

## Data Repository Item

### “Global Frequency of Magnitude 9 Earthquakes” by R. McCaffrey

#### Table DR1 explanation.

**Length** – length of subduction thrust measured along strike.

**Rate range** - Range of convergence rates along subduction segment.

**Rate source:** Source of relative angular velocity between plates. a - Sella et al. (2002); b – Bird (2003); c – DeMets et al. (1994); d - McCaffrey et al. (2007); e – Wallace et al. (2005); f – Wallace et al. (2004a); g – Wallace et al. (2004b).

**Dip** – dip angle of thrust estimated from CMT solutions (McCaffrey, 1997).

**Sip range** – Range of expected slip during M9 earthquake. Derived using  $u = 2.5 \pm 1.0 \times 10^{-5} L$  where L is length of thrust fault along strike.

**β and sigma** – value of β from Kagan (1999), assumed values for Cascadia and Timor.

**Predicted Mw max** – predicted Mw of largest earthquake that can occur on the fault.

$$M_o^{max} = \mu u_{av} L Z_{max}/\sin \delta$$

$$M_w^{max} = 2/3 \log_{10} (M_o^{max} - 9.1)$$

Maximum fault depth  $Z_{max} = 40$  km (Tichelaar and Ruff, 1993), fault length  $L$  and fault dip  $\delta$  taken from individual faults,  $\mu = 30$  GPa.  $u_{av} = 2.5 \times 10^{-5} L$ .

**Obs. Mw max, 100 year** – observed largest thrust earthquake at trench during last 100 years. (Kanamori, 1983; Engdahl and Villaseñor, 2002; Harvard CMT).

**Obs. Mw max, 300 year** – observed largest thrust earthquake at trench during last 300 years, taken from Stein and Okal,(2007).

**Recurrence time** – Nominal time between M9 earthquakes using

$$T = u_{av} / f \chi v$$

where  $u_{av} = 2.5 \times 10^{-5} L$ ,  $v$  is the convergence rate,  $f = 1$ , and  $\chi = 1$ .

**Recurrence time range** – Range of times between M9 earthquakes estimated from ranges of  $v$ ,  $\beta$  and  $u_{av}$ , where  $f = 1 - \beta$ .

**Age** – age of the subducting plate in Millions of years (McCaffrey, 1997).

**Plate pairs** (HW = hanging wall; FW = footwall)– plates meeting at subduction zones.

Abbreviations: An – Antarctic; Au – Australia; Bu – Burma; Ca – Caribbean; Co – Cocos; Cs – South China; Hf – Hikurangi forearc; In – Indian; Jf – Juan de Fuca; Ma – Marianas forearc; Na – North America; Nz – Nazca; Ok – Okhotsk; Or – Oregon forearc; Pa – Pacific; Ph – Philippine; Sa – South America; Sf – Sumatra forearc; Su – Sunda; Sw – Sandwich; To – Tonga forearc.

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Table DRI.

