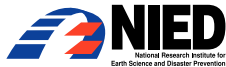


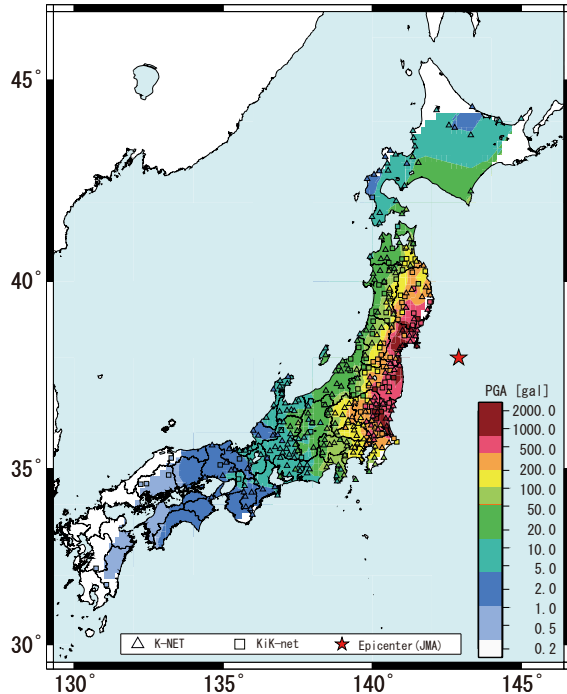
2011 Off the Pacific Coast of Tohoku earthquake, Strong Ground Motion



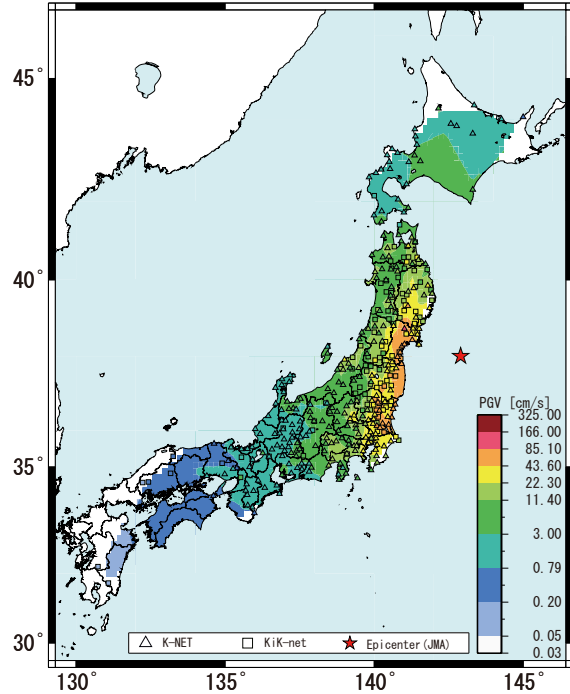
National Research Institute for Earth Science and Disaster Prevention

2011/3/11 14:46, Depth 24km, M9.0 (JMA)

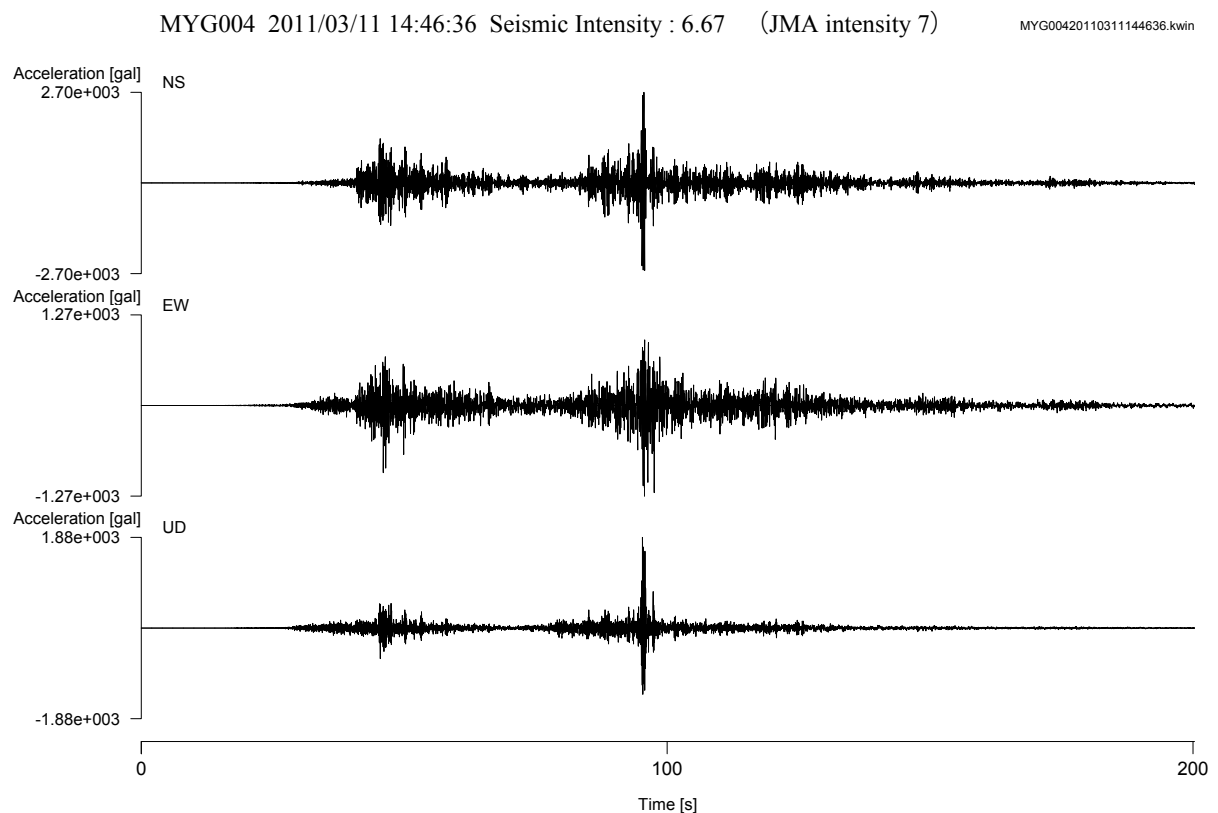
Peak Ground Acceleration (surface)



