Seismicity correlations

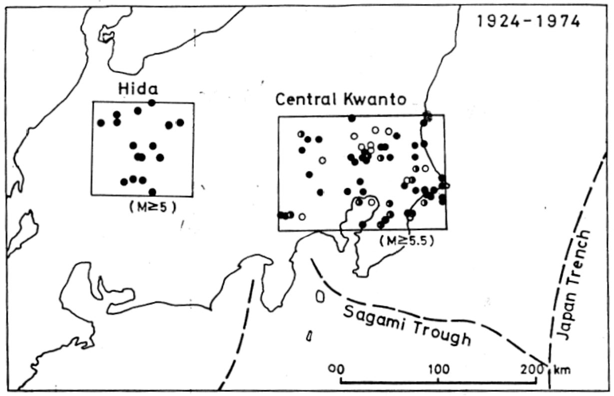
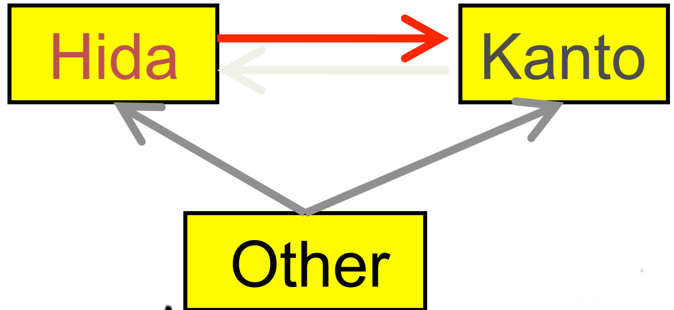
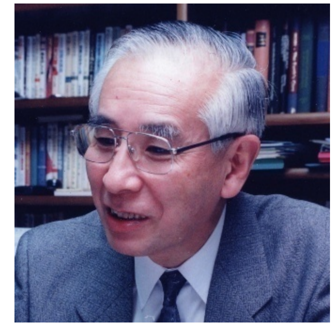


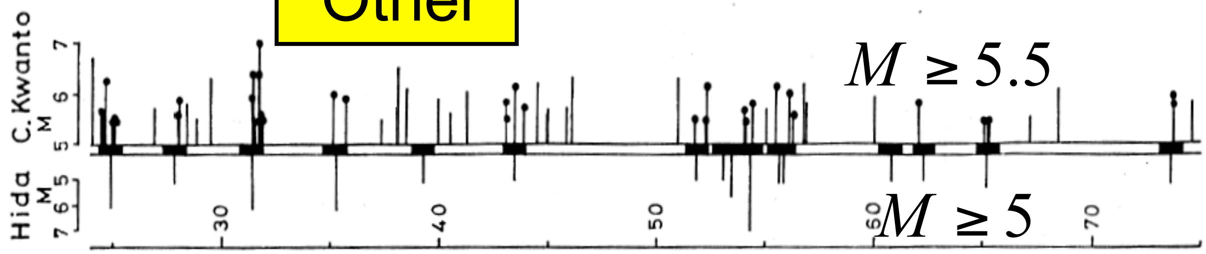
Fig. 1. Epicenters of 16 earthquakes in Hida and 61 earthquakes in central Kwanto. Filled and half-filled circles in the central rectangle indicate the earthquakes which occurred within :hs and within one year from one of the Hida earthquakes, 'ely.

(1981, 82)

Utsu (1975) Zisin (JSSJ)

