On strong ground motion from recent normal faulting earthquakes in Japan

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# Outline of the earthquakes used in this study

Ekq name	Time	M_w	Slip Style	備考
Ekq 2011/03/19	2011/03/19	5.8	NM	F-NET
Ekq 2011/03/23	2011/03/23	5.7	NM	F-NET
Hamadori	2011/04/11	6.7	NM	GCMT
Western Tottori	2000/10/06	6.7	SS	GCMT
Noto Hanto	2007/03/25	6.7	RV	GCMT

Characteristics of the 2011/4/11 Hamadori Eqk
★Normal faulting
★Surface break（Max. of surface slip: 2m）
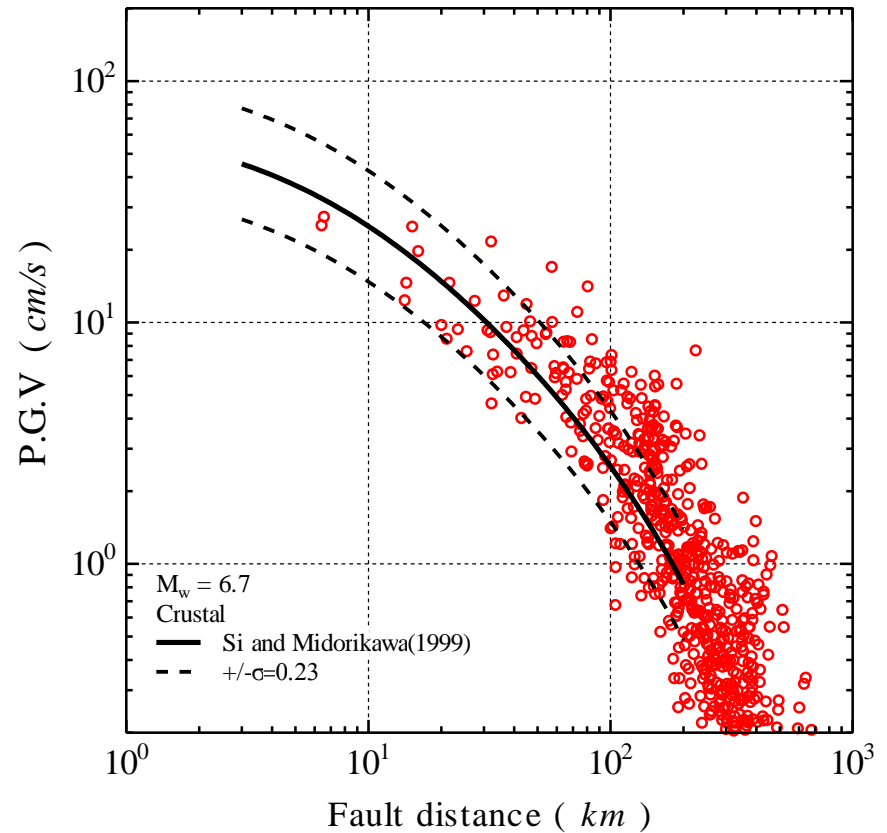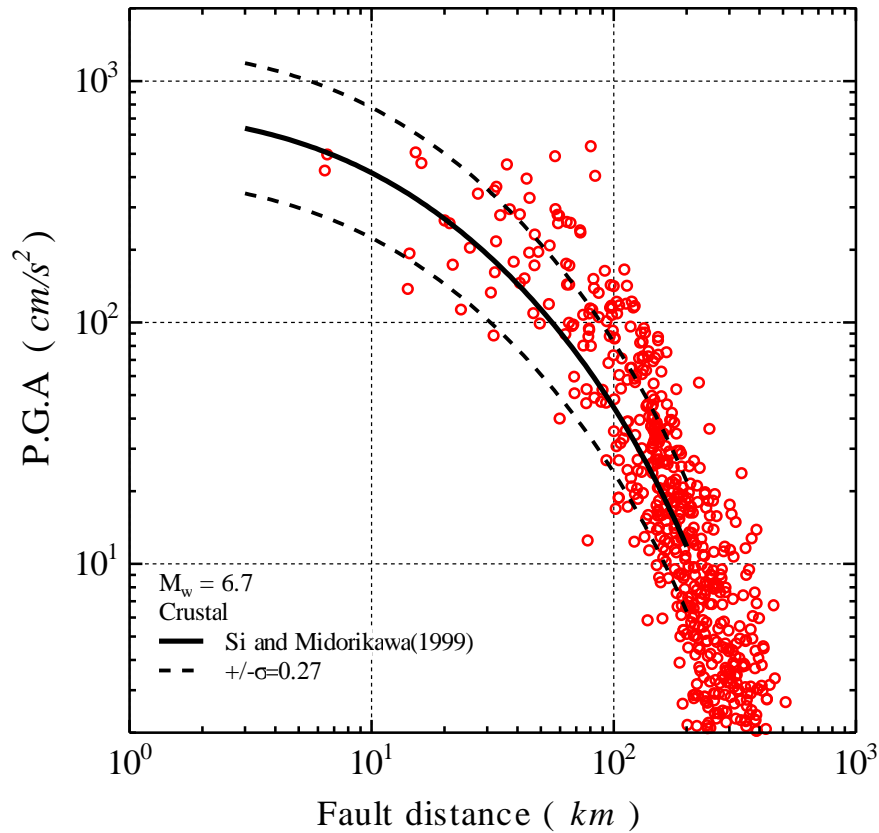
http://www.globalcmt.org