Peak Ground Velocity (surface)



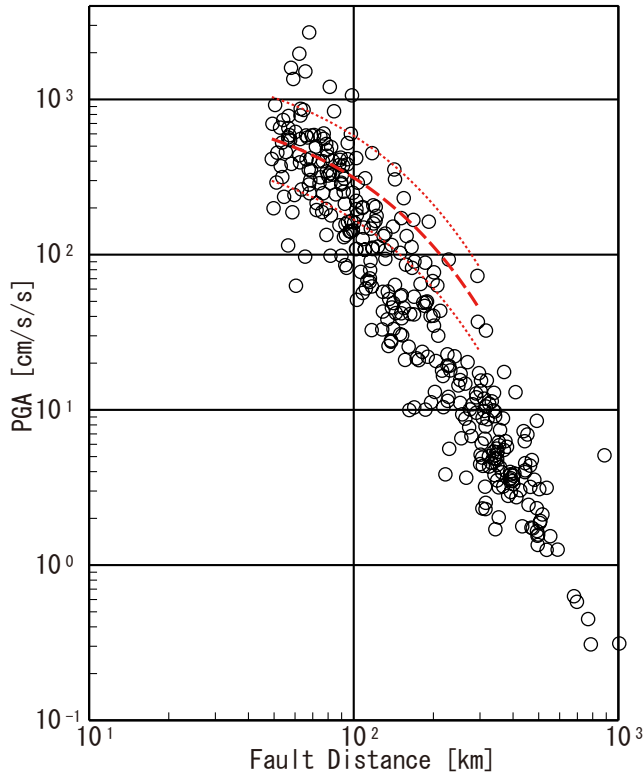
The largest peak ground acceleration among K-NET and KiK-net sites was recorded at MYG004 K-NET station (waveforms displayed below), reaching 2933 gals (3 components vector summation).



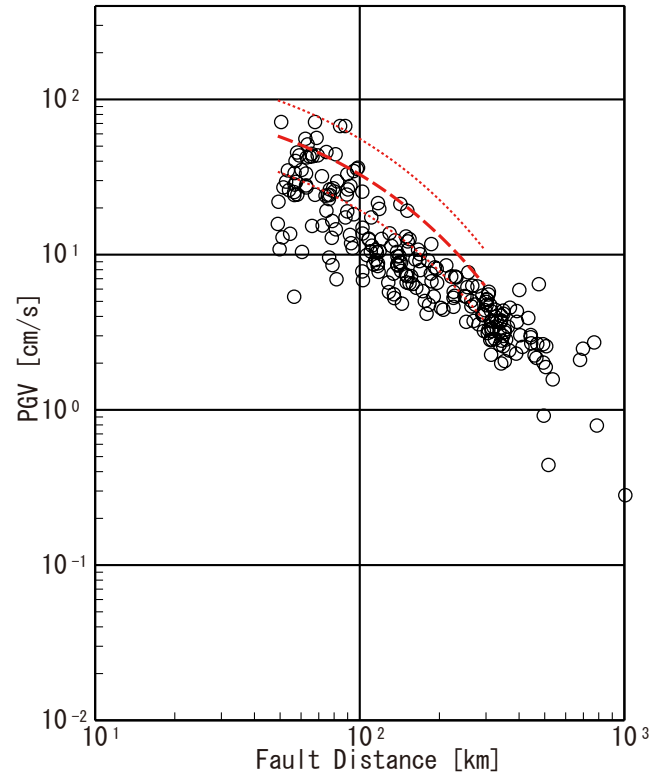
Comparison of observed values of PGA and PGV with ground motion empirical attenuation laws (preliminary)

2011/03/11 14:46 Depth=24km(JMA), Mw=8.9(USGS)

