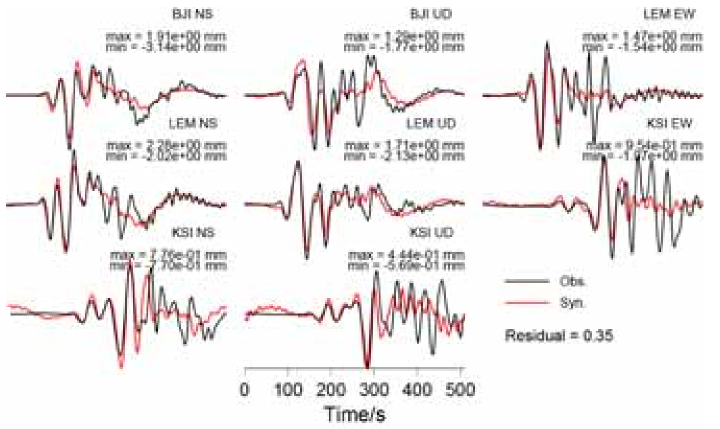
$$m_d(t) = \sum_{i=1}^{Np} a_i s(t - i\Delta\tau),$$

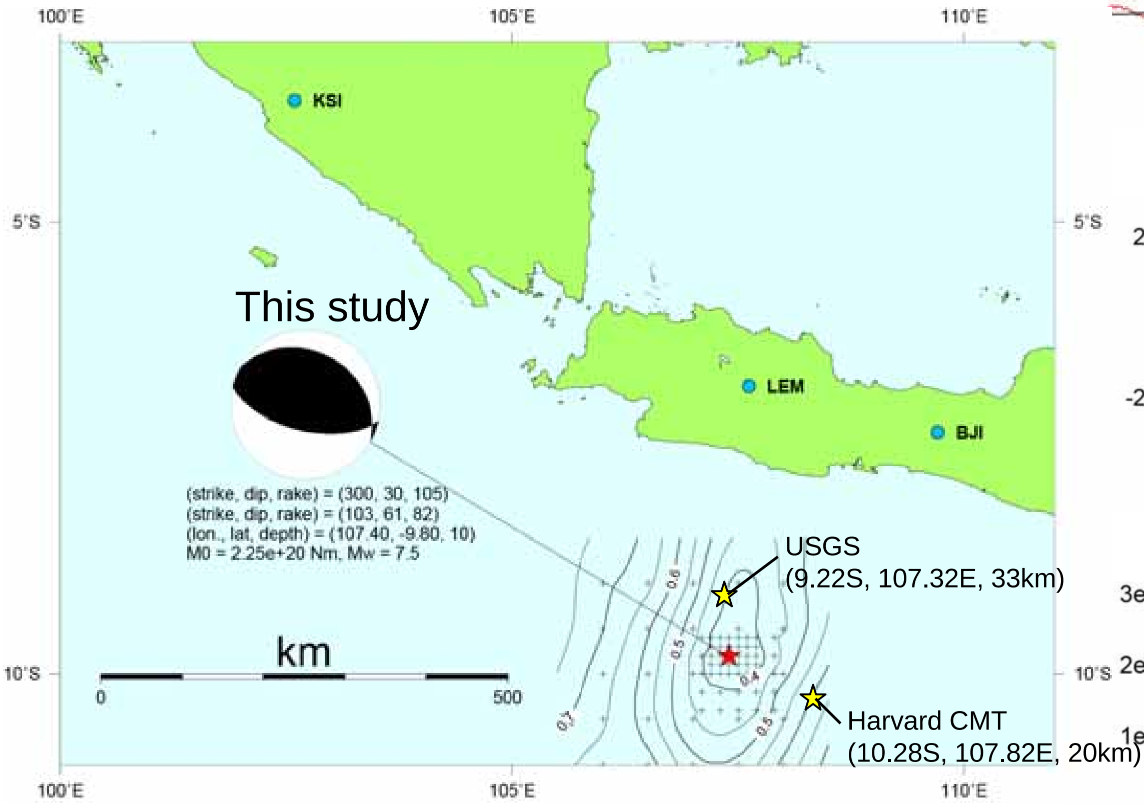
$$m_d^f(t) = \sum_{i=1}^{Np} a_i s^f(t - i\Delta\tau),$$

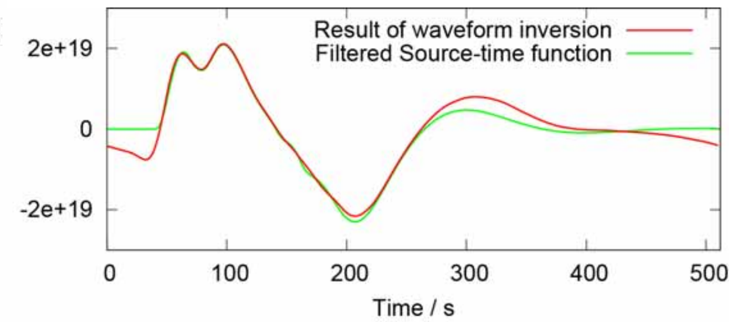


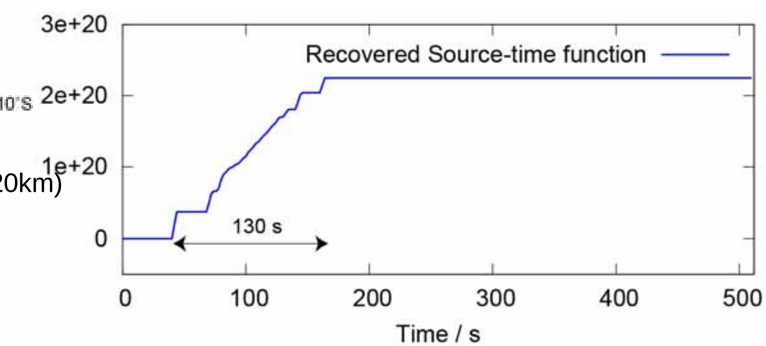
minimizing $|m^f(t) - m_d^f(t)|^2$ under $a_i \geq 0$