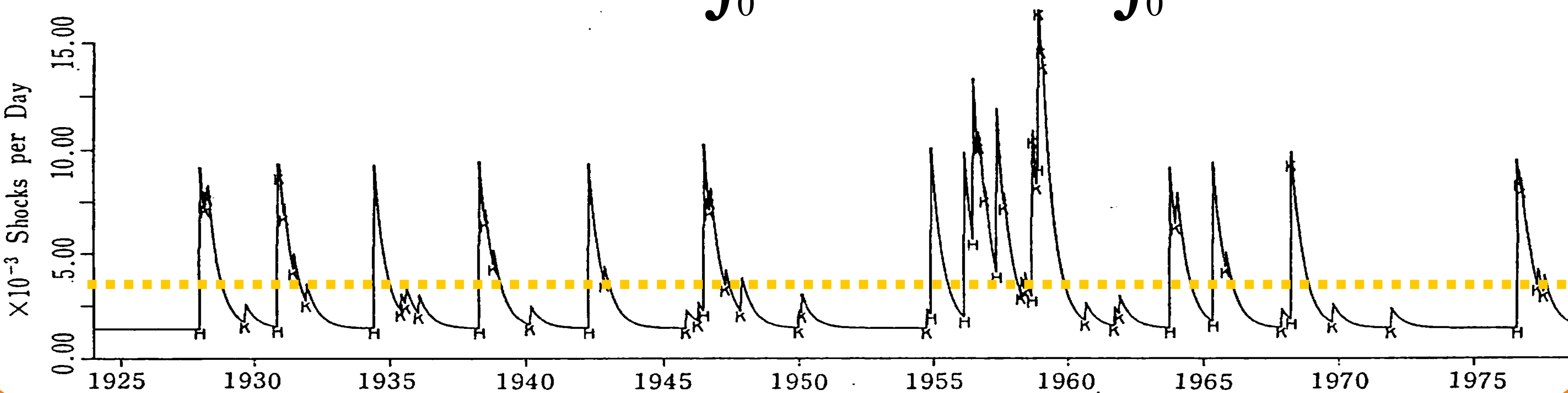






seismicity = (trend) + (internal triggering) + (external triggering)

$$\lambda(t \mid H_t) = \mu(t) + \int_0^t g(t-s)dN_s + \int_0^t h(t-s)dM_s$$



seismicity = (trend) + (internal tiriggering) + (external triggering)

$$\lambda(t \mid H_t) = \mu(t) + \int_0^t g(t-s)dN_s + \int_0^t h(t-s)dM_s \;=\; \mu(t) + \sum_{\{i;\, t_i<t\}} g(t-t_i) + \sum_{\{j;\, \tau_j<t\}} h(t-\tau_j)$$