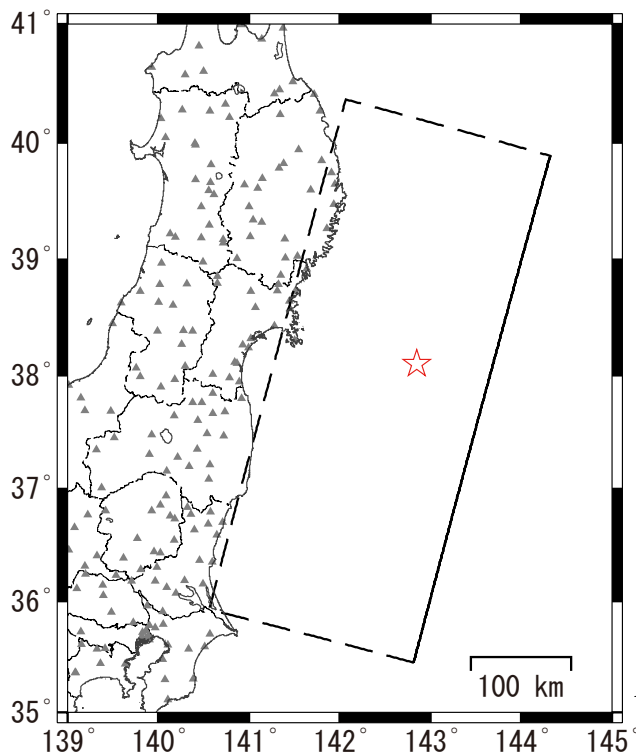
----- Shi & Midorikawa (1999) inter-plate



Peak Ground Acceleration (PGA)



Peak Ground Velocity (PGV)



- PGA and PGV were obtained as the maximum values between horizontal components.
- Observed PGV values were corrected to a $V_s=600\text{m/s}$, by removing the amplification at every station from boring information.
- ※ The Mw8.9 is beyond the range of applicability of the empirical attenuation laws (Shi and Midorikawa,1999)
- ※ The fault model used is preliminary

Assumed fault model

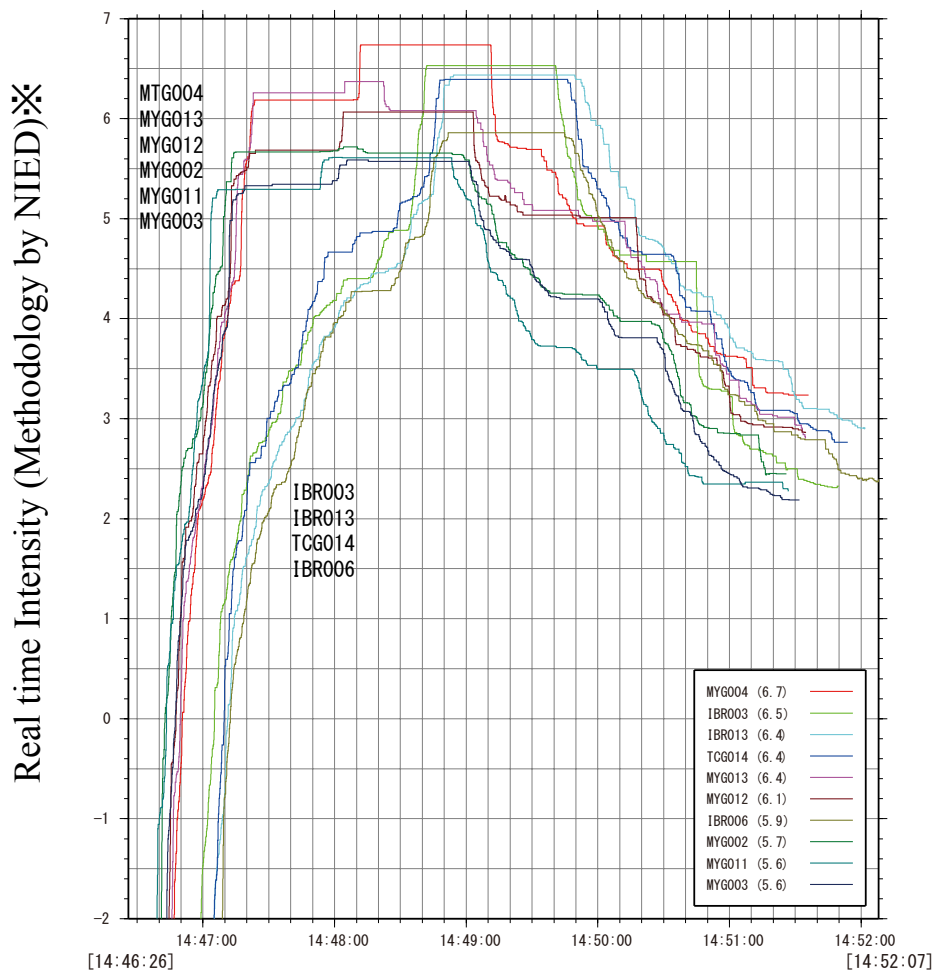
List of 10 largest Observed Peak Ground Accelerations

	Station name	PGA	JMA intensity※
1	MYG004	2933gal	6.6
2	MYG012	2019gal	6.0
3	IBR003	1845gal	6.4
4	MYG013	1808gal	6.3
5	IBR013	1762gal	6.4
6	FKSH10	1335gal	6.0
7	TCGH16	1305gal	6.5
8	TCG014	1291gal	6.3
9	IBRH11	1224gal	6.2
10	MYGH10	1137gal	6.0

※JMA Instrumental intensity

This list is based on information obtained by March 13, from 276 K-NET and 112 KiK-net sites.