2006/7/17 Off Java (Mw7.5)
more than 600 were killed by tsunami

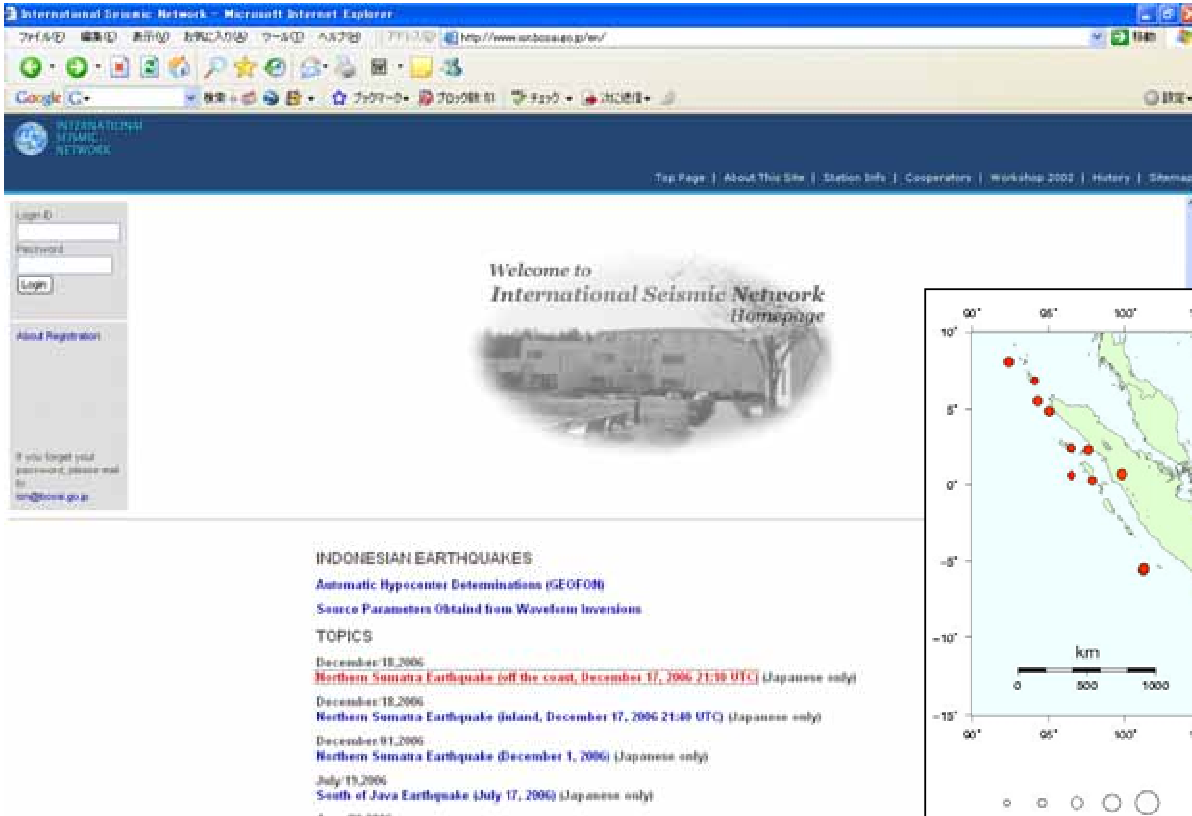


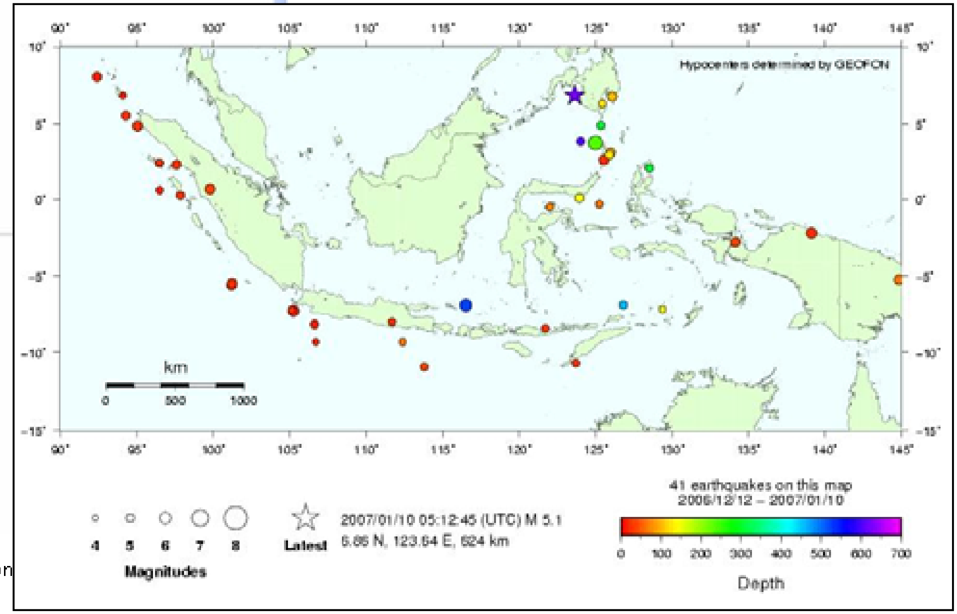






www.isn.bosai.go.jp/en/index.html





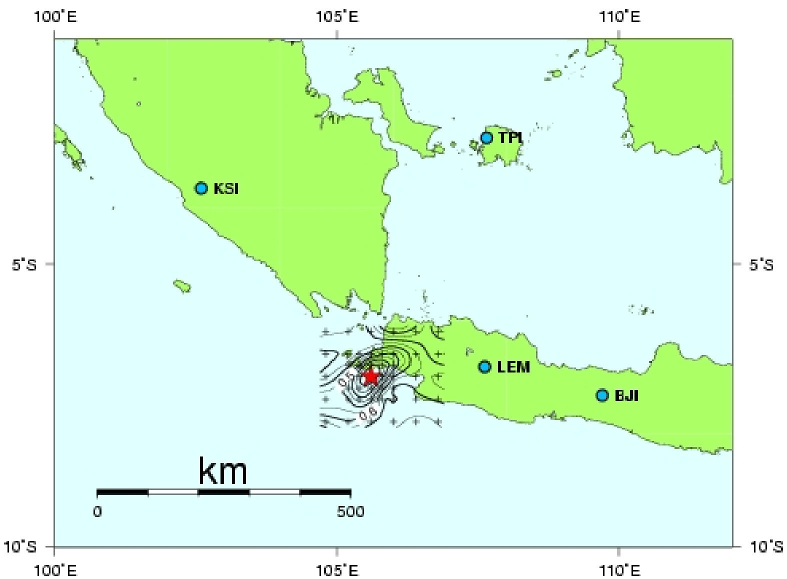
List of source locations and mechanisms obtained from waveform inversions (Indonesia region

Date (UTC)	Longitude	Latitude	Detph (km)	Mw	Analysis
2006/12/23 22:59	105.6 E	7.0 S	40	5.4	Manual
