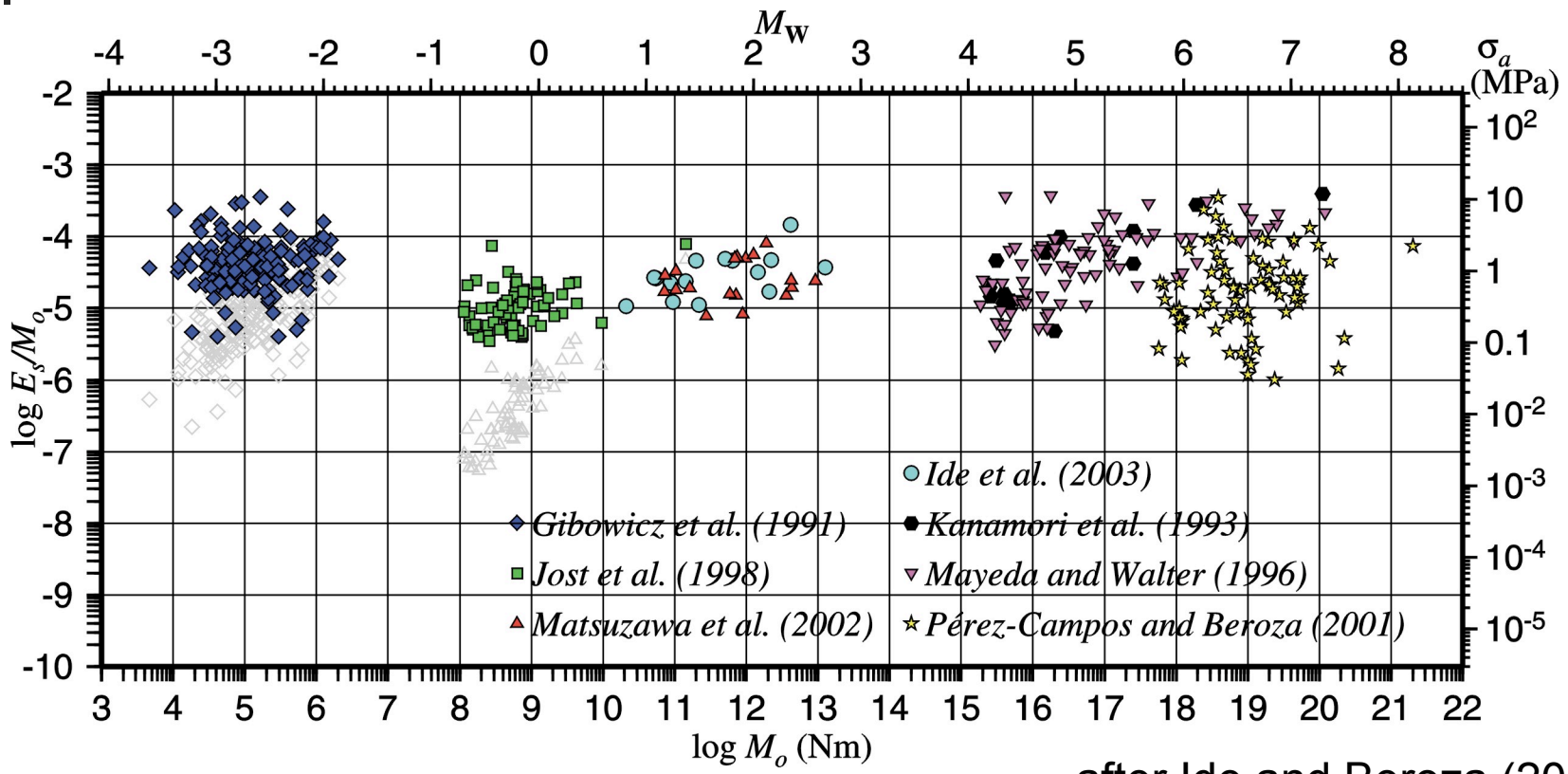
Energy estimation of aftershocks of the 2000 Tottori, Japan, earthquake: wide-scale analysis using Hi-Net, 1000 sps data.

