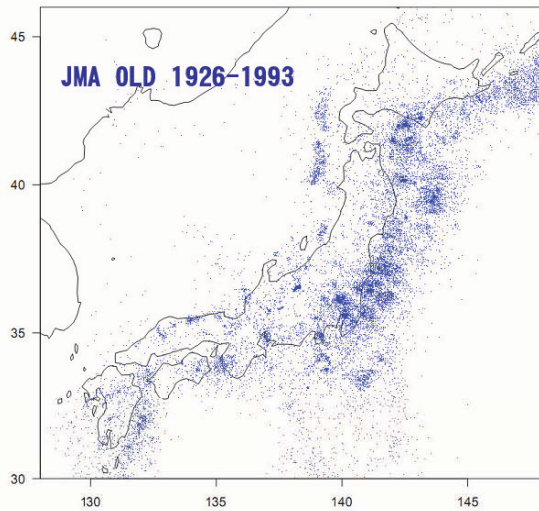


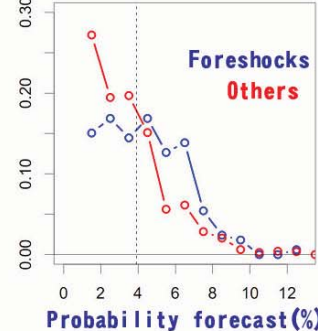
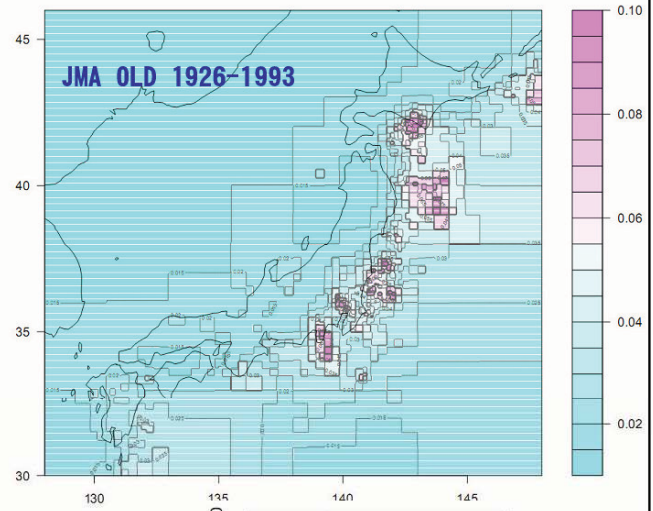
群れの先頭(孤立地震を含む)



Forecast	0-2.5%	2.5-5%	5%-	All
Foreshocks	29	76	61	166
Others	1434	1713	717	3864
All types	1463	1789	778	4206
Ratio(%)	2.0	4.2	7.8	3.9

Ent0=301.32, ent=298.39 / aic0=16383.30, aic1=13062.95

前震である確率の地域性



予測列と実際と評価の例

(1994-2009)