2006/12/19 12:50	98.0 E	2.4 N	50	5.1	Manual
2006/12/17 21:40	99.9E	0.6N	15	5.8	Manual
2006/12/17 21:10	95.2 E	4.8 N	30	5.9	Manual
2006/12/01 3:59	99.0 E	3.4 N	180	6.4	Manual

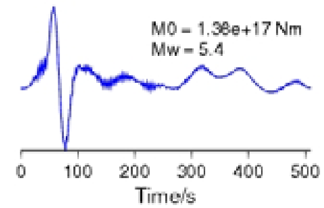
Currently manual, but

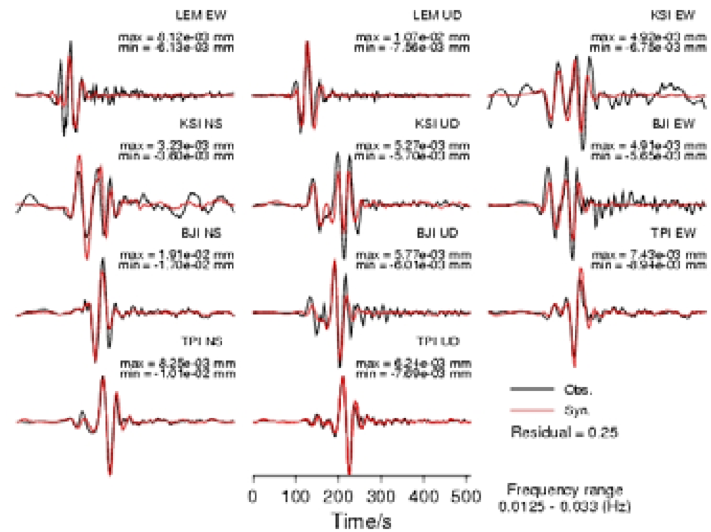
automated in the near future

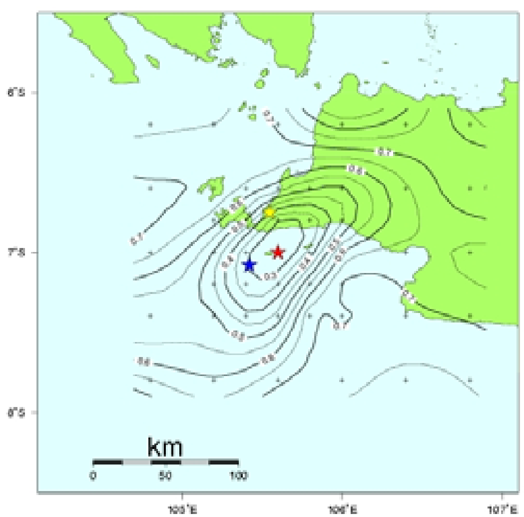
2006/12/23 Western Java (Mw5.4)



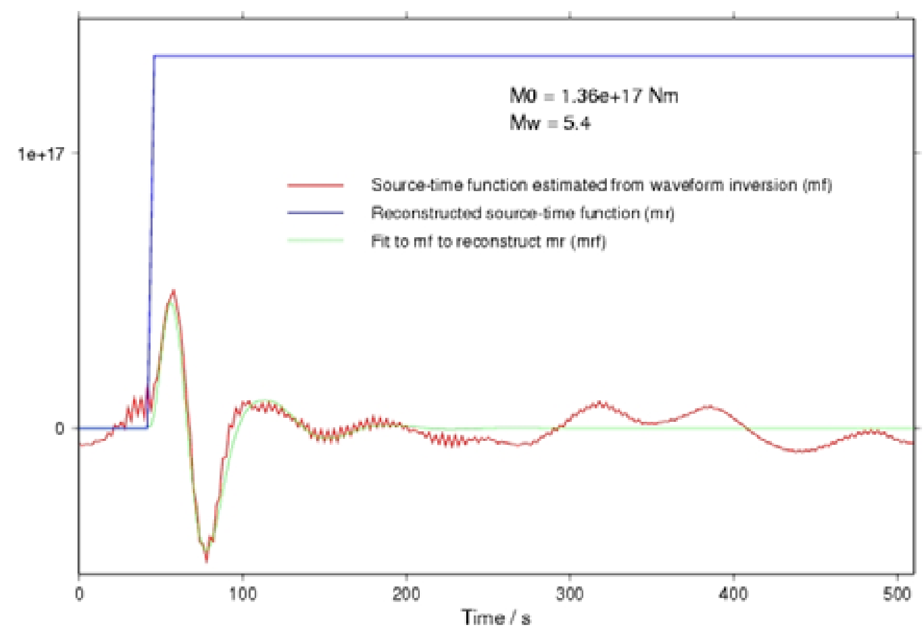
★ This study (105.6 E, -7.0 N, 40 km)