Kurosawa et al.（2011）, Report on the surface ruptures along the Itosawa fault, by Oyo corporation .
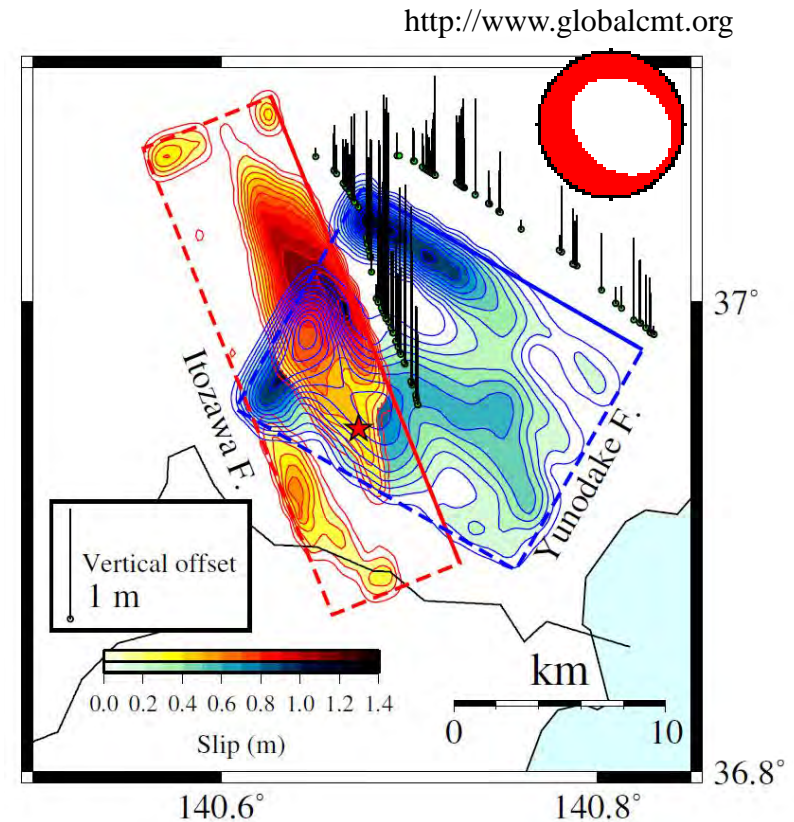
Shiba and Noguchi (2012)

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Plots of peak motions for the M_w6.7 Hamadori earthquake

Records from K-NET and KiK-net by NIED are used.

Si, Kawasato, Ohba, Watanabe, Masatsuki, and Sawaii (2012) A comparison of existing ground motion prediction equation to normal faulting earthquake, Summaries of technical papers of Annual Meeting, Architectural Institute of Japan, B-2, pp.177-178, 2012.

