

Appendix G. Supplementary Material to Support Chapter 7

Table G1 presents tilt volume, eruption efficiency, and magma supply rate from 1983 to 2008.

Figures G1–G3 present 1-year time series plots between 1 February 1982 and 1 February 2008 showing details of numbers of both short- and long-period earthquakes shown in text figures.

Figures G4–G7 present time series plot of earthquake swarms and plots of earthquake locations for the events of Stage IA.

Figures G8–G15 present time series plots of earthquake swarms and plots of earthquake locations for the events of Stage IB.

Figures G16–G24 present time series plot of earthquake swarms and plots of earthquake locations for the events of Stage IIA.

Figures G25–G49 present time series plot of earthquake swarms and plots of earthquake locations for the events of Stage IIB.

Figures G50–G82 present time series plot of earthquake swarms and plots of earthquake locations for the events of Stage III.

Appendix table G1. Tilt volume, eruption efficiency and magma supply rate 1983-2008

Cycle	Event ¹	beg date	end date	Dt (yr)	T _{mag} ²	T _{az}	T _{vol} ³	E _{vol} ⁴	E _{eff} ⁵	msr ⁶	Comment
Stage 1A											Pu'u 'Ō'o
Pu'u 'Ō'o	def	1/2/1983	1/14/1983		45.6	118.67	0.0205				def rotates cw
		1/3/1983	1/8/1983		86.2	133.78	0.0387				
		1/9/1983	1/14/1983		8.8	160.97	0.0040				
	sum						0.0632				
Episode 1	E	1/3/1983	1/23/1983					0.0112	0.177		
		2/24/1983	3/3/1983		13.9	117.1	0.0063				
Episode 2	E	2/10/1983	2/25/1983					0.0112	1.790		
		3/27/1983	4/9/1983		33.7	124.91	0.0152				
Episode 3	E	3/21/1983	3/28/1983					0.0304	2.006		
		6/12/1983	6/17/1983		16.2	112.93	0.0073				
Episode 4	E	6/13/1983	6/17/1983					0.0088	1.205		
		6/30/1983	7/3/1983		9.3	119.74	0.0042				
Episode 5		6/29/1983	7/3/1983					0.0104	2.485		
		7/22/1983	7/25/1983		16.7	116.57	0.0075				
Episode 6		7/22/1983	7/25/1983					0.0072	0.957		
		8/15/1983	8/18/1983		19.7	116.94	0.0089				
Episode 7		8/15/1983	8/17/1983					0.0112	1.265		
		9/5/1983	9/7/1983		14.8	116.57	0.0067				
Episode 8		9/6/1983	9/7/1983					0.0064	0.959		
		9/15/1983	9/17/1983		16.2	115.2	0.0073				
Episode 9		9/15/1983	9/17/1983					0.0064	0.876		
		10/5/1983	10/7/1983		16.9	107.82	0.0076				
Episode 10		10/5/1983	10/7/1983					0.0112	1.472		
		11/5/1983	11/8/1983		21.1	109.92	0.0095				
Episode 11		11/5/1983	11/7/1983					0.0096	1.010		
		11/30/1983	12/2/1983		24.6	110.56	0.0111				
Episode 12		11/30/1983	12/1/1983					0.0064	0.578		
		1/19/1984	1/23/1984		13.9	110.7	0.0062				
Episode 13		1/20/1984	1/22/1984					0.0080	1.283		
		1/29/1984	2/1/1984		12.1	112.31	0.0055				
Episode 14		1/30/1984	1/31/1984					0.0048	0.881		
		2/12/1984	2/17/1984		15.7	110.43	0.0070				
Episode 15		2/14/1984	2/15/1984					0.0064	0.909		
		3/3/1984	3/5/1984		18.2	104.7	0.0082				
Episode 16		3/3/1984	3/4/1984					0.0096	1.174		
		3/30/1984	3/31/1984		14.6	109.6	0.0066				
Episode 17		3/30/1984	3/31/1984					0.0080	1.219		
		4/18/1984	4/22/1984		30.1	111.9	0.0135				
Episode 18		4/18/1984	4/21/1984					0.0192	1.418		
		5/14/1984	5/18/1984		8.6	126.87	0.0039				
Episode 19		5/16/1984	5/18/1984					0.0016	0.412		
		6/6/1984	6/11/1984		21.6	124.11	0.0097				

Cycle	Event ¹	beg date	end date	Dt (yr)	T _{mag} ²	T _{az}	T _{vol} ³	E _{vol} ⁴	E _{eff} ⁵	msr ⁶	Comment
Episode 20		6/7/1984	6/8/1984					0.0032	0.330		
		6/30/1984	7/1/1984		12.7	107.2	0.0057				
Episode 21		6/30/1984	6/30/1984					0.0046	0.801		
		7/7/1984	7/10/1984		11.3	117.22	0.0051				
Episode 22		7/8/1984	7/9/1984					0.0063	1.227		
		7/28/1984	7/29/1984		16.2	112.93	0.0073				
Episode 23		7/28/1984	7/29/1984					0.0076	1.041		
		8/19/1984	8/21/1984		12.0	117.18	0.0054				
Episode 24		8/19/1984	8/20/1984					0.0093	1.723		
		9/19/1984	9/20/1984		20.9	114.44	0.0094				
Episode 25		9/19/1984	9/20/1984					0.0089	0.945		
		11/2/1984	11/4/1984		9.9	112.11	0.0045				
Episode 26		11/2/1984	11/2/1984					0.0053	1.181		
		11/19/1984	11/20/1984		10.5	105.95	0.0047				
Episode 27		11/20/1984	11/20/1984					0.0067	1.427		
		12/3/1984	12/4/1984		10.4	123.69	0.0047				
Episode 28		12/3/1984	12/4/1984					0.0099	2.126		
		1/2/1985	1/7/1985		16.5	112.54	0.0074				
Episode 29		1/3/1985	1/5/1985					0.0104	1.399		
		2/3/1985	2/5/1985		31.1	107.76	0.0140				
Episode 30		2/4/1985	2/5/1985					0.0113	0.806		
		3/11/1985	3/14/1985		30.9	116.57	0.0139				
Episode 31		3/13/1985	3/14/1985					0.0155	1.116		
		4/21/1985	4/23/1985		21.4	113.81	0.0096				
Episode 32		4/21/1985	4/22/1985					0.0130	1.353		
		6/12/1985	6/14/1985		7.7	109.8	0.0034				
Episode 33		6/13/1985	6/13/1985					0.0063	1.835		
		7/6/1985	7/8/1985		18.3	118.18	0.0082				
Episode 34		7/6/1985	7/7/1985					0.0085	1.032		
		7/25/1985	7/26/1985		13.1	118.81	0.0059				
Episode 35		7/26/1985	7/26/1985					0.0132	2.234		
Episode 35a		7/27/1985	8/12/1985					0.0132		0.3013	
		9/2/1985	9/3/1985		14.4	109.89	0.0065				
Episode 36		9/2/1985	9/2/1985					0.0092	1.421		
		9/24/1985	9/25/1985		14.3	104.04	0.0064				
Episode 37		9/24/1985	9/25/1985					0.0118	1.835		
		10/20/1985	10/22/1985		17.2	112.69	0.0077				

Cycle	Event ¹	beg date	end date	Dt (yr)	T _{mag} ²	T _{az}	T _{vol} ³	E _{vol} ⁴	E _{eff} ⁵	msr ⁶	Comment
Episode 38		10/21/1985	10/21/1985					0.0118	1.534		
		11/13/1985	11/15/1985		16.0	110.07	0.0072				
Episode 39		11/13/1985	11/15/1985					0.0110	1.528		
		1/1/1986	1/2/1986		14.5	114.54	0.0065				
Episode 40		1/1/1986	1/2/1986					0.0093	1.419		
		1/27/1986	1/28/1986		30.9	111.8	0.0063				
Episode 41		1/27/1986	1/28/1986					0.0110	1.746		
		2/22/1986	2/23/1986		21.4	114.9	0.0080				
Episode 42		2/22/1986	2/23/1986					0.0097	1.210		
		3/21/1986	3/23/1986		7.7	107.2	0.0057				
Episode 43		3/22/1986	3/22/1986					0.0082	1.448		
		4/11/1986	4/14/1986		18.3	102.24	0.0110				
Episode 44		4/13/1986	4/14/1986					0.0092	0.836		
		5/7/1986	5/8/1986		13.1	113.05	0.0066				
Episode 45		5/7/1986	5/8/1986					0.0075	1.138		
		6/1/1986	6/2/1986		14.4	104.86	0.0066				
Episode 46		6/2/1986	6/2/1986					0.0078	1.195		
		6/25/1986	6/29/1986		14.3	116.03	0.0062				
Episode 47		6/26/1986	6/26/1986					0.0070	1.137		
		7/18/1986	7/19/1986		17.2	105.82	0.0081				erz dil rate = .0459
ep 48 fissure		7/18/1986	7/19/1986					0.0058	0.714		Owen, 2000. JGR
stage IA	sum	1/2/1983	7/19/1986	3.5428			0.4304	0.4604	1.070	0.1215	msr using tilt vol
	mean az					113.07				0.1300	msr using E vol
	std dev					5.5794				0.1760	add erz dil rate
Stage IB		7/20/1986	11/8/1991	5.3032							net def
	ks I	12/3/1990	12/4/1990		9.2	302.2	0.0041				
		1/7/1991	1/15/1991		8.8	101.31	0.0040				
	ks I	8/20/1991	8/24/1991		4.9	290.56	0.0022				
	sum						0.0103	0.7743		0.1479	E vol, (Sutton and others, 2003)
	add dil						0.0459			0.1938	
Stage IIA		11/8/1991	4/1/1997	5.3963							
		11/7/1991	11/15/1991		15.5	116.57	0.0070				
episode 49		11/8/1991	11/26/1991					0.0110			vol = .011 (mr) ⁷
		2/17/1992	2/22/1992		18.0	102.93	0.0081				
episode 50		2/17/1992	3/3/1992	0.0411				0.0061			vol = .0032 (mr) ⁷

Cycle	Event ¹	beg date	end date	Dt (yr)	T _{mag} ²	T _{az}	T _{vol} ³	E _{vol} ⁴	E _{eff} ⁵	msr ⁶	Comment
		3/3/1992	3/4/1992		3.9	131.99	0.0017				
episode 51		3/7/1992	9/27/1992	0.5585				0.0826			vol = .024 (mr) ⁷
		10/4/1992	10/6/1992		7.1	121.76	0.0032				
episode 52		10/3/1992	2/20/1993	0.3833				0.0567			vol = .0002 (mr) ⁷
		2/7/1993	2/9/1993		5.1	128.16	0.0023				
		2/23/1993	3/2/1993		7.6	120.3	0.0034				
episode 53		2/20/1993	1/29/1997	3.9398				0.5824			vol = .535 (mr)
	ks inf	1/31/1996	2/1/1996		18.5	307.41	0.0083				ep 54 dike vol
		10/25/1996	10/28/1996		4.5	116.57	0.0020				(Owen and others, 2000; Thornber and others, 1996)
		1/27/1997	1/30/1997		26.8	118.22	0.0121				1.3km*2.4 km*0.3m
episode 54		1/30/1997	1/31/1997					0.0003			vol = .00000936 km ³ ; (Desmarais and Segall, 2007)
episode 55		2/24/1997	4/1/1997	0.0986				0.0146			
	sum			5.3963			0.0481	0.7537		0.1486	vol = .00023km ³
	add dil						0.0459			0.1945	ep 55 vol from xt ⁸ total=.0159
stage IIB		4/1/1997	12/1/2003	6.6667							def
episode 55		4/1/1997	12/1/2003					0.9860			(Sutton and others, 2003)
		1/13/1998	1/15/1998		8.0	128.99	0.0036				ep 55 vol from xt ⁸ total=1.073
		9/11/1993	9/13/1993		7.1	158.63	0.0032				
		2/20/2000	2/22/2000		8.5	147.3	0.0038				
		12/20/2001	12/21/2001		4.1	129.29	0.0018				
		11/17/2003	11/18/2003		6.4	116.57	0.0029				
	sum						0.0154	0.9860		0.1502	
	add dil						0.0459			0.1961	msr before co ₂ increase
Stage IIIA	total uplift	12/1/2003	5/18/2007	3.4606	57.8	316.21	0.0260				inf
episode 55		12/1/2003	5/18/2007					0.5570			ep 55 vol from xt ⁸ total=0.557
	def	12/4/2003	12/5/2003		5.9	140.91	0.0027				
		3/4/2004	3/5/2004		6.7	109.98	0.0030				co ₂ began increase (3x) in 2004
		5/12/2004	5/14/2004		6.4	116.57	0.0029				
		6/3/2004	6/9/2004		8.0	115.64	0.0036				

Cycle	Event ¹	beg date	end date	Dt (yr)	T _{mag} ²	T _{az}	T _{vol} ³	E _{vol} ⁴	E _{eff} ⁵	msr ⁶	Comment
		7/8/2004	7/11/2004		6.9	135	0.0031				
		7/27/2004	7/30/2004		9.8	130.29	0.0044				
		12/23/2004	12/27/2004		3.1	131.19	0.0014				
		1/27/2006	2/3/2006		5.5	128.66	0.0025				
		3/3/2006	3/8/2006		8.8	128.37	0.0040				
		3/10/2006	3/13/2006		9.3	111.8	0.0042				
Cycle	Event ¹	beg date	end date	Dt (yr)	T _{mag} ²	T _{az}	T _{vol} ³	E _{vol} ⁴	E _{eff} ⁵	msr ⁶	Comment
		3/20/2006	3/22/2006		5.9	129.09	0.0027				
	sum						0.0604	0.5570		0.1784	
	add dil						0.0459			0.2243	
episode 55	total	2/24/1997	6/17/2007	10.3080				1.6600		0.1610	xt ⁸ mr ⁷
stage IIIB		5/18/2007	3/19/2008	0.8378							def
		5/22/2007	5/29/2007		7.6	130.56	0.0034				
		6/15/2007	6/20/2007		34.8	122.51	0.0157				
episode 56	E	6/19/2007	6/19/2007					0.0000			Father's Day E ; (Poland and others, 2008)
		7/6/2007	7/16/2007		4.7	132.56	0.0021				
episode 57	E	7/2/2007	7/20/2007					0.0007			
episode 58	E	7/21/2007	3/19/2008	0.6626				0.0913			volume from xt ⁸ mr ⁷ estimate
		7/21/2007	1/1/2009	1.4511							
	sum						0.0212	0.0913		0.1343	
	add dil						0.0459			0.1802	

¹ Abbreviations: inf=inf; def=def; ; vol=volume; dil=dilation; cw=clockwise; trans=transfer; I=intrusion; E=E; ks=Kīlauea's summit; erz=East rift zone; swr=Southwest rift zone; kfz=Koa'e fault zone

² Uwēkahuna tilt magnitude in microradians

³ Tilt volume in cubic kilometers=Uwēkahuna tilt magnitude*.00045 (see text for explanation)

⁴ Values are equivalent magma volume obtained by multiplying published volumes by 0.8 to account for vesiculation

⁵ Eruption efficiency calculated for non-sustained rift eruptions as erupted volume/deflation volume associated with the eruption. For consistency eruption efficiencies are only calculated using the Uwēkahuna tilt.

⁶ Minimum magma supply rate calculated as described in text. The volume equivalent for pre-E inf is added to the sum of volume equivalents for subsequent defs and then divided by the elapsed time. Values used in the calculation are shown in **bold** text. The volume equivalent of pre-eruption *deflation* (italics used for emphasis) is not used as it is already included in the deflation sum.

⁷ mr = HVO monthly report

⁸ xt = Christinal Heliker volume estimate (see Heliker and Mattox, 2003, table 1)

Cross references, chapter 7 tables and appendix G map figures

[Table column heads are row “0;” only rows with information are counted; “do,” same as above; color coding indicates eruptions (red), traditional intrusions without eruption (blue); inflationary intusions (green), and suspected deep intrusions (magenta)]

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140	7.1	13	G5
do	do	28	G6
141	7.1 cont	14	G7
148	7.2	3	G9
do	do	10	G10
do	do	12	G11
do	do	13	G12
149	7.2 cont	6,7	G13
do	do	10,11	G14
do	do	13,14	G15
156	7.3	1	G17
do	do	2	G18
do	do	3,5	G19
do	do	6	G20
do	do	24	G21
do	do	28	G22
do	do	32	G23A
157	7.3 cont	7,8	G23B
do	do	10-12	G23C
do	do	15	G24
158	7.4	6	G26
do	do	17,18	G27A
do	do	19	G27B

Chap. 7 page	Chap. 7 table	Row in table	App. G figure
do	do	20	G28
do	do	23	G29
do	do	24,26	G30
do	do	29	G31
do	do	31	G32
do	do	33	G33
159	7.4 cont	3	G34A
do	do	5	G34B
do	do	13	G35
do	do	15	G36
do	do	18	G37
do	do	21	G38
do	do	22	G39
do	do	24	G40
do	do	28	G41
do	do	29	G42
do	do	30	G43
160	7.4 cont	1,2	G44
do	do	3	G45
do	do	4	G46
do	do	6	G47
do	do	9	G48
do	do	13	G49
166	7.5	5	G51
do	do	11	G52
do	do	12	G53
do	do	15	G54
do	do	17	G55
do	do	18	G56
do	do	20,21	G57

Chap. 7 page	Chap. 7 table	Row in table	App. G figure
do	do	23.25	G58
do	do	30	G59
do	do	31-33	G60
167	7.5 cont	2	G60
do	do	5	G61
do	do	6	G62
do	do	7	G63
do	do	8	G64A
do	do	9	G64B
do	do	10	G64C
do	do	11	G64D
do	do	13-15	G65
do	do	16-17	G66
do	do	18-19	G67
do	do	20-21	G68
do	do	22	G69
do	do	23	G70
do	do	24	G71
do	do	26	G72
do	do	27	G73
do	do	28	G74
do	do	30	G75
do	do	31	G76
176	7.6	1	G77
do	do	3	G78
31	7.6 cont	1	G79
do	do	7	G80
do	do	8	G81
do	do	9	G82

Figure G1. Graphs showing Kīlauea short-period earthquakes per day and those of magnitude >4 , 1982 to February 2008. *A–Z*, Data at 1-year intervals. Dates on figures in mm/dd/yyyy format.

Figure G2. Graphs showing Kīlauea long-period earthquakes per day and those of magnitude >4 , 1982 to February 2008. *A–Z*, Data at 1-year intervals. Dates on figures in mm/dd/yyyy format.

Figure G3. Graphs showing Kīlauea earthquake swarms (long- and short-period), from 1982 to February 2007. *A–Z*, Data at 1-year intervals. Dates on figures in mm/dd/yyyy format.

Figure G4. Graphs showing Kīlauea activity from 1 January 1983–20 July 1986 (Pu‘u ‘Ō‘o-Kupaianaha eruption Stage IA). Time series shows short- and long-period earthquake swarms for all regions as short vertical lines. Dates on figure in mm/dd/yyyy format. See text figure 7.1 and table 7.1 for event details.

Figure G5. Map showing activity around suspected deep intrusion on 23 December 1984. Data from 22–24 December. Dates on figure in mm/dd/yyyy format.

Figure G6. Map showing activity around suspected deep intrusion on 5–6 October 1985 beneath site SDI 2 (chap. 5, fig. 5.2). Data from 4–8 October.. Dates on figure in mm/dd/yyyy format.

Figure G7. Map showing activity around episode 48 fissure eruption on 18–19 July 1986 associated with migration of eruption from Pu‘u ‘Ō‘o to Kupaianaha. Data from 14–24 July. Dates on figure in mm/dd/yyyy format.

Figure G8. Graphs showing Kīlauea activity during Pu‘u ‘Ō‘o-Kupaianaha eruption Stage IB from 20 July 1986 to 8 November 1991. Time series shows short- and long-period earthquake swarms for all regions. See text figure 7.5 and table 7.2 for event details. Dates on figure in mm/dd/yyyy format.

Figure G9. Map showing activity around Nāmakaniipao earthquake swarm of 13 September 1986. Data from 13–14 September. This sequence not associated with an east rift intrusion. Dates on figure in mm/dd/yyyy format.

Figure G10. Map showing activity around Nāmakaniipao earthquake swarm of 11–12 July 1988. This sequence not associated with an east rift intrusion. Dates on figure in mm/dd/yyyy format.

Figure G11. Map showing activity around upper east rift intrusion on 17 September 1988. Data from 12–21 September. Dates on figure in mm/dd/yyyy format.

Figure G12. Map showing *M*6.2 south flank earthquake on 25 June 1989, mainshock and aftershocks to 30 June. Dates on figure in mm/dd/yyyy format.

Figure G13. Map showing activity around summit intrusion on 4 December 1990. Data from 11 November to 6 December. Intrusion indicated by inflationary tilt begins near the shallow magma chamber (small open cross) imaged in 1996 by long-period seismic array. Intrusion then extends downrift to south and southeast. The intrusion was accompanied by a few long-period earthquakes. It is possible that this intrusion marks the advent of a second summit magma reservoir at ~1 km depth. This is the first of several intrusions to be preceded within a month or so by a Nāmakaniipao sequence (Okubo and Nakata, 2003). Dates on figure in mm/dd/yyyy format.

Figure G14. Map showing activity around upper east rift intrusion on 26 March 1991. Data from 25–30 March, with a precursory Nāmakaniipaio sequence on 13 March. Dates on figure in mm/dd/yyyy format.

Figure G15. Map showing activity around upper east rift intrusion on 21 August 1991. Data from 17–25 August, with a precursory Nāmakaniipaio sequence on 10 August. Dates on figure in mm/dd/yyyy format.

Figure G16. Graphs showing Kīlauea activity from 8 November 1991 to 1 January 1997 (Pu‘u ‘Ō‘o -Kupaianaha eruption Stage IIA). Time series shows short- and long-period earthquake swarms for all regions as vertical lines connected across the time of intrusion. See text figure 7.7 and table 7.3 for event details. Dates on figure in mm/dd/yyyy format.

Figure G17. Map showing activity around eruption of 8–26 November 1991 (episode 49 to 26 November. Eruption returns to Pu‘u ‘Ō‘o accompanied by very few earthquakes. Dates on figure in mm/dd/yyyy format.

Figure G18. Map showing activity around upper east rift intrusion on 28–29 January 1992. Data from 25–31 January. Dates on figure in mm/dd/yyyy format.

Figure G19. Map showing activity around eruption of 17 February-3 March 1992 (episode 50 to 3 March). Data from 9–19 February. Eruption is preceded by a Nāmakaniipaio sequence on 4 February 1992 and an east rift intrusion on 11–13 February. Dates on figure in mm/dd/yyyy format.

Figure G20. Map showing activity around upper east rift intrusion on 3–4 March 1992. Data from 1–5 March. Intrusion precedes episode 51 on 7 March. Dates on figure in mm/dd/yyyy format.

Figure G21. Map showing activity around suspected deep intrusion on 11–12 September 1993 beneath site SDI 2 (chap. 5, fig. 5.2). Data from 9–14 September. Dates on figure in mm/dd/yyyy format.

Figure G22. Map showing activity around deep magma-supply earthquake 1 February 1994. Data from 26 January to 4 February. *M*5.2 mainshock is located just offshore in the central south flank. Aftershocks trace a major part of the deep magma supply path (Wright and Klein, 2006). Possible foreshocks are located a considerable distance to the west and north. Dates on figure in mm/dd/yyyy format.

Figure G23. Maps showing: *A*, Activity around a suspected deep intrusion on 25–26 October 1994. Data from 23 to 27 October. *B–C*, Activity around a paired inflationary intrusion on 1–2 February 1996, within which an eruption “surge” occurs about 3 hours after the beginning of intrusion—(*B*) short-period seismicity and (*C*) long-period seismicity. Data from 27 January to 11 February. Dates on figure in mm/dd/yyyy format.

Figure G24. Map showing activity around a suspected deep intrusion on 25–26 October 1996 beneath site SDI 2 (see chap. 5, fig. 5.2). Data from 23–30 October. Dates on figure in mm/dd/yyyy format.

Figure G25. Graphs showing Kīlauea activity from 1 January 1997–1 December 2003 (Pu‘u ‘Ō‘o-Kupaianaha eruption Stage IIB). Time series shows short- and long-period earthquake swarms for all regions as vertical lines. See text figure 7.10 and table 7.4 for event details. Dates on figure in mm/dd/yyyy format.

Figure G26. Map showing earthquake locations for a Nāmakanipaio sequence on 2–3 June 1997 not associated with an east rift intrusion. Data from 30 May to 10 June. Dates on figure in mm/dd/yyyy format.

Figure G27. Map showing activity around a small summit and upper east rift intrusion accompanied by a "surge" on 14 January 1988. Dates on figure in mm/dd/yyyy format. *A*, Short-period seismicity. *B*, Long-period seismicity.

Figure G28. Map showing activity around a Nāmakanipaio sequence on 27–28 January 1998 not associated with an east rift intrusion. Data from 26–28 January. Dates on figure in mm/dd/yyyy format.

Figure G29. Map showing activity around a silent earthquake (Montgomery-Brown and others, 2009) on 19 September 1998. Data from 18–20 September. The earthquake pattern resembles that of suspected deep intrusions beneath zone SDI 2. Dates on figure in mm/dd/yyyy format.

Figure G30. Map showing Kīlauea activity on 27–28 September 1998. Data from 27–30 September. Two mainshocks: *M*4.6 (27 September) located northeast of Kīlauea Caldera, and *M*4.8 (28 September) located in the eastern south flank, the latter with aftershocks. Dates on figure in mm/dd/yyyy format.

Figure G31. Map showing activity around $M5.2$ Hilea (Mauna Loa) earthquake on 16 April 1999 and aftershocks. Data from 16–23 April. Seismicity beneath the Kīlauea lower southwest rift zone was triggered beginning 1 hour after the mainshock and continuing for nearly 15 hours. Dates on figure in mm/dd/yyyy format.

Figure G32 Map showing activity around 26 May 1999 Nāmakanipaio mainshock $M4.3$ with aftershocks. Data from 25–30 May. Dates on figure in mm/dd/yyyy format.

Figure G33. Map showing activity around upper east rift intrusion on 12 September 1999. Data from 10–16 September. Dates on figure in mm/dd/yyyy format.

Figure G34. Map showing activity around upper east rift intrusion on 23–24 February 2000, preceded by a swarm of deep magma-supply earthquakes. Data from 17–29 February. *A*, Short-period seismicity. *B*, Long-period seismicity.

Figure G35. Map showing activity around an eruptive surge on 24 September 2000. Data from 20–28 September. Dates on figure in mm/dd/yyyy format.

Figure G36. Map showing activity around a silent earthquake (Montgomery-Brown and others, 2009) on 8–9 November 2000 preceding a broader south flank earthquake swarm. Data from 8–18 November. Dates on figure in mm/dd/yyyy format.

Figure G37. Map showing activity around an eruptive surge on 20 May 2001. Data from 16–24 May. Dates on figure in mm/dd/yyyy format.

Figure G38. Map showing activity around suspected deep intrusion on 23–24 June 2001 beneath site SDI 2 (chap. 5, fig. 5.2). Data from 22–30 June. Dates on figure in mm/dd/yyyy format.

Figure G39. Map showing activity around a silent earthquake (Montgomery-Brown and others, 2009) on 19 September 2001. Data from 17–22 September. Dates on figure in mm/dd/yyyy format.

Figure G40. Map showing activity around an eruptive surge on 9 December 2001 preceding a small summit intrusion. Data from 8–15 December. Dates on figure in mm/dd/yyyy format.

Figure G41. Map showing activity around a small upper east rift intrusion on 19 December 2001. Data from 17–23 December. Dates on figure in mm/dd/yyyy format.

Figure G42. Map showing activity around suspected deep intrusion on 12 February 2002 beneath site SDI 2 (chap. 5, fig. 5.2). Data from 10–16 February. Dates on figure in mm/dd/yyyy format.

Figure G43. Map showing activity around an eruptive surge on 5 April 2002. Data from 2–8 April. No earthquakes occurred during the surge. Dates on figure in mm/dd/yyyy format.

Figure G44. Map showing activity around two suspected deep intrusions on 21 August and 28–29 August 2002 beneath site SDI 2 (chap. 5, fig. 5.2). Data from 20–31 August. Dates on figure in mm/dd/yyyy format.

Figure G45. Map showing activity around a silent earthquake (Montgomery-Brown and others, 2009) on 17 December 2002. Data from 11–18 December. Dates on figure in mm/dd/yyyy format.

Figure G46. Map showing activity around an eruptive surge on 21 January 2003. Data from 8–28 January. No earthquakes during the surge. Dates on figure in mm/dd/yyyy format.

Figure G47. Map showing activity around a Nāmakaniipao sequence on 6–7 April 2003, preceded and followed by deep magma supply earthquakes. Data from 31 March–14 April. Dates on figure in mm/dd/yyyy format.

Figure G48. Map showing activity around a silent earthquake (Montgomery-Brown and others, 2009) on 3 July 2003 preceded by a suspected deep intrusion near site SDI 3 (chap. 5, fig. 5.2) on 1–2 July. Data from 28 June–5 July. Dates on figure in mm/dd/yyyy format.

Figure G49. Map showing activity around an eruptive surge on 8 August 2003, with both short-period and long-period summit seismicity before and after. Data from 6–10 August. Dates on figure in mm/dd/yyyy format.

Figure G50. Graphs showing Kīlauea activity from 1 December 2003 to 19 March 2008 (Pu‘u ‘Ō‘o-Kupaianaha eruption Stage III). Time series shows short- and long-period earthquake swarms for all regions as vertical lines connected across the times of intrusion. Dates on figure in mm/dd/yyyy format. See text fig. 7.13 and tables 7.5 and 7.6 for event details.

Figure G51. Map showing activity around a suspected deep intrusion on 22 December 2003 beneath site SDI 2 (see chap. 5, fig. 5.2). Data from 18–26 December 2003. Dates on figure in mm/dd/yyyy format.

Figure G52. Map showing activity around an upper east rift intrusion on 4 March 2004 accompanying a surge. Data from 2–8 March 2004. Dates on figure in mm/dd/yyyy format.

Figure G53. Map showing seismic activity preceding and following an eruptive surge on 20 March 2004. Data from 18–26 March 2004. Dates on figure in mm/dd/yyyy format.

Figure G54. Map showing activity around an uppermost east rift intrusion on 12–13 May 2004, preceding an eruptive surge on 15 May. Data from 8–18 May. Dates on figure in mm/dd/yyyy format.

Figure G55. Map showing activity around a small upper east rift intrusion 4 June 2004. Data from 3–9 June. Dates on figure in mm/dd/yyyy format.

Figure G56. Map showing activity around a double east rift intrusion on 9–10 July 2004 showing downrift migration of epicenters. Data from 1–14 July. Pre- and posteruption south flank earthquakes extend well east of the rift intrusion site. Dates on figure in mm/dd/yyyy format.

Figure G57. Map showing activity around an upper east rift intrusion on 27 July 2004 accompanying a surge. Data from 25 July–2 August. Earthquakes after the surge occur near the upper middle east rift boundary. Dates on figure in mm/dd/yyyy format.

Figure G58. Map showing activity around a Nāmakaniipao sequence on 2 November 2004. Data from 29 October–9 November. Dates on figure in mm/dd/yyyy format.

Figure G59. Map showing activity around an upper east rift intrusion on 22–23 December 2004. Data from 19–29 December. Dates on figure in mm/dd/yyyy format.

Figure G60. Map showing activity around a silent earthquake (Montgomery-Brown and others, 2009) on 25–27 January 2005, preceded on 24–25 January by an upper east rift intrusion and followed on 27–29 January by a Nāmakaniipao sequence. Dates on figure in mm/dd/yyyy format.

Figure G61. Map showing activity around an upper-middle east rift intrusion on 29–30 December 2005, preceded by deep magma-supply earthquakes. Data from 25 December 2005 to 2 January 2006. Dates on figure in mm/dd/yyyy format.

Figure G62. Map showing activity around the beginning of paired intrusions on the uppermost seismic southwest rift zone and the uppermost east rift zone on 15–16 January 2006. Data from 14–19 January. The first intrusion is on the upper east rift. Dates on figure in mm/dd/yyyy format.

Figure G63. Map showing activity around a Nāamakanipaio sequence on 22–23 January 2006. Data from 20–23 January. Dates on figure in mm/dd/yyyy format.

Figure G64. Maps showing activity around a series of nearly continuous paired intrusions into the upper east rift zone and the uppermost seismic southwest rift zone in January-February 2006. Dates on figure in mm/dd/yyyy format. *A*, 25–26 January 2006: An intrusion into the uppermost east rift zone. Data from 24–28 January. *B*, 29–31 January 2006: Two intrusions beneath the upper east rift zone separated by about 10 hours. The preintrusion east rift seismicity is colocated with the syneruption seismicity. Data from 29–31 January. *C*, 1–8 February 2006: A large paired intrusion into the upper east rift zone and upper seismic southwest rift zone accompanied by several deep magma-supply earthquakes. Data from 1–9 February. *D*, 9–18 February 2006: A continuation of of nearly continuous intrusions into the upper east rift zone and the uppermost seismic southwest rift zone, consisting of successive swarms of 40, 38, 10, 12, and 48 rift events. Data from 9–20 February.

Figure G65. Map showing activity around two intrusions overlapping in time on 22–24 February 2006, which are the last of a 1-month sequence of paired intrusions on the uppermost east rift zone and uppermost seismic southwest rift zone. Data from 21–25

February. The intrusions were preceded by a Nāmakaniipaio sequence that began on 22 February. Dates on figure in mm/dd/yyyy format.

Figure G66. Map showing activity during waning of nearly continuous intrusion into the upper east rift zone and the uppermost seismic southwest rift zone on 27 February to 1 March 2006. Data from 26 February to 2 March. Dates on figure in mm/dd/yyyy format.

Figure G67. Map showing activity around Nāmakaniipaio sequence on 1–4 March 2006, directly preceding a small upper seismic southwest rift intrusion. Data from 1–5 March. Dates on figure in mm/dd/yyyy format.

Figure G68. Map showing activity around Nāmakaniipaio sequence on 6 March 2006, overlapping with a small upper seismic southwest rift intrusion on 6–7 March. Data from 5–7 March. Dates on figure in mm/dd/yyyy format.

Figure G69. Map showing activity around Nāmakaniipaio sequence on 11 March 2006 accompanying a small intrusion into the uppermost seismic southwest rift zone. Data from 10–12 March. Dates on figure in mm/dd/yyyy format.

Figure G70. Map showing activity around a suspected deep intrusion on 16 March 2006 beneath site SDI 2 (chap. 5, fig. 5.2). Data from 15–17 March. Dates on figure in mm/dd/yyyy format.

Figure G71. Map showing activity around a small upper east rift intrusion on 22–23 March 2006, followed by paired (nonswarm) activity beneath the upper east rift zone and upper seismic southwest rift zone. Data from 19–29 March. Dates on figure in mm/dd/yyyy format.

Figure G72. Map showing activity around a small upper-middle east rift intrusion on 9–10 May 2006, preceded by paired (nonswarm) activity beneath the upper east rift zone and upper seismic southwest rift zone and a possible suspected deep intrusion beneath the central south flank. Data from 4–12 May. Dates on figure in mm/dd/yyyy format.

Figure G73. Map showing activity around an intrusion on 29–30 July 2006 beneath the upper seismic southwest rift zone. Data from 28–31 July. Dates on figure in mm/dd/yyyy format.

Figure G74. Map showing activity around an upper east rift intrusion on 3–4 August 2006, followed by paired (nonswarm) activity beneath the upper east rift zone and upper seismic southwest rift zone. Data from 1–8 August. Dates on figure in mm/dd/yyyy format.