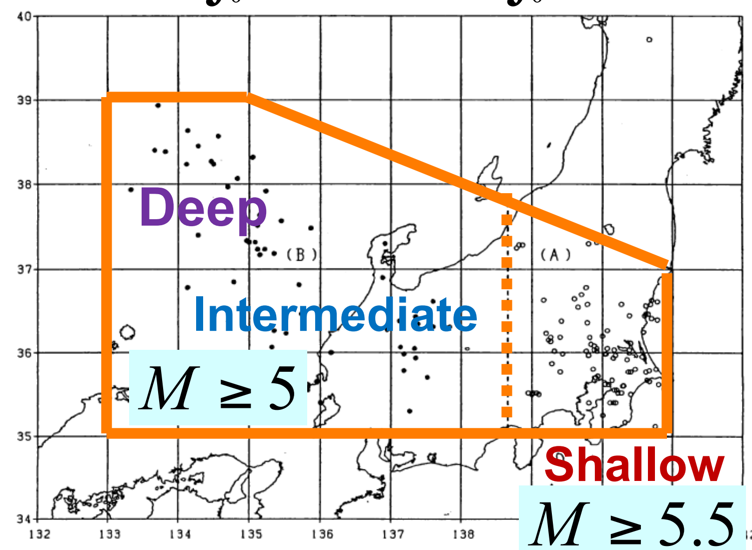
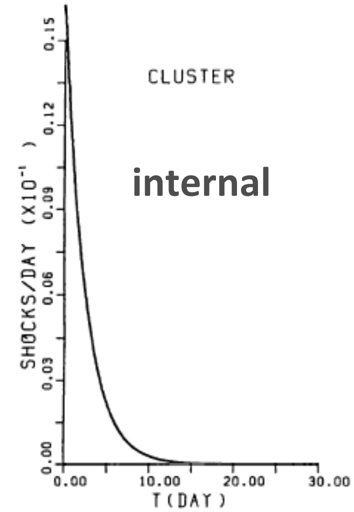
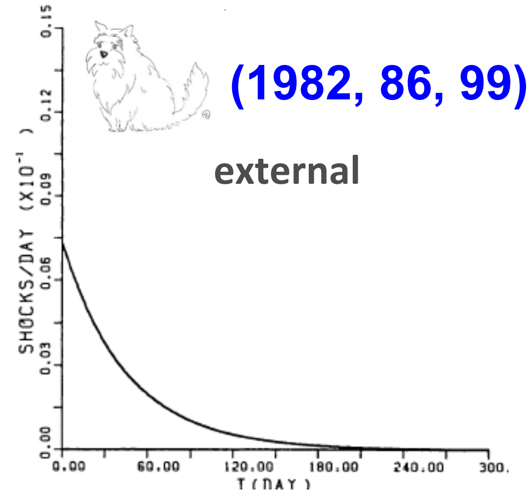
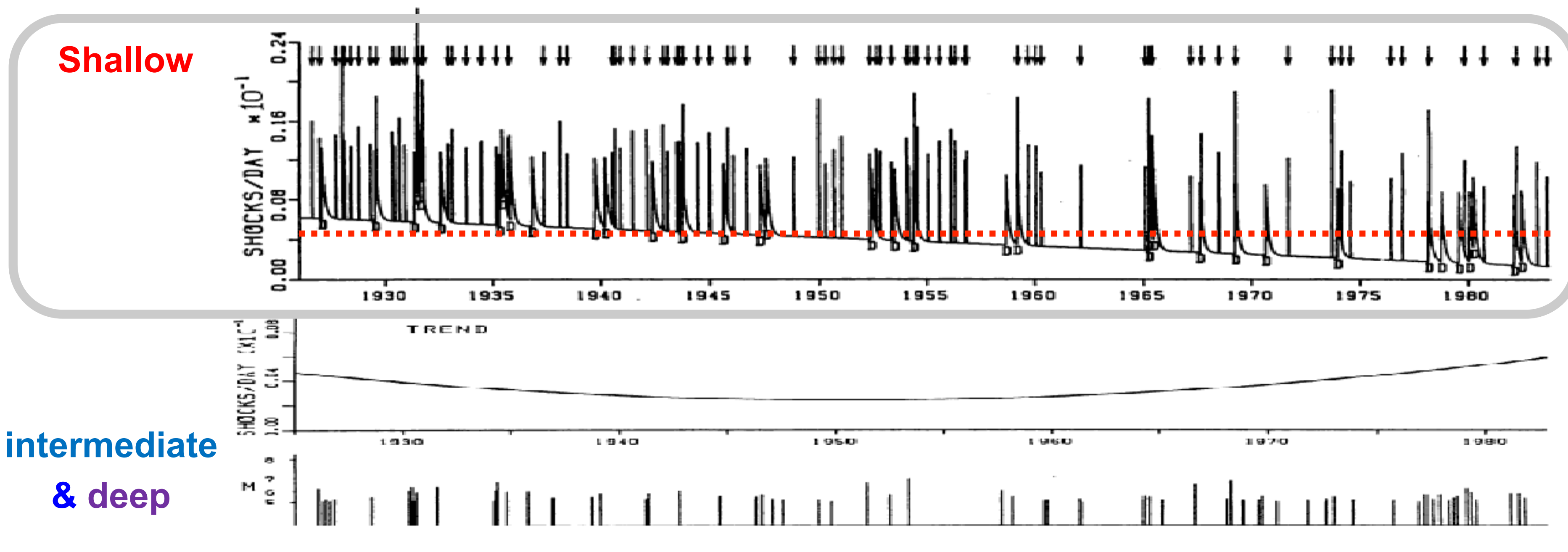
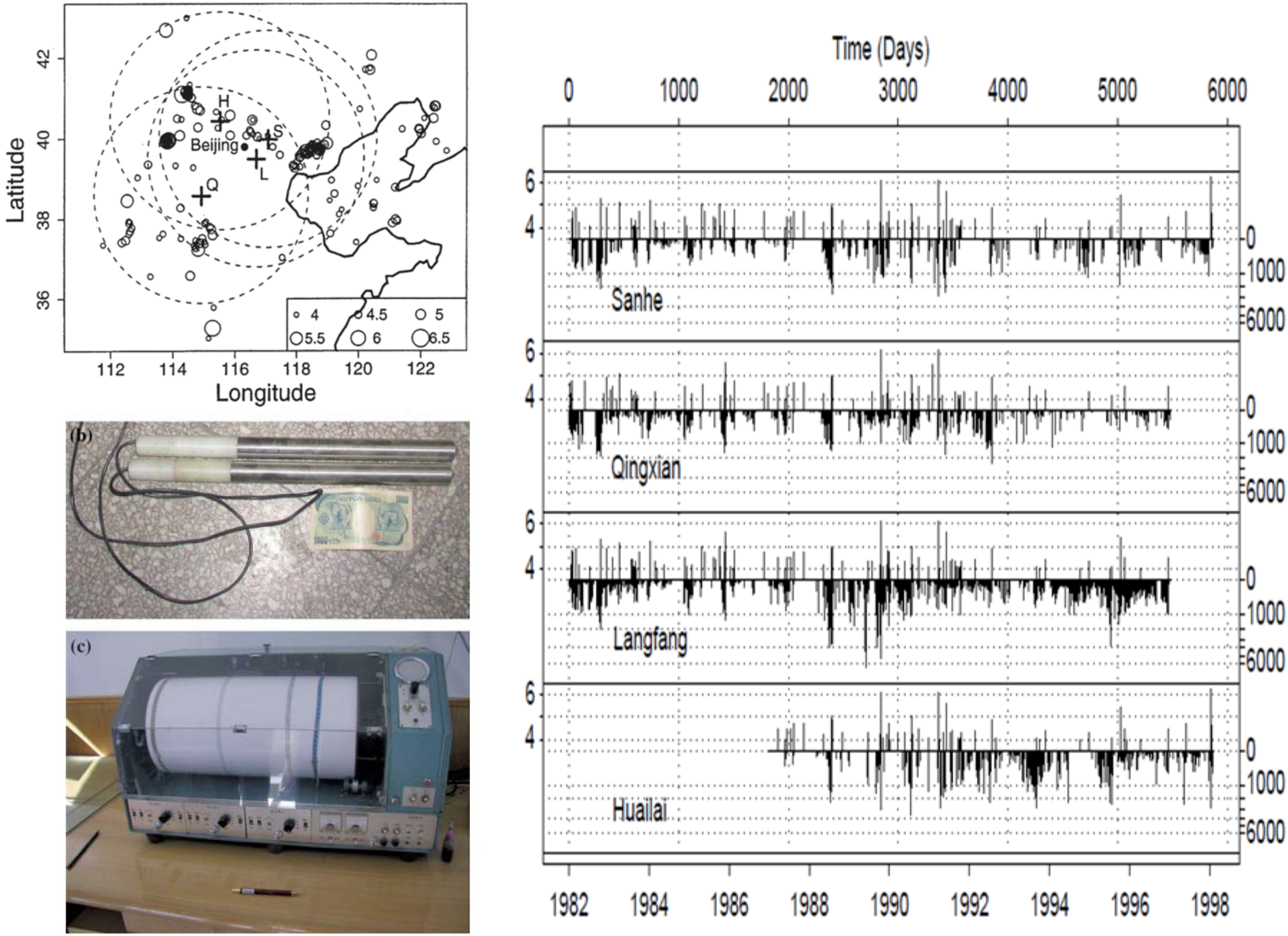


