J-Rapid Symposium Flash Japon
Sendai, 6-7 March 2013
Projects

• Rapid response geophysical survey in the fault zone. Sh. Kodaira and G. Moore (U.S.A.)

• Urgent surveys for evacuation measures from unexcepted large tsunami. K. Satake and H. Harjono (Indonesia)

• Evaluation potential of large aftershocks. Yo Fukushima P. Segall (U.S.)

• DYNTOHOKU. S. Ide and R. Madariaga (France)

• Tohoku Oki from Earth to Oceans and Space Sh Watada and A. Sladen (France)

• Crustal seismic velocity changes and deformation T. Nishimua and F. Brenguier (France)

• Paleoseismology and paleotsunamis of the NE Japan subduction zone. Sh. Toda and M. Meghraoui (France)
Major questions about the Tohoku earthquake

1. Why was it unexpected?
2. What did actually happen and will happen?
3. Why did it grow to be so big?
4. How can we better observe future mega-thrust earthquakes?
Why did we not expect it?

Interpretation of Historical seismicity of Tohoku

Expected Earthquake M~8

Abe et Kanamori et al, 1970s

http://www.j-shis.bosai.go.jp/map, ca. 2010
Simulation of a possible tsunami source based on Jogan Earthquake of 869

Improved paleoseismology
Toda and Meghraoui

Minoura et al, 2001
What did actually happen?

Many

Slip on the fault

Nishimura et al, 2011-13

Satake Harjono

Tsunami height

Fujii-Satake, 2011
What did actually happen?

The source of high frequencies is not the same as the source of low frequencies.

Ide and Madariaga

Satake Harjono

(Nishimura Brenguier)
What did actually happened and will happen?

Geodesy

- Coseismic (120 s)
- Post seismic (10 years?)
- Inter-seismic (>1000 years)
- Coastal subsidence
- Offshore uplift creates tsunami

From Roger Bilham,
1. What did actually happen and what will happen?

We only have 20 years of geodetic data for an earthquake that took at least 1000 to prepare. And we can only observe in the surface.

Fukushima Segall classical and modern geodesy

Ide Madariaga GPS near and far field

Nishimura Brenguier local GPS

Toda Meghraoui coastal deformation
Why did it grow to be so big?

Kodaira and G.F. Moore       Ide and Madariaga

Affects rupture process (Ide+Madariaga)

Affects tsunami generation (Satake+Harjono       Watada+Sladen)
How can we better observe future mega-thrust earthquakes?

Use space observations: infrasounds, GPS observed in the upper atmosphere, etc.
Watada-Sladen

Detect velocity changes using seismological methods (coda waves, noise crosscorrelations)

T. Nishimura, F. Brenguier