GMPE in Japan by Si and Midorikawa (1999)

Equation of PGV by Si and Midorikawa (1999) shown as follows:

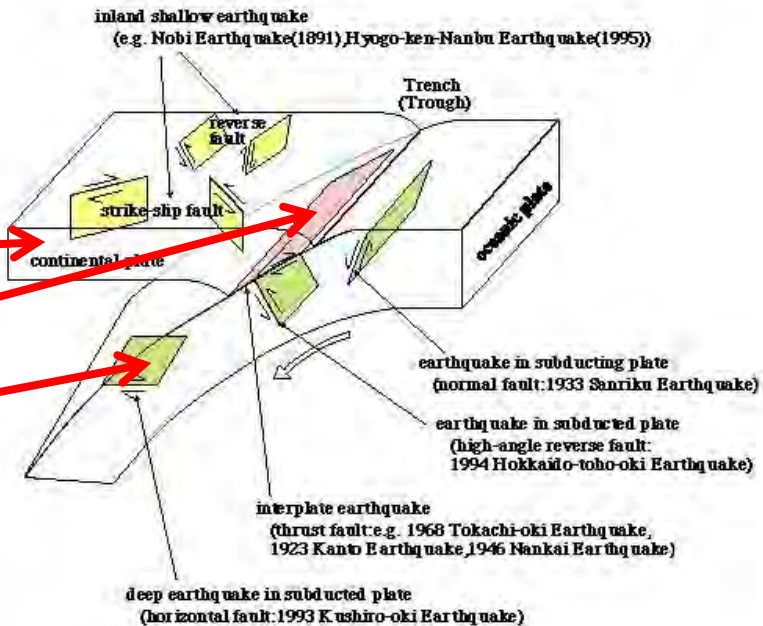$$\log PGV = 0.58 M_w + 0.0038 D + d - \log(X + 0.0028 \bullet 10^{0.5 M_w}) - 0.002 X - 1.29$$

where X, M_w show fault distance, and moment magnitude, respectively. D is focal depth represented by the depth of the center of a fault plane. d shows is defined as bellow:

$d=$

0.0 for crustal

-0.02 for inter-plate

0.12 for intra-plate

inland shallow earthquake
(e.g. Nobi Earthquake(1891),Hyogo-ken-Nanbu Earthquake(1995))

Trench
(Trough)

reverse
fault

strike-slip fault

continental plate

oceanic plate

earthquake in subducting plate
(normal fault:1933 Sanriku Earthquake)

earthquake in subducted plate
(high-angle reverse fault:
1994 Hokkaido-toho-oki Earthquake)

interplate earthquake
(thrust fault:e.g. 1968 Tokachi-oki Earthquake,
1923 Kanto Earthquake,1946 Nankai Earthquake)

deep earthquake in subducted plate
(horizontal fault:1993 Kushiro-oki Earthquake)

• The GMPE is defined on stiff ground with Vs30=600m/s
• Adopted as the GMPE used in the hazard map in Japan

http://www.hp1039.jishin.go.jp/eqchreng/f2-18.htm

Average residuals for records within 100km in fault distance

$$\text{Residual} = \log\left(\frac{\text{PGM}_{\text{obs}}}{\text{PGM}_{\text{SM99}}}\right)$$

Normal faulting earthquake	PGA	PGV
Eqk 2011/03/19	0.21	0.06
Eqk 2011/03/23	0.06	-0.11
Hamadori Eqk	0.18	0.08
Average	0.16	0.02

(1) Comparising with Si and Midorikawa (1999), the three normal faulting earthquakes show larger PGA, but almost the same PGV in average.

(2) Normal faulting Mw6.7 Hamadori eqk shows larger PGA than the SS event, but almost the same as the RV event, but almost the same for PGV.

(3) Physical background is under investigation.

Earthquakes	PGA	PGV	Slip style
Hamadori	0.18	0.08	NM
Western Tottori	0.06	-0.01	SS
Noto-hanto	0.15	0.09	RV

Thank you very much for your attention!

Si, Kawasato, Ohba, Watanabe, Masatsuki, and Sawaii (2012) A comparison of existing ground motion prediction equation to normal faulting earthquake, Summaries of technical papers of Annual Meeting, Architectural Institute of Japan, B-2, pp.177-178, 2012.