Satoshi Ide (University of Tokyo)
Makoto Matsubara and Kazushige Obara (NIED)

Problem

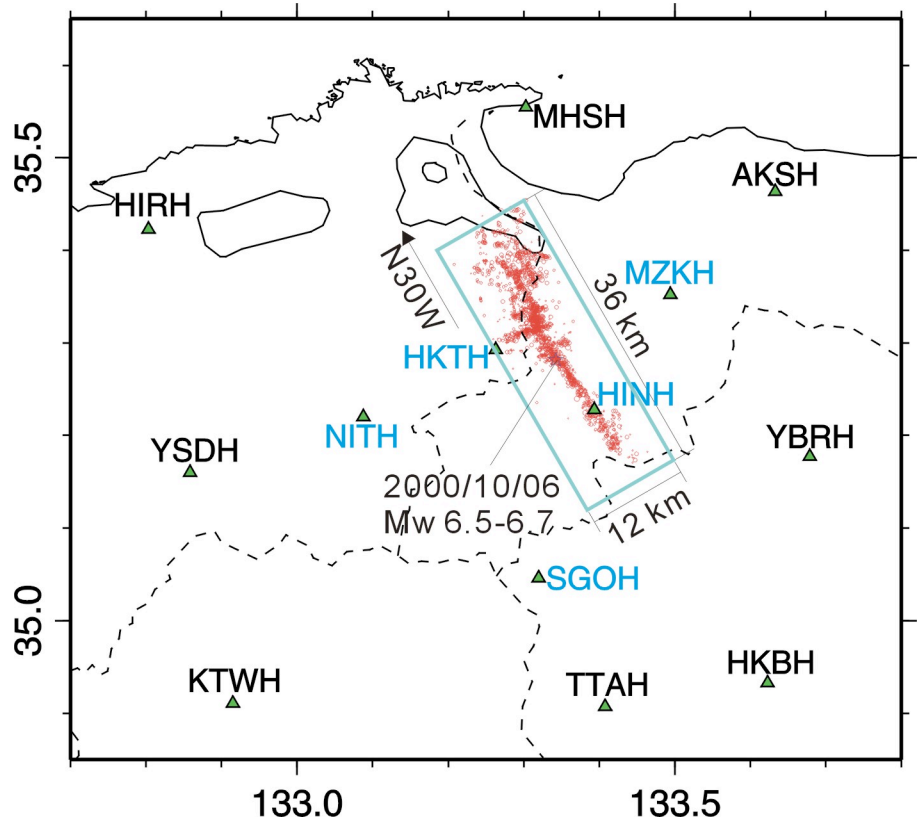


after Ide and Beroza (2001)

- Unclear size dependence
- Different method for each data set
- Regional difference in apparent stress (Jin and Fukuyama, 2003)

Event: 2000 Tottori EQ

- 2000/10/06 Mw 6.5-6.7
- So far largest shallow event recorded by Hi-Net & KiK-Net, Japan
- Shallow borehole Granite/Basalt sites
- Hi-Net data
  - 100 sps at 13 sites
    Period 1 (2000/10/05-10/18)
    Period 2 (2002/03-2002/12)
  - 1000 sps at 5 sites
    Period 2 (2002/03-2002/12)
- KiK-Net data
  - Unsaturated for mainshock