Figure G75. Map showing activity around a suspected deep intrusion on 3–5 April 2007 beneath the central south flank. Continuous GPS measurement did not record a spreading step. Data from 1–10 April. Dates on figure in mm/dd/yyyy format.

Figure G76. Map showing activity around a silent earthquake (Montgomery-Brown and others, 2010) on 16 April 2007 associated with very low seismicity. Data from 15–18 April. Dates on figure in mm/dd/yyyy format.

Figure G77. Map showing activity around two intrusions on 24–27 May 2007 beneath the upper east rift zone separated by about 9 hours. Data from 22–29 May. Dates on figure in mm/dd/yyyy format.

Figure G78. Map showing activity around intrusion on 31 May–1 June 2007 beneath the uppermost seismic southwest rift zone. Data from 30 May–2 June. Dates on figure in mm/dd/yyyy format.

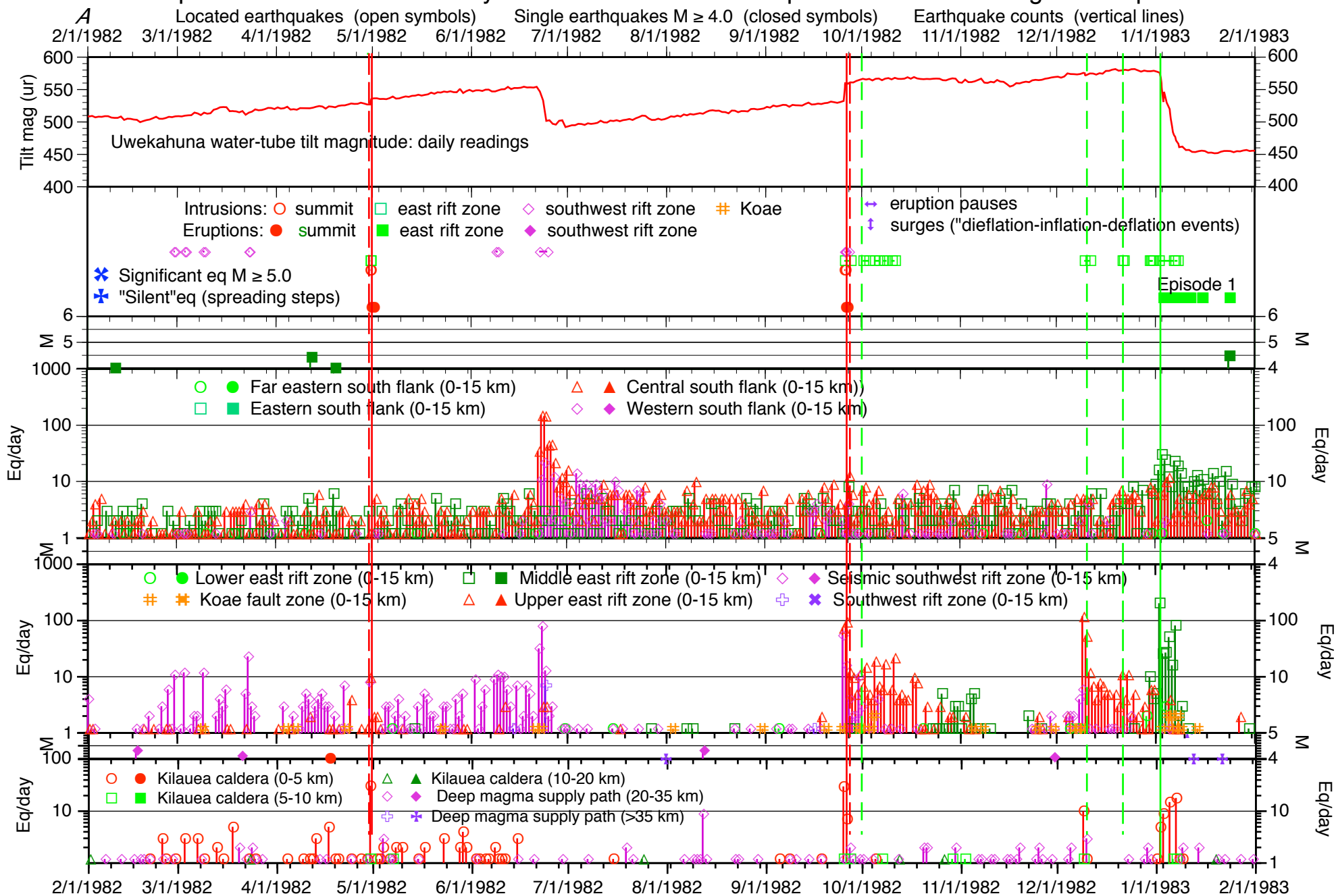
Figure G79. Map showing activity around silent earthquake (Montgomery-Brown and others, 2009) on 17–18 June 2007 that overlaps in time with the intrusion accompanying the Father’s Day eruption (see text fig. 7.14). Data from 17–18 June. Dates on figure in mm/dd/yyyy format.

Figure G80. Map showing activity around a small upper east rift intrusion on 3–4 July 2007. Data from 2–4 July. Dates on figure in mm/dd/yyyy format.

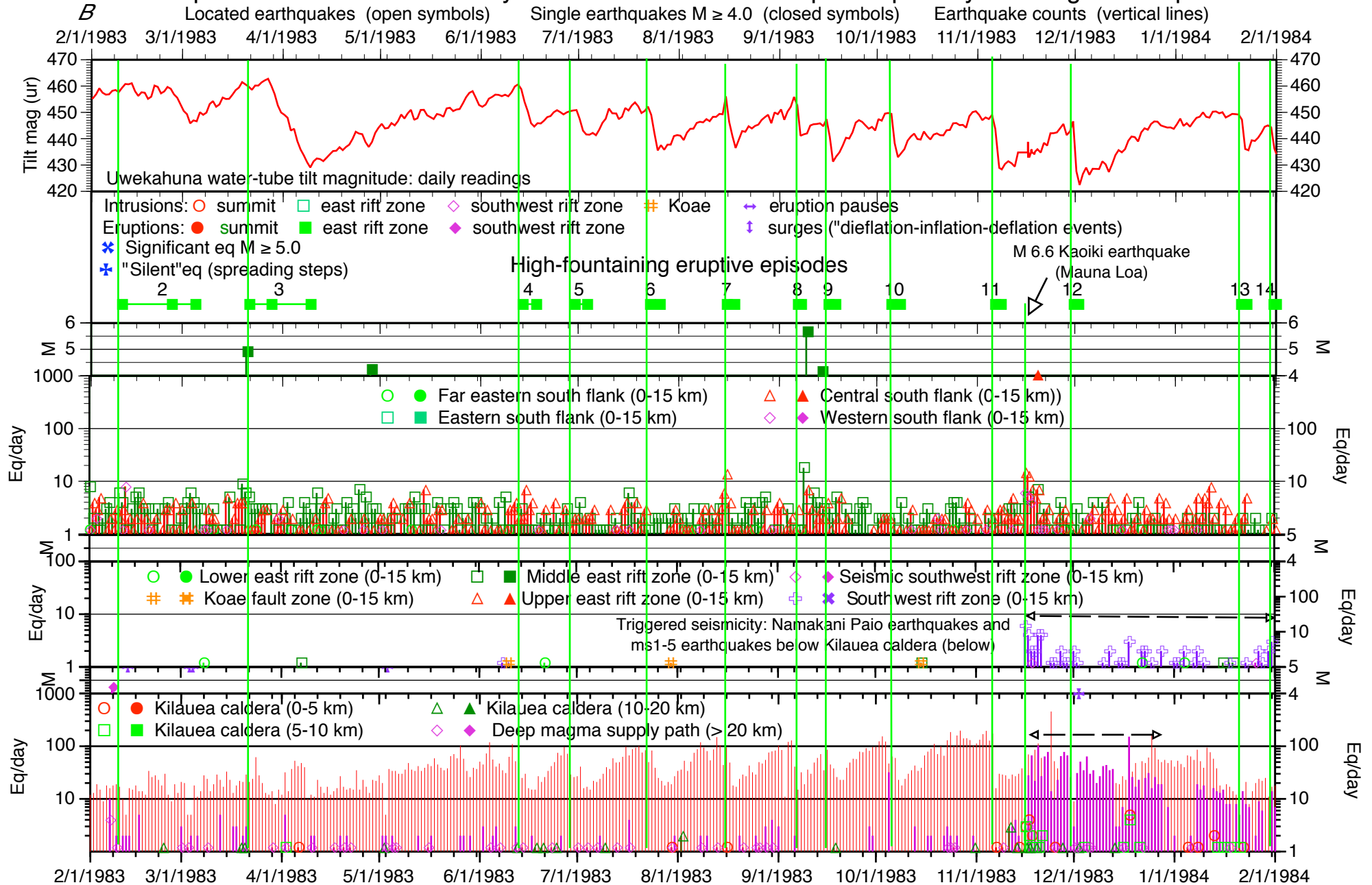
Figure G81. Map showing activity around a small middle east rift intrusion on 5–6 July 2007, anticipating the east rift eruption of 21 July (vents shown). Data from 5–11 July. Dates on figure in mm/dd/yyyy format.

Figure G82. Map showing activity around an upper east rift intrusion on 16–17 July 2007, precursory to the eruption on 21 July (vents shown). Data from 12–21 July. South flank seismicity occurs only before and after the intrusion and extends to a region south of the eruption vents. Dates on figure in mm/dd/yyyy format.

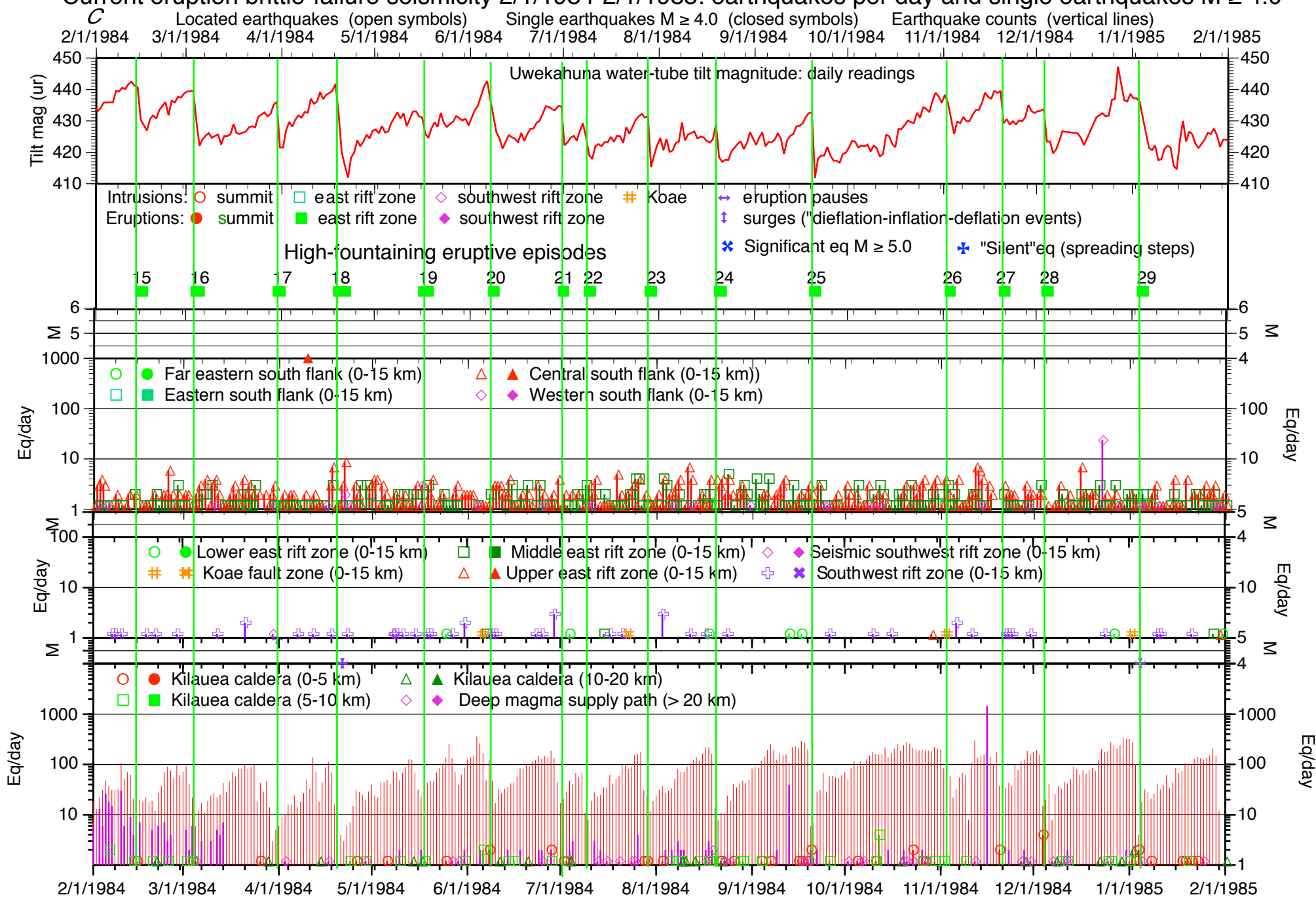
Current eruption brittle-failure seismicity 2/1/1982-2/1/1983: earthquake swarms and single earthquakes $M \geq 4.0$



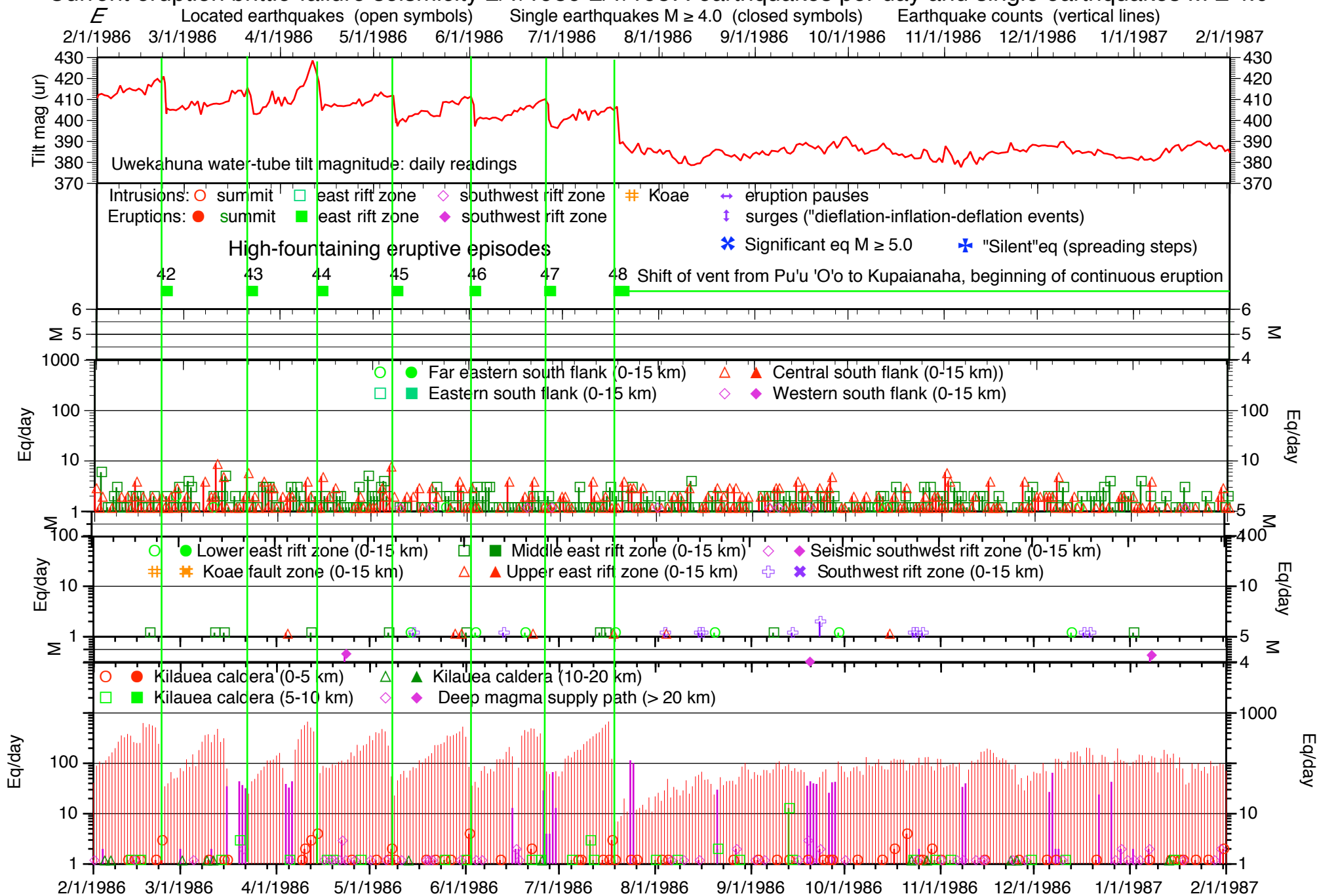
Appendix figure G1 b

Current eruption brittle-failure seismicity 2/1/1983-2/1/1984: earthquakes per day and single earthquakes $M \geq 4.0$ 

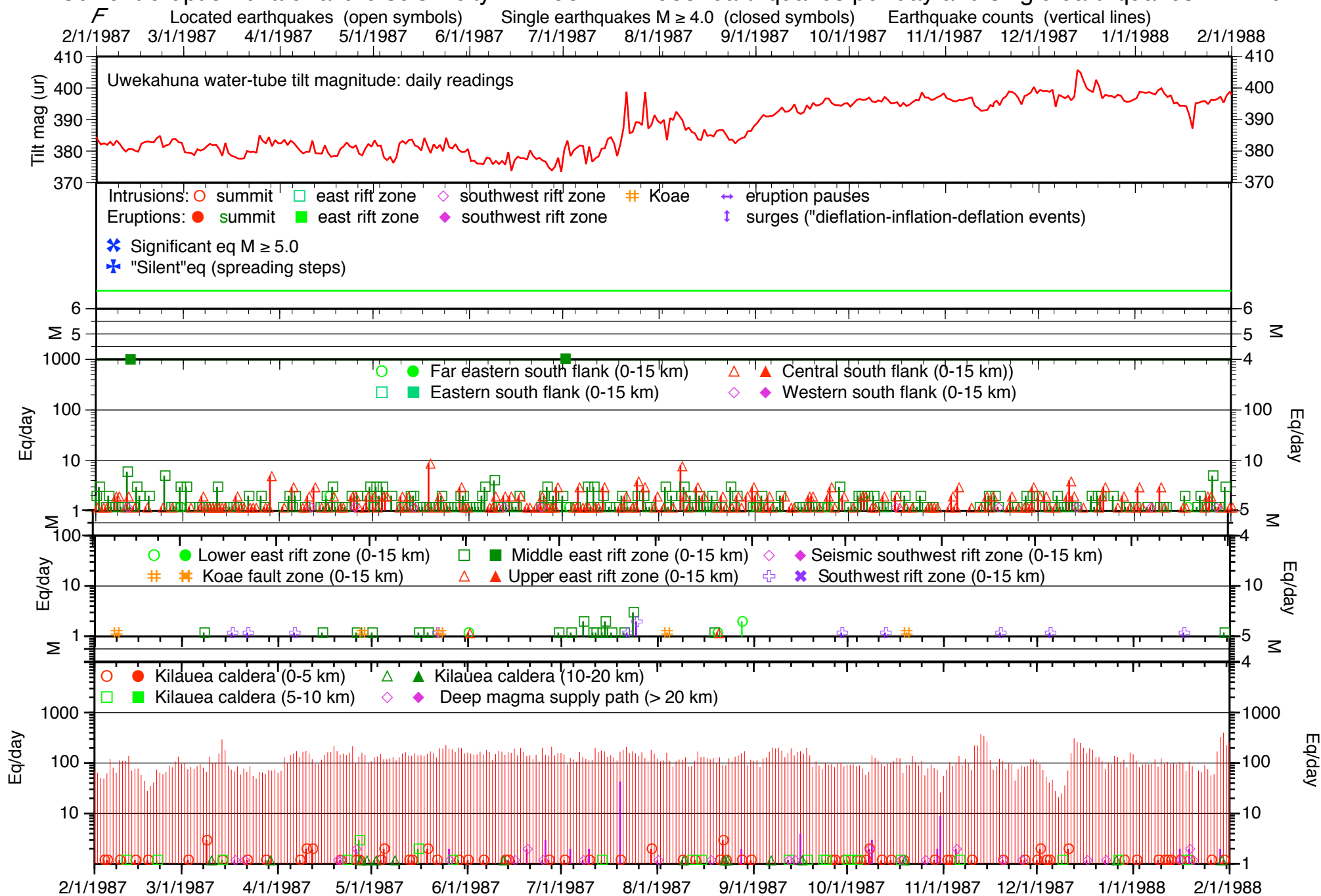
Appendix figure G1 c

Current eruption brittle-failure seismicity 2/1/1984-2/1/1985: earthquakes per day and single earthquakes $M \geq 4.0$ 

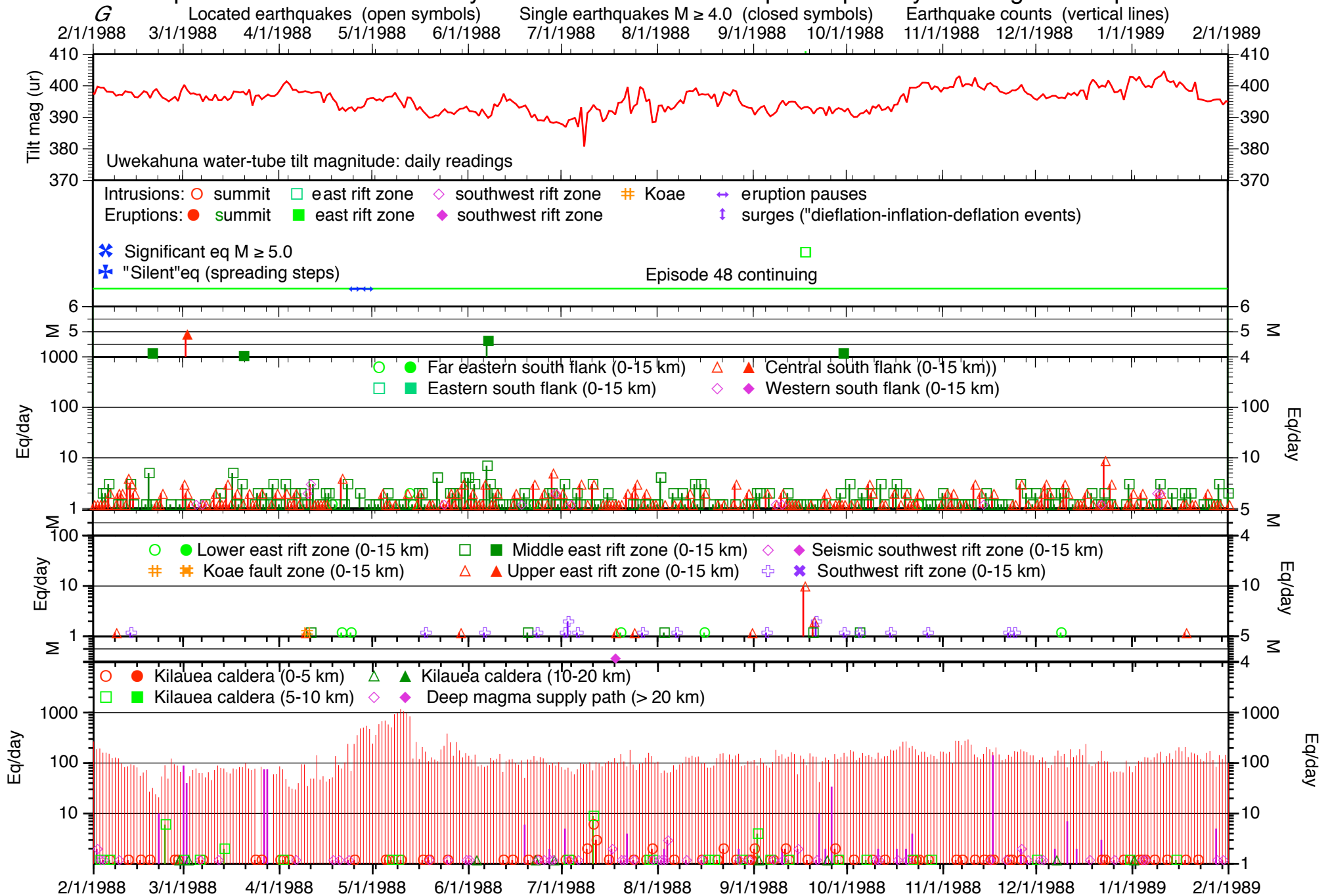
Appendix figure G1 e

Current eruption brittle-failure seismicity 2/1/1986-2/1/1987: earthquakes per day and single earthquakes $M \geq 4.0$ 

Appendix figure G1 f

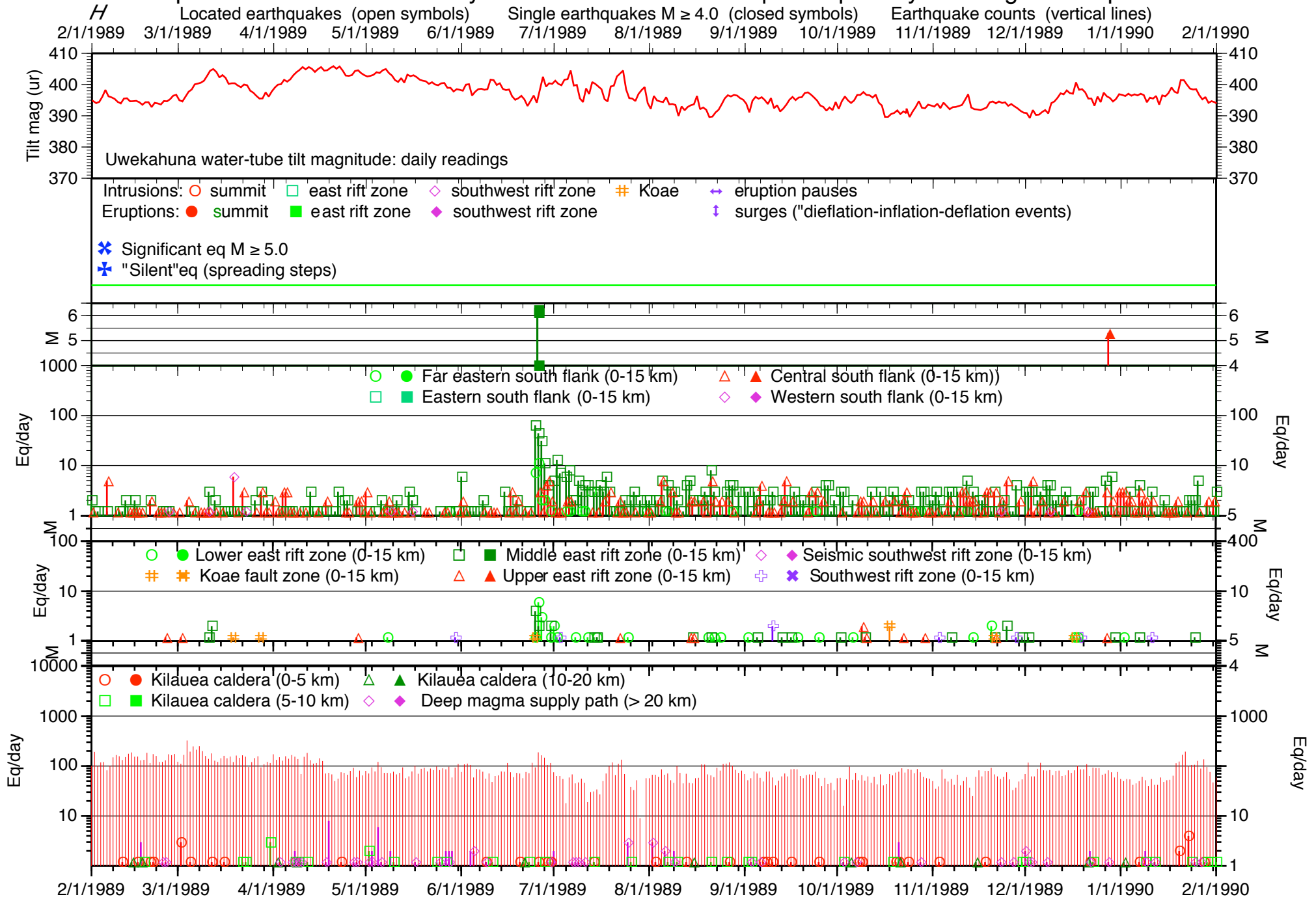
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Appendix figure G1 g

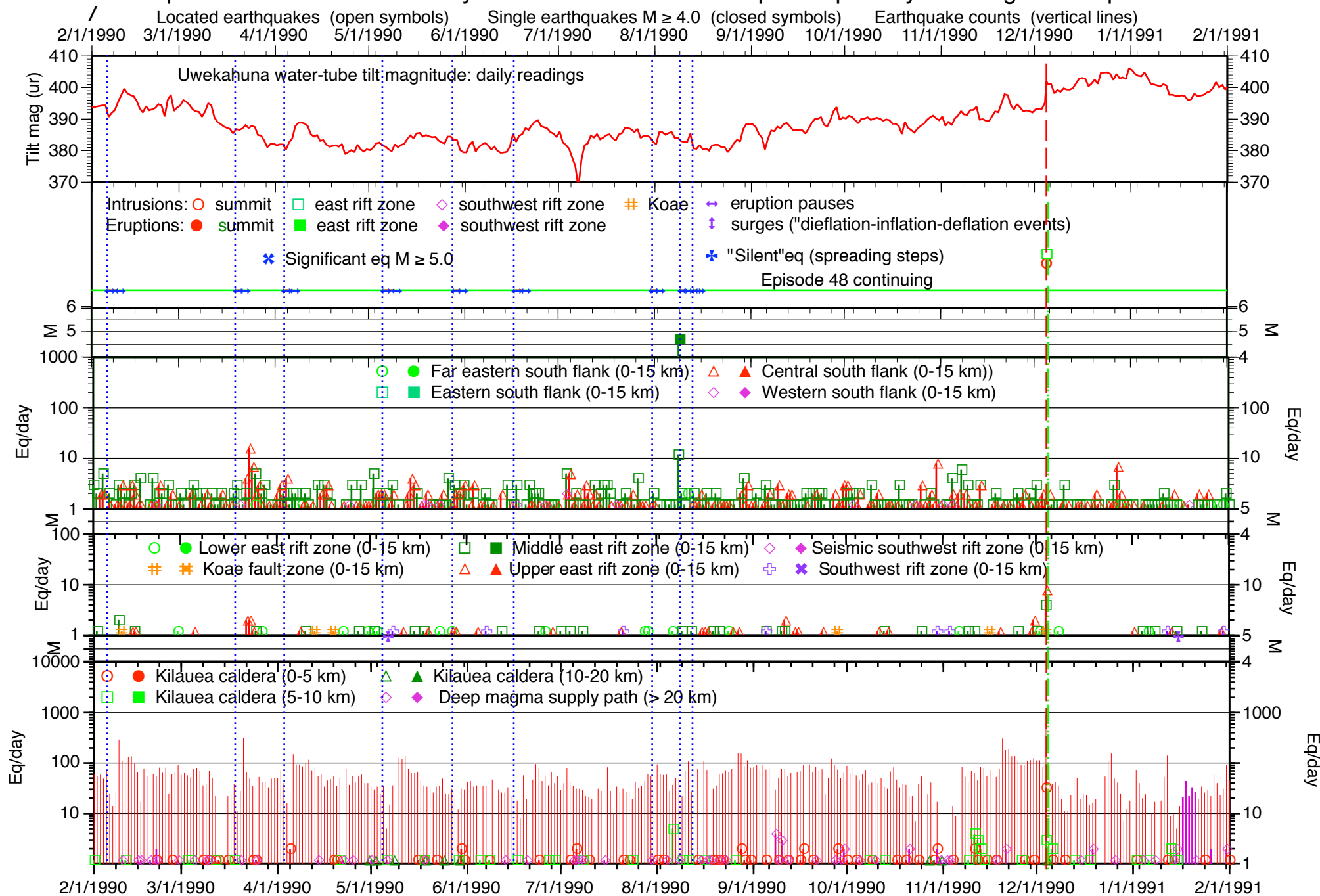
Current eruption brittle-failure seismicity 2/1/1988-2/1/1989: earthquakes per day and single earthquakes $M \geq 4.0$ 

Appendix figure G1 h

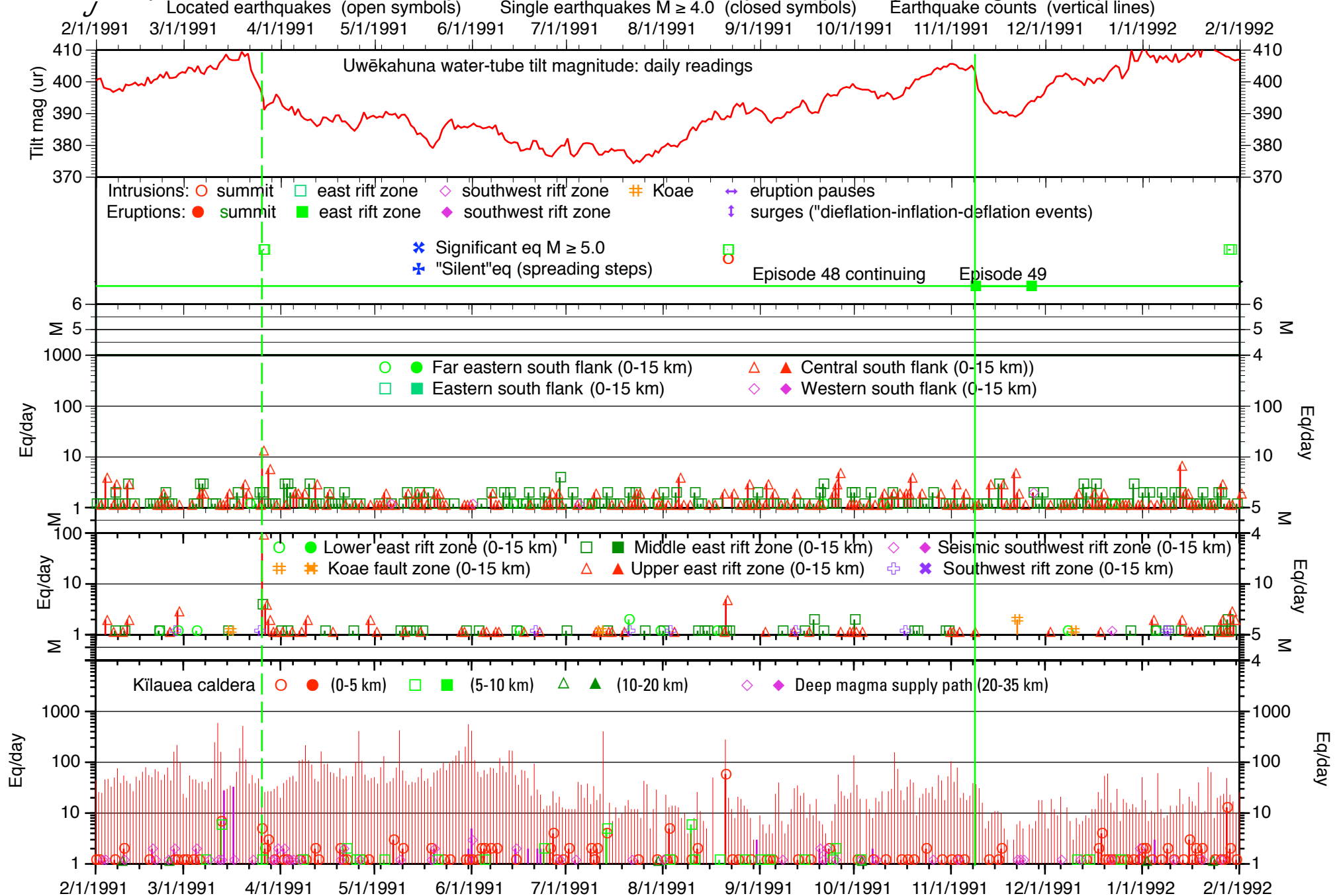
Current eruption brittle-failure seismicity 2/1/1989-2/1/1990: earthquakes per day and single earthquakes $M \geq 4.0$