No.	Trench Name	Length, km	Rate range, mm/yr	Rate source	Dip, °	Dip sigma, °	Slip range, meters	$\beta$	$\beta$ sigma	Predicted max Mw	Obs. Max Mw 100 yr	Obs. Max Mw 300 yr	Recurrence Time, years	Recurr. Time range, years	Age, Ma	Plate HW	Pairs FW
1	ALASKA	1489	55- 66	a	18	7	22-52	0.59	0.05	9.5	9.2	9.3	606	872- 2146	49	Na	Pa
2	ANDAMAN	1701	16- 44	b	24	3	25-59	0.72	0.13	9.5	9.3	1379	2091- 8739	83	Bu	In	
3	ANTILLES	1228	17- 21	a	25	9	18-43	0.59	0.11	9.3	6.1	7.5	1600	2066- 6381	87	Ca	Na
4	C. AMERICA	1506	62- 83	c	22	6	22-52	0.68	0.07	9.4	7.8	7.6	513	894- 2473	16	Ca	Co
5	C. CHILE	1304	63- 75	a	13	6	19-45	0.56	0.05	9.5	9.5	9.6	468	620- 1534	23	Sa	Nz
6	CASCADIA	1048	32- 38	d	9	3	15-36	0.50	0.20	9.5	7.2	9.1	737	614- 2861	5	Or	Jf
7	E. ALEUTIAN	1092	64- 76	a	21	6	16-38	0.59	0.05	9.3	9.1	8.6	385	552- 1363	56	Na	Pa
8	ECU-COLOM	1358	52- 63	a	22	5	20-47	0.56	0.05	9.4	8.8	8.5	588	777- 1922	21	Sa	Nz
9	HIKURANGI	781	22- 48	g	20	10	11-27	0.79	0.04	9.1	7.7	7.8	553	1385- 3865	100	Hf	Pa
10	IZU	1167	34- 46	e	26	6	17-40	0.81	0.11	9.2	6.6	7.2	723	1739- 4619	145	Ph	Pa
11	JAPAN	654	62- 81	a	22	7	9-22	0.57	0.04	9.0	8.3	8.2	226	311- 762	132	Ok	Pa
12	JAVA	1849	61- 74	a	20	11	27-64	0.67	0.06	9.6	7.8	7.7	675	1171- 3069	75	Su	Au
13	KAMCHATKA	907	69- 84	a	30	6	13-31	0.57	0.04	9.1	9.0	8.9	294	399- 977	115	Ok	Pa
14	KERMADEC	1421	50- 66	a	24	7	21-49	0.79	0.04	9.4	8.0	8.1	609	1605- 3966	100	Au	Pa
15	KURILES	1242	69- 82	a	26	8	18-43	0.57	0.04	9.3	8.5	8.5	410	561- 1371	128	Ok	Pa
16	MARIANAS	1812	31- 70	e	25	8	27-63	0.81	0.11	9.5	7.7	7.2	893	1990- 6165	134	Ma	Pa
17	MEXICO	1378	42- 61	b	21	7	20-48	0.58	0.06	9.4	8.0	8.1	663	900- 2344	9	Na	Co
18	N. CHILE	1581	63- 74	a	22	8	23-55	0.56	0.05	9.5	8.5	8.3	573	762- 1887	41	Sa	Nz
19	NANKAI	923	59- 76	a	21	7	13-32	0.66	0.10	9.2	8.1	8.8	339	528- 1607	23	Cs	Ph
20	NEW BRITAIN	867	75-157	f	20	3	13-30	0.61	0.04	9.1	8.1	8.1	186	268- 728	50	Sb	Wk
21	NEW GUINEA	1030	103-121	a	20	10	15-36	0.57	0.05	9.2	8.2	8.2	229	312- 768	100	Au	Pa
22	NEW HEBRIDES	1187	70- 86	a	28	8	17-41	0.60	0.04	9.2	7.5	7.8	378	561- 1364	40	Pa	Au
23	PERU	1599	58- 70	a	22	8	23-55	0.56	0.05	9.5	8.4	9.2	618	806- 2020	37	Sa	Nz
24	PHILIPPINE	1512	95-113	a	25	9	22-52	0.61	0.05	9.4	8.0	8.0	361	539- 1355	43	Su	Ph
25	RYUKYU	1131	74- 92	a	25	8	16-39	0.66	0.10	9.2	6.7	8.0	339	525- 1619	46	Cs	Ph
26	S. CHILE	1218	15- 19	a	25	3	18-42	0.56	0.05	9.3	5.7	5.7	1734	2304- 5731	16	Sa	An
27	SANDWICH	1000	63- 82	b	27	7	15-35	0.67	0.06	9.1	7.0	7.0	343	579- 1573	57	Sw	Sa
28	SOLOMON	1585	86-105	a	20	3	23-55	0.61	0.04	9.5	7.8	7.8	412	626- 1522	50	Pa	Au
29	SUMATRA	1393	60- 75	b	20	9	20-48	0.72	0.13	9.4	8.7	9.2	512	925- 2862	61	Sf	Au
30	TIMOR	1256	69- 84	a	20	10	18-43	0.67	0.06	9.4	7.5	7.5	409	709- 1864	100	Su	Au
31	TONGA	1450	125-252	e	24	7	21-50	0.79	0.04	9.4	8.5	8.3	191	479- 1321	100	To	Pa
32	W. ALEUTIAN	1244	69- 80	a	22	8	18-43	0.59	0.05	9.3	8.7	8.7	414	593- 1471	72	Na	Pa