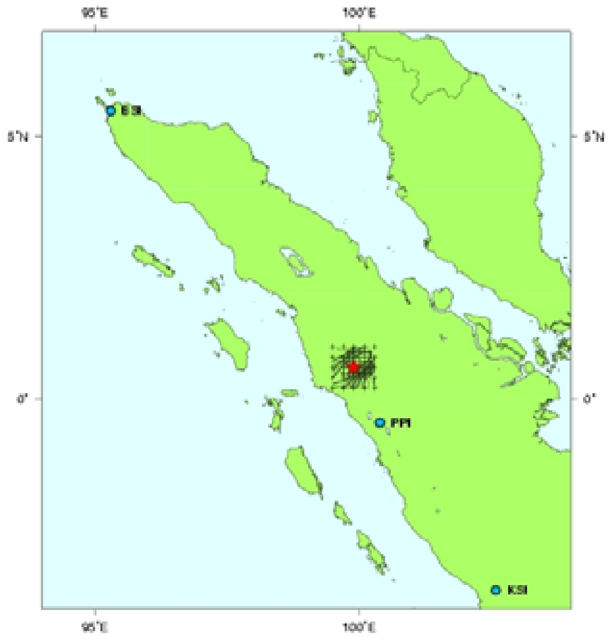


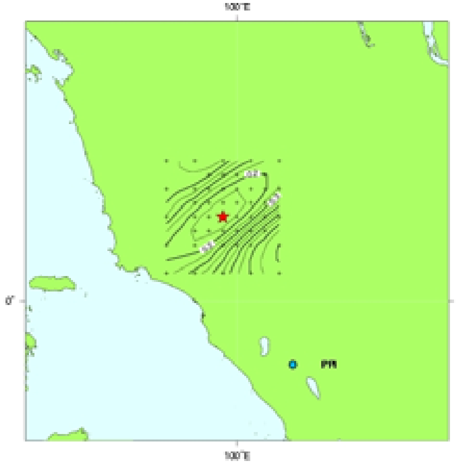


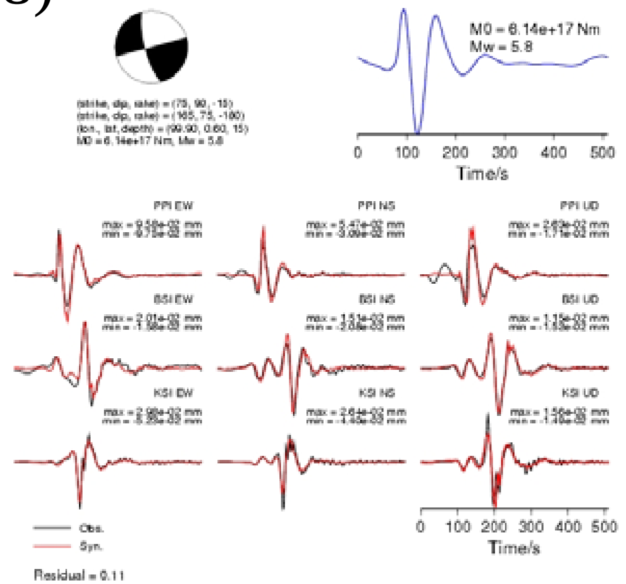
★ This study (105.6 E, -7.0 N, 40 km)
★ USGS (105.548 E, -6.750 N, 84.3 km)
★ GFZ (105.42 E, -7.08 N, 48 km)

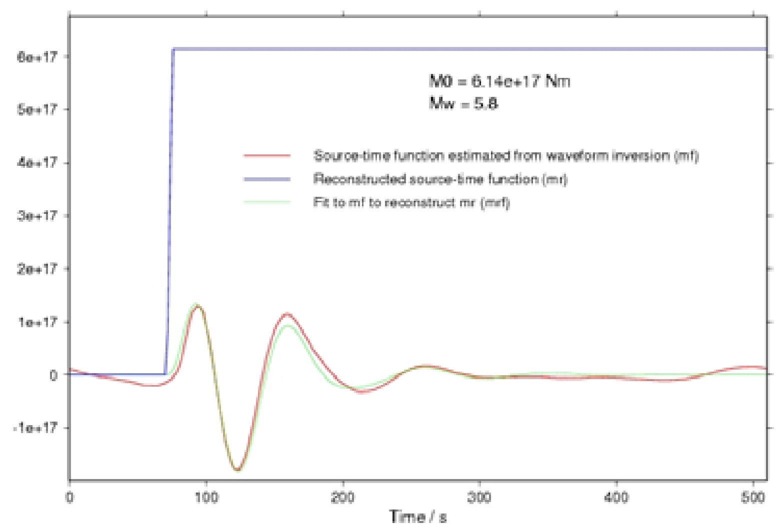


2006/12/17 Central Sumatra (Mw5.8)