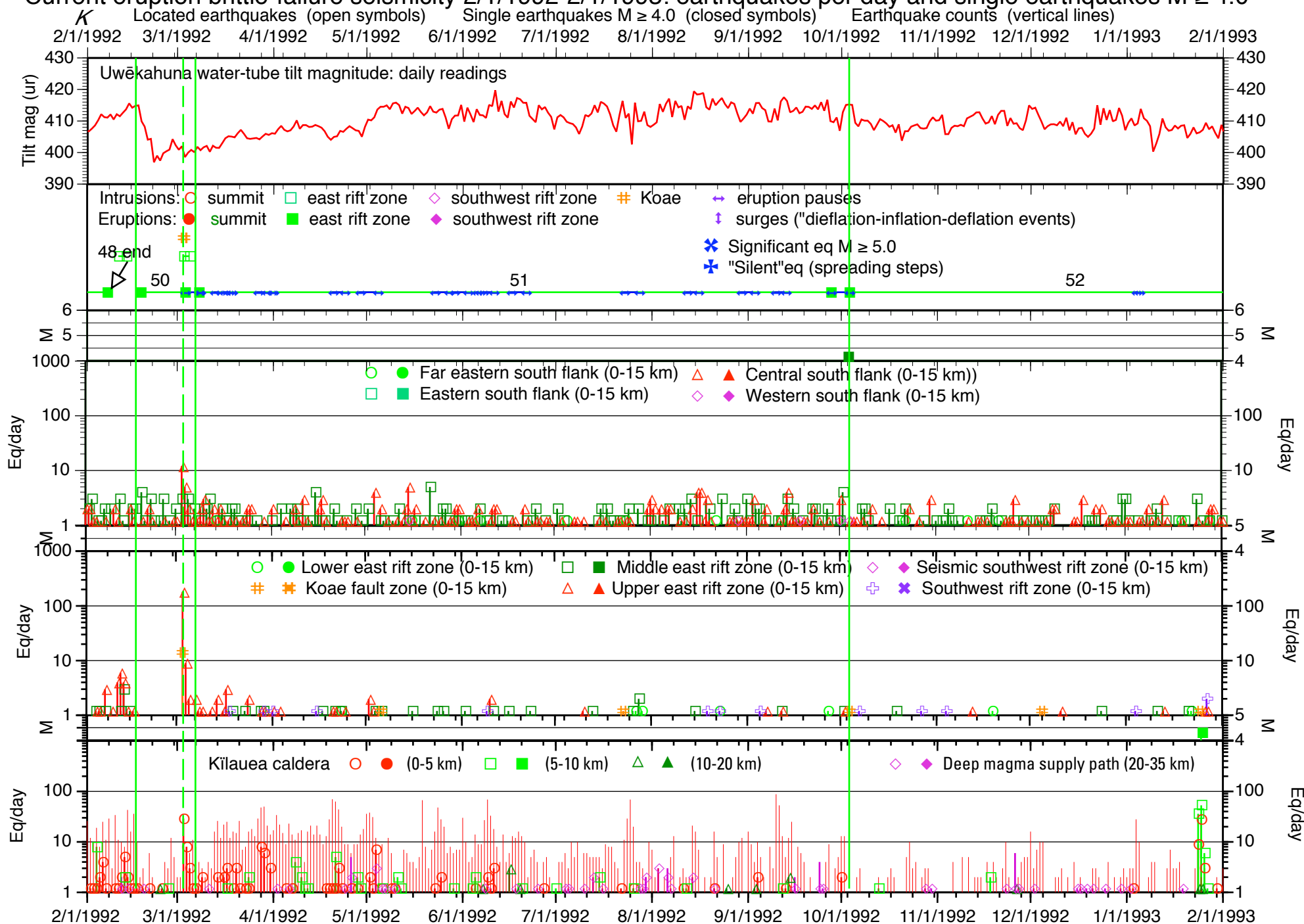
Appendix figure G1 i

Current eruption brittle-failure seismicity 2/1/1990-2/1/1991: earthquakes per day and single earthquakes $M \geq 4.0$ 

Appendix figure G1 j

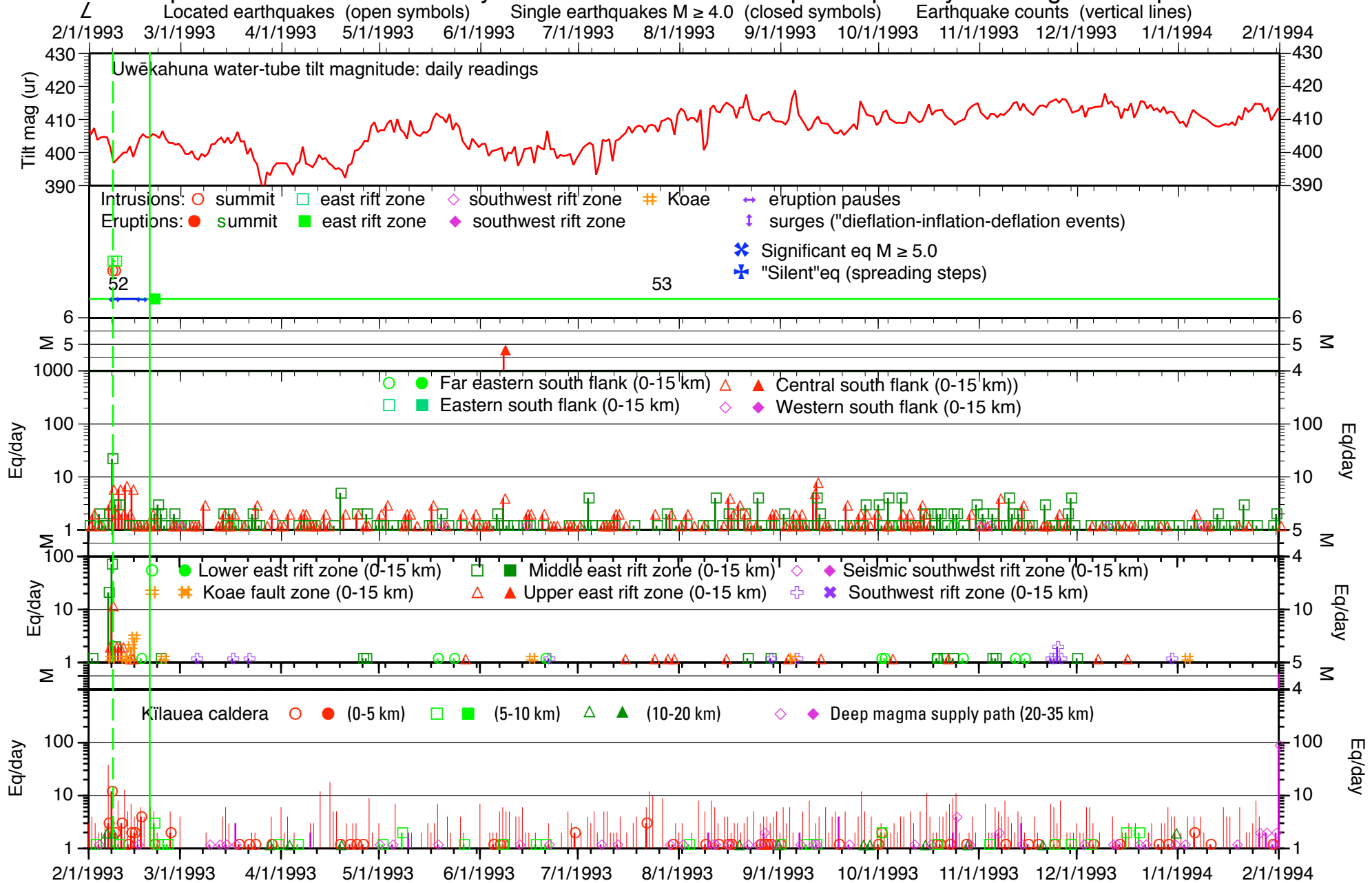
Current eruption brittle-failure seismicity 2/1/1991-2/1/1992: earthquakes per day and single earthquakes $M \geq 4.0$ 

Appendix figure G1 k

Current eruption brittle-failure seismicity 2/1/1992-2/1/1993: earthquakes per day and single earthquakes $M \geq 4.0$ 

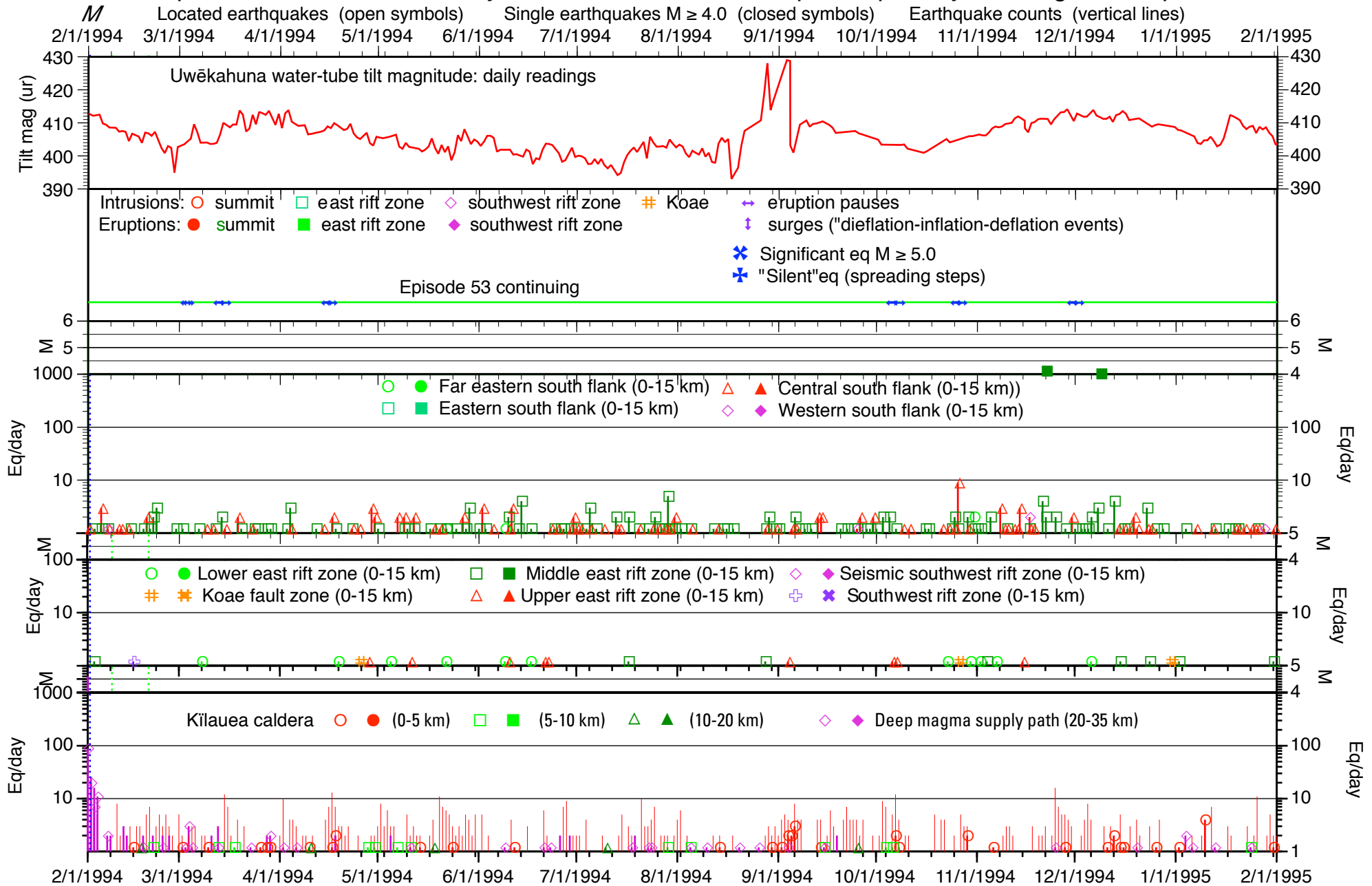
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Current eruption brittle-failure seismicity 2/1/1993-2/1/1994: earthquakes per day and single earthquakes $M \geq 4.0$

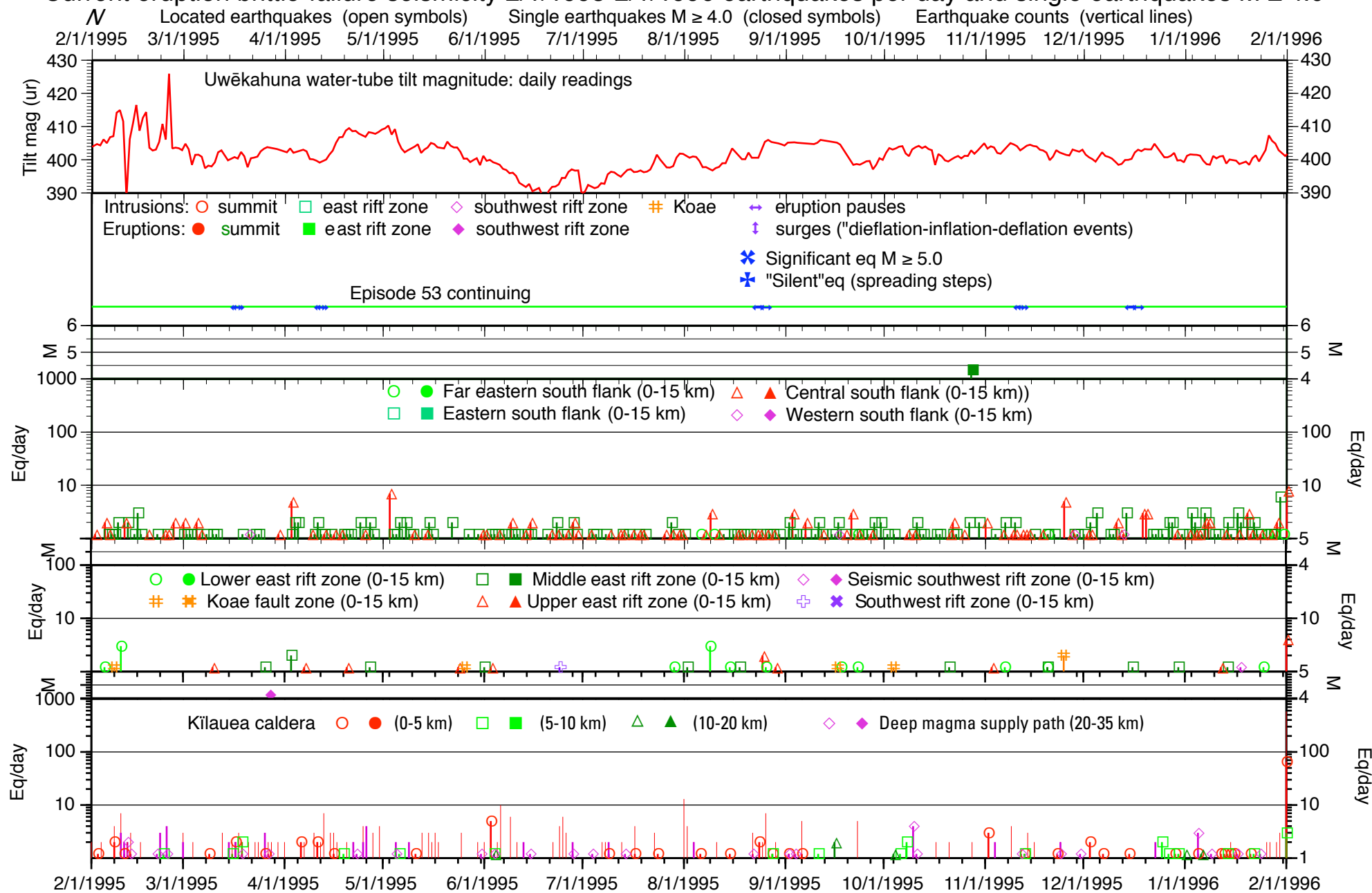


Appendix figure G1 m

Current eruption brittle-failure seismicity 2/1/1994-2/1/1995: earthquakes per day and single earthquakes $M \geq 4.0$



Appendix figure G1 n

Current eruption brittle-failure seismicity 2/1/1995-2/1/1996 earthquakes per day and single earthquakes $M \geq 4.0$ 

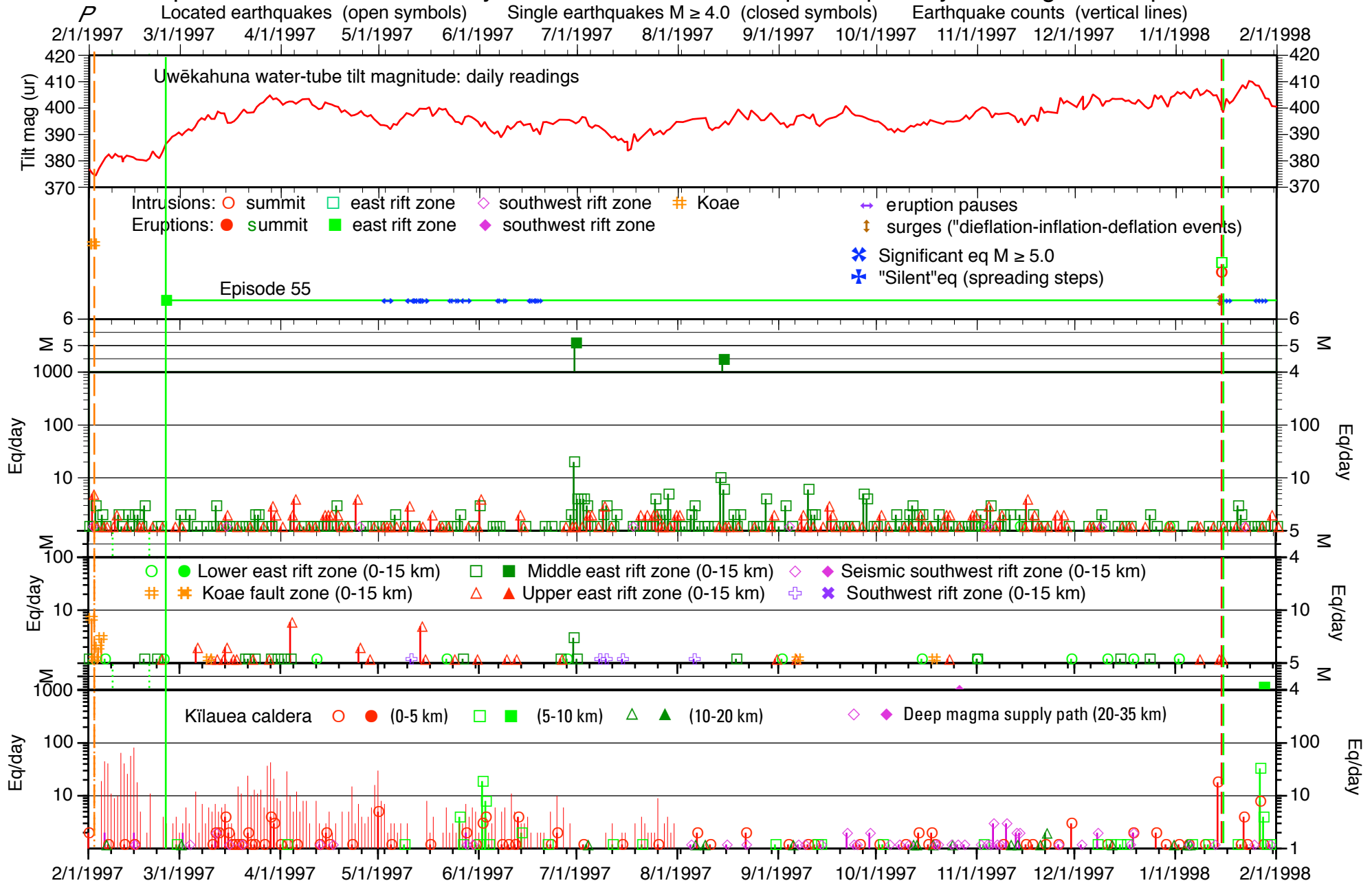
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Current eruption brittle-failure seismicity 2/1/1996-2/1/1997: earthquakes per day and single earthquakes $M \geq 4.0$

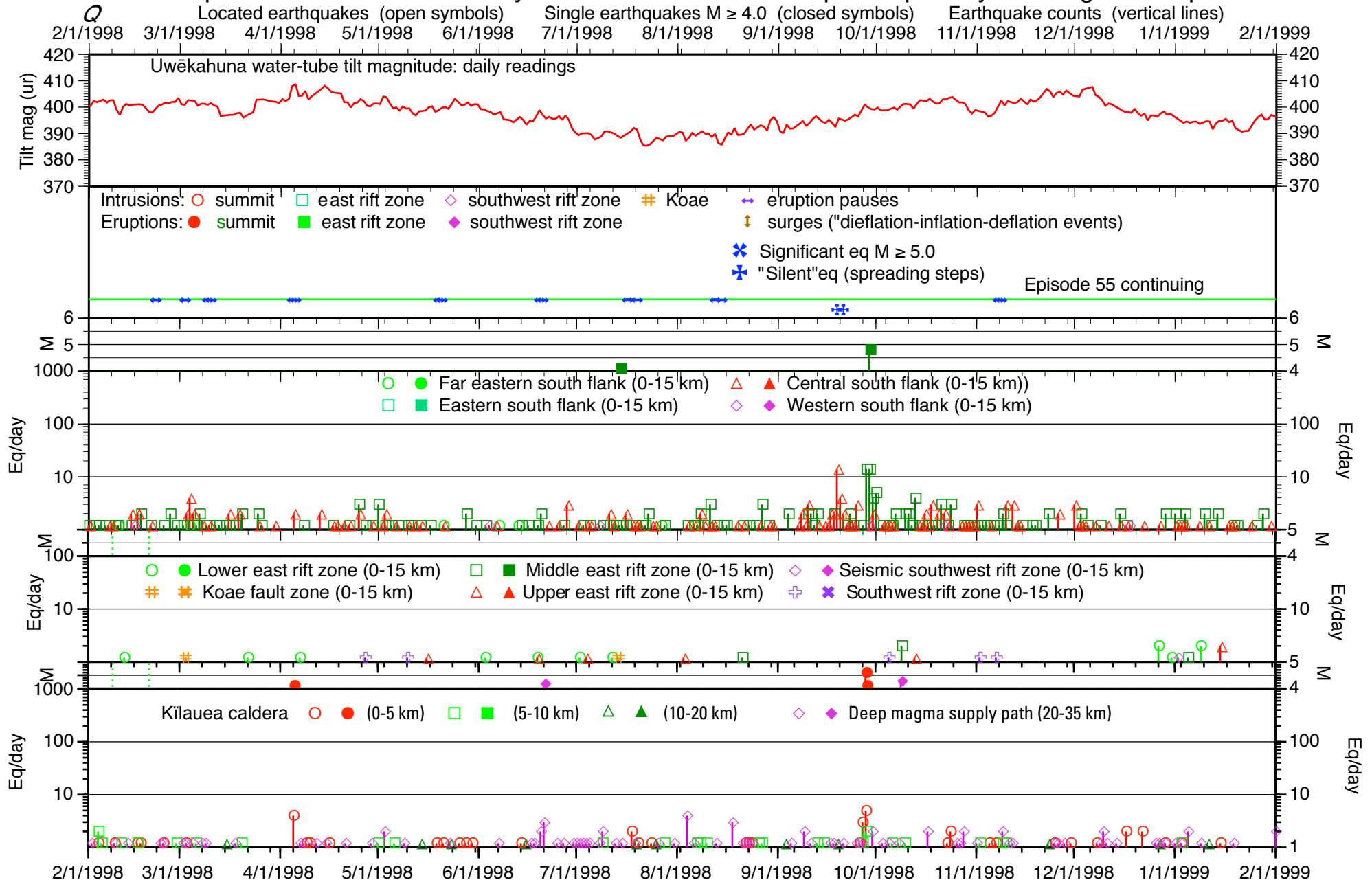


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Current eruption brittle-failure seismicity 2/1/1997-2/1/1998 earthquakes per day and single earthquakes $M \geq 4.0$

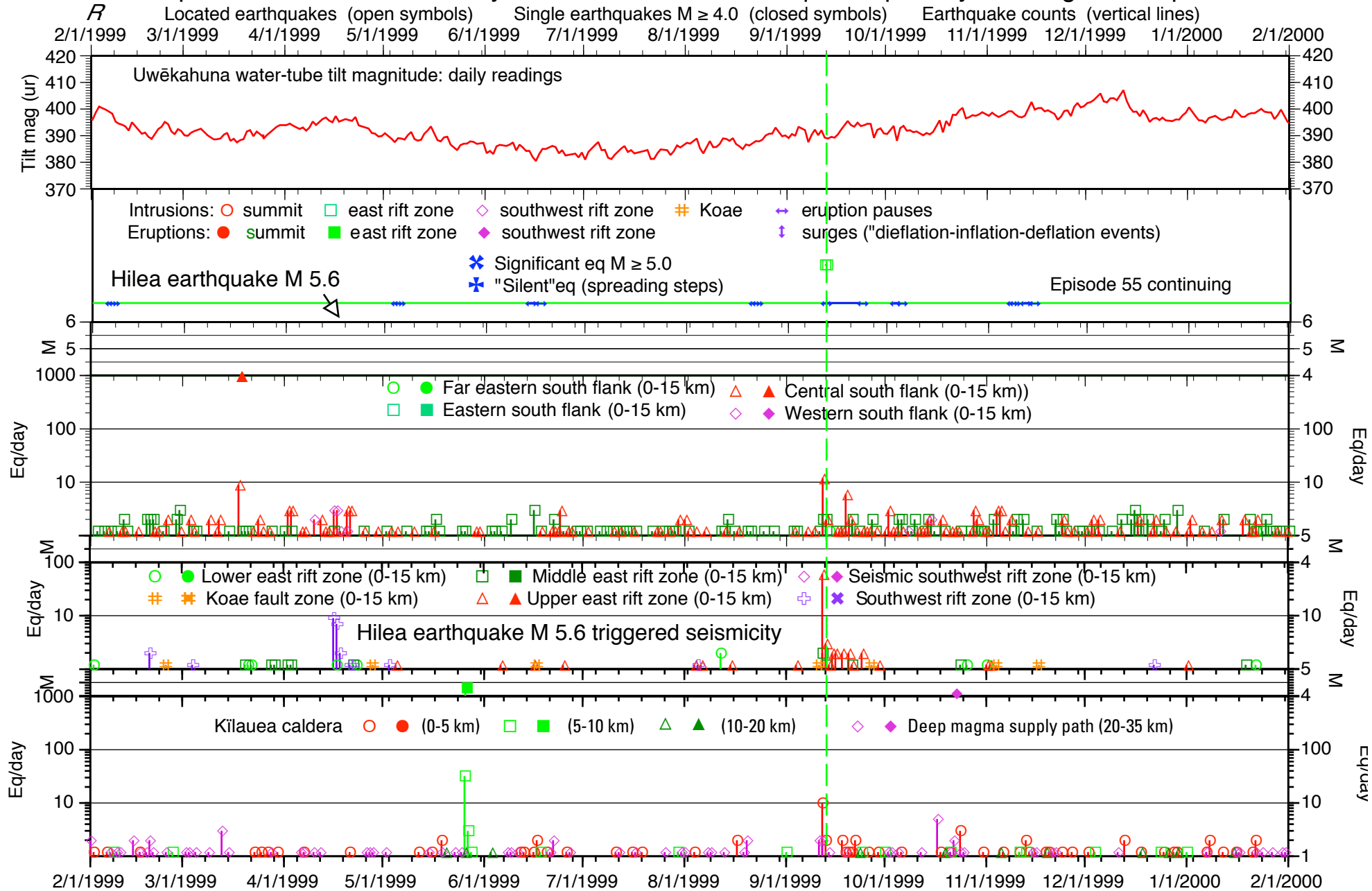


Appendix figure G1 q

Current eruption brittle-failure seismicity 2/1/1998-2/1/1999: earthquakes per day and single earthquakes $M \geq 4.0$ 

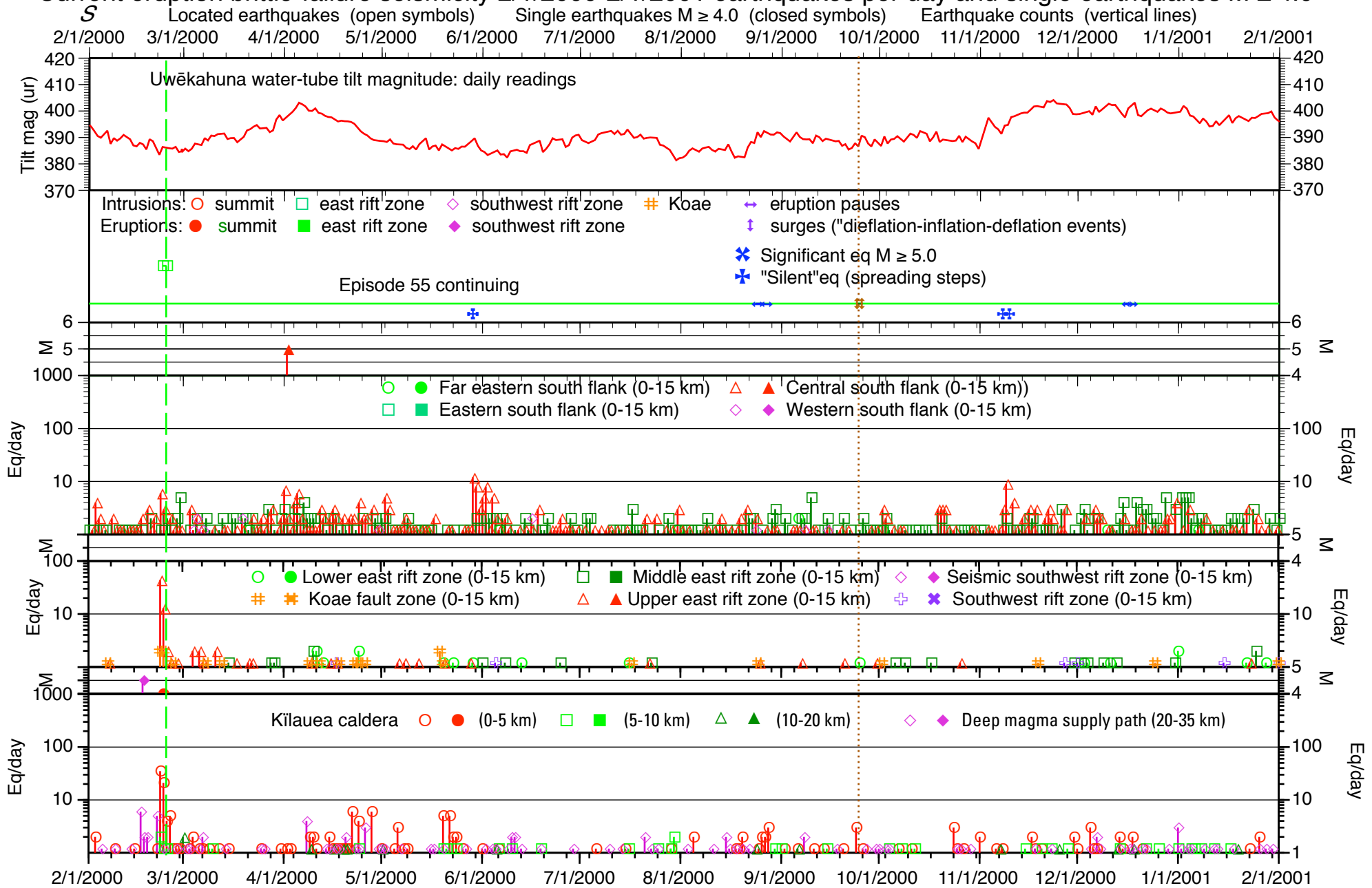
Appendix figure G1 r

Current eruption brittle-failure seismicity 2/1/1993-2/1/1994: earthquakes per day and single earthquakes M ≥ 4.0