Figure 3. Spatial distributions of the shocks given in Table 6. Open circles and solid circles stand for the shallower and deeper shocks, respectively



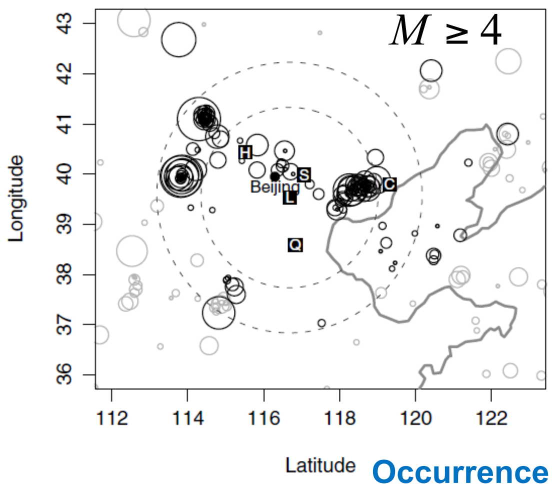


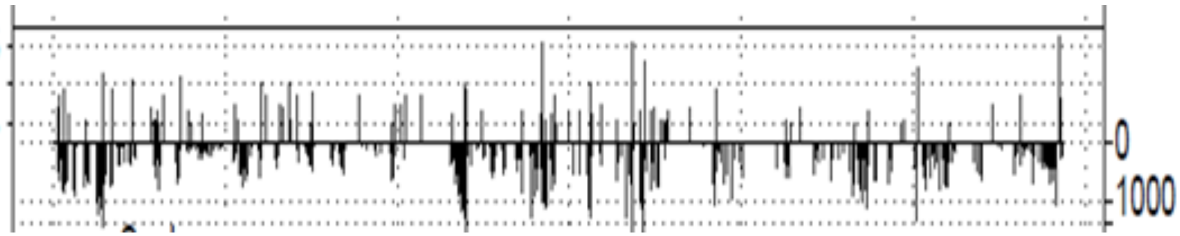




Latitude
Longitude
42
40
38
36
112
114
116
118
120
122
H
S
L
Q
Beijing
4
4.5
5
5.5
6
6.5
(b)
(c)
Time (Days)
0
1000
2000
3000
4000
5000
6000
Sanhe
Qingxian
Langfang
Huailai
6
4
0
1000
6000
1982
1984
1986
1988
1990
1992
1994
1996
1998