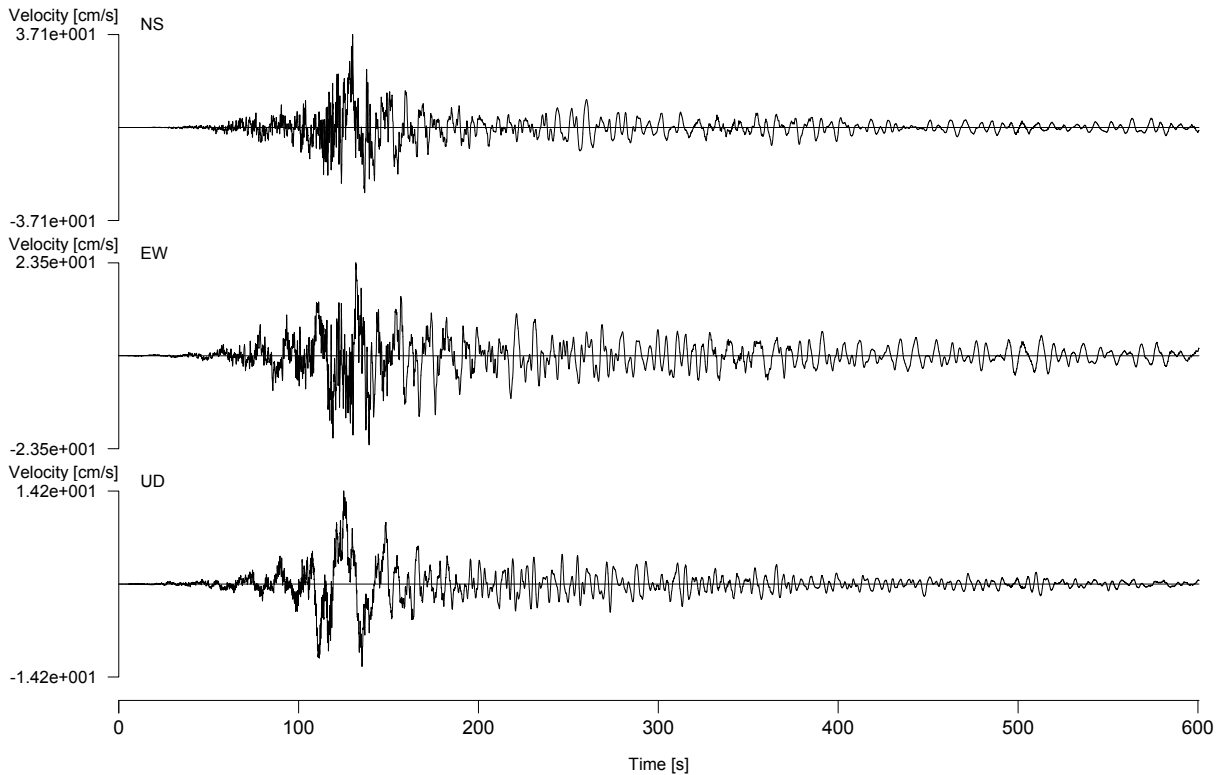
Evolution of intensity values in time



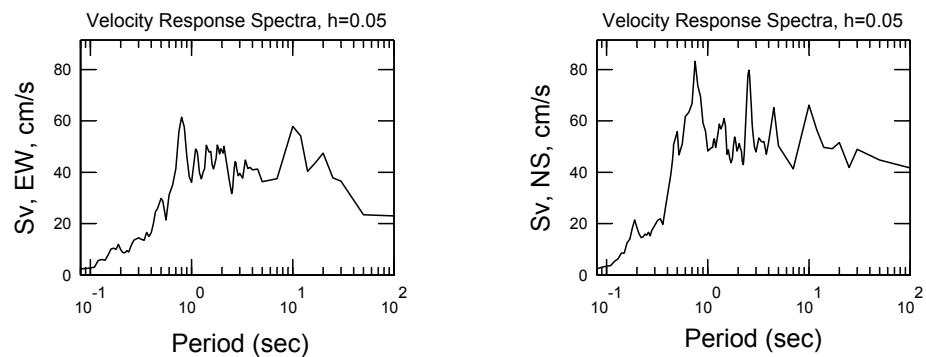
※Kunugi et al. (2008)

Long Period Ground Motion recorded at K-NET, Chiba station (CHB009)