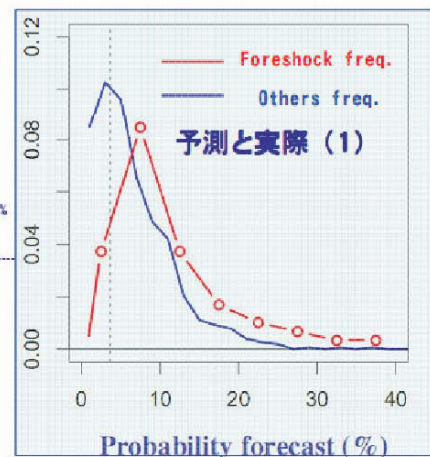
1stEQ	CLS	#C	P_C	ENTROPY	CUM'E	P2	P3	P4	P5	P6	P7	...
1	-2465	1	6.94%	-0.03456	-0.03456	6.94%						
2	-2466	1	4.66%	-0.01036	-0.04492	4.66%						
3	-2468	1	5.14%	-0.01538	-0.06030	5.14%						
4	-2469	2	10.06%	-0.06869	-0.12899	7.46%	12.67%					
5	-2470	1	18.58%	-0.16812	-0.29711	18.58%						
6	-2471	1	10.71%	-0.07592	-0.37303	10.71%						
7	-2472	1	0.15%	0.03586	-0.33717	0.15%						
8	-2473	1	1.69%	-0.02032	-0.31684	1.69%						
9	-2474	4	9.49%	-0.06231	-0.37915	9.11%	11.16%	7.87%	9.82%			
10	-2475	1	6.03%	-0.02478	-0.40394	6.03%						
730	-3306	1	33.19%	-0.36589	20.94383	33.19%						
731	-3307	9	19.69%	1.68040	22.62423	4.62%	7.92%	16.20%	18.04%	19.32%	18.92%	29.78%
732	-3308	1	6.38%	-0.02555	22.59568	6.38%						
733	-3309	1	2.07%	-0.01644	22.61211	2.07%						
734	-3311	1	4.44%	-0.00799	22.60412	4.44%						
735	-3312	6	0.50%	0.03241	22.63653	0.09%	0.30%	0.46%	0.59%	0.73%	0.81%	
736	-3314	1	7.87%	-0.04459	22.59194	7.87%						
737	-3315	1	3.04%	0.00646	22.59840	3.04%						
738	-3316	1	12.76%	-0.09908	22.49932	12.76%						
739	-3317	1	9.42%	-0.06158	22.43774	9.42%						
740	-3318	1	8.27%	-0.04892	22.38882	8.27%						
810	-3398	1	6.44%	-0.02924	23.40055	6.44%						
811	-3399	2	3.32%	0.00367	23.40421	3.04%	3.09%					
812	-3400	3	7.61%	-0.04178	23.36244	7.50%	8.21%	7.13%				
813	-3401	3	10.84%	-0.07737	23.28507	16.26%	8.93%	7.33%				
814	-3402	1	7.00%	-0.03524	23.24963	7.00%						
815	-3403	1	5.19%	-0.01591	23.23392	5.19%						
816	-3405	3	2.53%	0.01173	23.24565	1.13%	3.19%	3.27%				
817	-3406	7	29.68%	-0.31472	22.93093	16.80%	18.81%	40.96%	39.30%	30.44%	29.83%	31.67%
818	-3407	1	7.69%	-0.04267	22.88826	7.69%						
819	-3408	1	4.63%	-0.01004	22.87822	4.63%						

2*ent0 = 446.8 2*ent = 401.1 2*deltaEntropy = -45.8

Forecast	0-2.5%	2.5-5%	5-10%	10-15%	15% ~	All
Foreshocks	3	8	25	11	12	59
Others	168	195	242	107	48	760
All Types	171	203	267	118	60	819
Ratio(%)	1.8	3.9	9.4	9.3	20.0	7.2

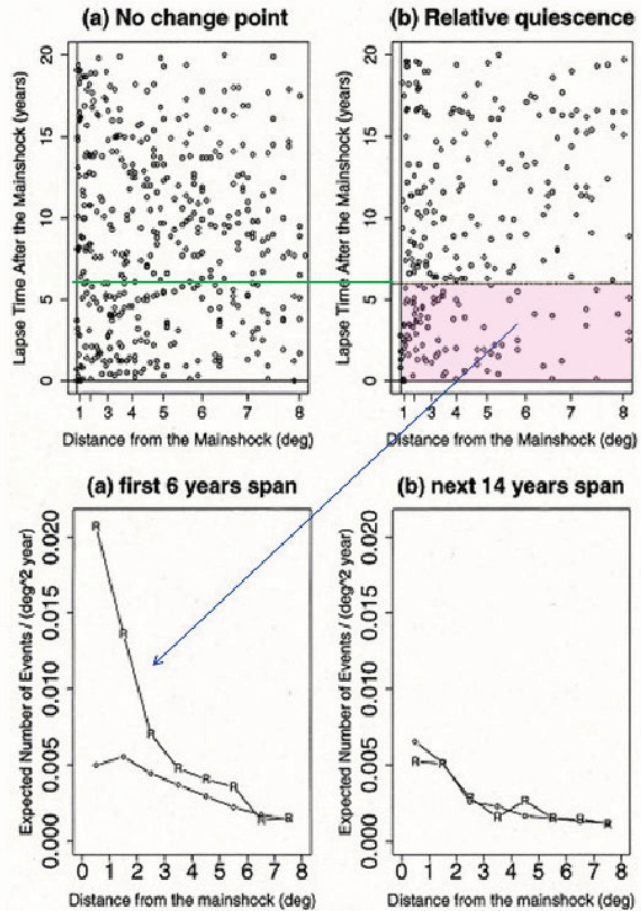
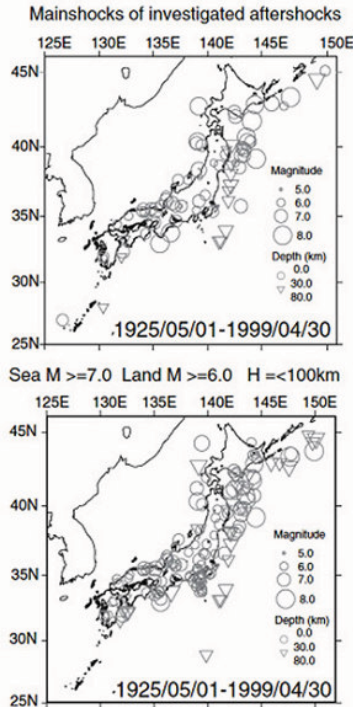
予測と実際 (2)