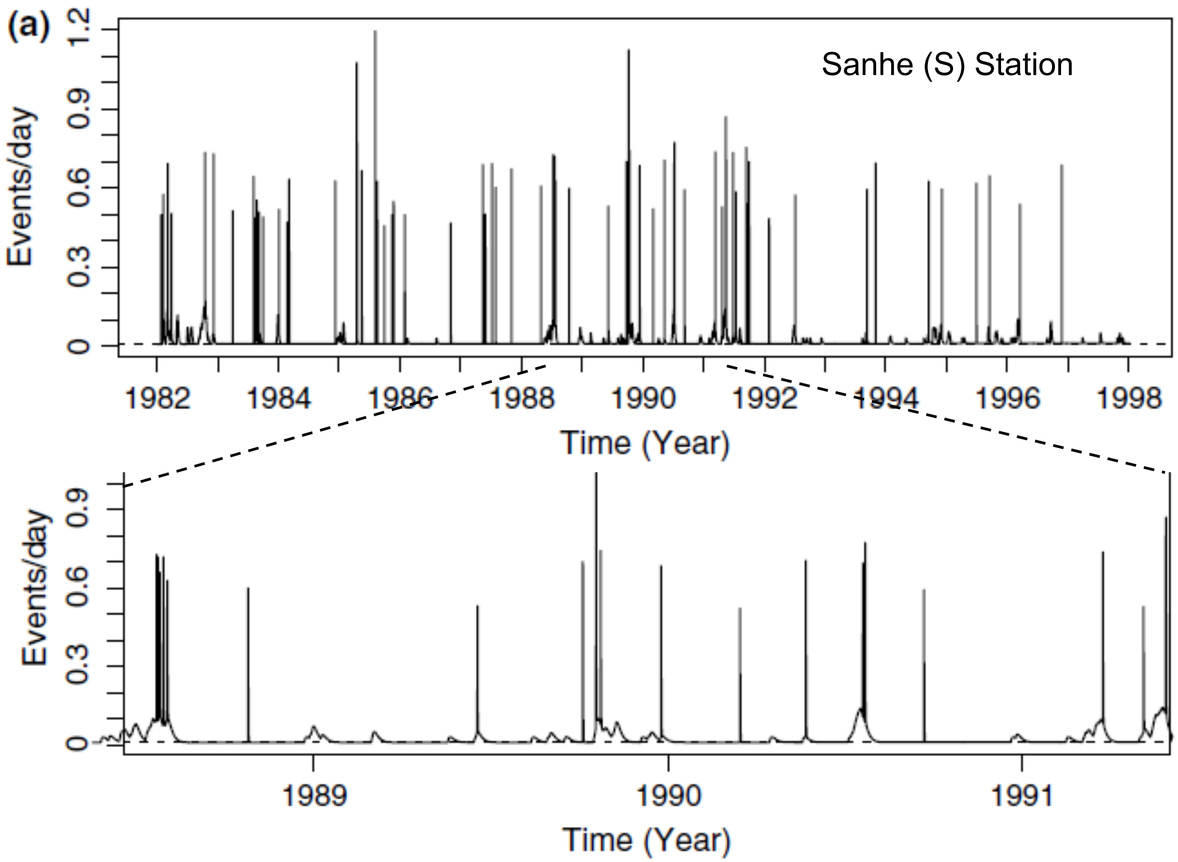
Zhuang et al. (2005, *PAGEOPH*)