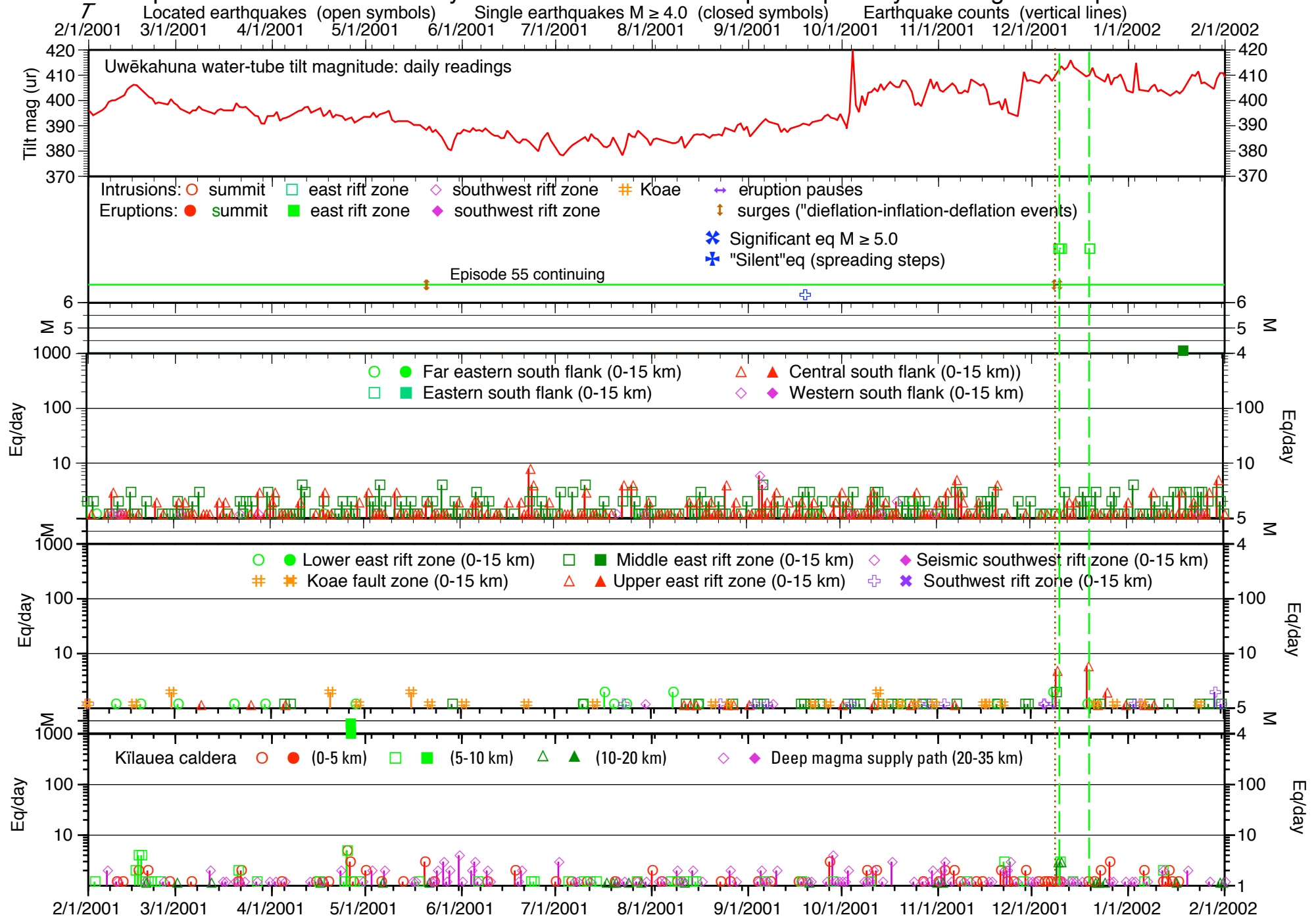


Appendix figure G1 s

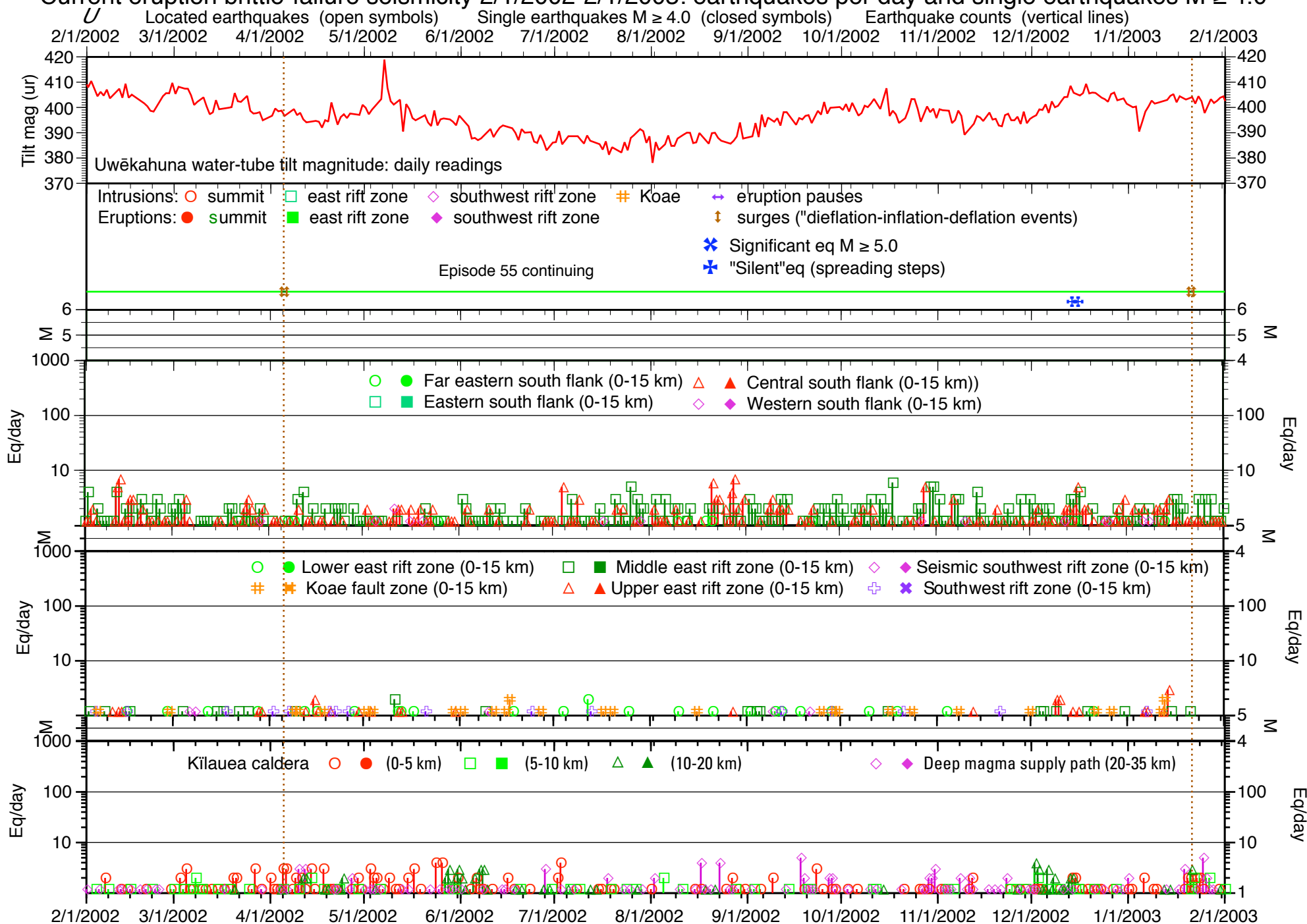
Current eruption brittle-failure seismicity 2/1/2000-2/1/2001 earthquakes per day and single earthquakes M ≥ 4.0



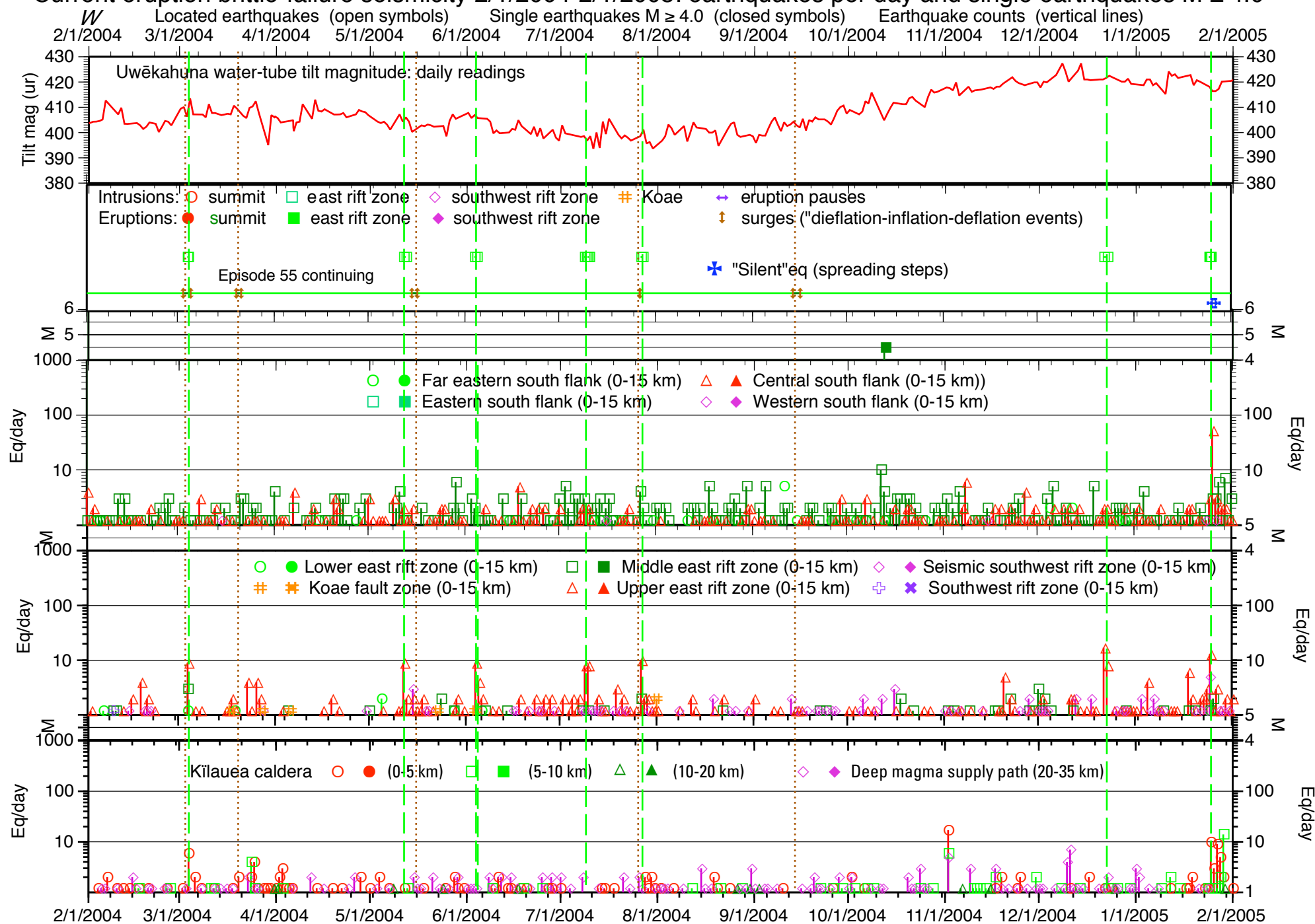
Appendix figure G1 t

Current eruption brittle-failure seismicity 2/1/2006-2/1/2007: earthquakes per day and single earthquakes $M \geq 4.0$ 

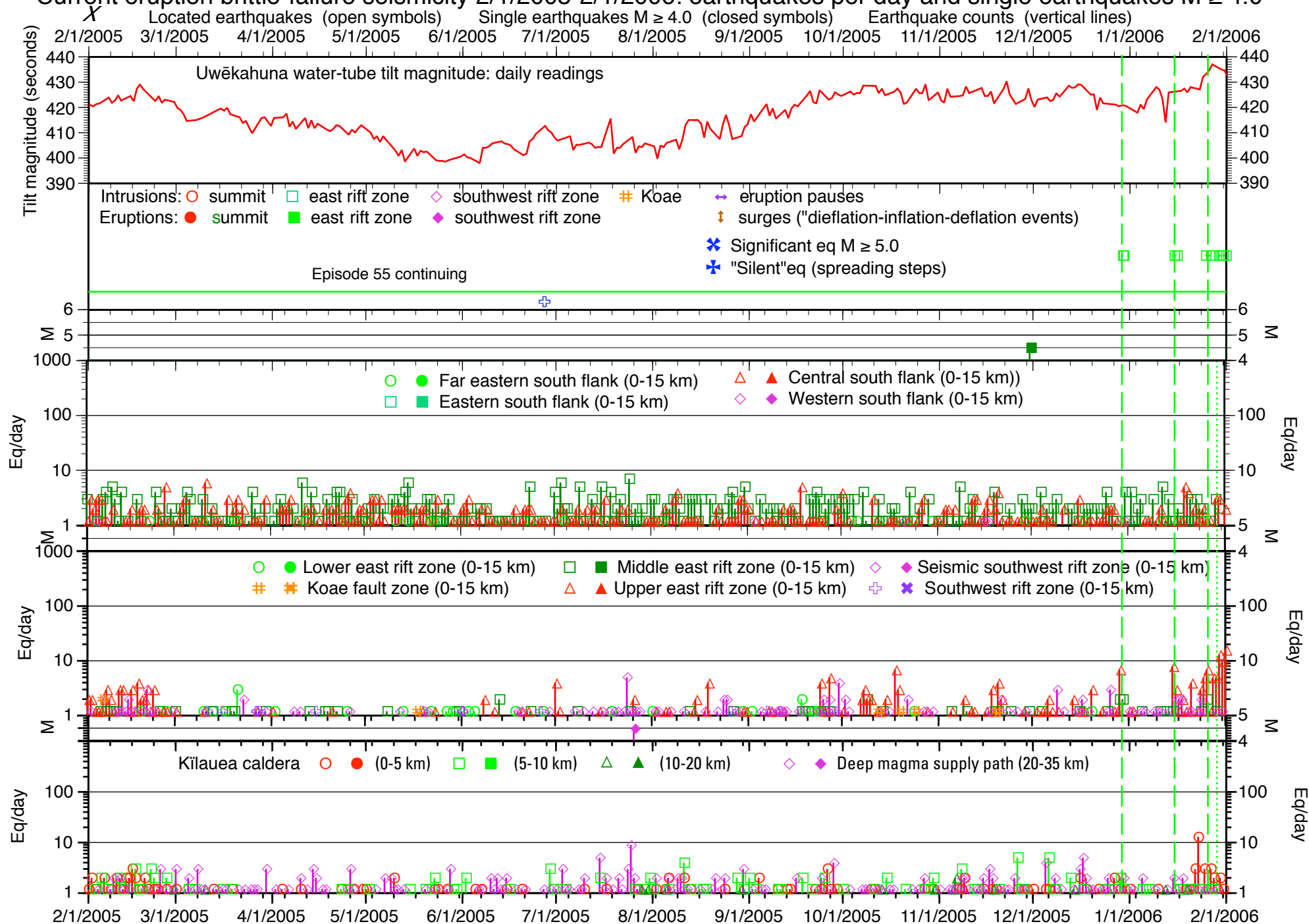
Appendix figure G1 u

Current eruption brittle-failure seismicity 2/1/2002-2/1/2003: earthquakes per day and single earthquakes $M \geq 4.0$ 

Appendix figure G1 w

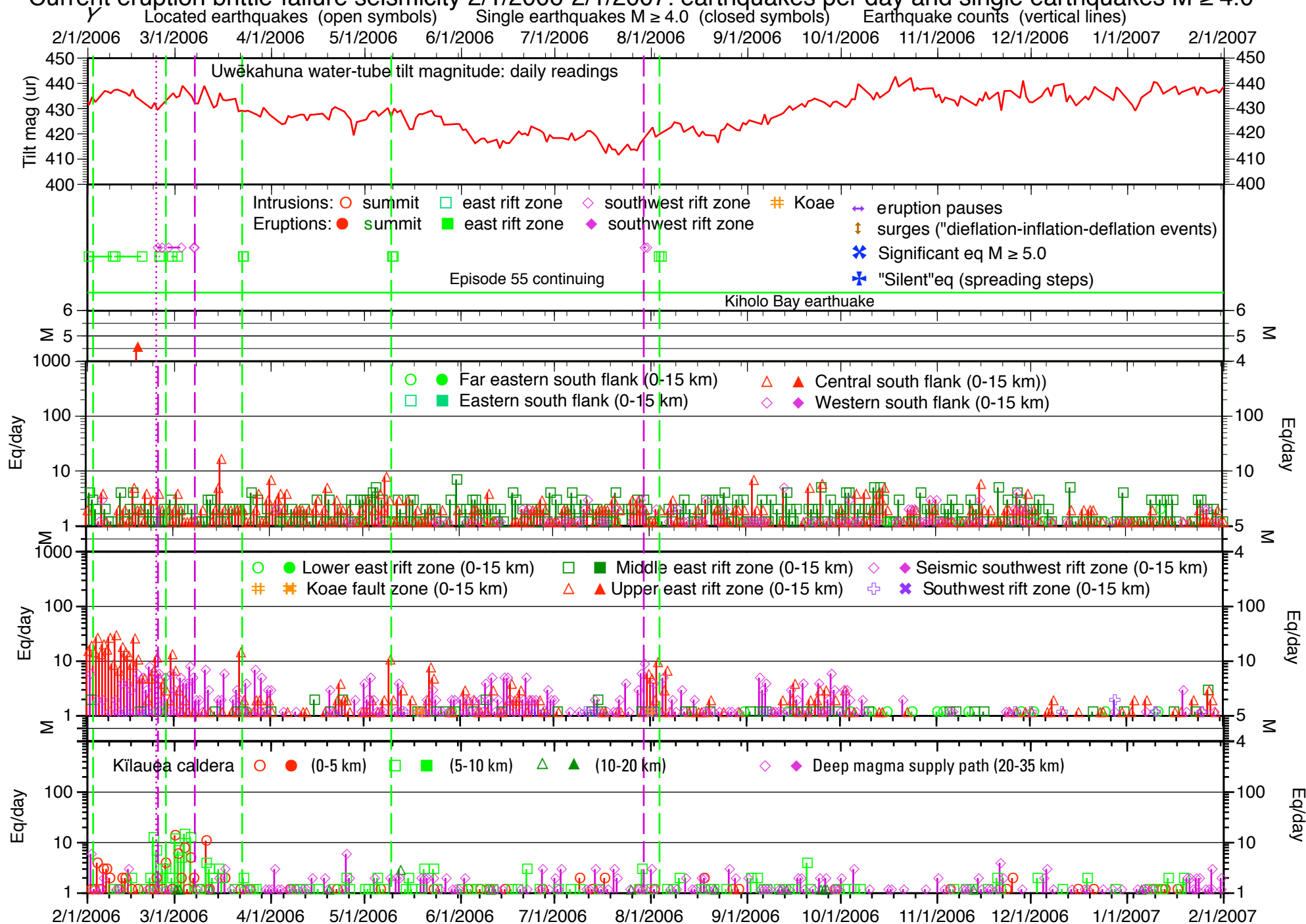
Current eruption brittle-failure seismicity 2/1/2004-2/1/2005: earthquakes per day and single earthquakes $M \geq 4.0$ 

Appendix figure G1 x

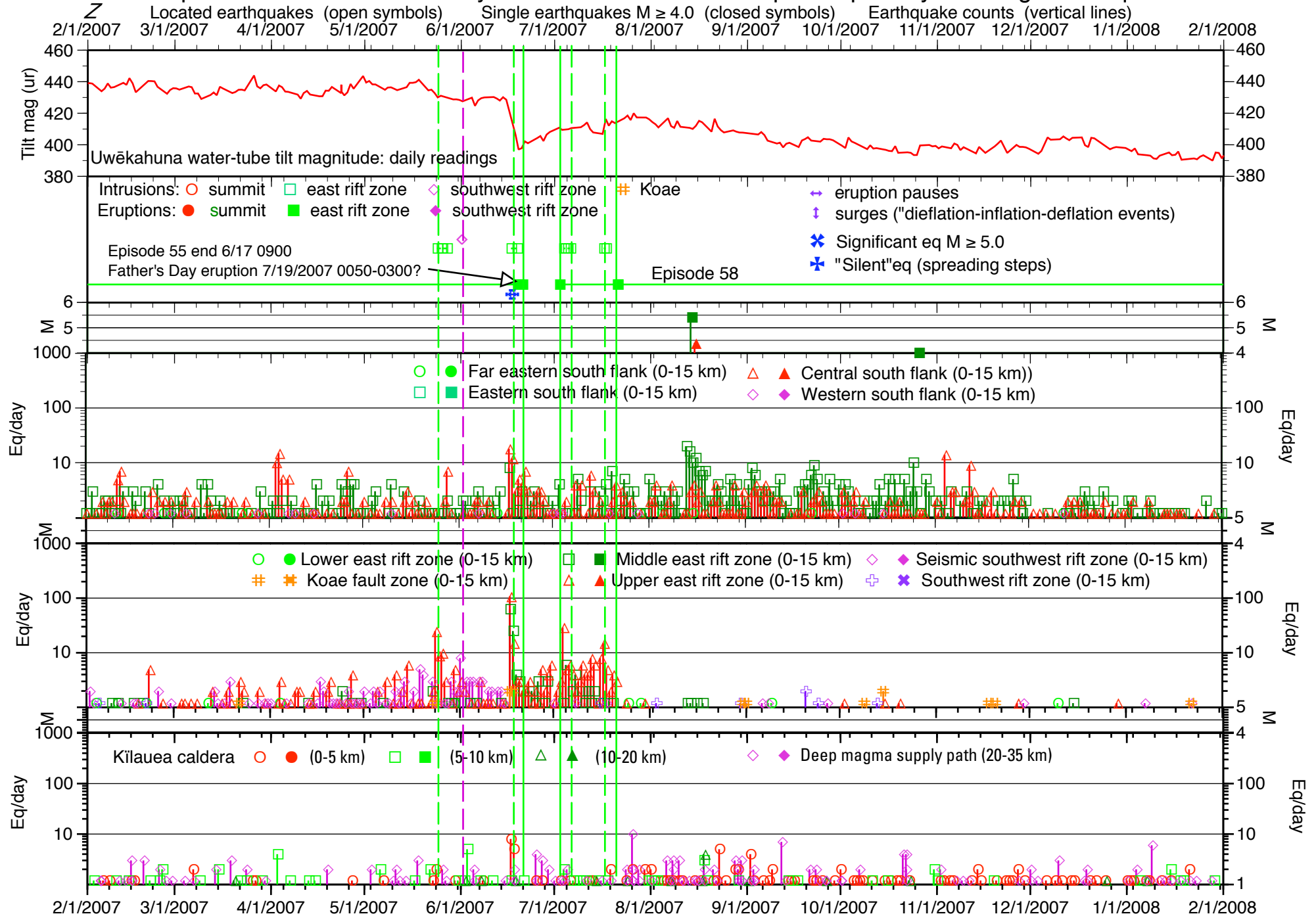
Current eruption brittle-failure seismicity 2/1/2005-2/1/2006: earthquakes per day and single earthquakes $M \geq 4.0$ 

Appendix figure G1 y

Current eruption brittle-failure seismicity 2/1/2006-2/1/2007: earthquakes per day and single earthquakes $M \geq 4.0$

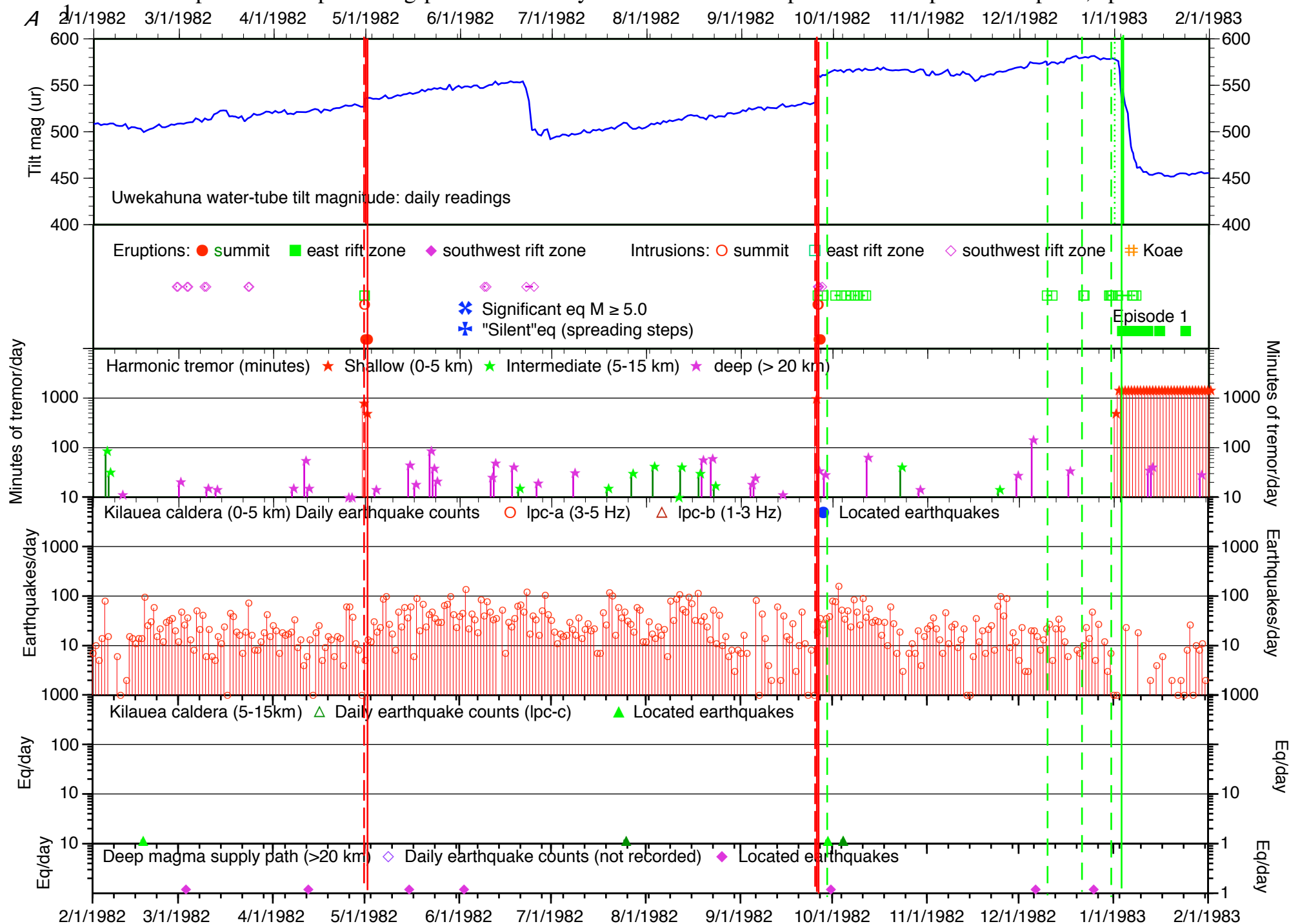


Appendix figure G1 z

Current eruption brittle-failure seismicity 2/1/2007-2/1/2008: earthquakes per day and single earthquakes $M \geq 4.0$ 

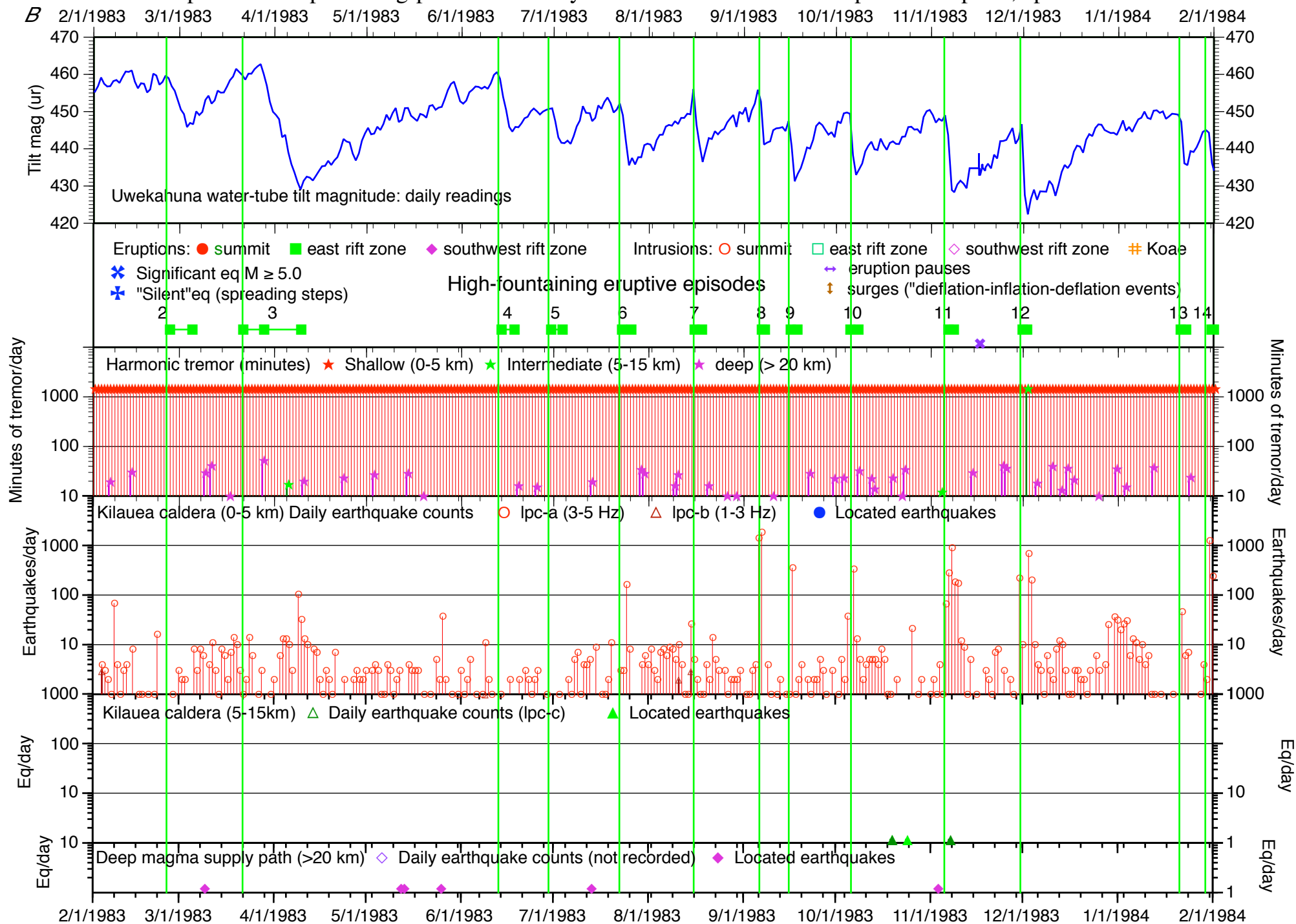
Appendix figure G2 a

Pu'u 'Ō'o-Kupaianaha eruption long-period seismicity 2/1/1982-2/1/1983: precursors to episodic eruption, episode



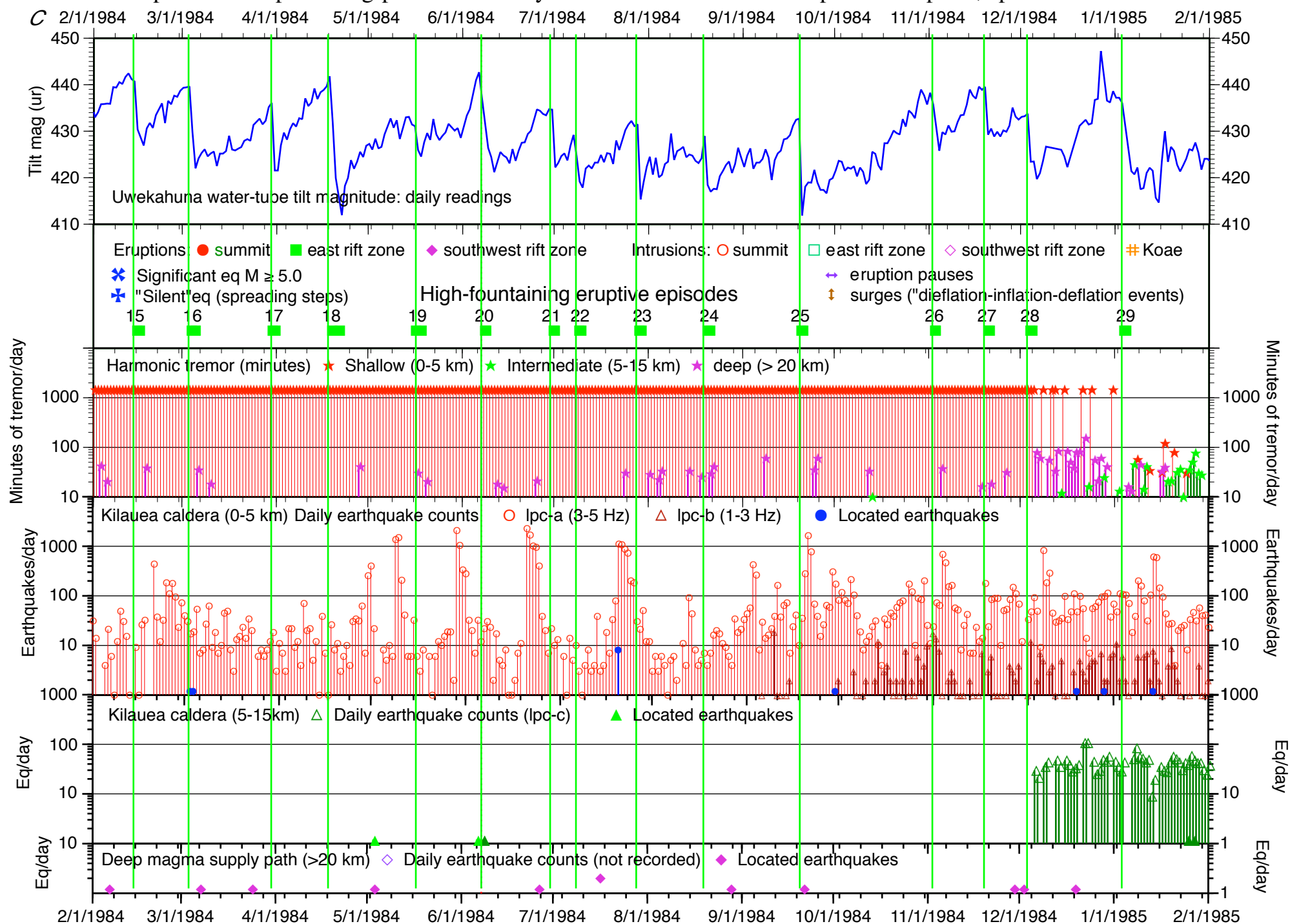
Appendix figure G2 b

Pu'u 'Ō'o-Kupaianaha eruption long-period seismicity 2/1/1983-2/1/1984: Initial episodic eruption, episodes 2-14



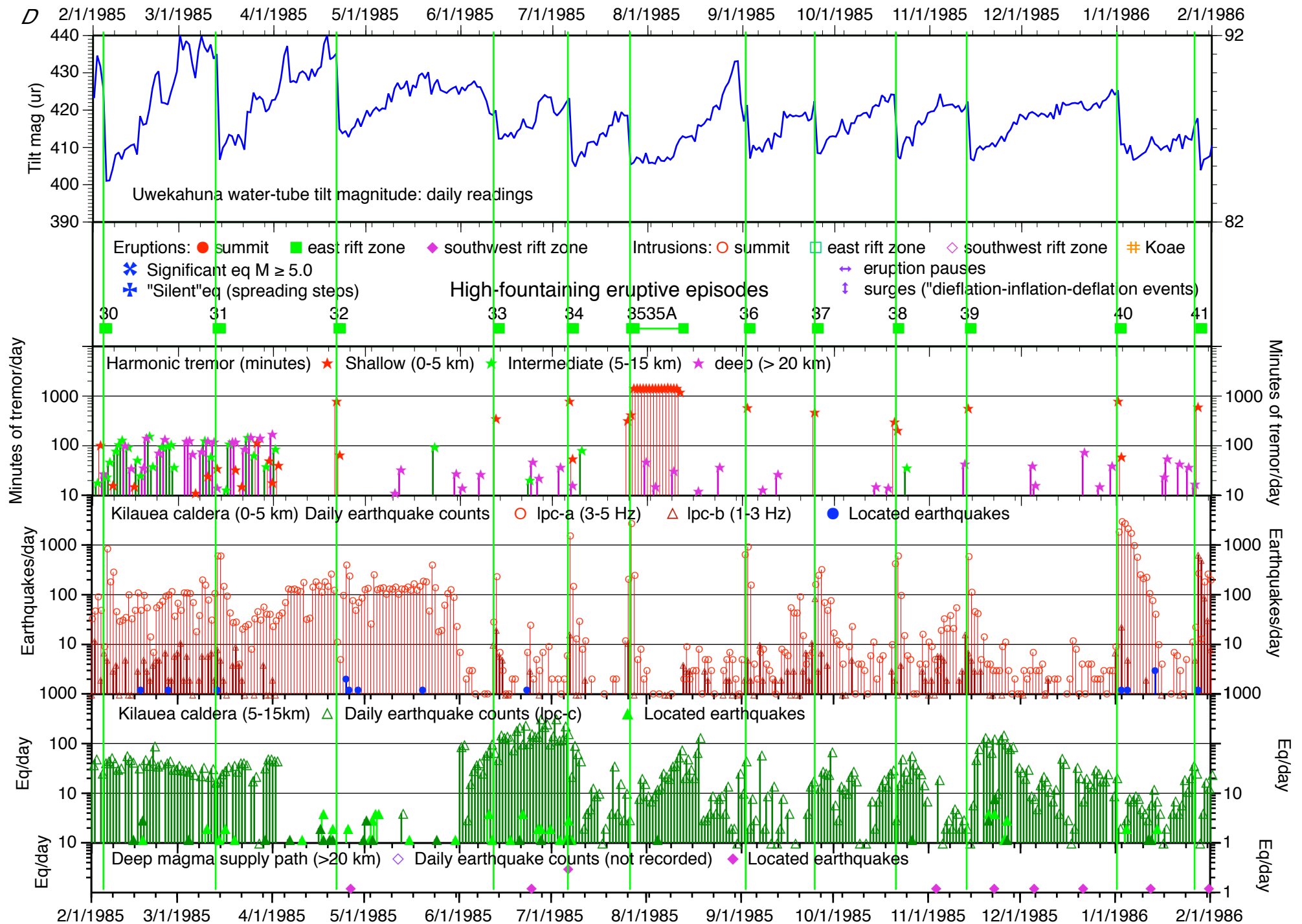
Appendix figure G2 c

Pu'u Ō'ō-Kupaianaha eruption long-period seismicity 2/1/1984-2/1/1985: Initial episodic eruption, episodes 20-29