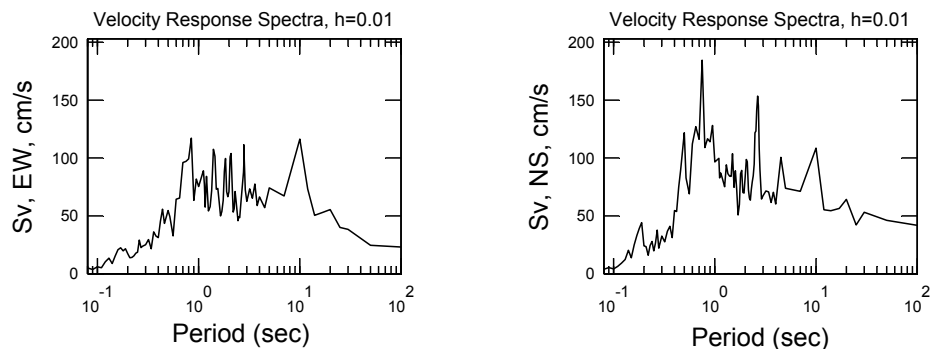
CHB009 2011/03/11 14:47:09



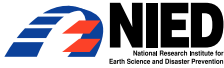
Velocity Response Spectra (5% damping)



Velocity Response Spectra (1% damping)



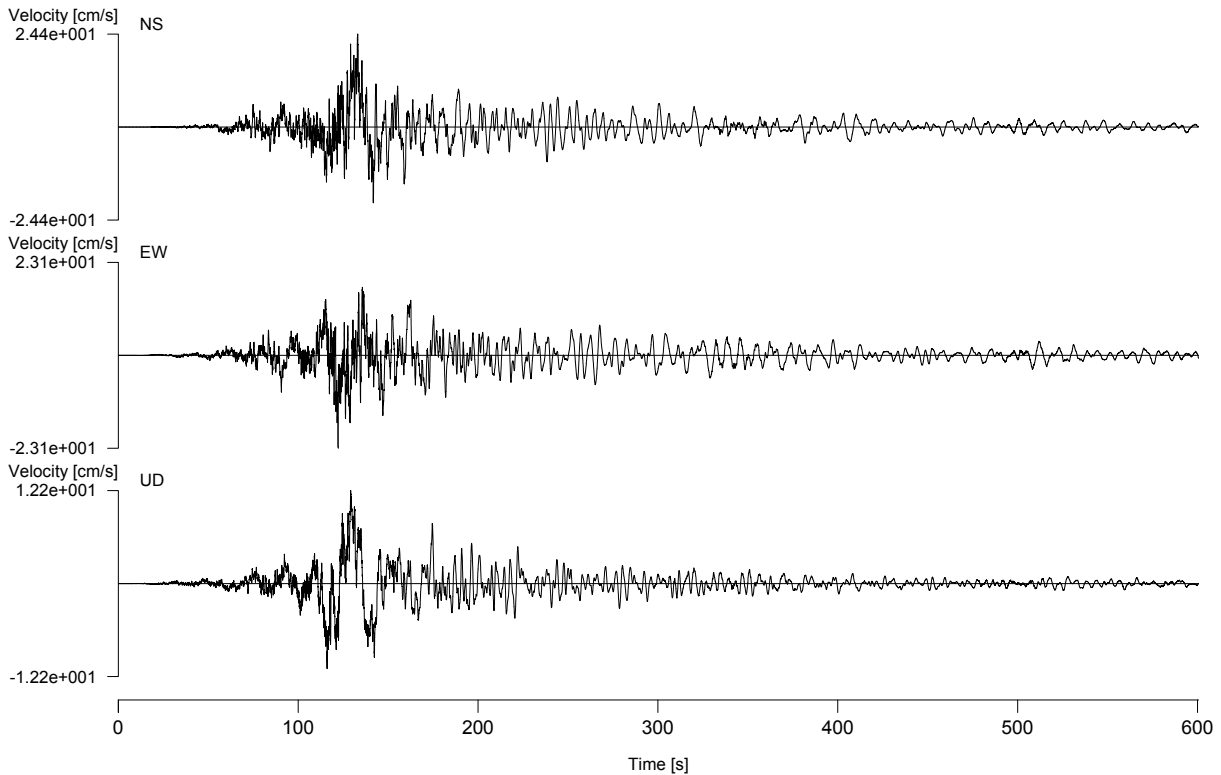
2011 Off the Pacific Coast of Tohoku earthquake, Strong Ground Motion



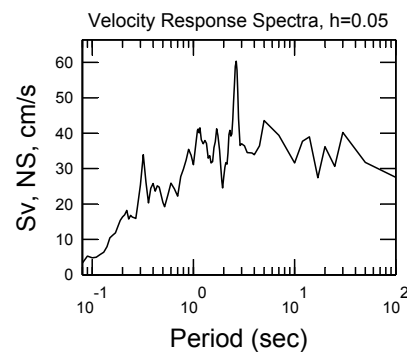
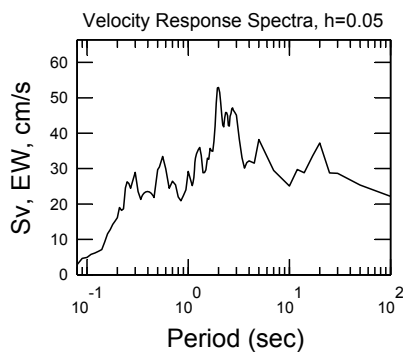
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Science and Disaster Prevention