←2009年茨城県沖M7.0

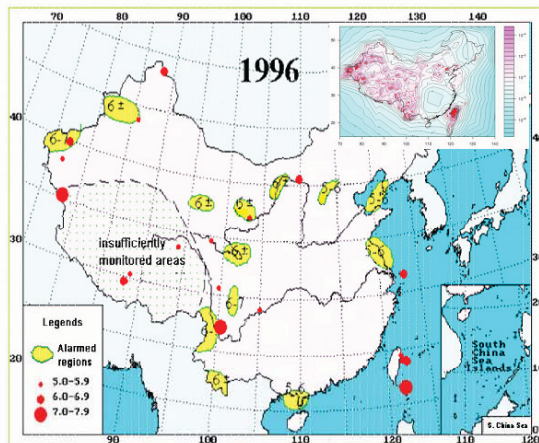


AIC0=2905.5 AIC1=2886.3 DAIC=-19.2

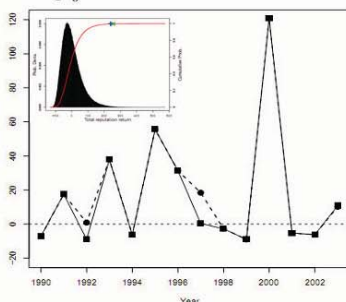
余震の静穏化



Official Annual Earthquake Predictions by the China Earthquake Administration



$$\text{Odds} = \frac{1-p_0}{p_0}; \quad p_0 \text{ is reference probability}$$



Zhuang & Jiang (2010)

Table 1: Scores for each CEA prediction. p_0 : reference probabilities. G : return ratio. R : reputation return. b : Gutenberg-Richter b-value.