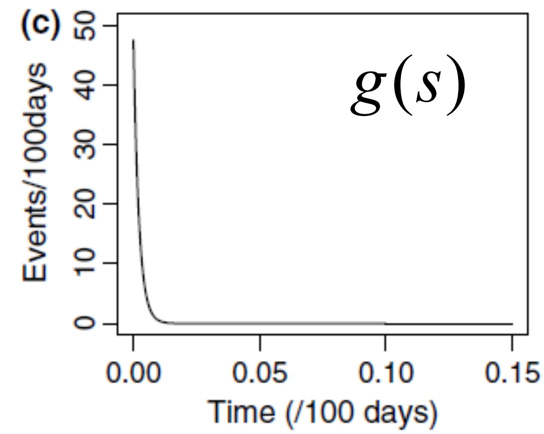


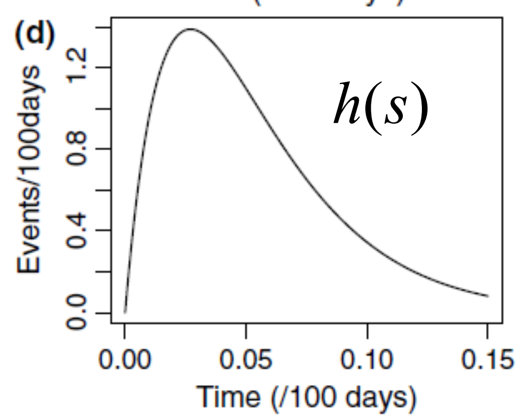


$$
\begin{aligned}
\lambda(t \mid H_t) &= \mu + \int_0^t g(t-s)\,dN_s + \int_0^t h(t-s)\,dM_s \\
&= \mu + \sum_{\{i;\, t_i<t\}} g(t-t_i) + \sum_{\{j;\, \tau_j<t\}} h(t-\tau_j)
\end{aligned}
$$