Long Period Ground Motion recorded at K-NET, Shinjuku station (TKY007)

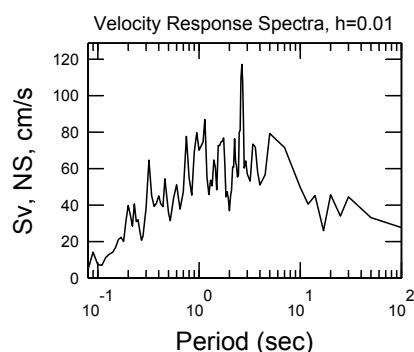
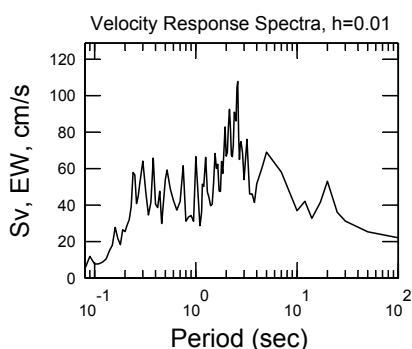
TKY007 2011/03/11 14:47:09



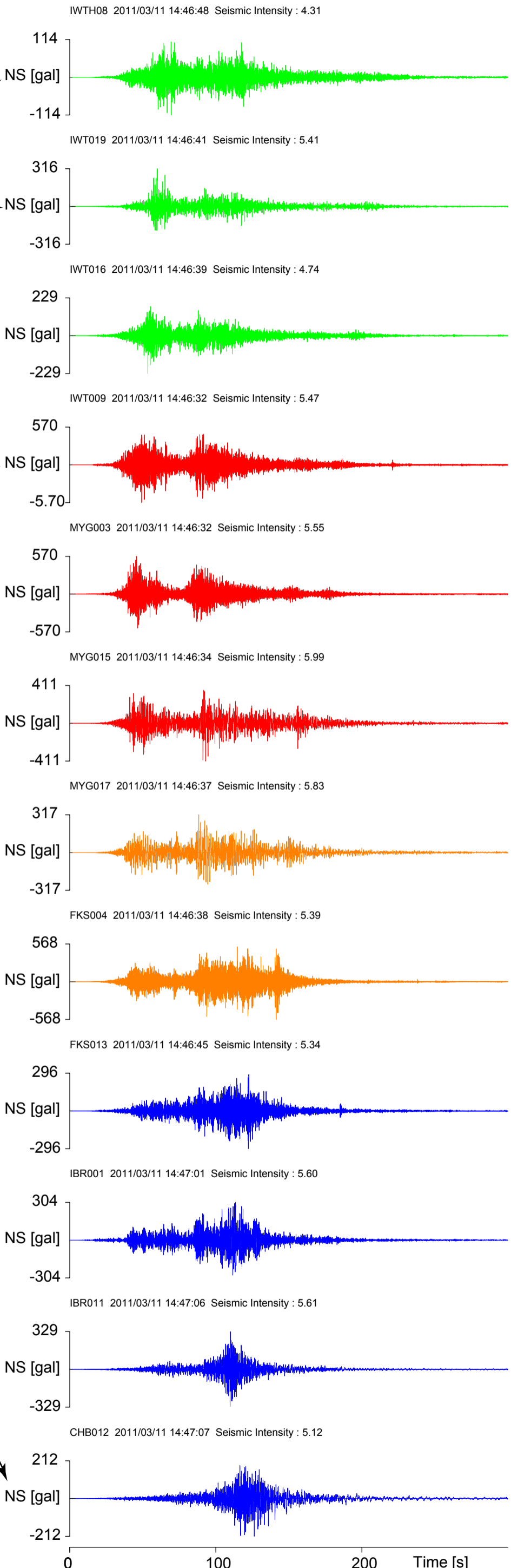
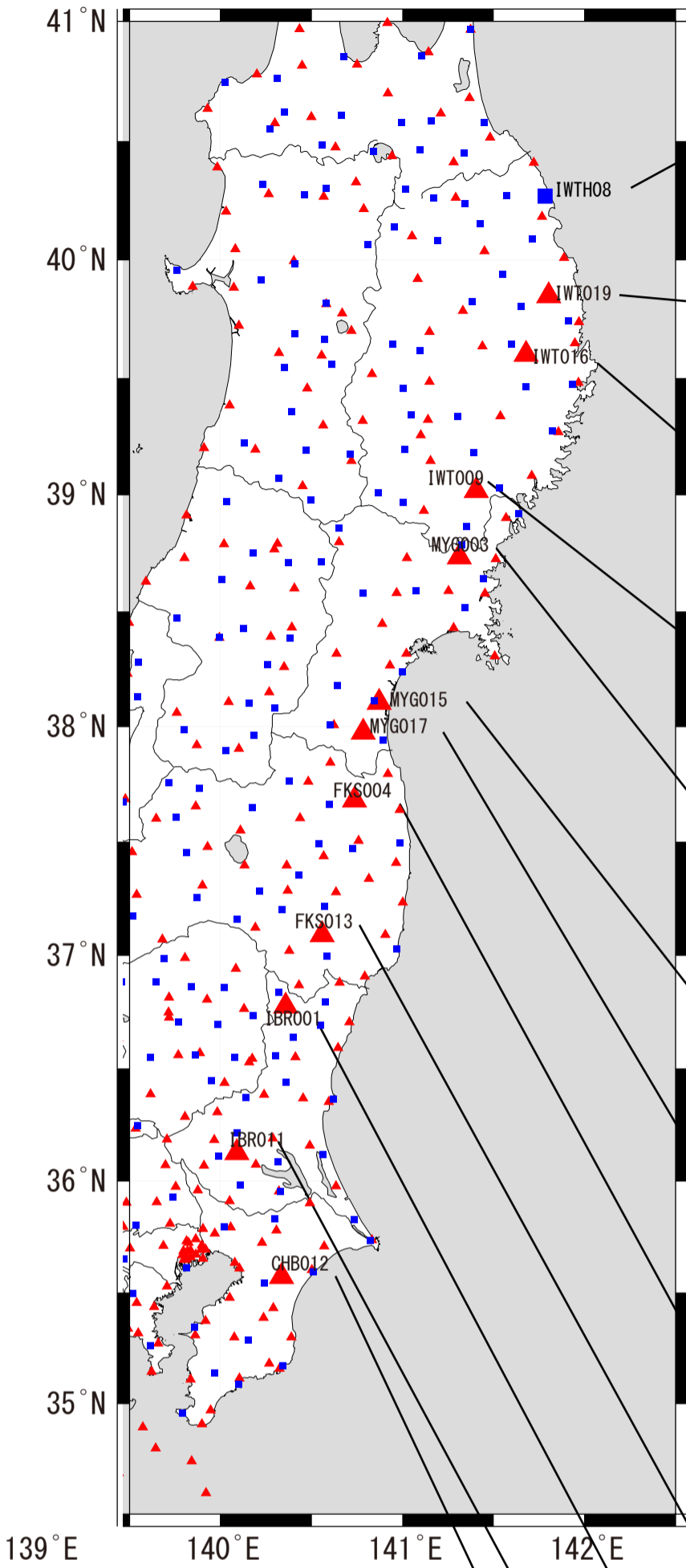
Velocity Response Spectra (5% damping)