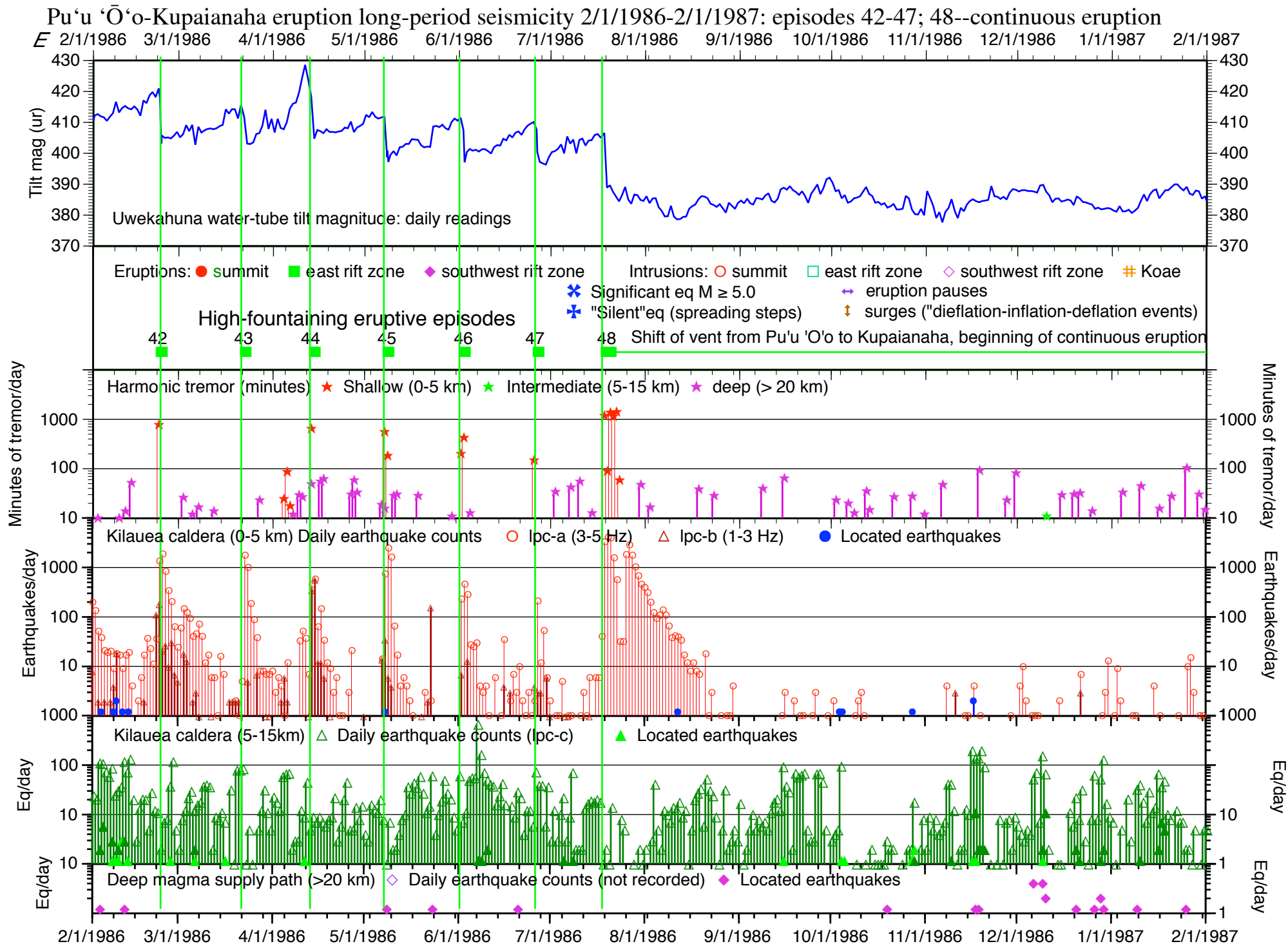


Appendix figure G2 d

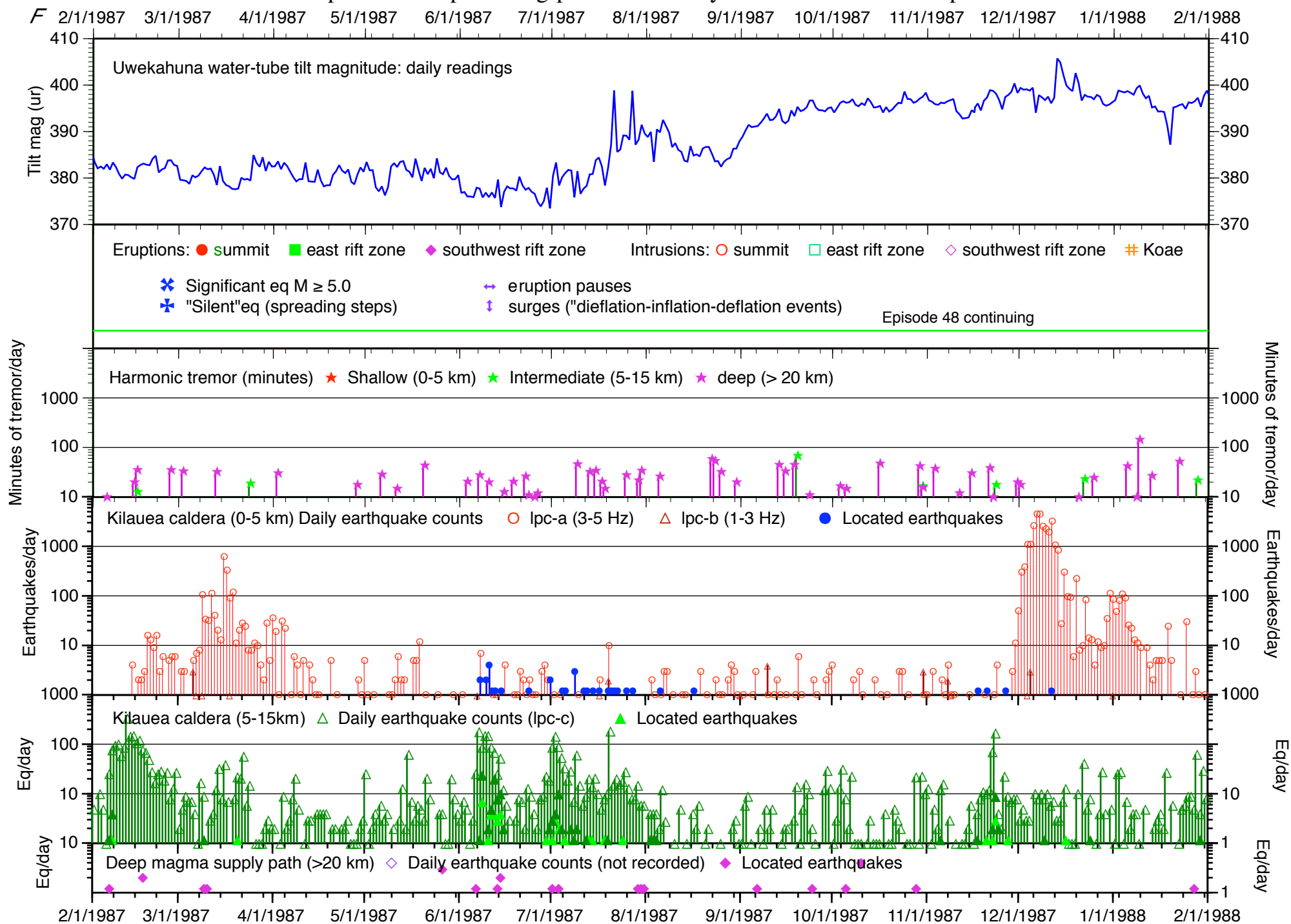
Pu'u 'Ō'o-Kupaianaha eruption long-period seismicity 2/1/1985-2/1/1986: Initial episodic eruption, episodes 30-41



Appendix figure G2 e

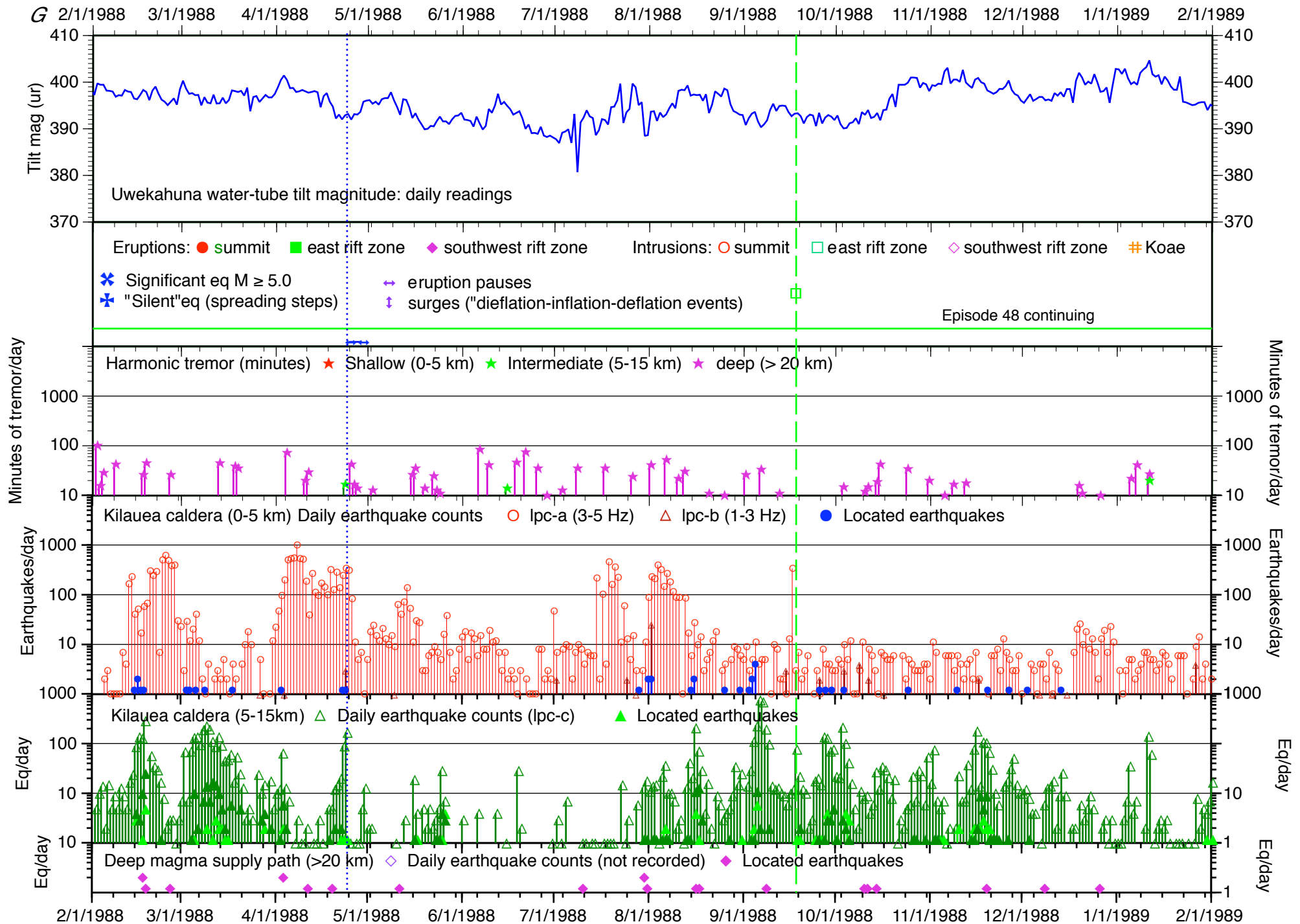


Appendix figure G2 f
 Pu'u 'Ō'o-Kupaianaha eruption long-period seismicity 2/1/1987-2/1/1988: Kupaianaha

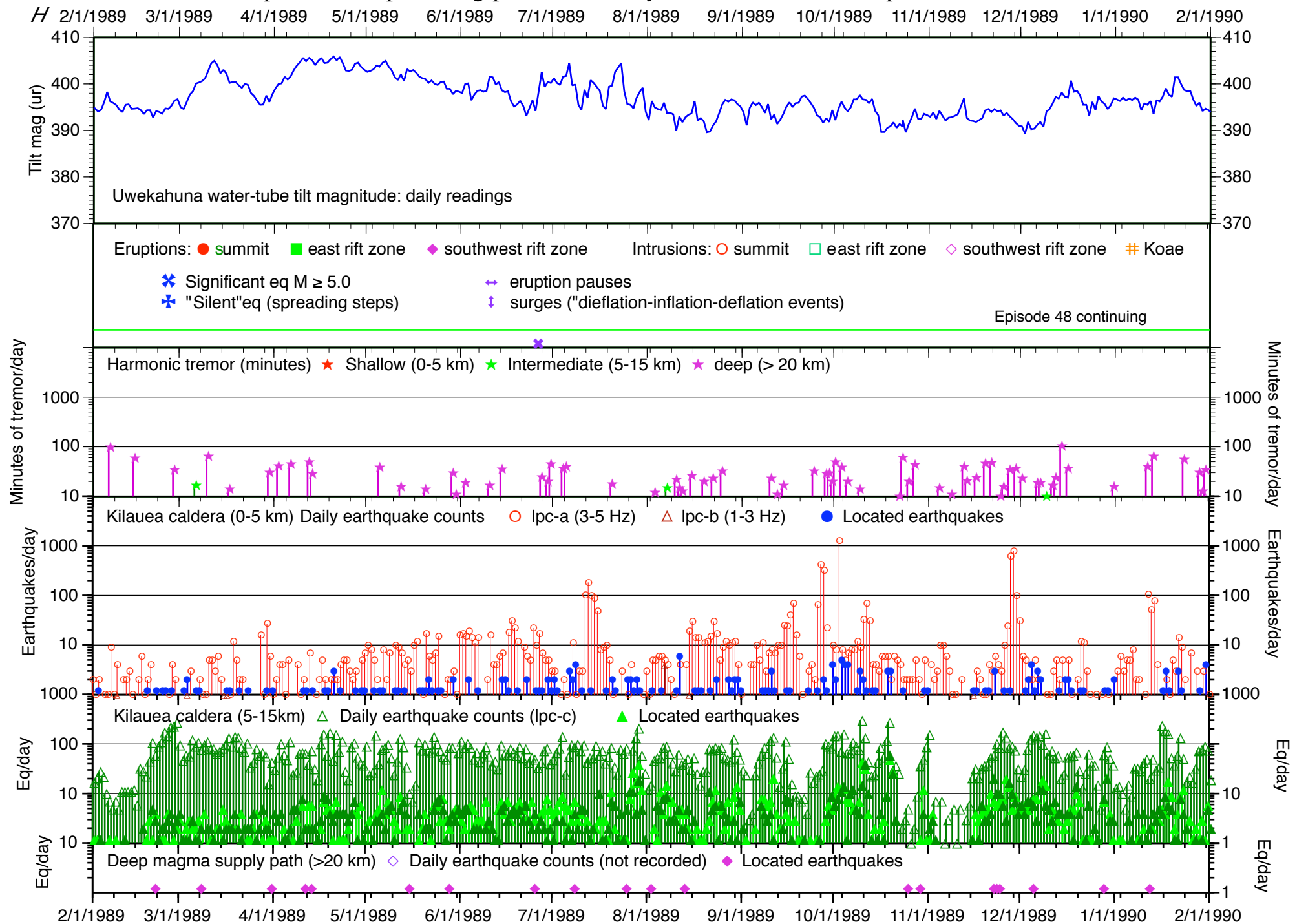


Appendix figure G2 g

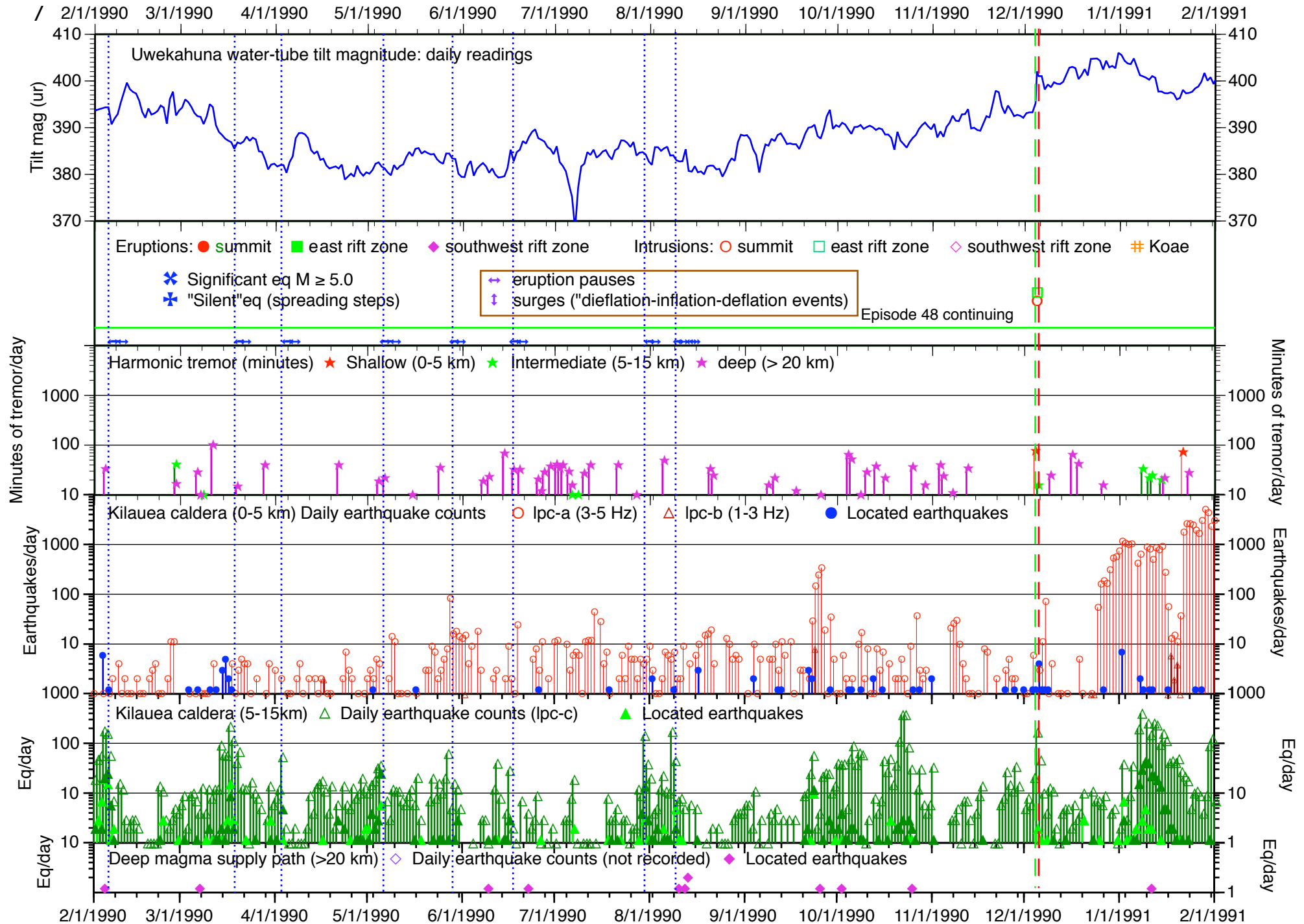
Pu'u Ō'ō-Kupaianaha eruption long-period seismicity 2/1/1988-2/1/1989: Kupaianaha



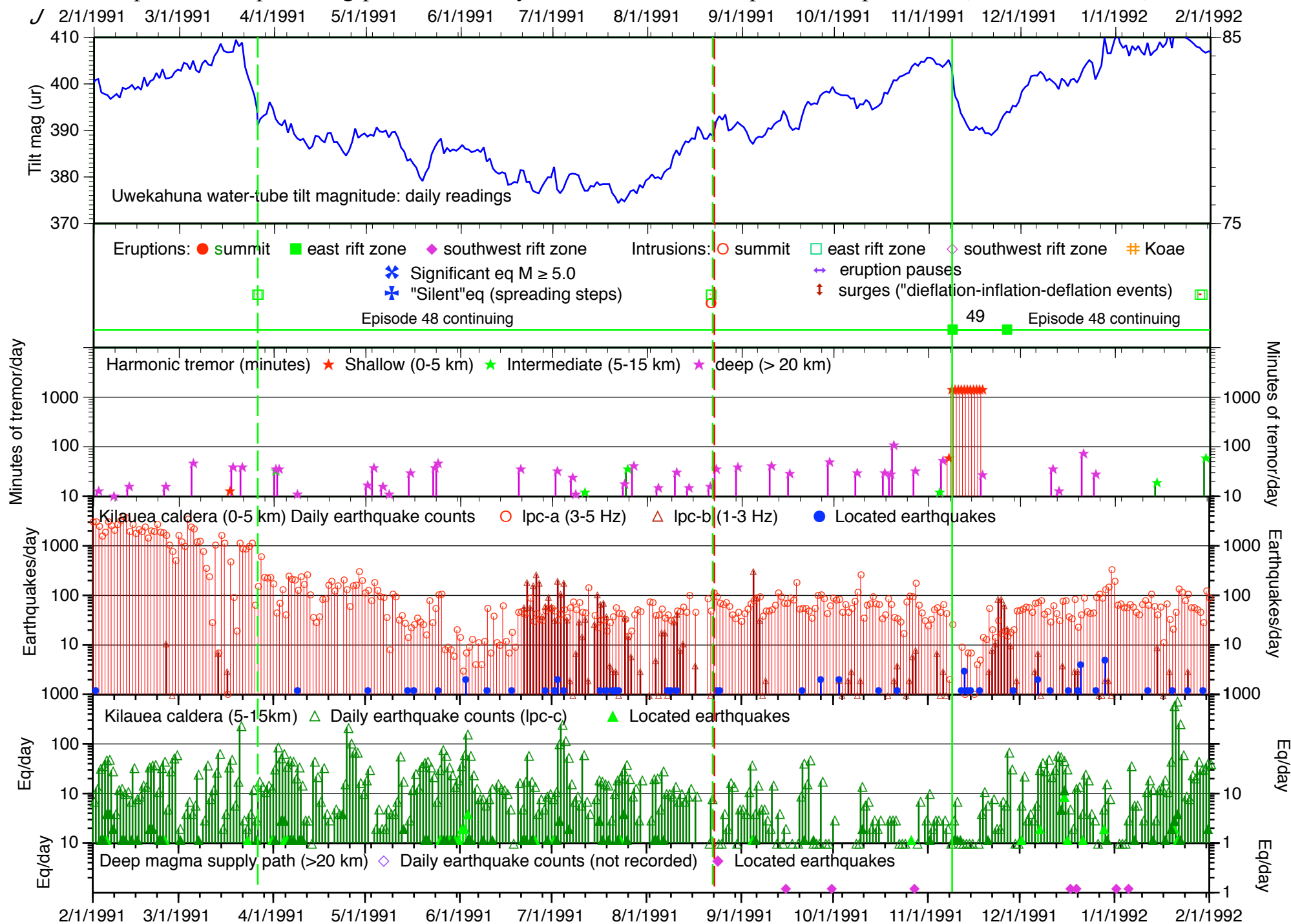
Appendix figure G2 h
Pu'u Ō'ō-Kupaianaha eruption long-period seismicity 2/1/1989-2/1/1990: Kupaianaha



Appendix figure G2 i
Pu'u Ō'o-Kupaianaha eruption long-period seismicity 2/1/1990-2/1/1991: Kupaianaha

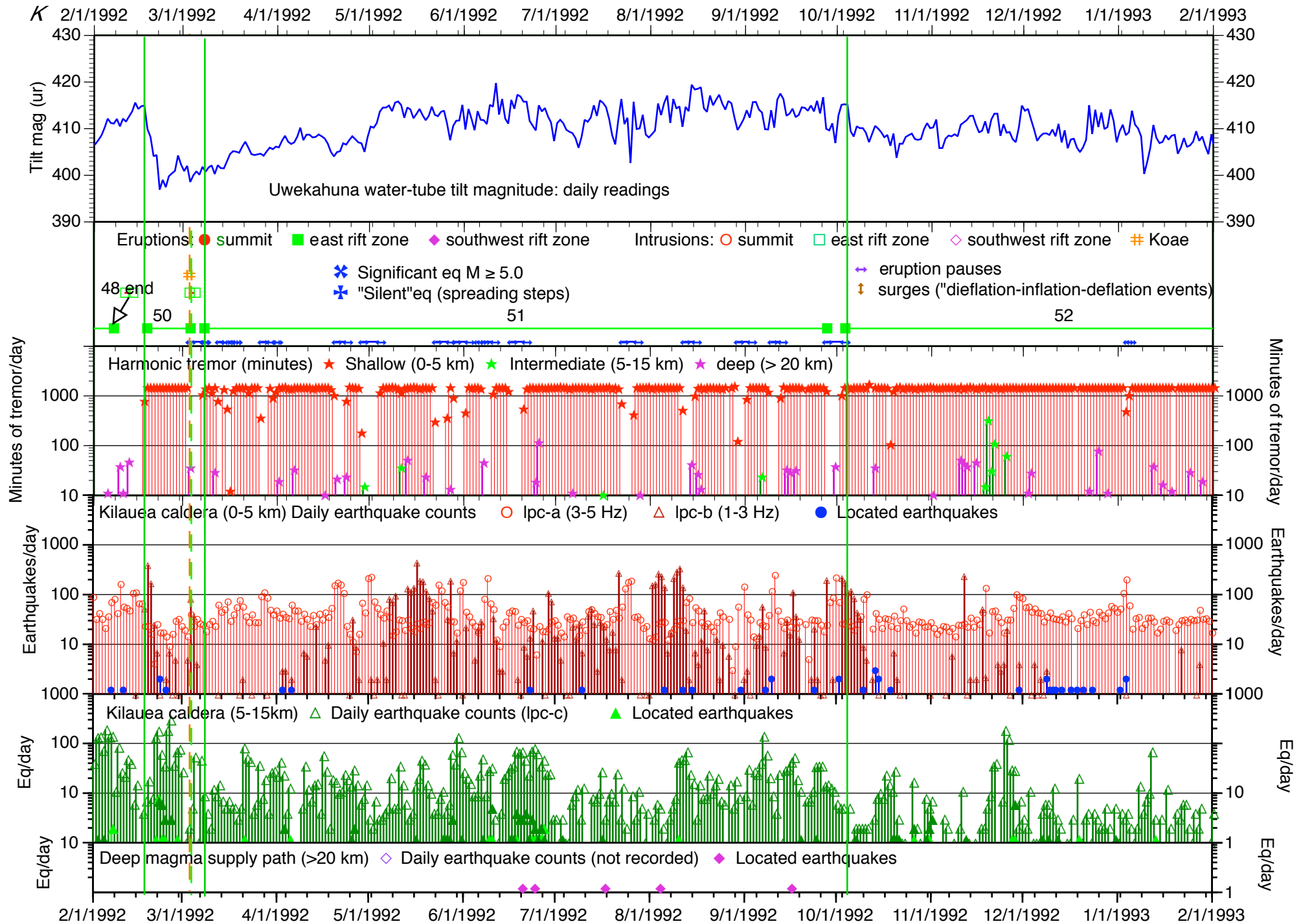


Appendix figure G2 j
 Pu'u 'Ō'o-Kupaianaha eruption long-period seismicity 2/1/1991-2/1/1992 Kupaianaha--episode 49 (return to Pu'u 'O'o)



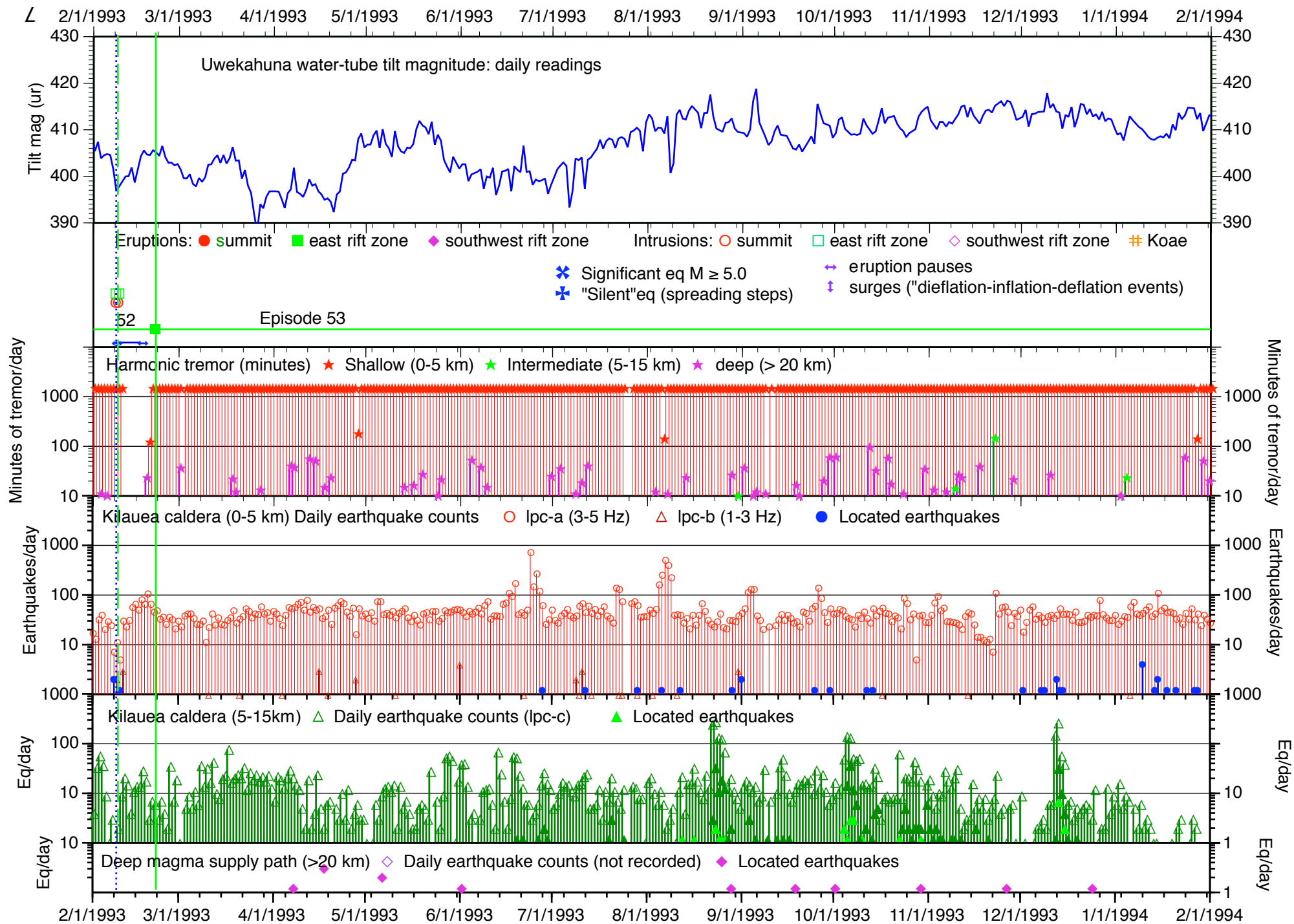
Appendix figure G2 k

Pu'u 'Ō'o-Kupaianaha eruption long-period seismicity 2/1/1992-2/1/1993 post-Kupaianaha--episodes 50-52



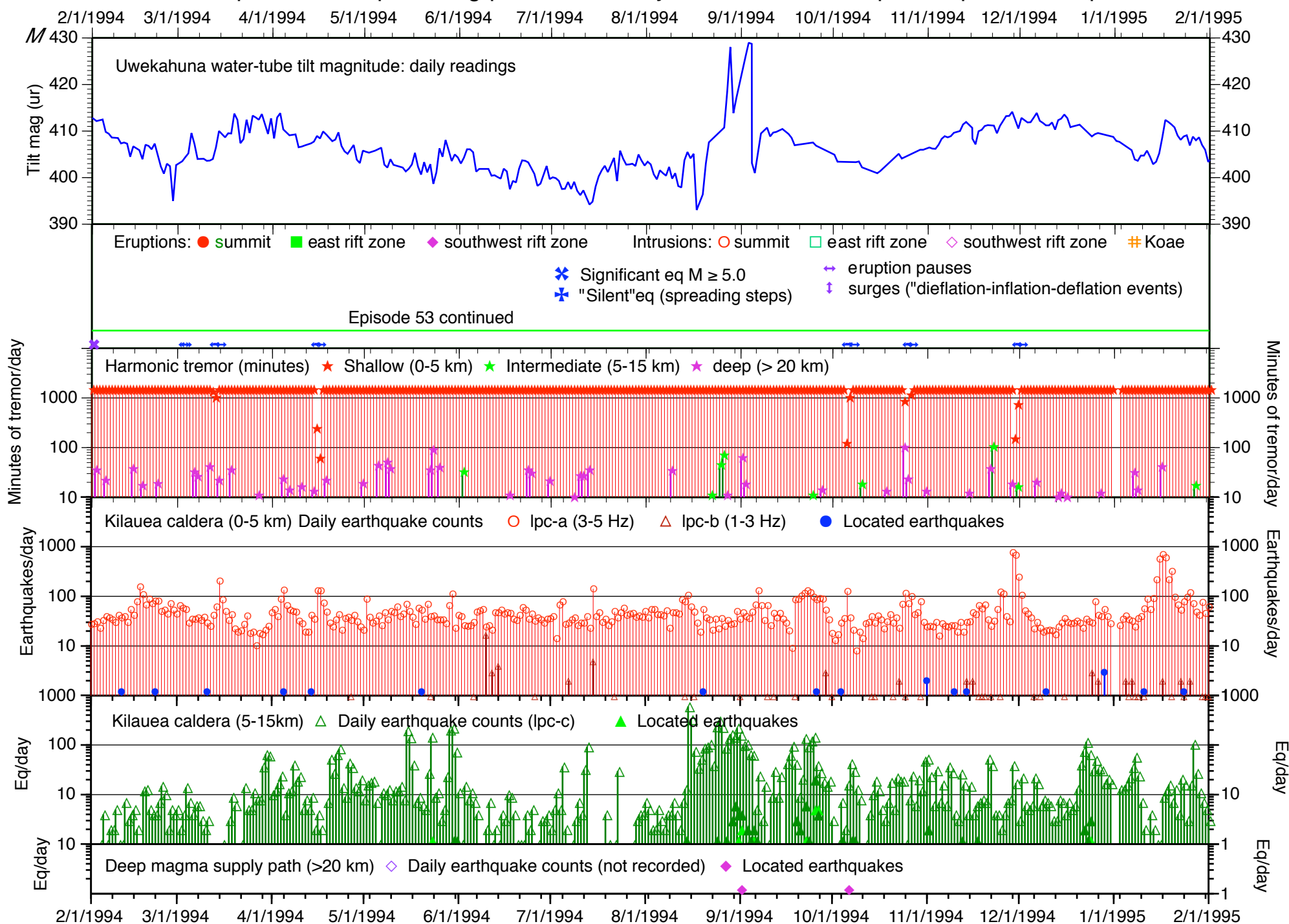
Appendix figure G2 I

Pu'u Ō'ō-Kupaianaha eruption long-period seismicity 2/1/1993-2/1/1994: post-Kupaianaha--episode 53