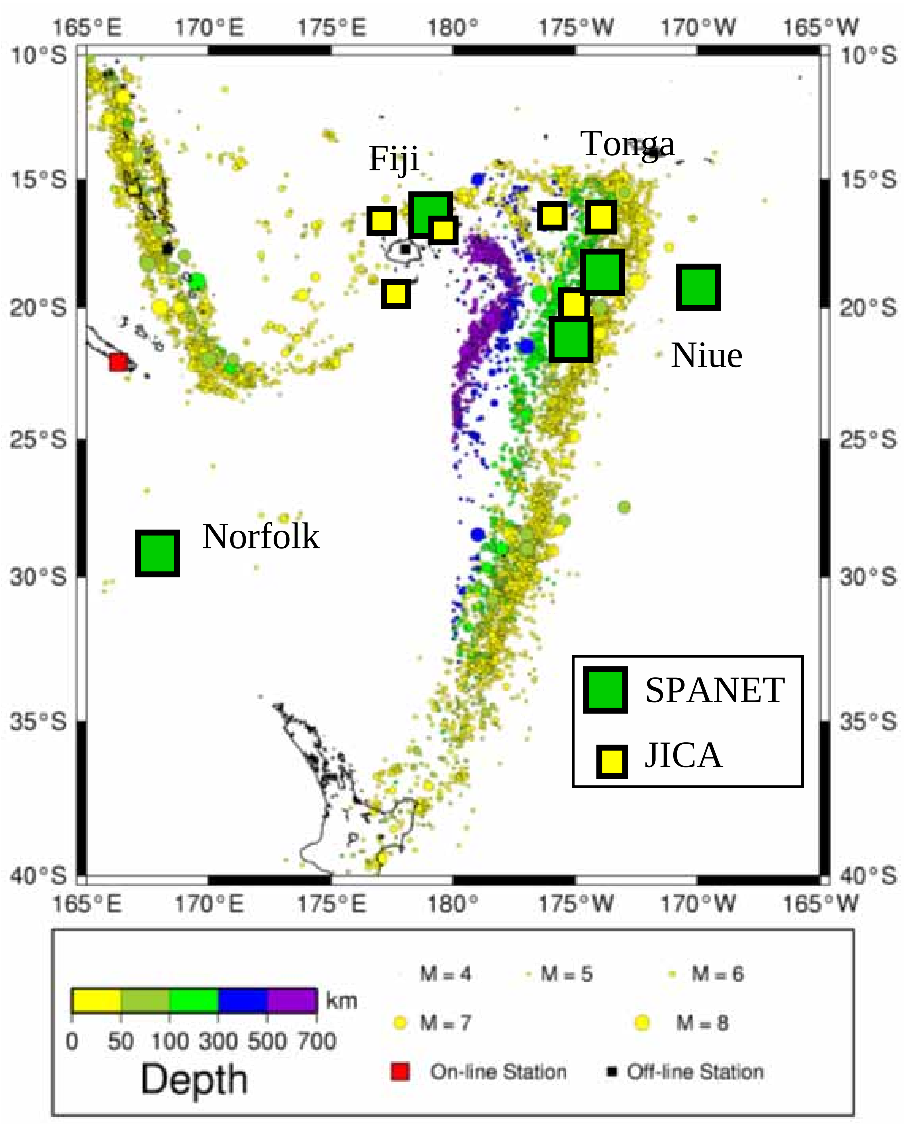


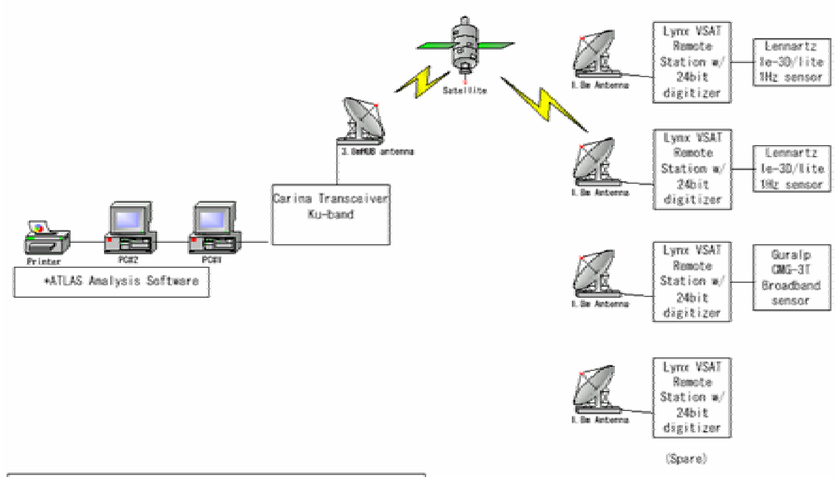






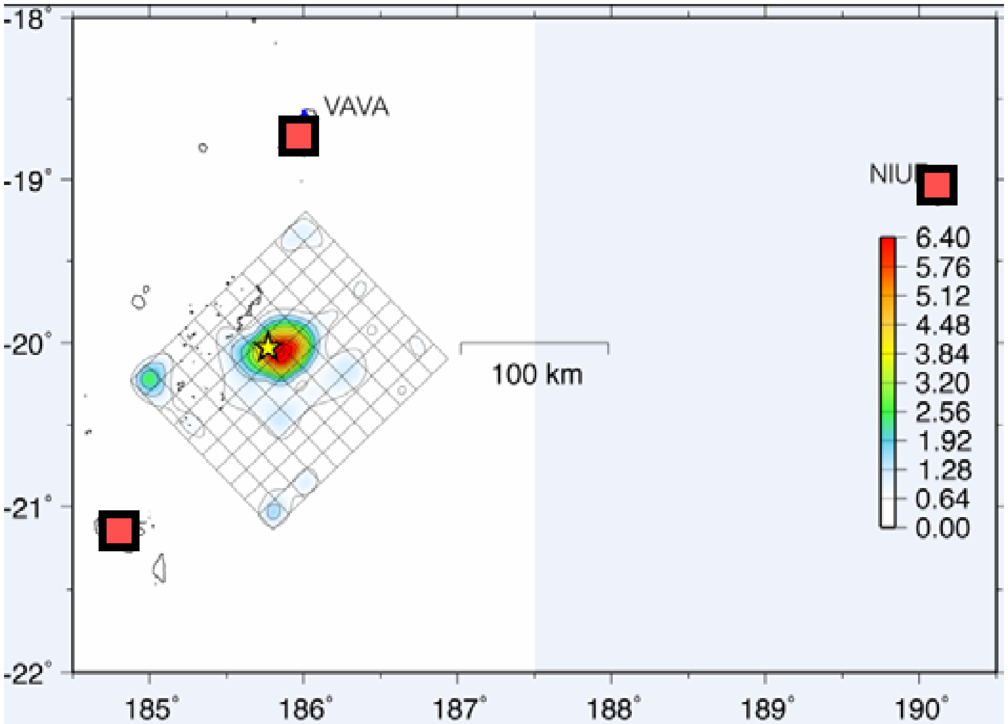
SPANET in the SW Pacific

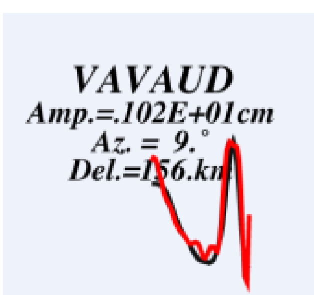


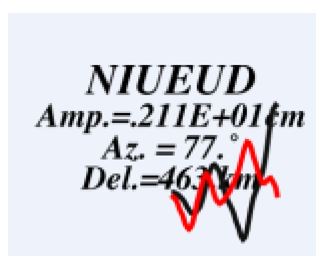


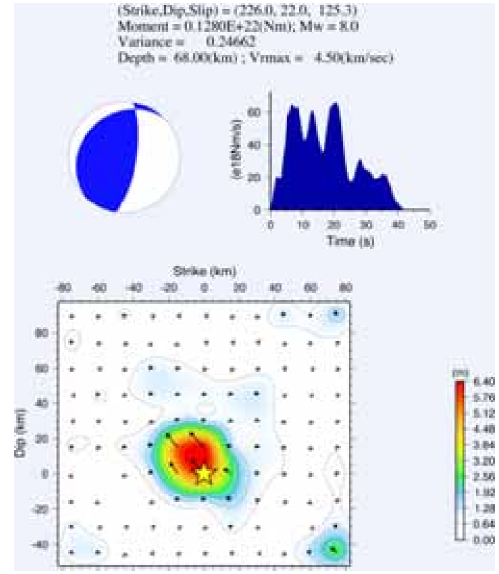