Velocity Response Spectra (1% damping)



Characteristics of near-source ground motions



The first phase is predominant

Both phases are distinct

The second phase is predominant

The first phase is not visible

Near-source acceleration waveforms display two remarkable phases of ground motion which suggest the existence of a least two areas of large slip.

In the northern part of the source area the first phase is predominant while in the South this phase is not visible.

These two phases of ground motion suggest large slip areas in the North and South regions respectively.

The remarkable differences in grow characteristics of intensity values for the Miyagi and Ibaraki regions indicate they originate from different slip areas.

A small ground motion phase is observed between the two large distinct phase at some stations (FKS013, FKS004, MYG017, MYG015).

Other secondary phases are also observed suggesting a very complex source process

Source Process of the 2011 Off the Pacific Coast of Tohoku earthquake based on Strong Ground Motions (Preliminary)

National Research Institute for Earth Science and Disaster Prevention



- Fault Model
- Strike : 195 degrees
- Dip : 13 degrees
- Size : 510km × 210km

- Results
- $M_0 : 3.28 \times 10^{23} \text{Nm}$ ($M_w 8.9$)
- Largest slip : 23m

This is a preliminary result and it will be updated

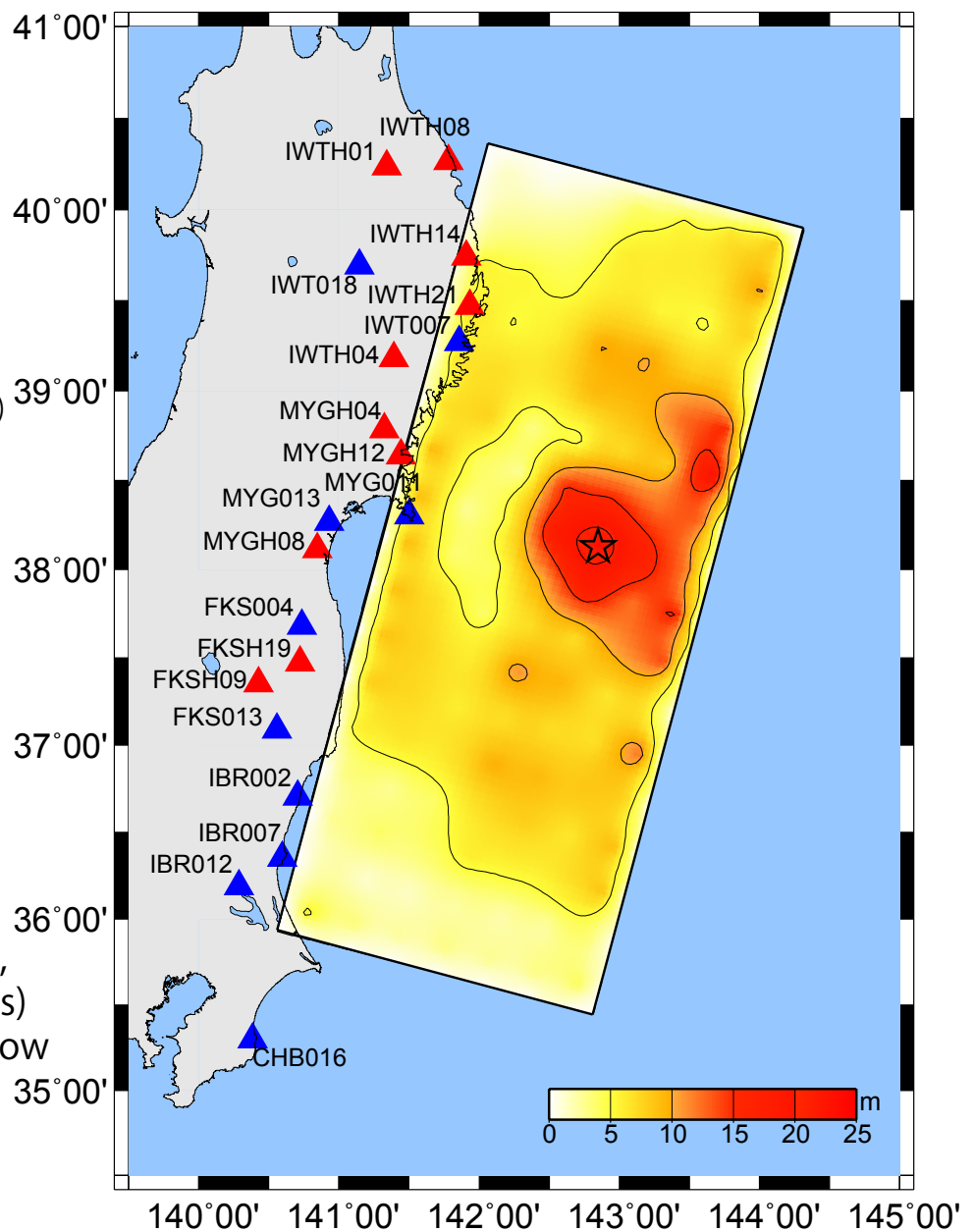


Figure 1 : Stations used for inversion (Red: K-NET stations, Blue: KiK-net borehole stations) and slip distribution. A red arrow displays the epicenter.

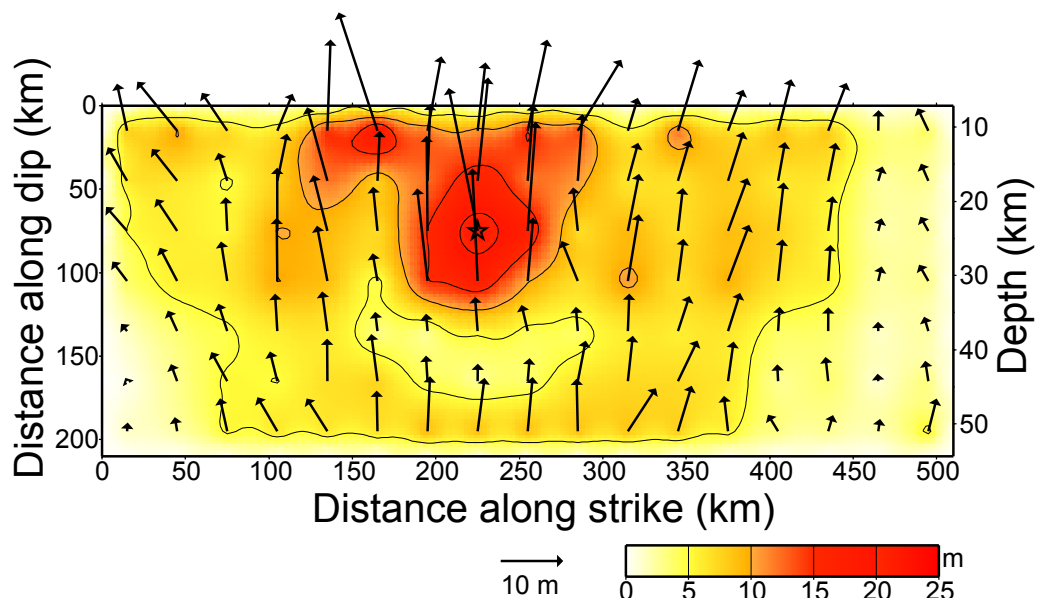


Figure 2 : Slip distribution. Contour lines of slip every 5 m are displayed. The arrows show the slip directions and amplitudes of the hanging wall.