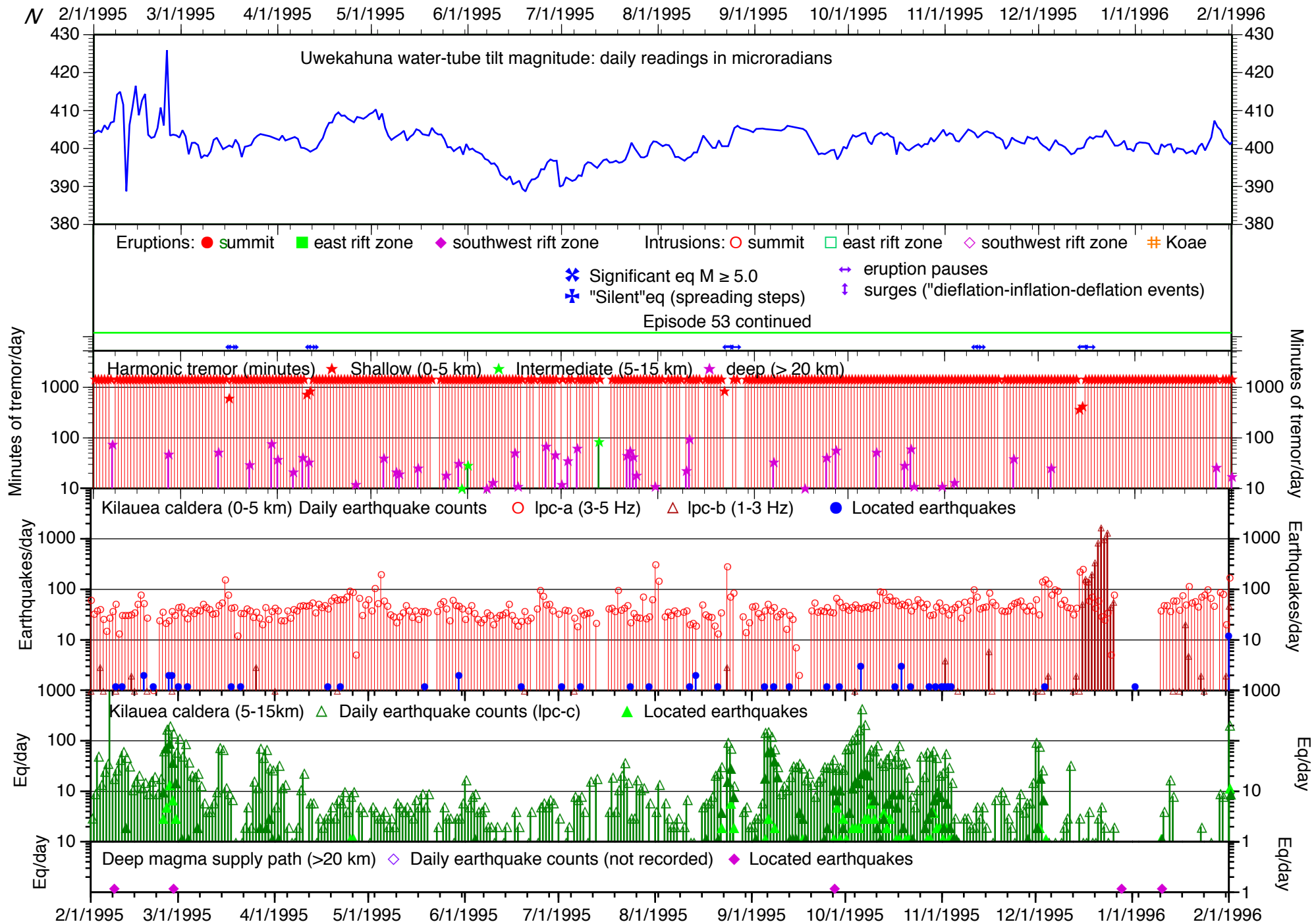
Appendix figure G2 m

Pu'u 'O'o-Kupaianaha eruption long-period seismicity 2/1/1994-2/1/1995 post-Kupaianaha--episode 53



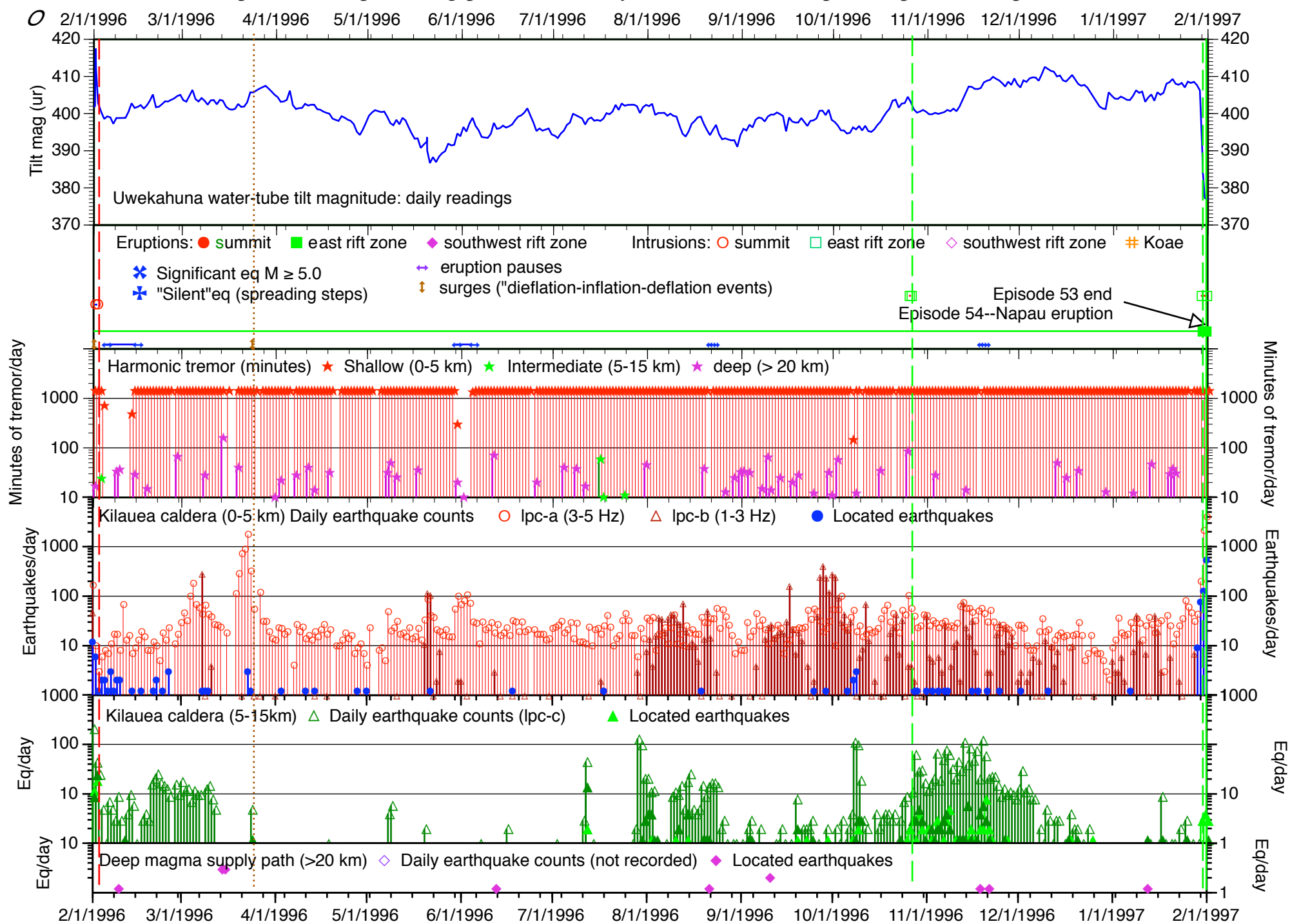
Appendix figure G2 n

Pu'u 'Ō'o-Kupaianaha eruption long-period seismicity 2/1/1995-2/1/1996 post-Kupaianaha--episode 53



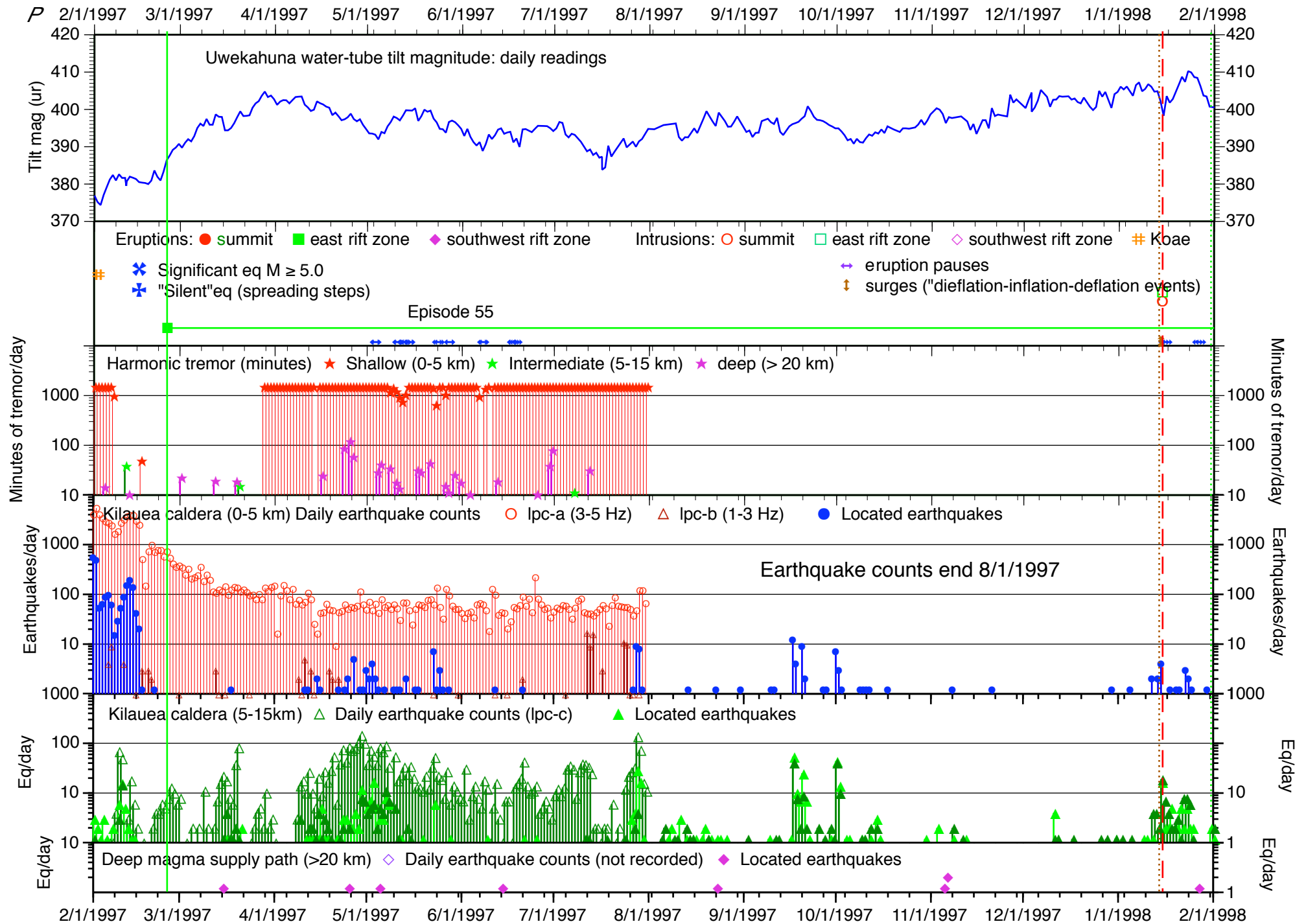
Appendix figure G2 o

Pu'u 'Ō'ō-Kupaianaha eruption long-period seismicity 21/1996-2/1/1997: post-Kupaianaha--episode 53-54



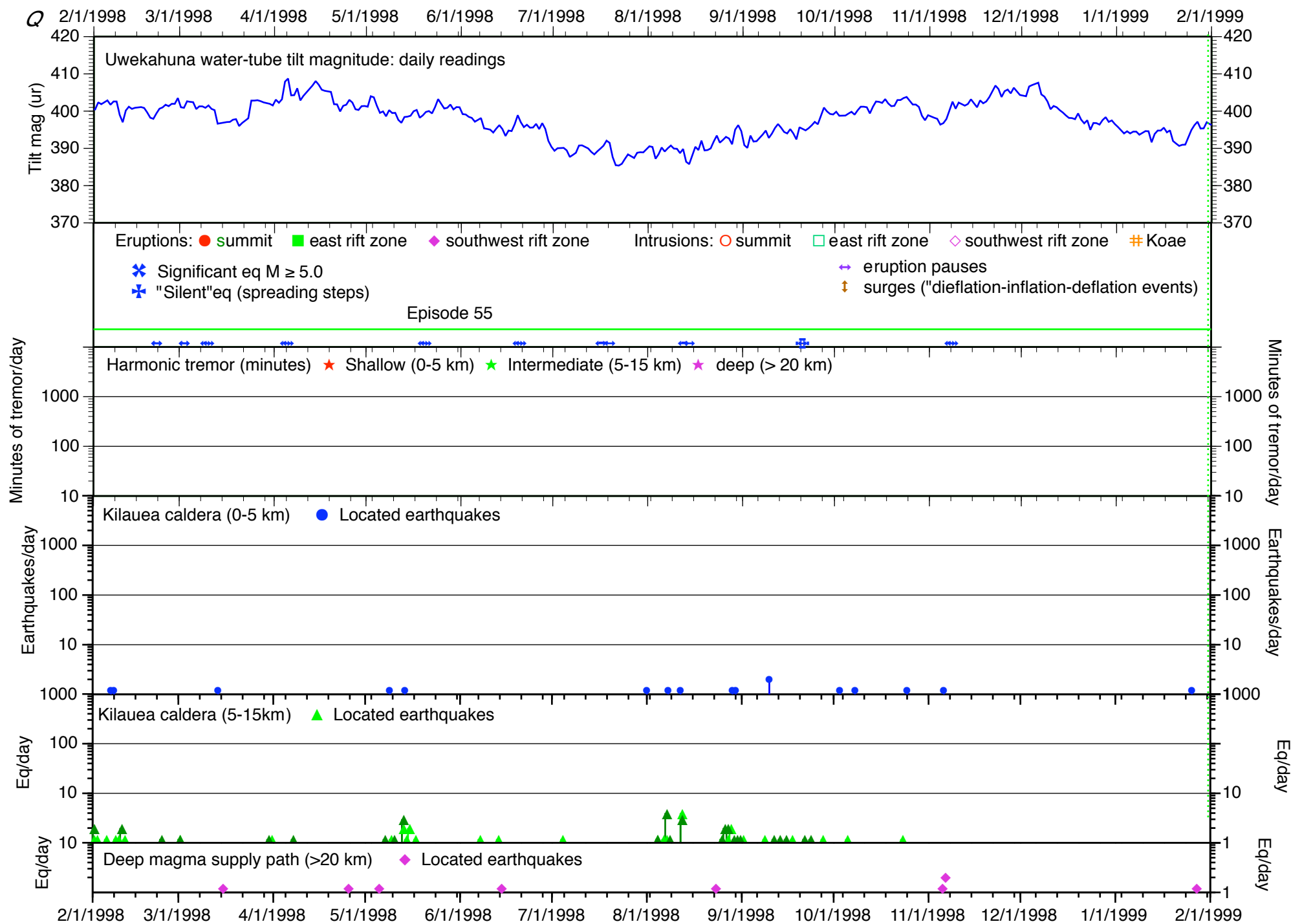
Appendix figure G2 p

Pu'u 'Ō'o-Kupaianaha eruption long-period seismicity 21/1997-2/1/1998 post-Kupaianaha--episode 54-55



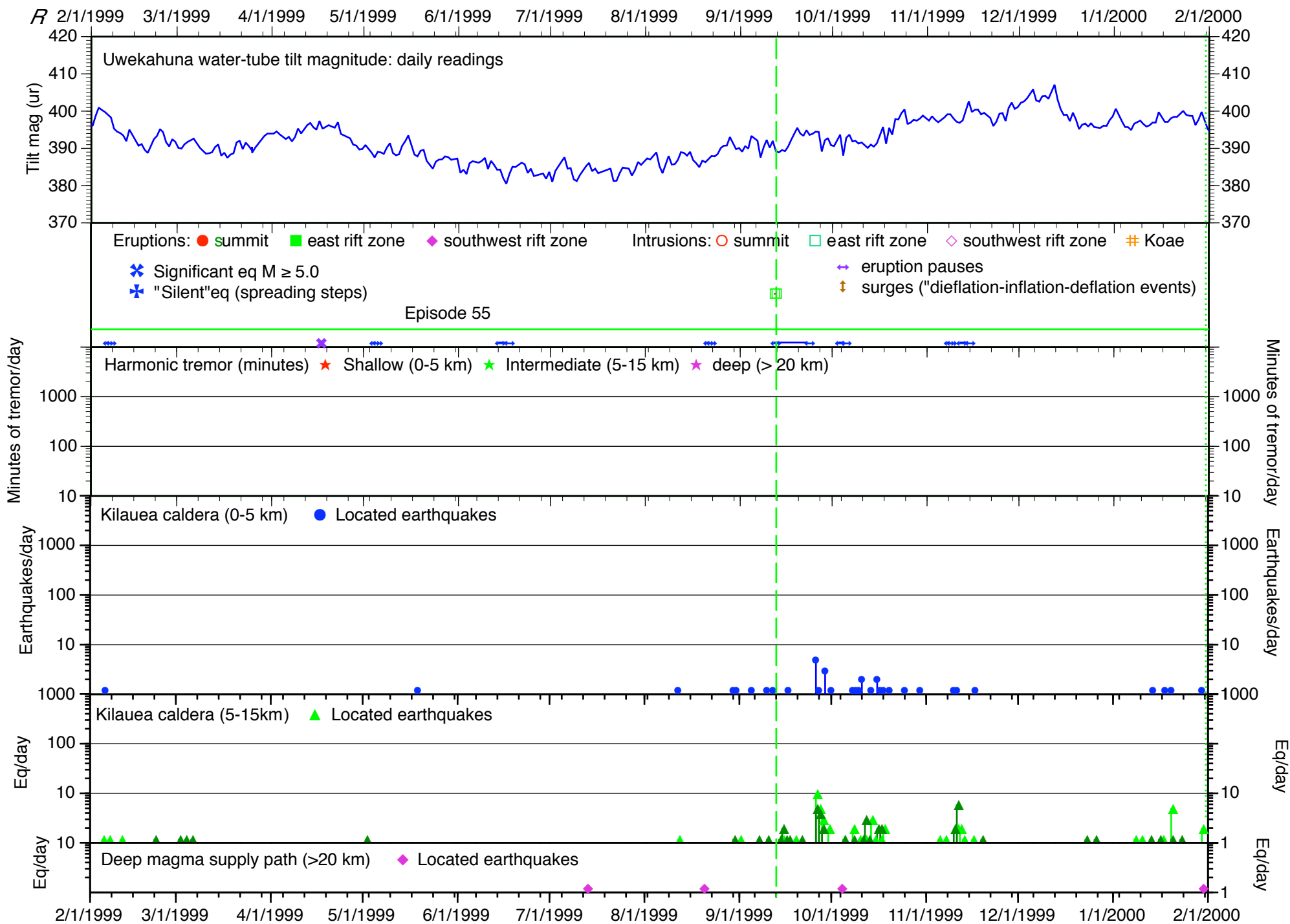
Appendix figure G2 q

Pu'u Ō'ō-Kupaianaha eruption long-period seismicity 21/1998-2/1/1999 post-Kupaianaha--episode 55



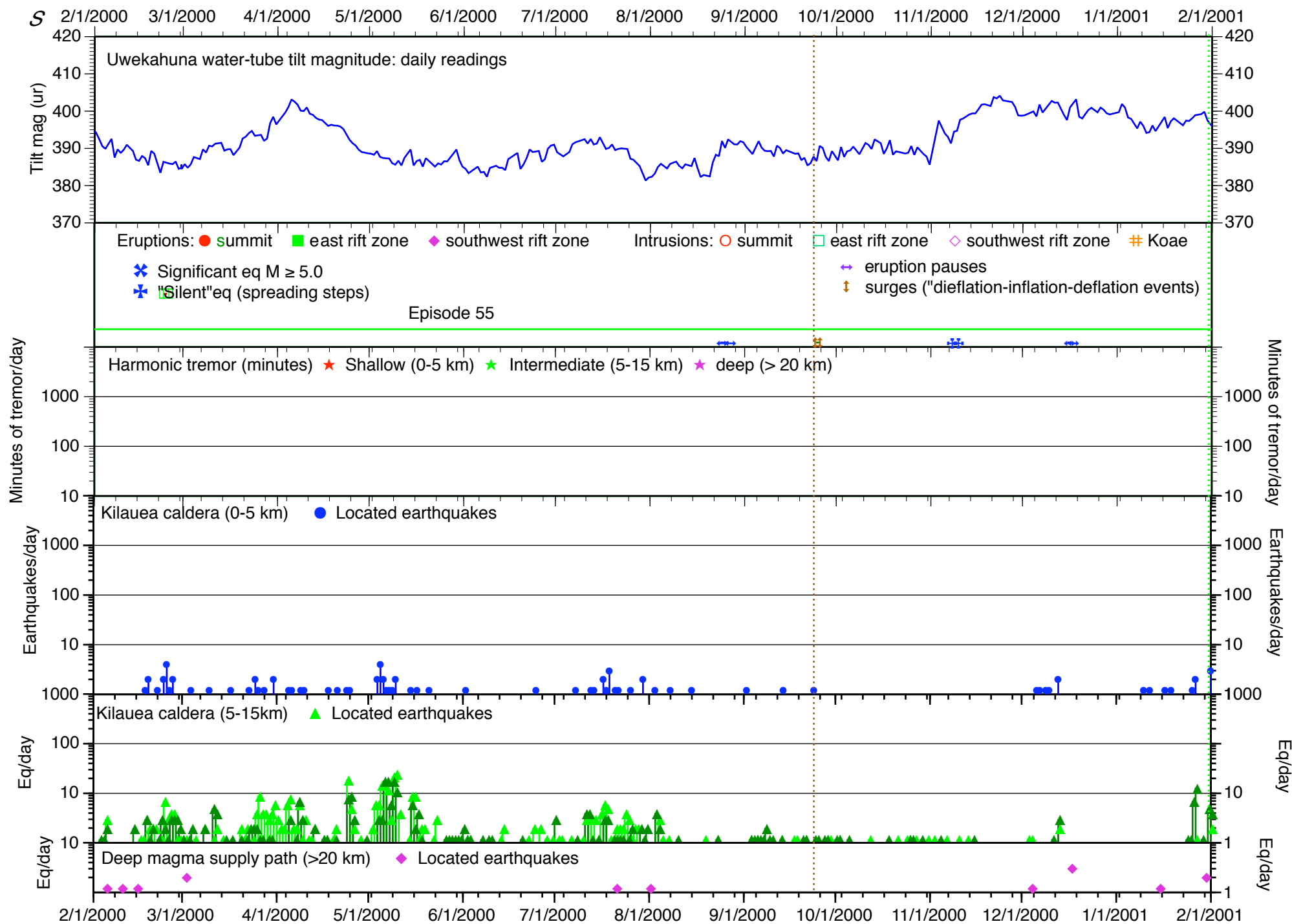
Appendix figure G2 r

Pu'u Ō'ō-Kupaianaha eruption long-period seismicity 21/1999-2/1/2000 post-Kupaianaha--episode 55



Appendix figure G2 s

Pu'u Ō'ō-Kupaianaha eruption long-period seismicity 21/2000-21/2001 post-Kupaianaha--episode 55



Appendix figure G2 t

Pu'u Ō'ō-Kupaianaha eruption long-period seismicity 21/2001-2/1/2002 post-Kupaianaha--episode 55

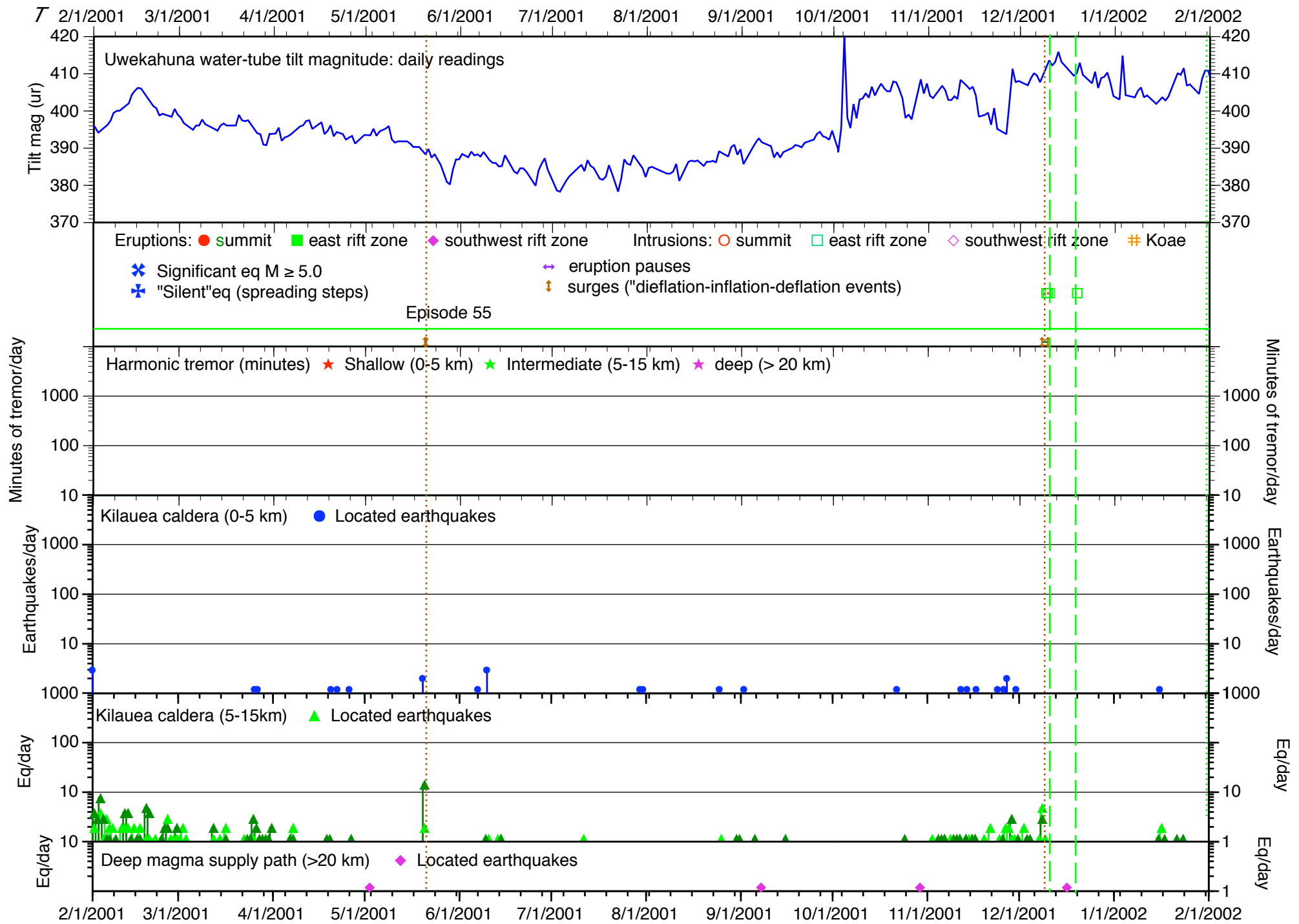
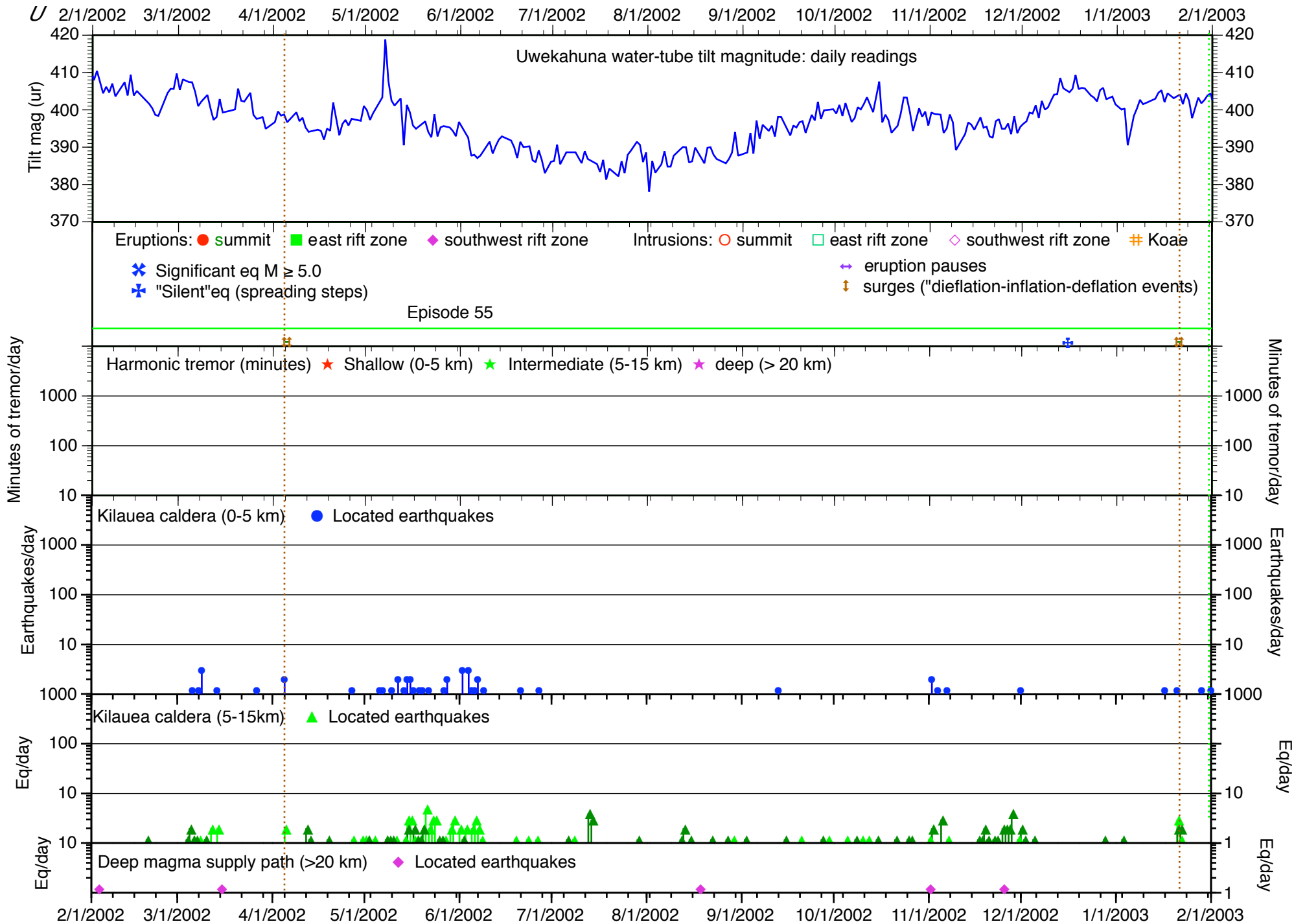
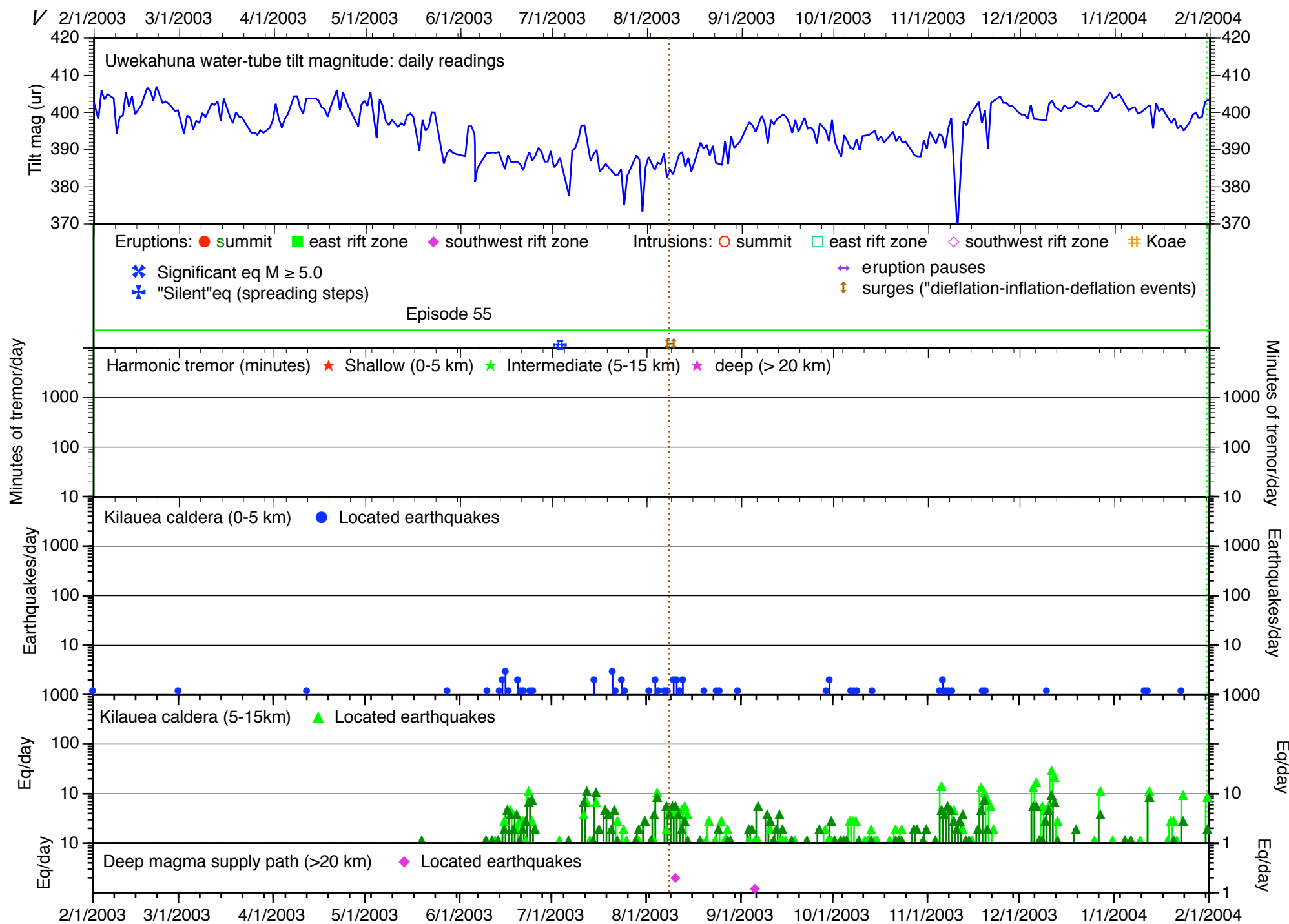


Figure 1 is a multi-panel plot showing Uwekahuna water-tube tilt magnitude and various seismic and volcanic parameters from February 2002 to February 2003. The top panel displays the Uwekahuna water-tube tilt magnitude (ur) on a linear scale from 370 to 420. The second panel shows harmonic tremor (minutes) on a logarithmic scale from 10 to 1000. The third panel shows Kilauea caldera earthquakes (0-5 km) on a logarithmic scale from 10 to 1000. The fourth panel shows Kilauea caldera earthquakes (5-15 km) on a logarithmic scale from 10 to 1000. The bottom panel shows deep magma supply path earthquakes (>20 km) on a logarithmic scale from 1 to 10. The plot includes a legend for eruptions, intrusions, and significant earthquakes, and a horizontal green line labeled 'Episode 55'.