May 3, 2006 Tonga Earthquake Mw7.9

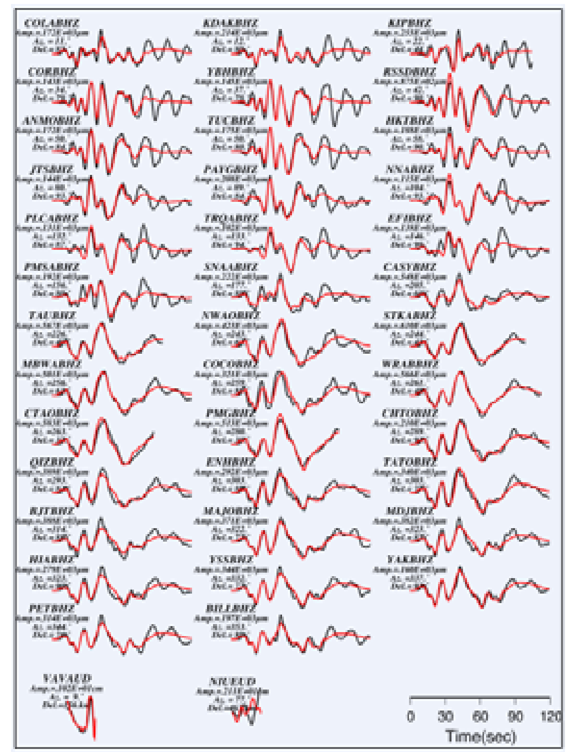
Minor damage to the buildings, small tsunami



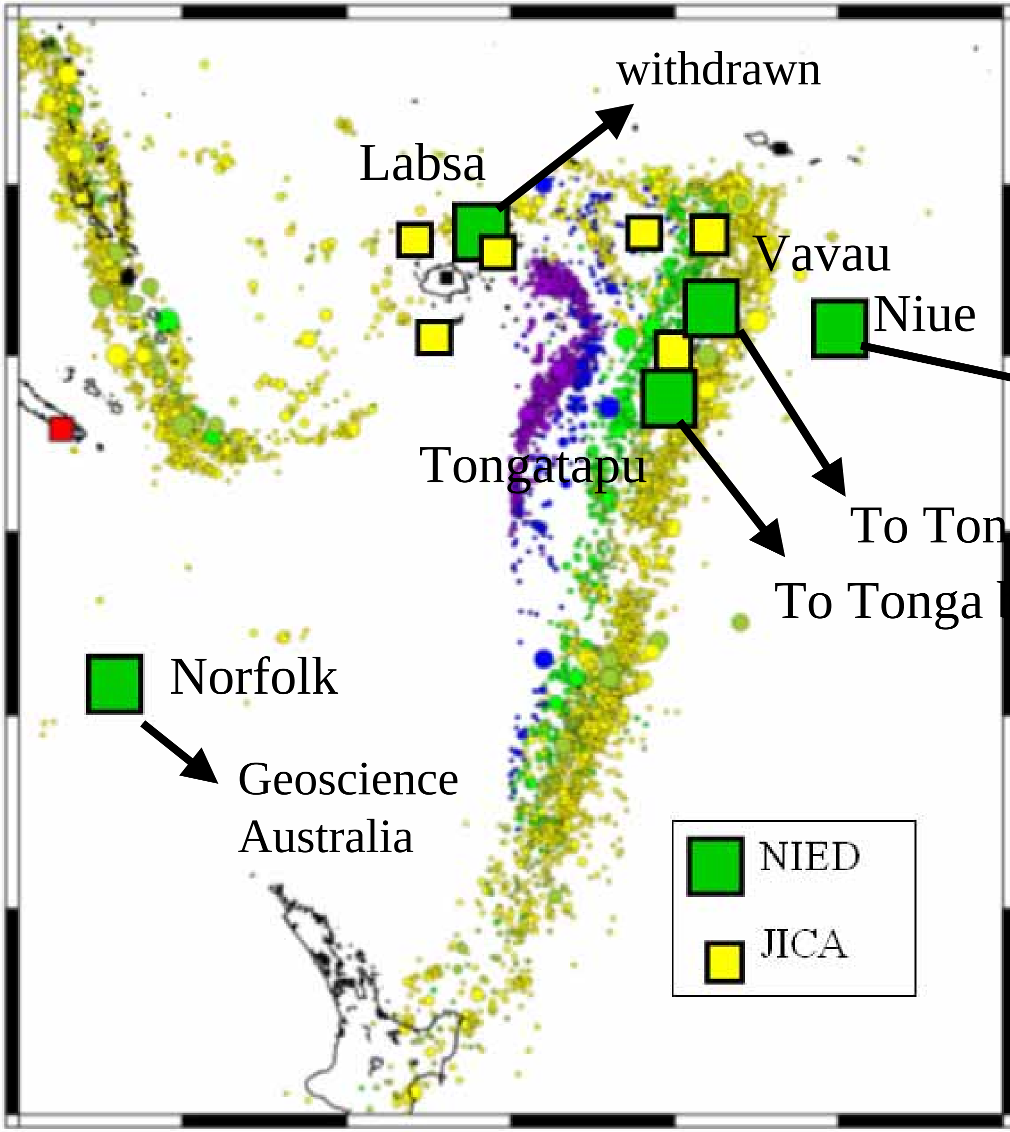








Off-line SPANET is being transferred to local/regional networks of SW Pacific Countries