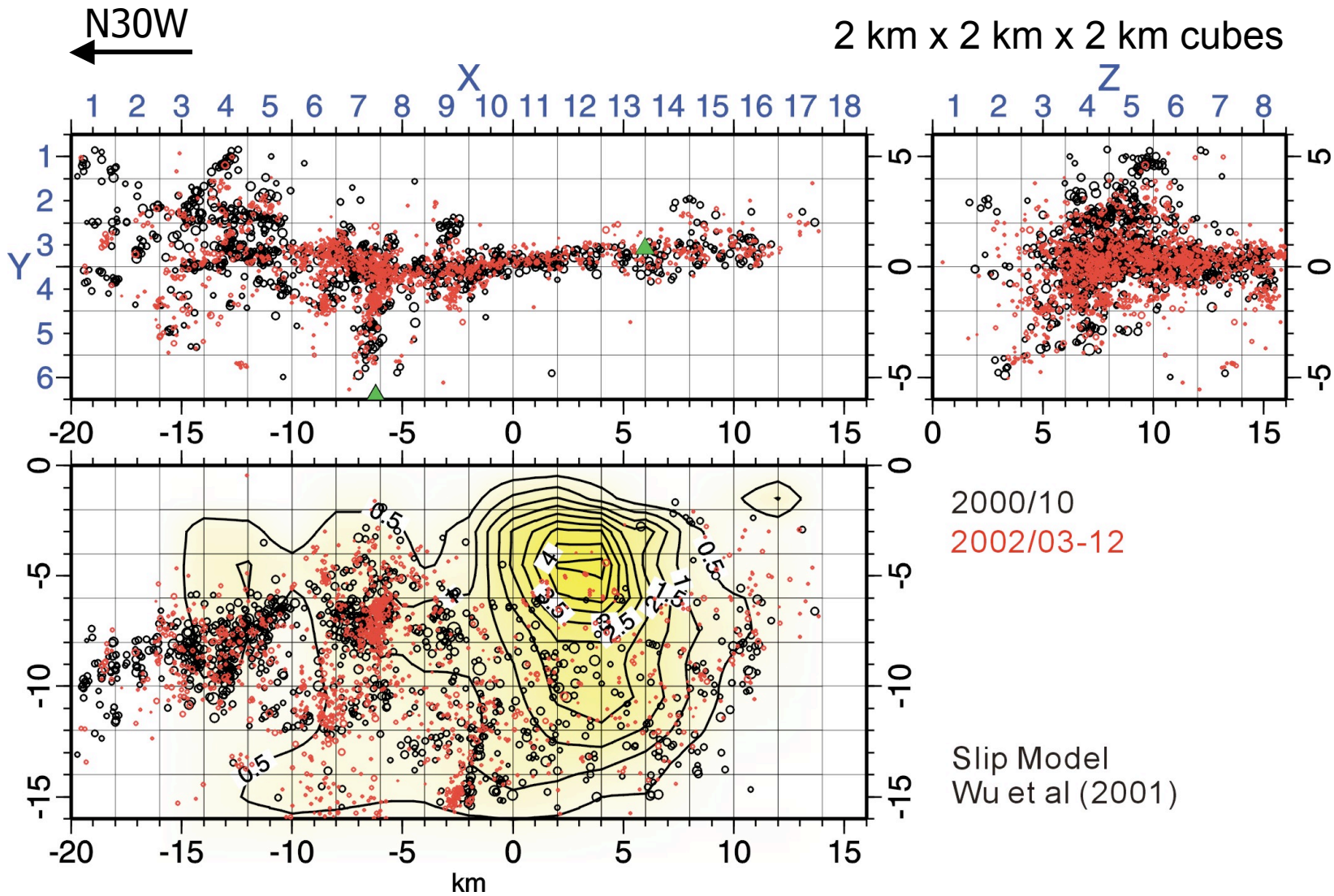


Mw 0.5-6.6

Procedure

- 1k sps data: 2.5 – 200 Hz M0.5 – M3
  100 sps data: 0.25 – 30 Hz M2.5 – M5
- Events within each small cell
- Mechanism determination using polarity and amplitude
- Use similar mechanism events
  (for smallest ones, just polarity similarities)
- Spectral ratio with omega-square assumption (P-waves, vertical component)