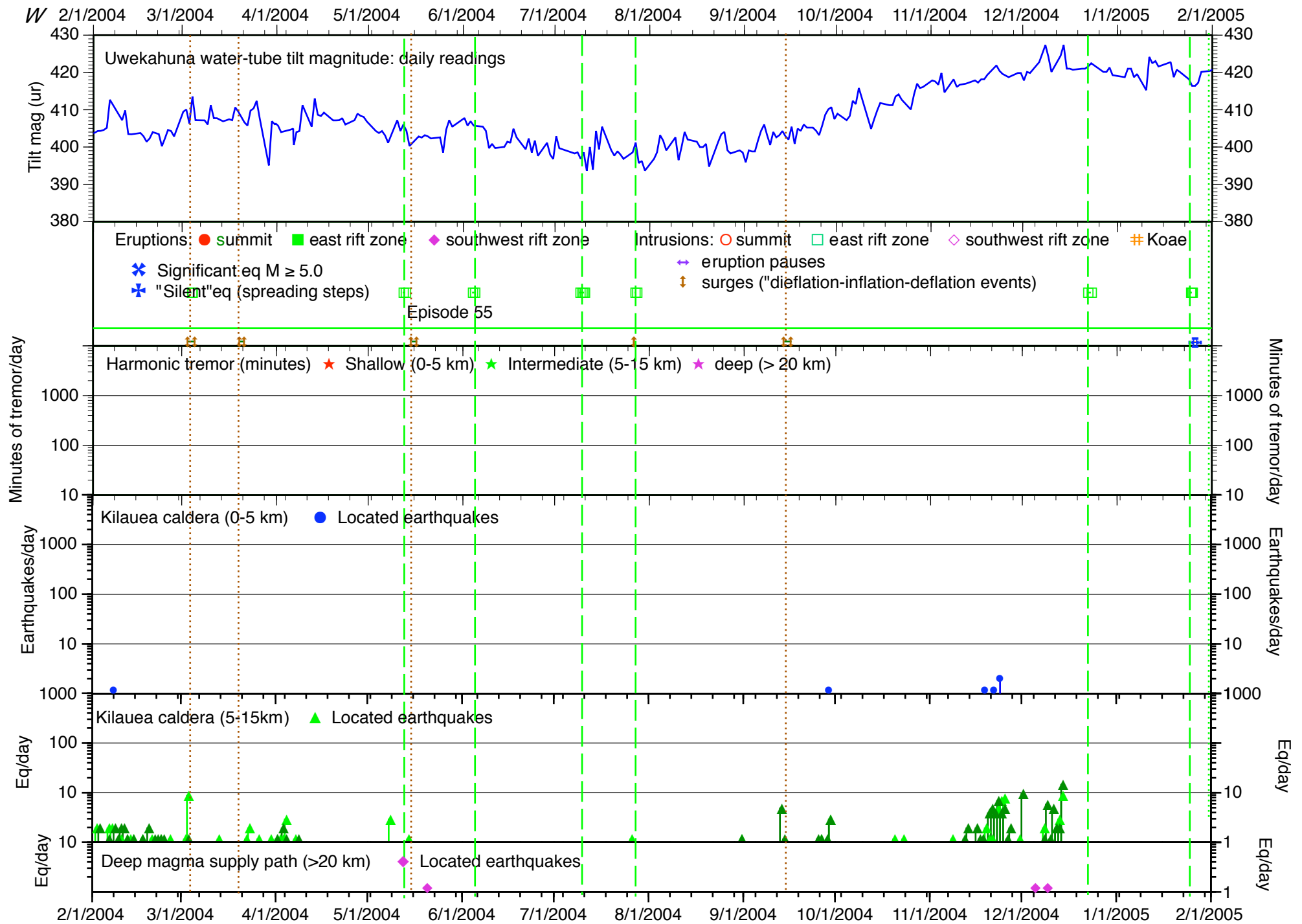
Appendix figure G2 v

Pu'u Ō'ō-Kupaianaha eruption long-period seismicity 21/2003-2/1/2004 post-Kupaianaha--episode 55



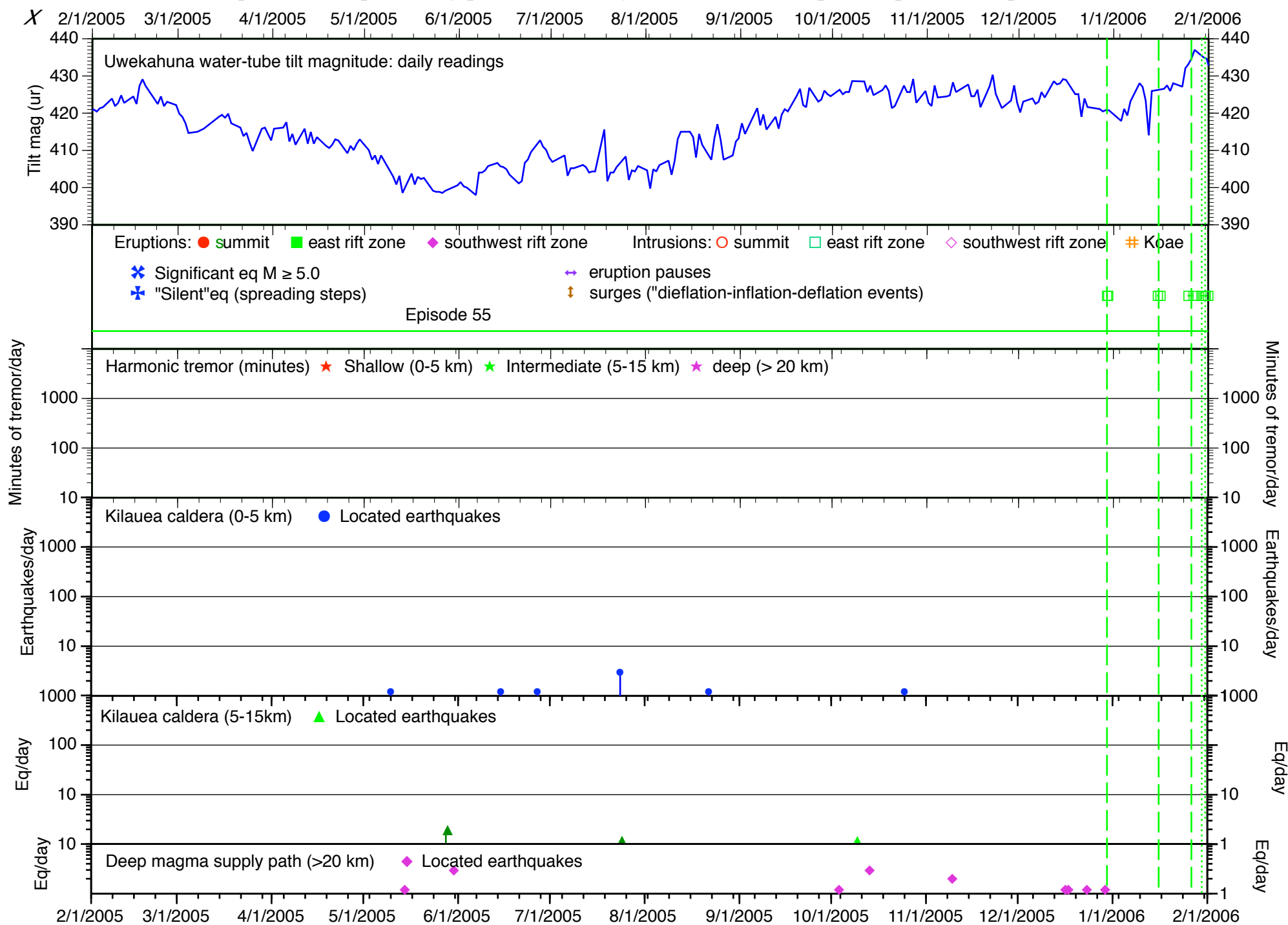
Appendix figure G2 w

Pu'u Ō'ō-Kupaianaha eruption long-period seismicity 21/2004-2/1/2005 post-Kupaianaha--episode 55



Appendix figure G2 x

Pu'u Ō'ō-Kupaianaha eruption long-period seismicity 21/2005-2/1/2006 post-Kupaianaha--episode 55



Appendix figure G2 y

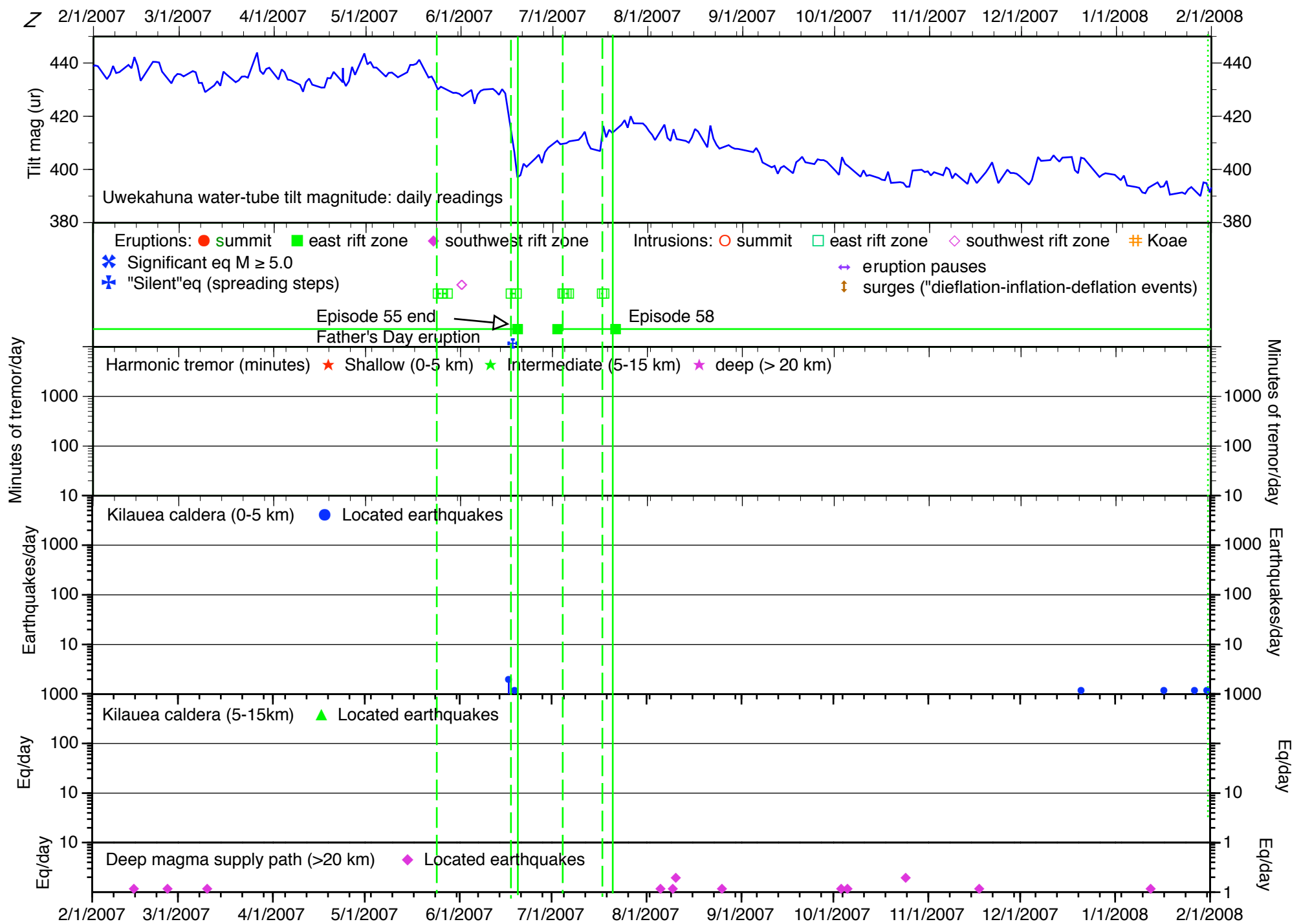
Pu'u Ō'ō-Kupaianaha eruption long-period seismicity 2/1/2006-2/1/2007 post-Kupaianaha--episode 55



Appendix figure G2 z

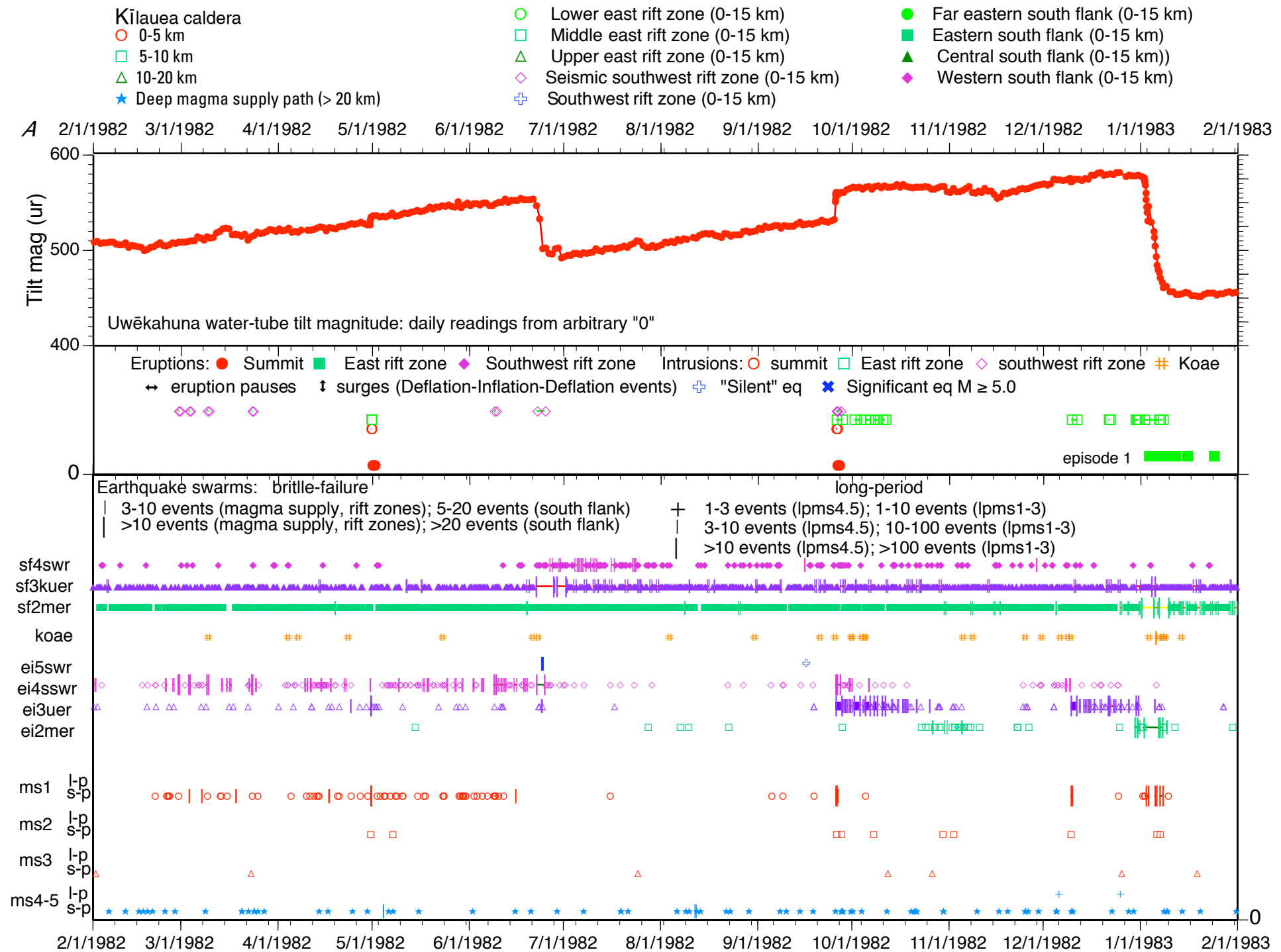
Pu'u Ō'ō-Kupaianaha eruptionn

long-period seismicity 21/2007-2/1/2008 post-Kupaianaha--episode 55-58



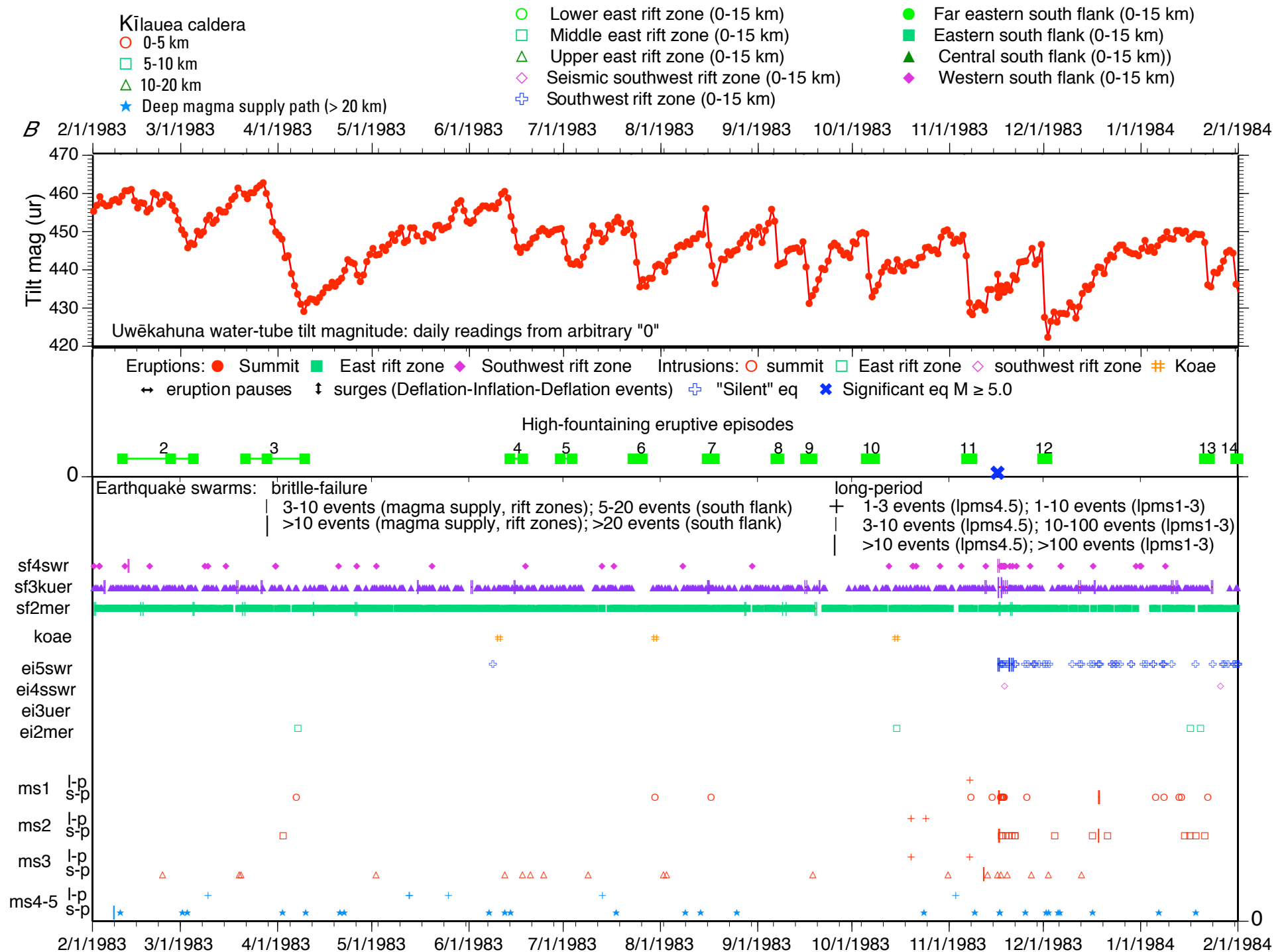
Appendix figure G3 a

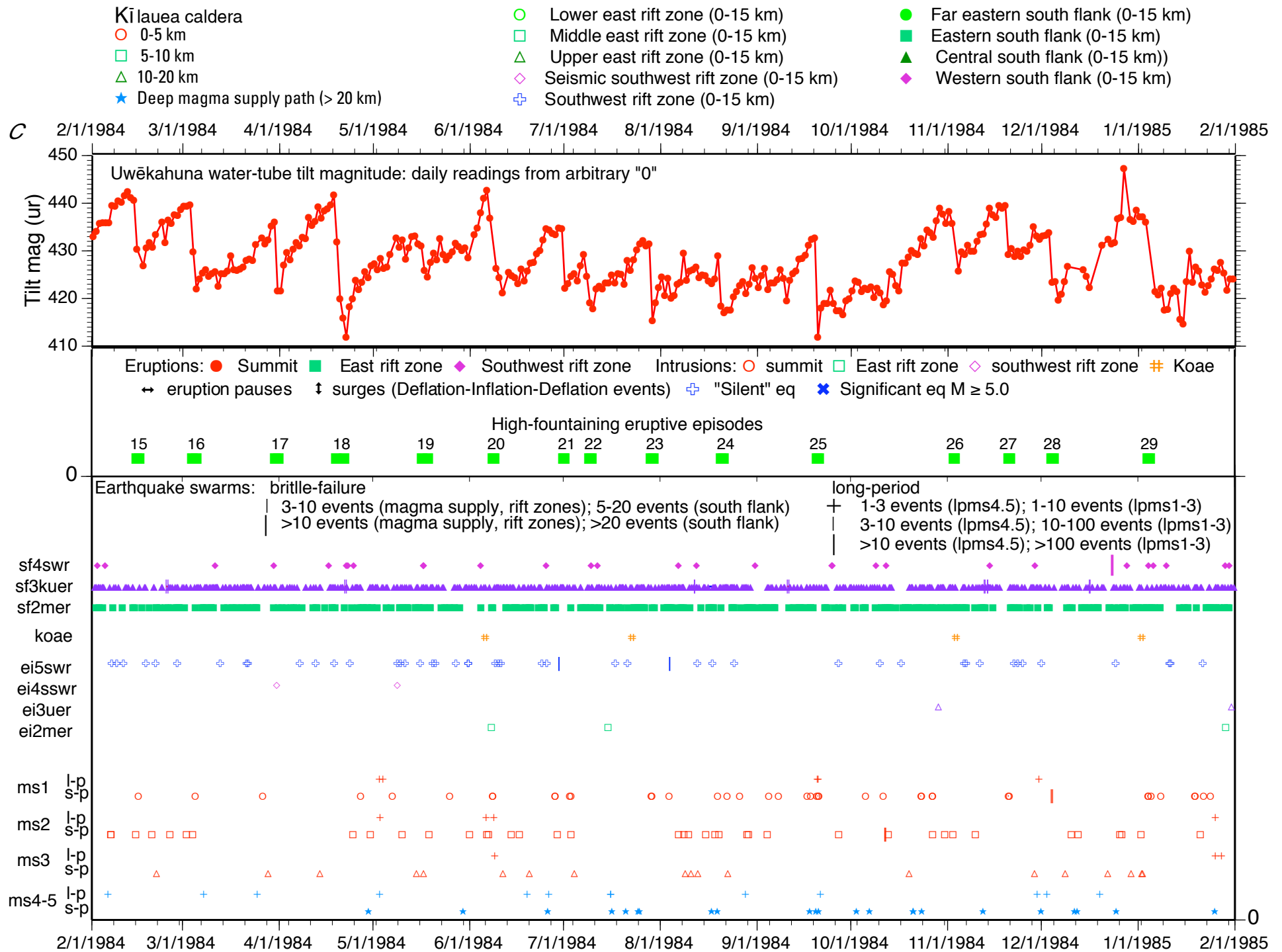
Pu'u 'Ō'o-Kupaianaha eruption: 2/1/1982-2/1/1983



Appendix figure G3 b

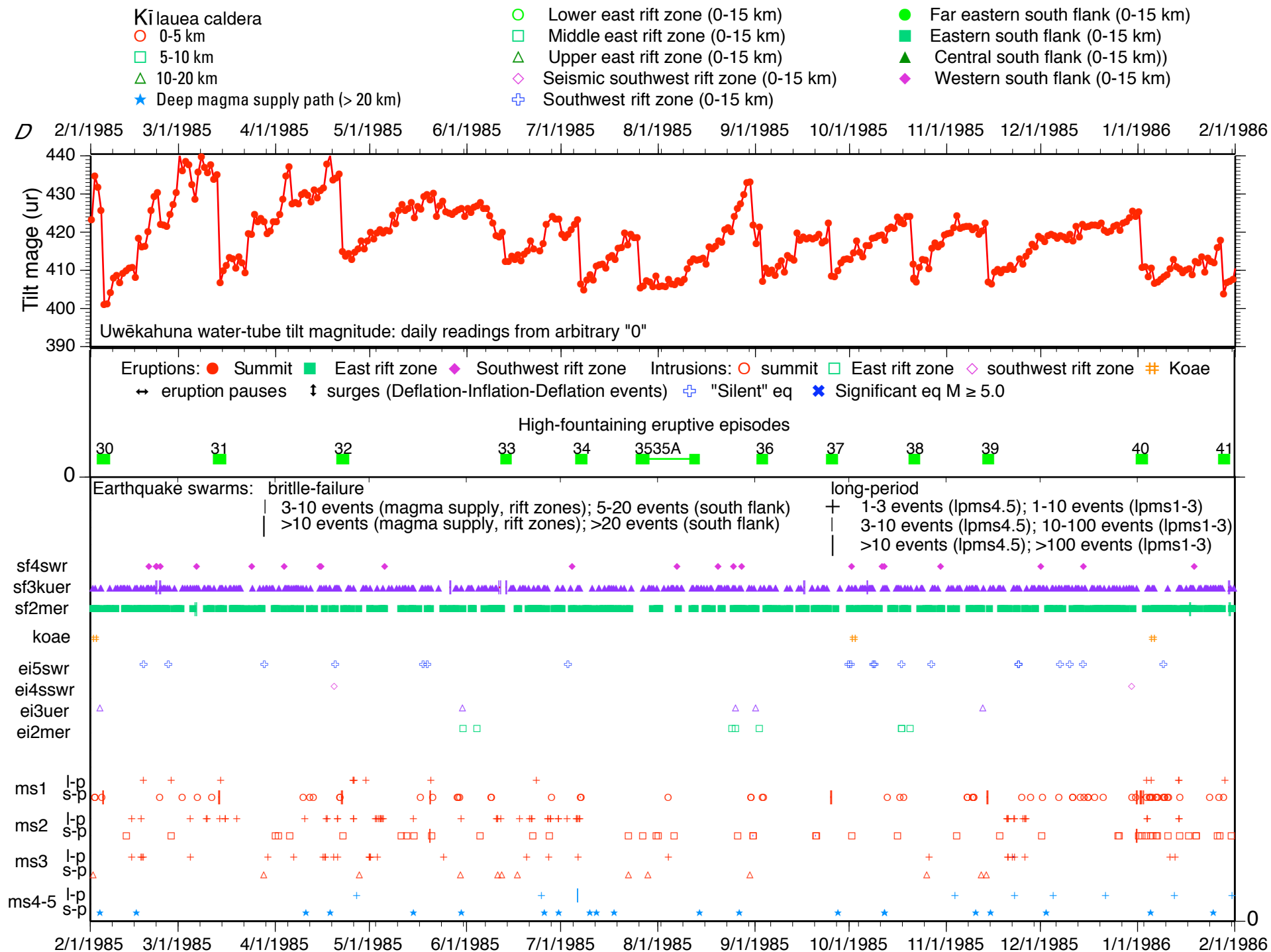
Pu'u Ō'o-Kupaianaha eruption: 2/1/1983-2/1/1984