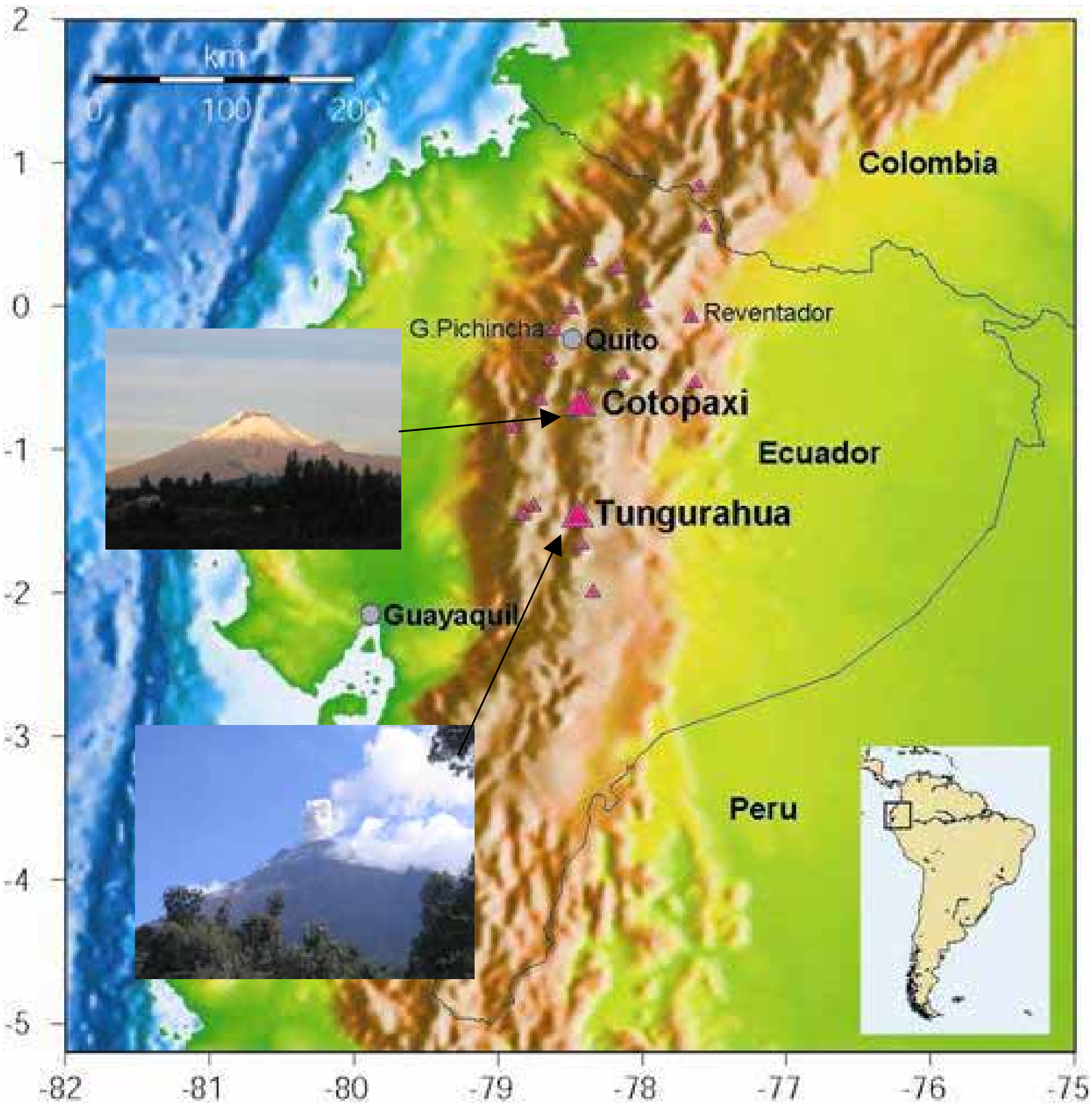


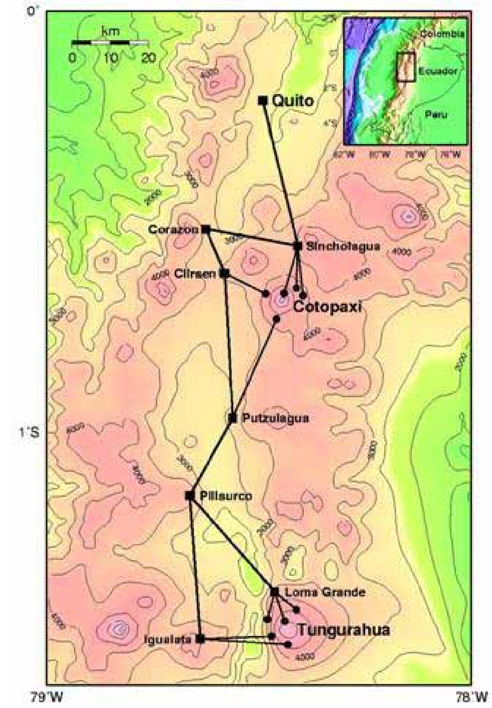
Manihiki

withdrawn (closed)

Upgrading Fiji and Tonga National Seismic Networks by JICA project (2007-2009)

Volcano Monitoring in Ecuador (JICA)