Year	Seq. #	Region	Magn.	p_0	G	#Eq.	R	b	$N(M \geq 3.0)$
1990	1	Central Tianshan	6.0-7.0	0.0396	17.85	0	-1.00	0.79	426
	2	Central Gansu	6.0-7.0	0.0215	45.58	0	-1.00	0.82	181
	3	Northwest Yunnan	5.5-6.5	0.1002	8.98	0	-1.00	0.93	624
	4	Kunming	5.5-6.5	0.0093	106.45	0	-1.00	0.88	42
	5	southern Sichuan	6.0-7.0	0.0221	44.25	0	-1.00	0.95	441
	6	Tibet	5.0-6.0	0.0078	126.63	0	-1.00	1.31	85
	7	Yellow Sea	5.0-6.0	0.0711	13.00	0	-1.00	0.87	118
1991	1	Central Tianshan	5.5-6.5	0.1723	4.80	0	-1.00	0.74	418
	2	W to Urumqi	6.0-7.0	0.0369	26.08	0	-1.00	0.83	351
	3	Central Gansu	6.0-7.0	0.0315	30.74	0	-1.00	0.85	343
	4	N to Yinchuan	5.5-6.5	0.0613	15.31	2	15.31	0.85	255
	5	S Gansu	5.5-6.5	0.0377	25.51	0	-1.00	0.92	231
	6	S Shaanxi	5.0-6.0	0.0665	14.03	0	-1.00	1.01	204
	7	W to Beijing	5.0-6.0	0.1856	4.38	1	4.38	0.67	152
	8	W Liaoning	5.0-6.0	0.0148	66.08	0	-1.00	1.21	108
	9	the Yellow Sea	5.0-6.0	0.1459	5.85	1	5.85	0.92	326
	10	NW Yunnan	5.5-6.5	0.0629	14.90	0	-1.00	0.96	482
	11	N Yunnan & S Sichuan	5.0-6.0	0.1572	5.36	0	-1.00	0.94	1008
1992	1	Kashli	5.5-6.5	0.0011	0.69	0	-1.00	0.72	1865
	2	Central Tianshan	5.5-6.5	0.1942	4.15	0	-1.00	0.74	509
	3	Central Gansu	6.0-7.0	0.0212	46.17	0	-1.00	0.83	209
	4	N to Yinchuan	5.5-6.5	0.0559	16.90	0	-1.00	0.83	216
	5	Beijing to N Shaanxi	5.0-6.0	0.0321	30.16	0	-1.00	0.97	86
	6	S Gansu	5.5-6.5	0.0543	17.42	0	-1.00	0.90	314
	7	NW Yunnan	5.5-6.5	0.1311	6.63	0(1)	-1.00(6.63) ¹	0.93	904
	8	N to Kunming	6.0-7.0	0.0184	53.47	0	-1.00	0.99	532
	9	the Yellow Sea	5.0-6.0	0.2389	3.28	0(1)	-1.00(3.28)	0.97	603
1993	1	Kashli	5.0-6.5	0.0051	0.77	0	-1.00	0.71	1728
	2	N Xinjiang	6.0-7.0	0.0447	21.38	0	-1.00	0.83	474
	3	Central W Gansu	6.0-7.0	0.0321	30.12	1	30.12	0.83	332
	4	N to Yinchuan	5.5-6.5	0.0735	12.60	0	-1.00	0.79	236
	5	Beijing & W	4.5-5.5	0.3405	1.94	0	-1.00	0.57	115
	6	the Yellow Sea	5.0-6.0	0.1052	8.50	0	-1.00	0.87	196
	7	NW Yunnan	5.5-6.5	0.4603	1.17	0	-1.00	0.78	1846
	8	SW Sichuan	5.5-6.5	0.0712	13.04	1	13.04	0.91	449
	9	S Gansu	5.5-6.5	0.0335	28.83	0	-1.00	0.86	153
1994	1	Kashli	5.5-6.5	0.0067	0.80	1	0.80	0.67	1418
	2	W to Urumqi	6.0-7.0	0.0257	37.85	0	-1.00	0.86	341
	3	Central Qinghai	5.5-6.5	0.1223	7.17	0	-1.00	0.58	143
	4	Central Gansu	5.5-6.5	0.0221	44.32	0	-1.00	0.82	86
	5	NW Yunnan	6.0-7.0	0.0426	22.49	0	-1.00	0.97	1181
	6	Garze	5.5-6.5	0.0184	53.33	0	-1.00	0.89	103
	7	N Shaanxi	5.0-5.5	0.0219	44.63	0	-1.00	1.09	136
	8	the Yellow Sea	5.0-6.0	0.0386	16.05	0	-1.00	0.87	110
1995	1	Kashli	5.5-6.5	0.0315	0.58	0	-1.00	0.73	2356
	2	N Xinjiang	5.5-6.5	0.1193	7.38	1	7.38	0.83	534
	3	Central Qinghai	5.5-6.5	0.1051	8.51	0	-1.00	0.60	142
	4	Central Gansu	5.5-6.5	0.1056	8.46	0	-1.00	0.82	450
	5	Central S Shaanxi	5.0-6.0	0.0353	27.35	0	-1.00	1.12	204
	6	the Yellow Sea	5.5-6.5	0.0173	56.88	0	-1.00	0.86	46
	7	E Guangdong	5.0-6.0	0.0195	50.39	0	-1.00	1.05	81
	8	Leiqiu Peninsula	5.0-6.0	0.0183	53.76	2	53.76	0.82	28
	9	S Yunnan	5.5-6.5	0.2845	2.51	1	2.51	0.80	1214
	10	NW Yunnan	6.0-7.0	0.0579	16.35	0	-1.00	0.92	1160
	11	Garze	5.5-6.5	0.0563	17.66	0	-1.00	0.85	690
1996	1	Kashli	6.0-7.0	0.4054	1.47	1	1.47	0.74	3167
	2	W to Urumqi	5.5-6.5	0.1601	5.24	1	5.24	0.84	790
	3	Qinghai	5.0-6.0	0.0242	40.30	0	-1.00	0.71	55
	4	Central Gansu	5.5-6.5	0.0523	18.10	1	18.10	0.98	533
	5	N to Yinchuan	5.5-6.5	0.0497	19.11	0	-1.00	0.85	245
	6	NE Shaanxi	5.0-6.0	0.1077	8.28	0	-1.00	0.88	199
	7	Bohai Sea	5.0-6.0	0.0377	25.49	0	-1.00	1.20	313

(Continued on Next Page...)

¹-1.00 is the return under the strict interpretation and 6.63 is the return under the loose interpretation.