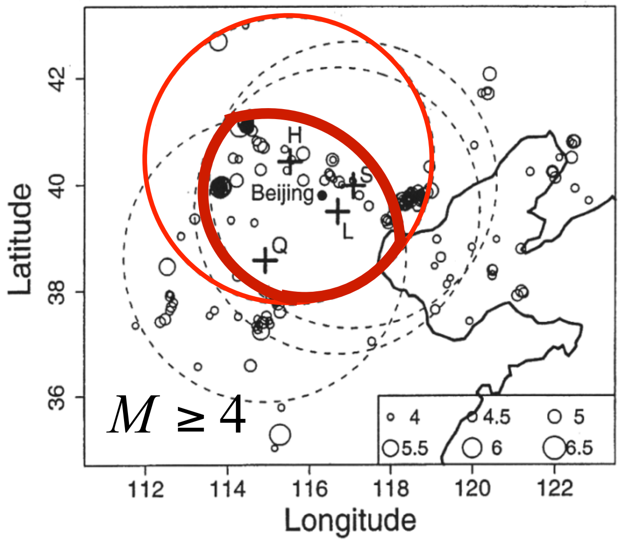
Occurrence rate of M>=4 event per day

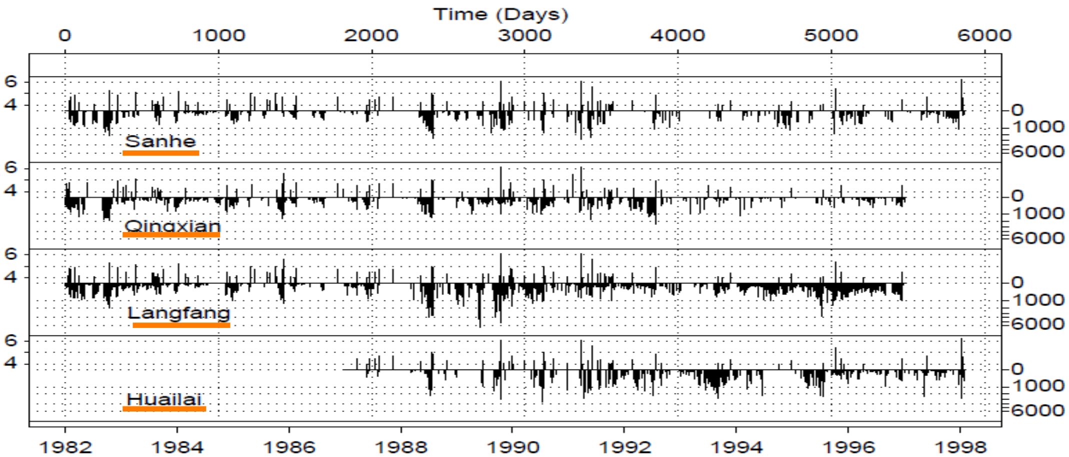






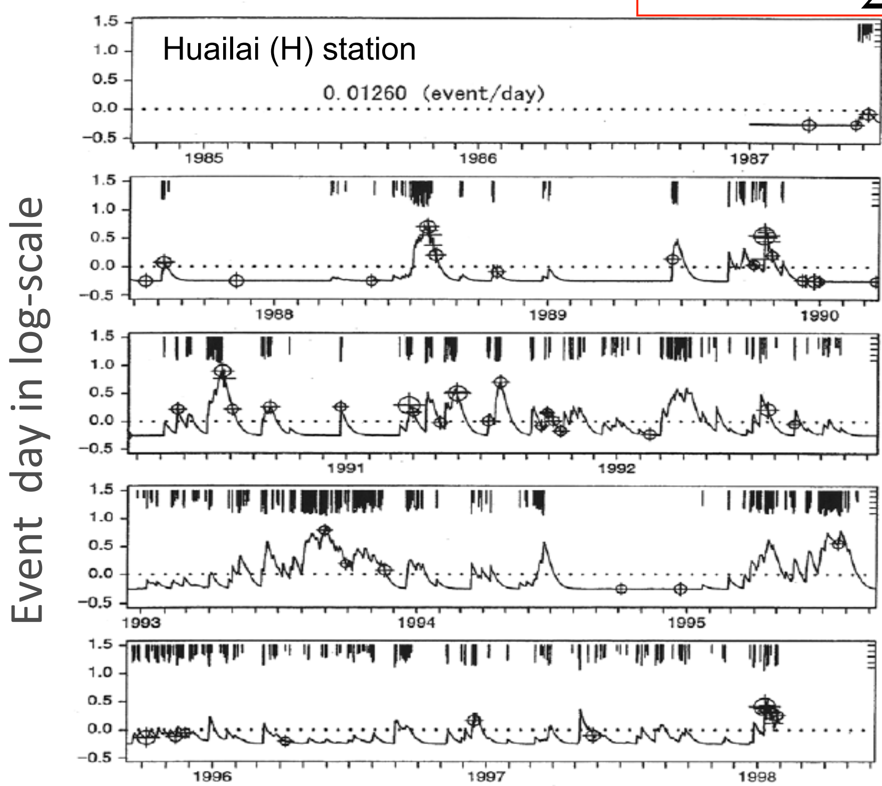
Zhuang & Ogata (2001, *RCCEP*)



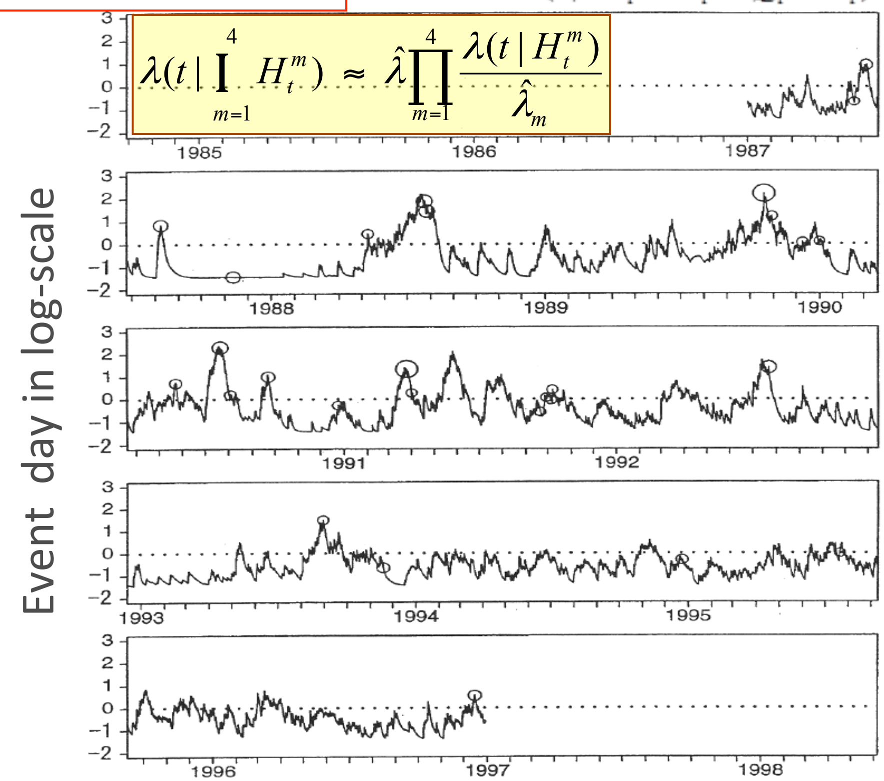


Occurrence rate of M>=4 event per day

$$\lambda(t \mid H_t) = \mu + \int_S^t h(t-s)\xi(s)^a\,ds$$
$$= 0.00702 + \sum_{j=S}^{t} 0.000117\, e^{-0.142(t-j)}\, \xi_j^{0.69}$$



$$\lambda(t \mid H_t \cap L_t \cap Q_t \cap S_t)$$



$$\lambda\left(t \mid \bigcap_{m=1}^{4} H_t^m\right) \approx \hat{\lambda} \prod_{m=1}^{4} \frac{\lambda(t \mid H_t^m)}{\hat{\lambda}_m}$$