Hypocenters and Cell Division

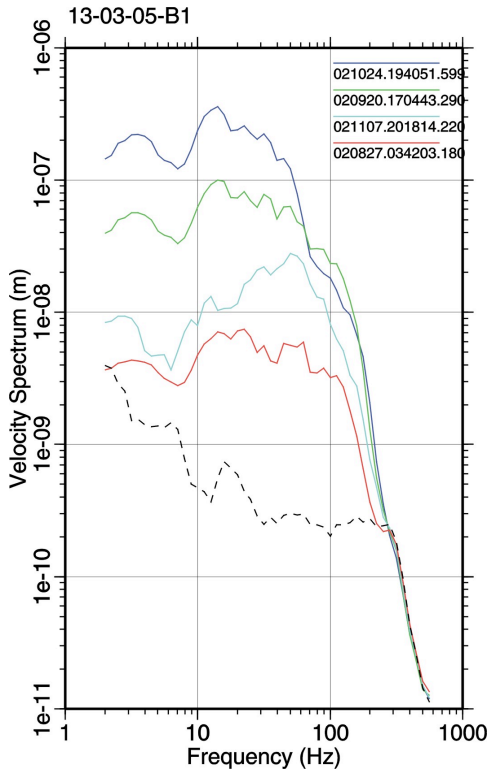


hypocenters are relocated using hypoDD (Waldhauser and Ellsworth, 2000)

Analysis of 1k Data

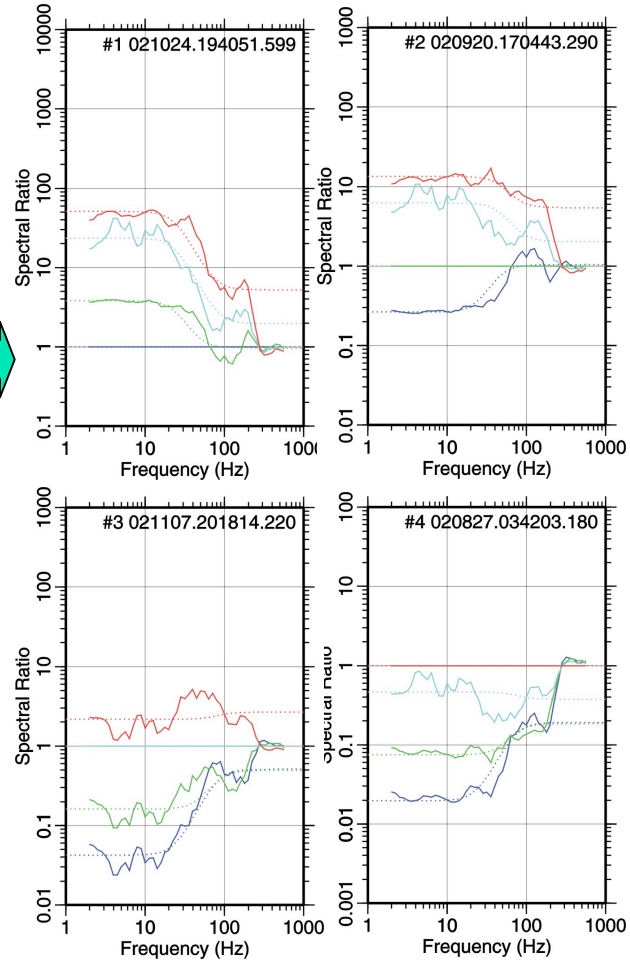
Spectral ratio analysis (Ide et al., 2003) similar to MEGF Analysis (Hough, 1996)

Calculate Spectrum

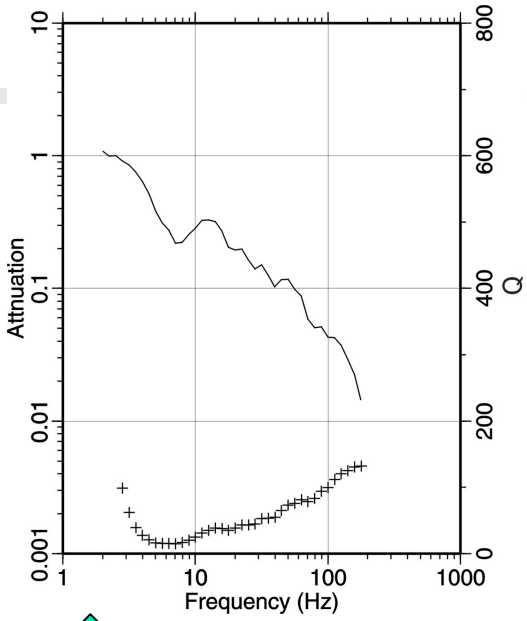


Only P wave (vertical)