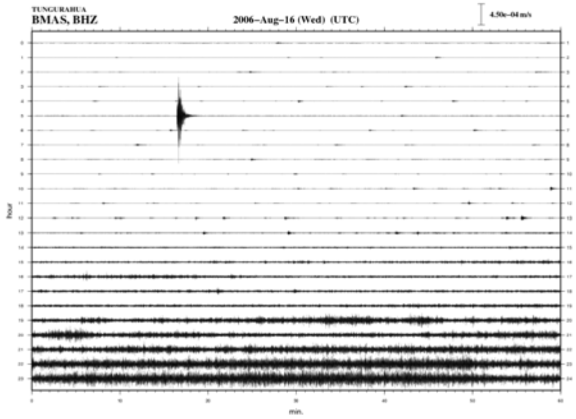


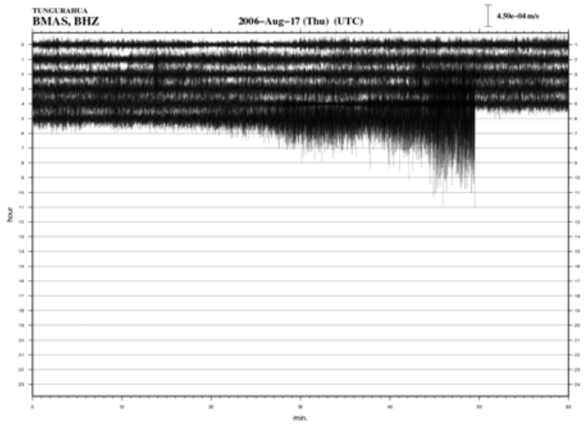
Eruption of Tungurahua on August 17, 2006


INFORME

Volcán Tungurahua incrementa actividad y obliga a evacuar 1.500 personas

Hugo Yépez vulcanólogo del Instituto Geofísico de la Escuela Politécnica Nacional de Quito explica el proceso eruptivo.





→People safely evacuated by the warning issued by IG based on the data

Our direction

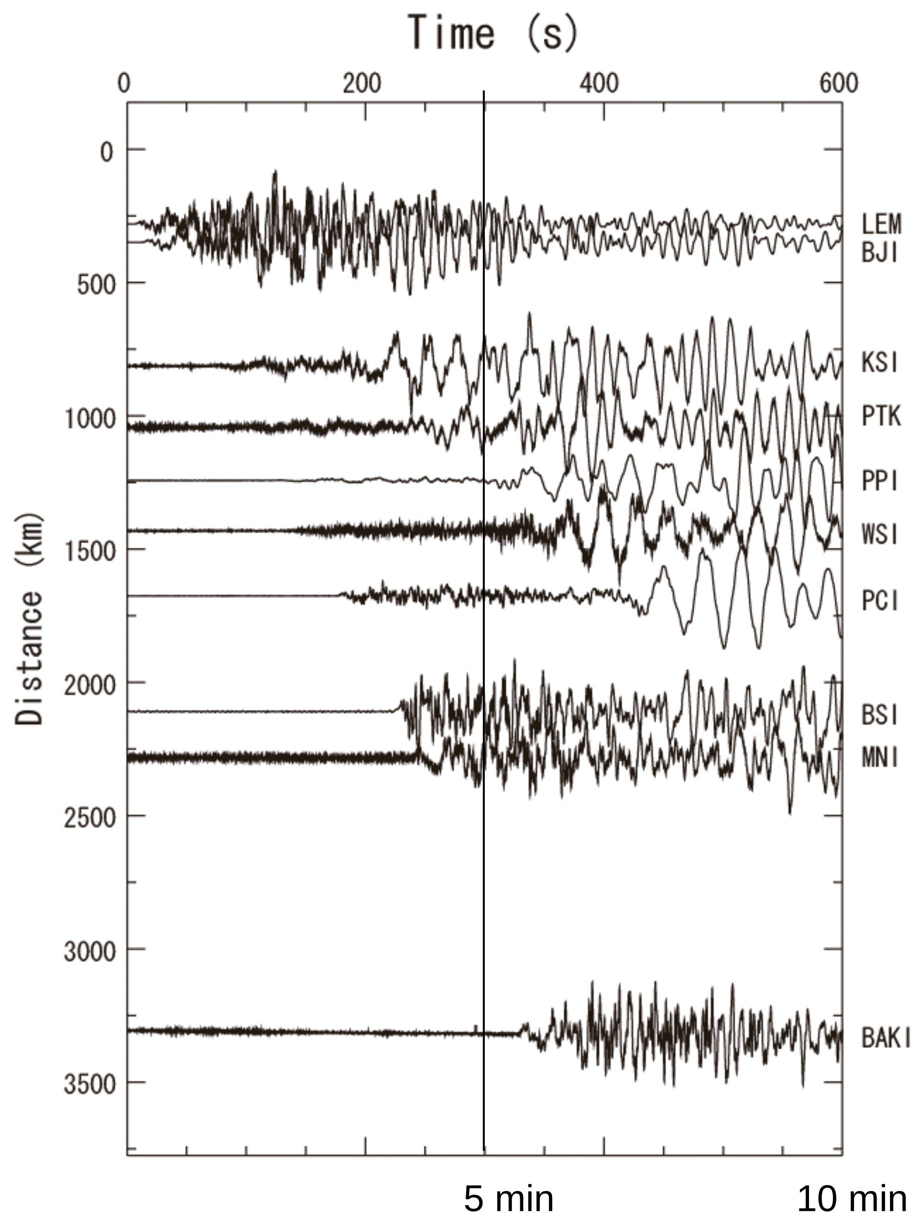
Filling observation gaps in Asia-Pacific countries by cooperating to JICA projects

and

Research cooperation with the counter-part organizations

for sustainable operation of the earthquake observation networks

Thank you.



Time (s)
0
200
400
600
0
500
1000
1500
2000
2500
3000
3500
Distance (km)
LEM
BJI
KSI
PTK
PPI
WSI
PCI
BSI
MNI
BAKI
5 min
10 min