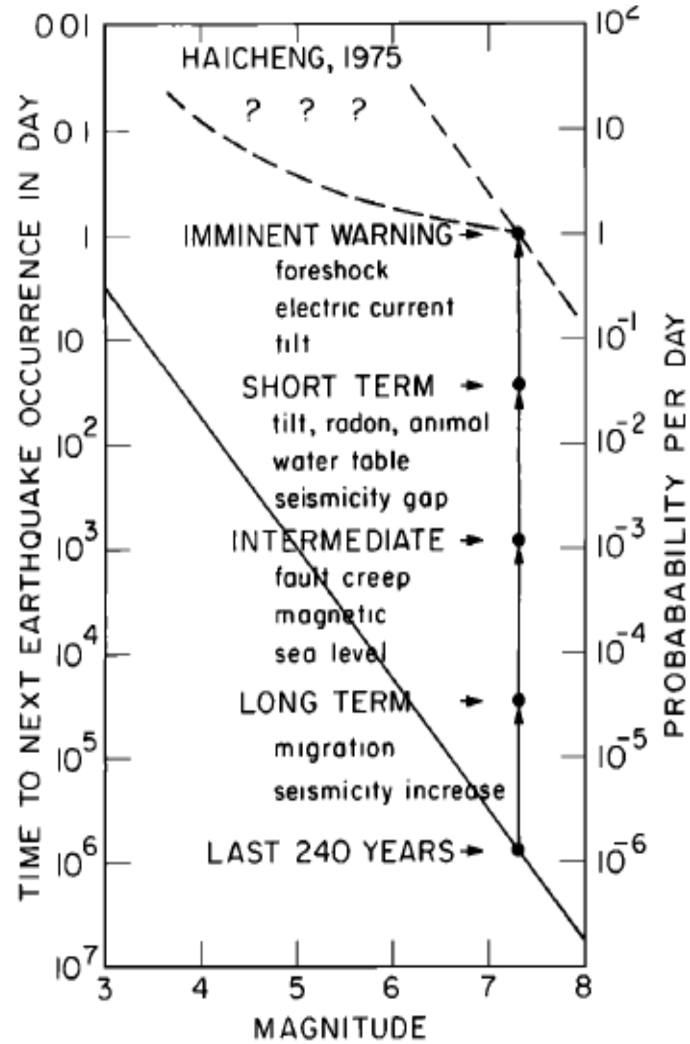
Mutiple Elements Prediction Formula

$$P(M \mid A, B, C, \cdots, S) = \frac{1}{1 + \left(\frac{1}{P_A} - 1\right)\left(\frac{1}{P_B} - 1\right)\left(\frac{1}{P_C} - 1\right)\cdots\left(\frac{1}{P_S} - 1\right) \Big/ \left(\frac{1}{P_0} - 1\right)^{N-1}}$$

Utsu (1977) *Zisin (J. SSJ)*

$$\approx P_0 \cdot \boxed{\frac{P_A}{P_0}} \frac{P_B}{P_0} \frac{P_C}{P_0} \cdots \frac{P_S}{P_0}$$

Aki (1981) Ewing series



$$\textbf{Probability gain} = \frac{\textbf{Conditional probability}}{\textbf{Baseline probability}}$$

$$= \frac{\textbf{Pr (Precursor of an large earthquake | Anomaly)}}{\textbf{Pr (Large earthquake)}}$$

$$\lambda_\theta(t \mid H_t) = \textbf{(trend)} + \textbf{(Seasonality)} + \textbf{(triggering)}$$

$$= \mu + \sum_{j=1}^{J} a_j t^j + \sum_{k=1}^{K} \left\{ c_{2k-1} \cos \frac{2\pi k t}{T_0} + c_{2k} \sin \frac{2\pi k t}{T_0} \right\} + \int_0^t g(t-s)\, dN_s$$

Bull.ISI, 1983; *J.App.Probab.*, 1986; *PAGEOPH*, 1999

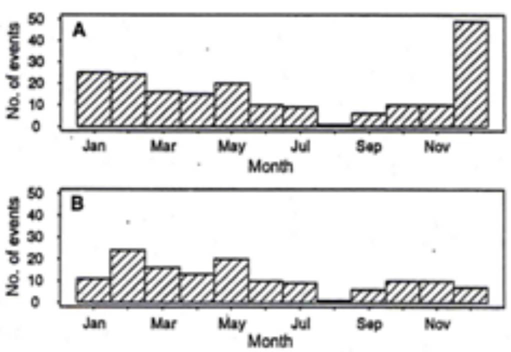


Fig. 6 Monthly totals of events in the HK catalogue: A, the full period; B, the same data as (A) with the 12 months (1 July 1984–30 June 1985) containing the Bay of Plenty swarm removed.

NZJGG, 1997