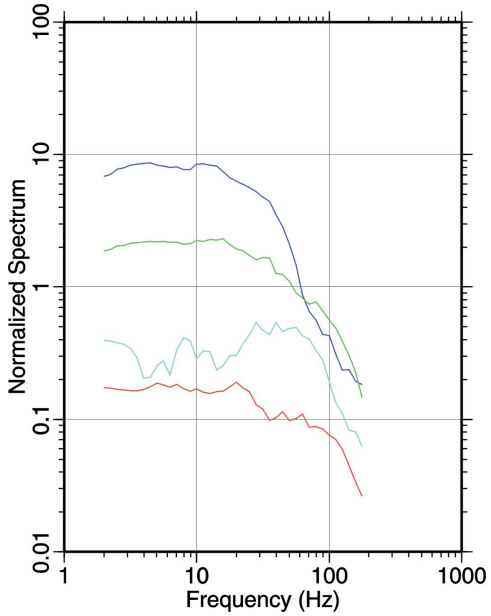
Linearized inversion



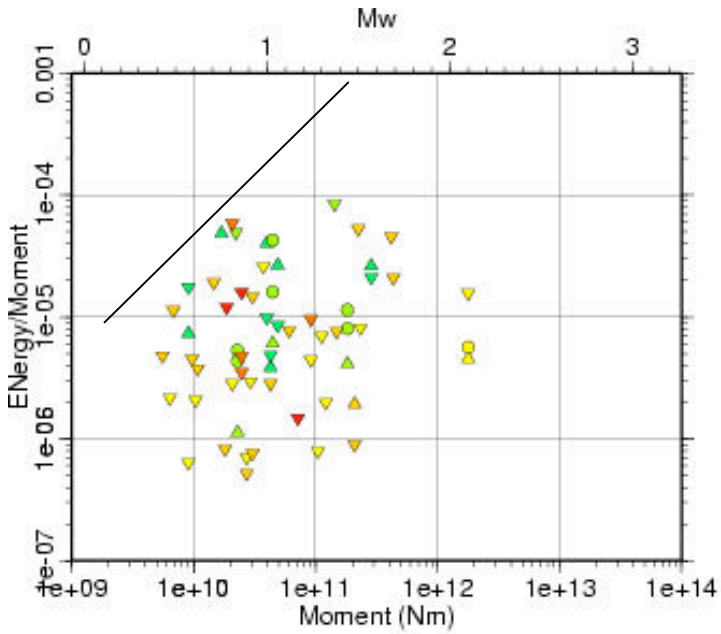
Attenuation Estimate



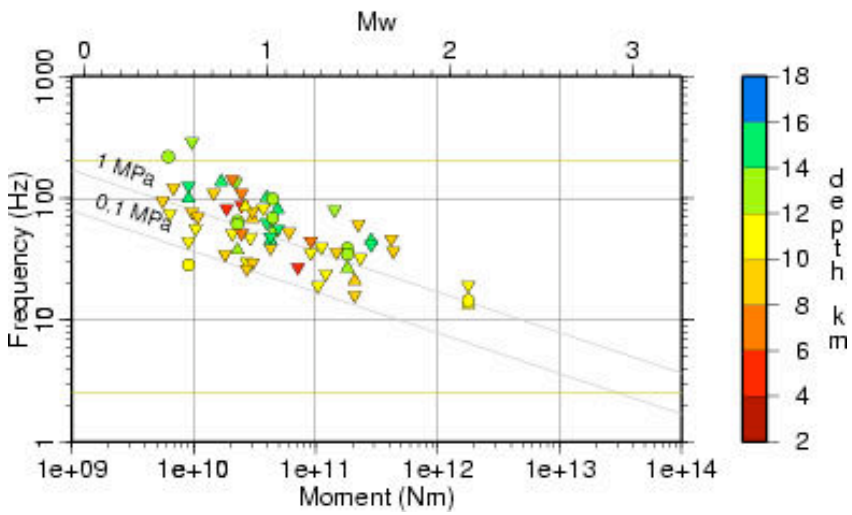
Energy Estimate



Scaling: 1k sps data



E_s approx. E_s^p x 10

Depth dependence?

Size dependence?