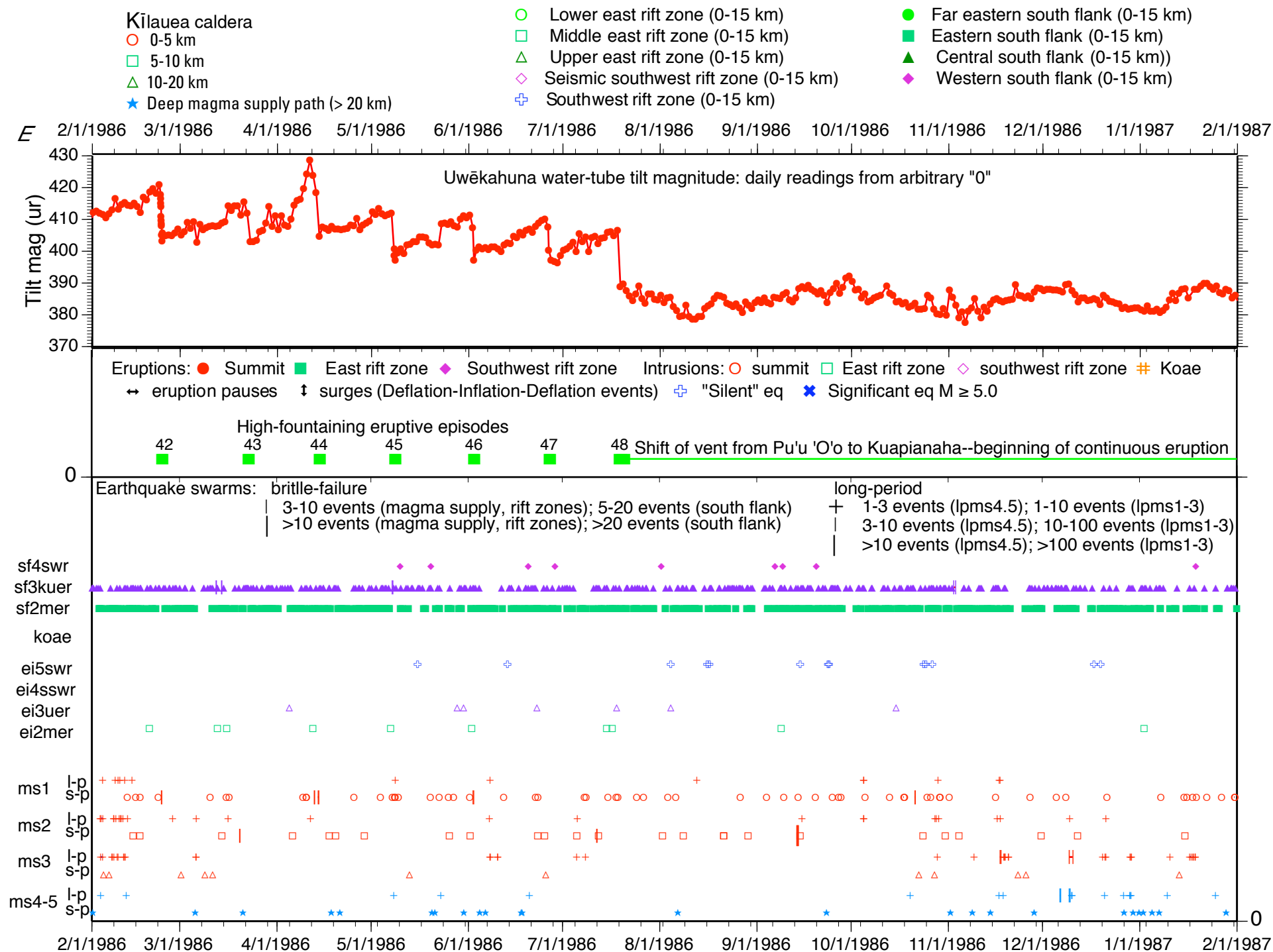
Appendix figure G3 d

Pu'u Ō'ō-Kupaianaha eruption: 2/1/1985-2/1/1986

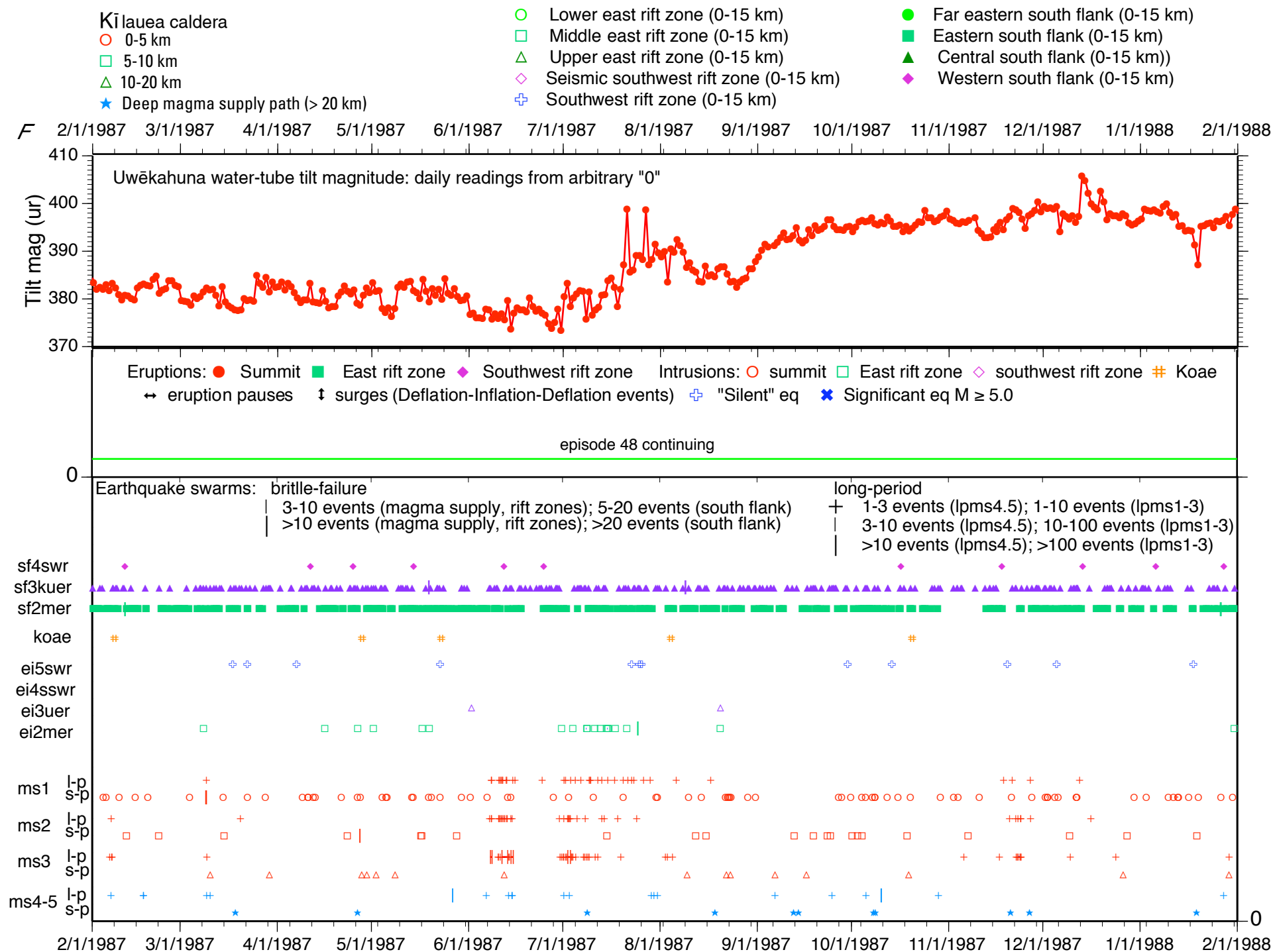


Appendix figure G3 e

Pu'u 'Ō'o-Kupaianaha eruption: 2/1/1986-2/1/1987

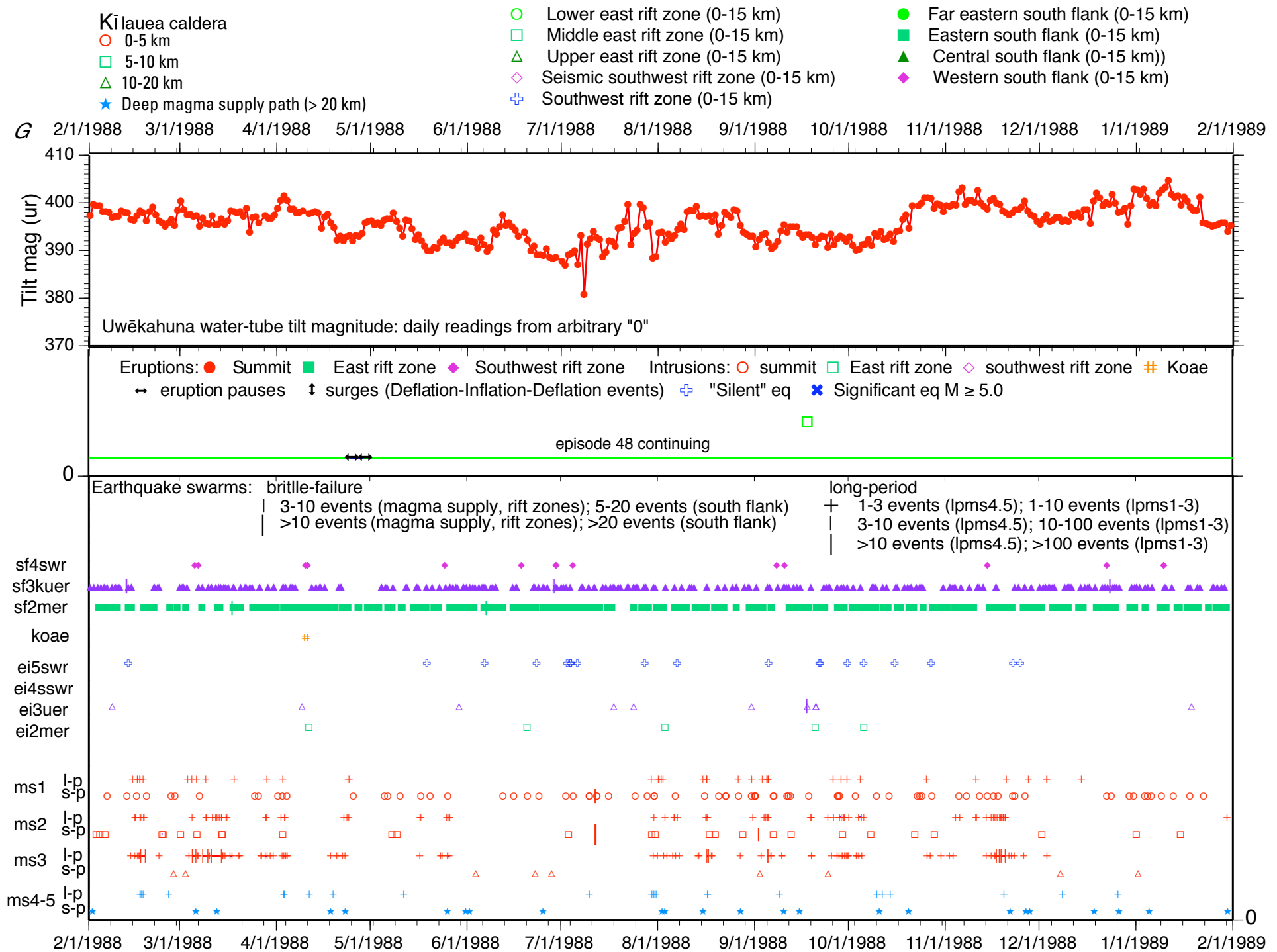


Appendix figure G3 f Pu'u 'Ō'o-Kupaianaha eruption: 2/1/1987-2/1/1988

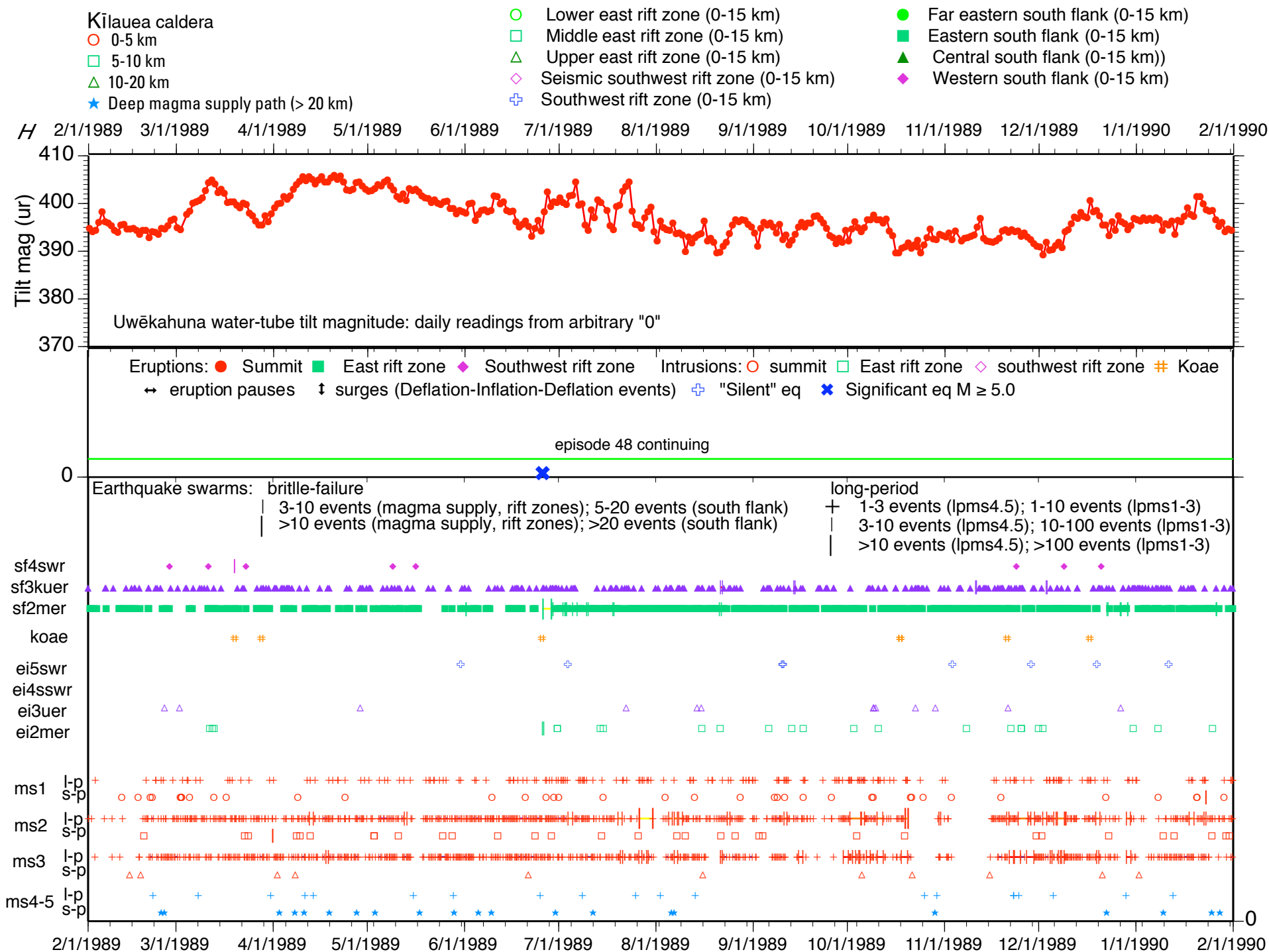


Appendix figure G3 g

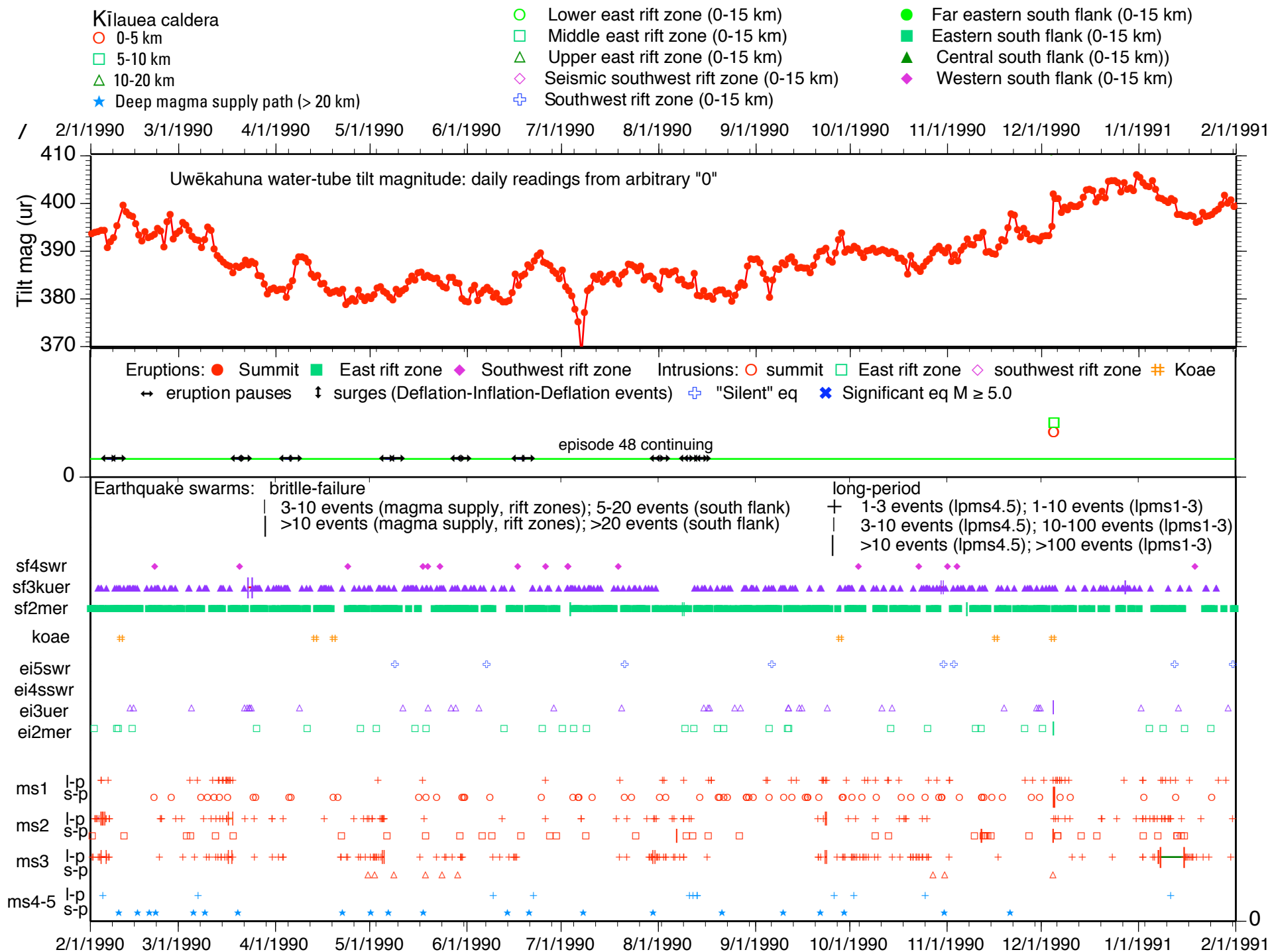
Pu'u Ō'ō-Kupaianaha eruption: 2/1/1988-2/1/1989



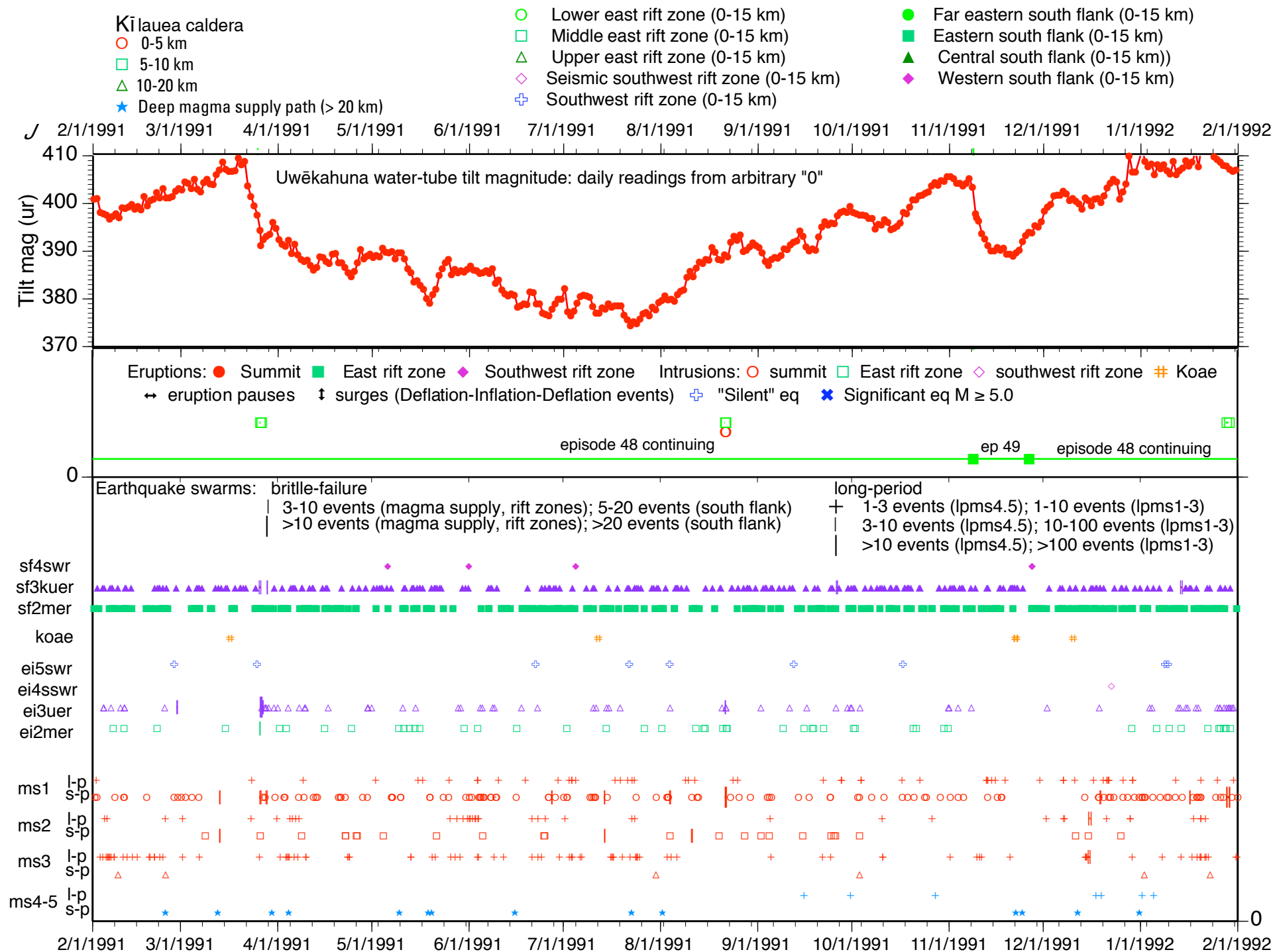
Appendix figure G3 hPu'u 'Ō'o-Kupaianaha eruption: 2/1/1989-2/1/1990



Appendix figure G3 i Pu‘u ‘Ō‘o-Kupaianaha eruption: 2/1/1990-2/1/1991

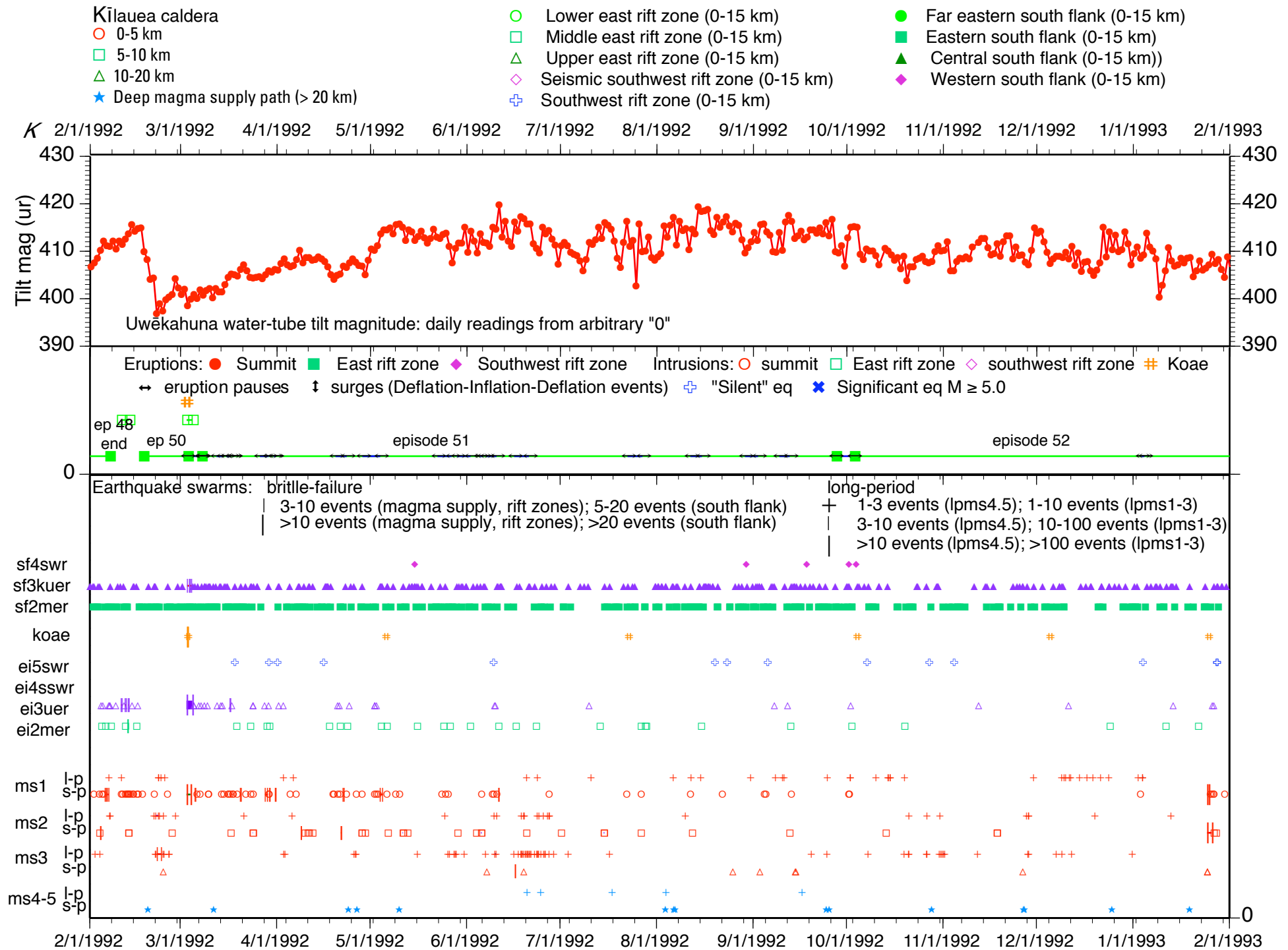


Appendix figure G3 j Pu'u 'Ō'o-Kupaianaha eruption: 2/1/1991-2/1/1992



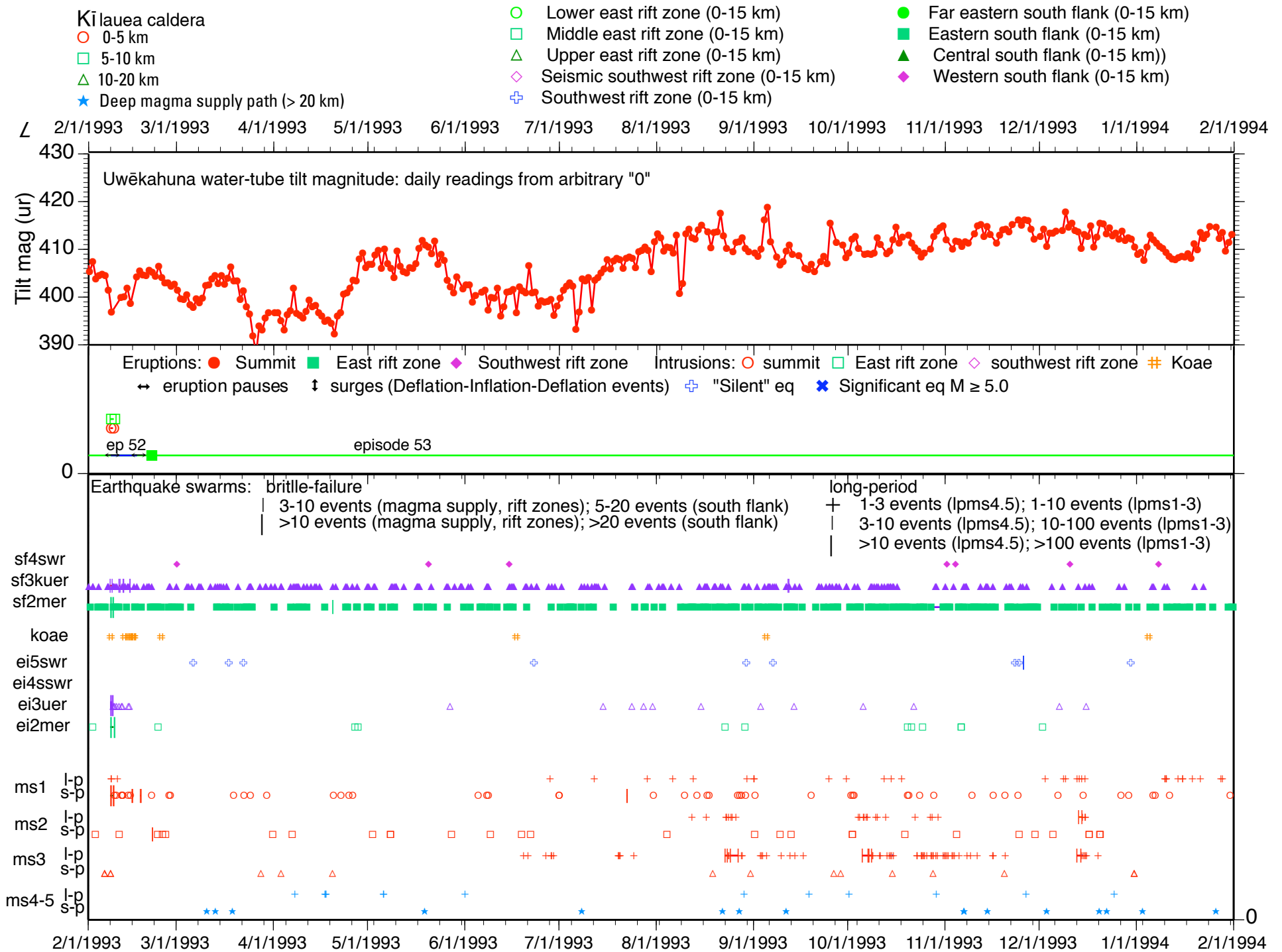
Appendix figure G3 k

Pu'u 'Ō'o-Kupaianaha eruption: 2/1/1992-2/1/1993



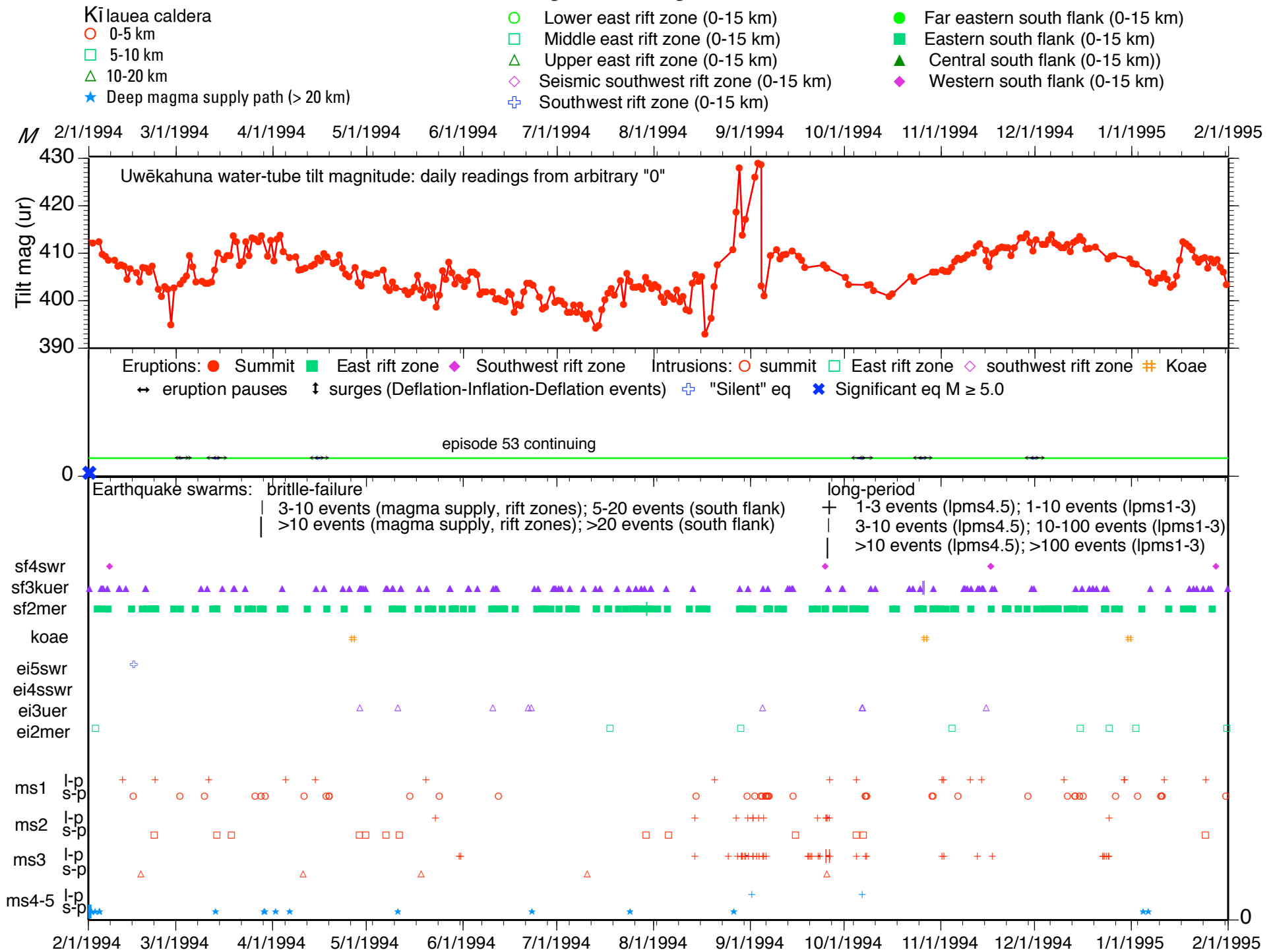
Appendix figure G3 I

Pu'u Ō'ō-Kupaianaha eruption: 2/1/1993-2/1/1994



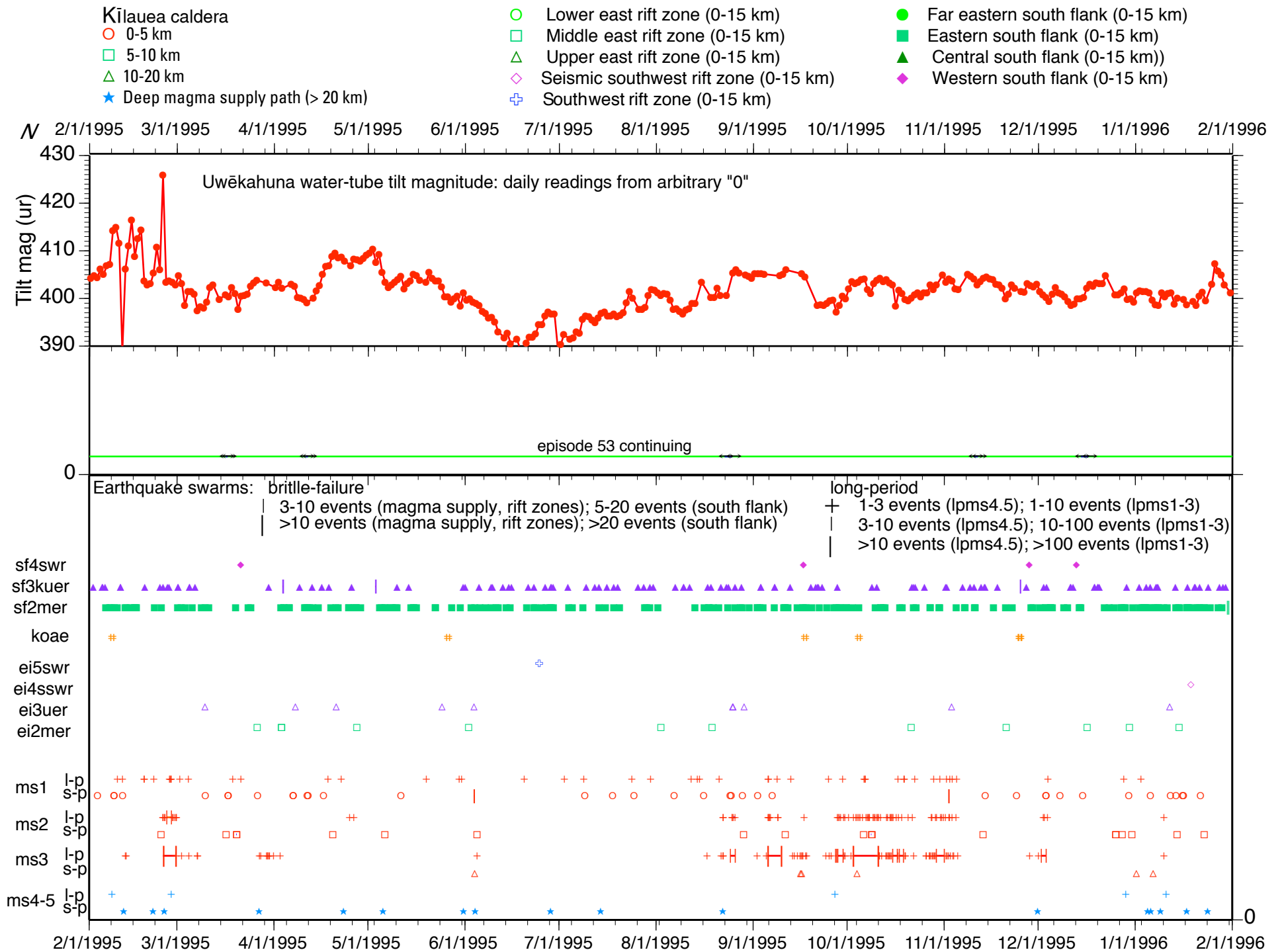
Appendix figure G3 m

Pu'u 'Ō'o-Kupaianaha eruption: 2/1/1994-2/1/1995



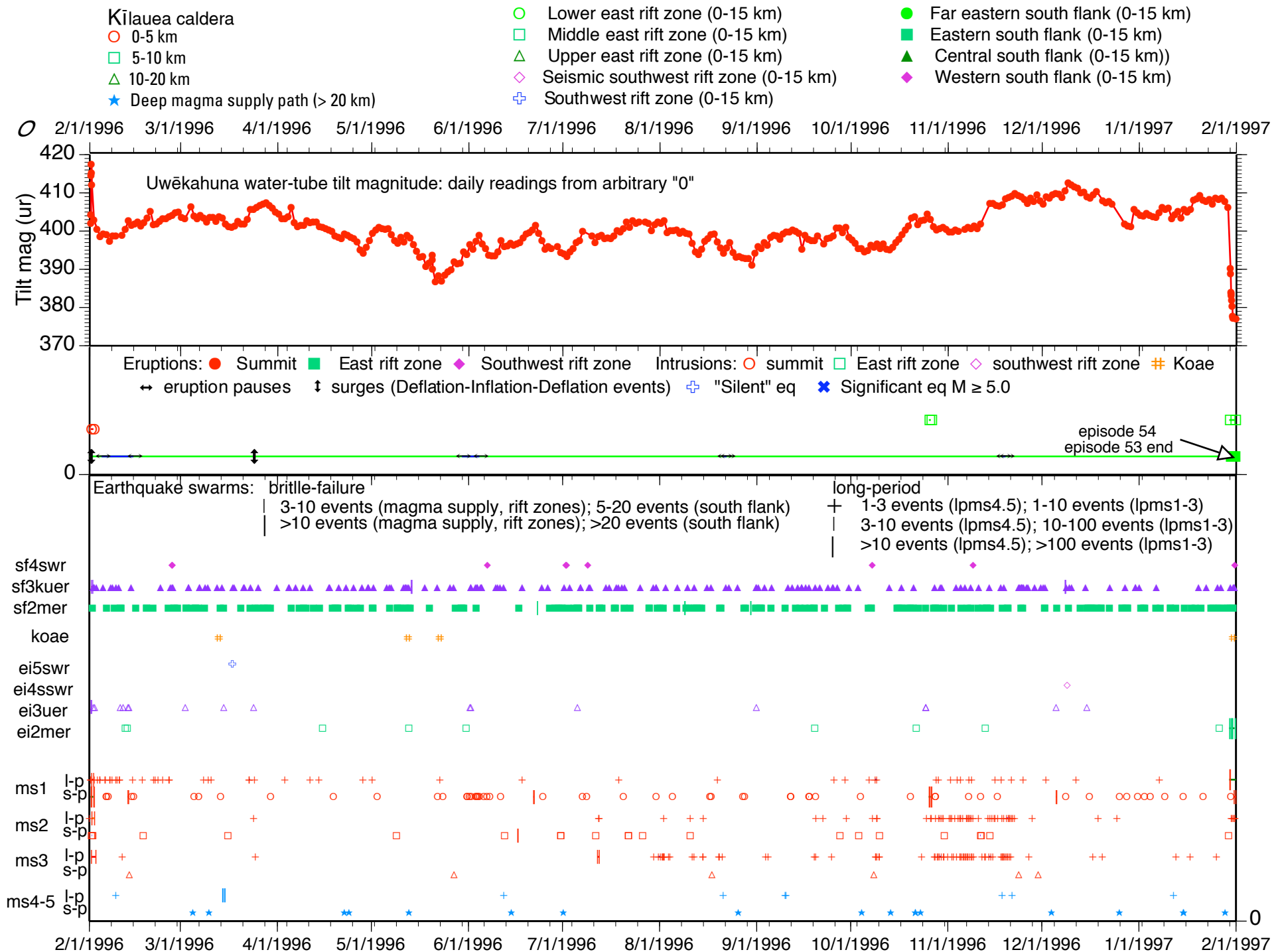
Appendix figure G3 n

Pu'u 'Ō'o-Kupaianaha eruption: 2/1/1995-2/1/1996



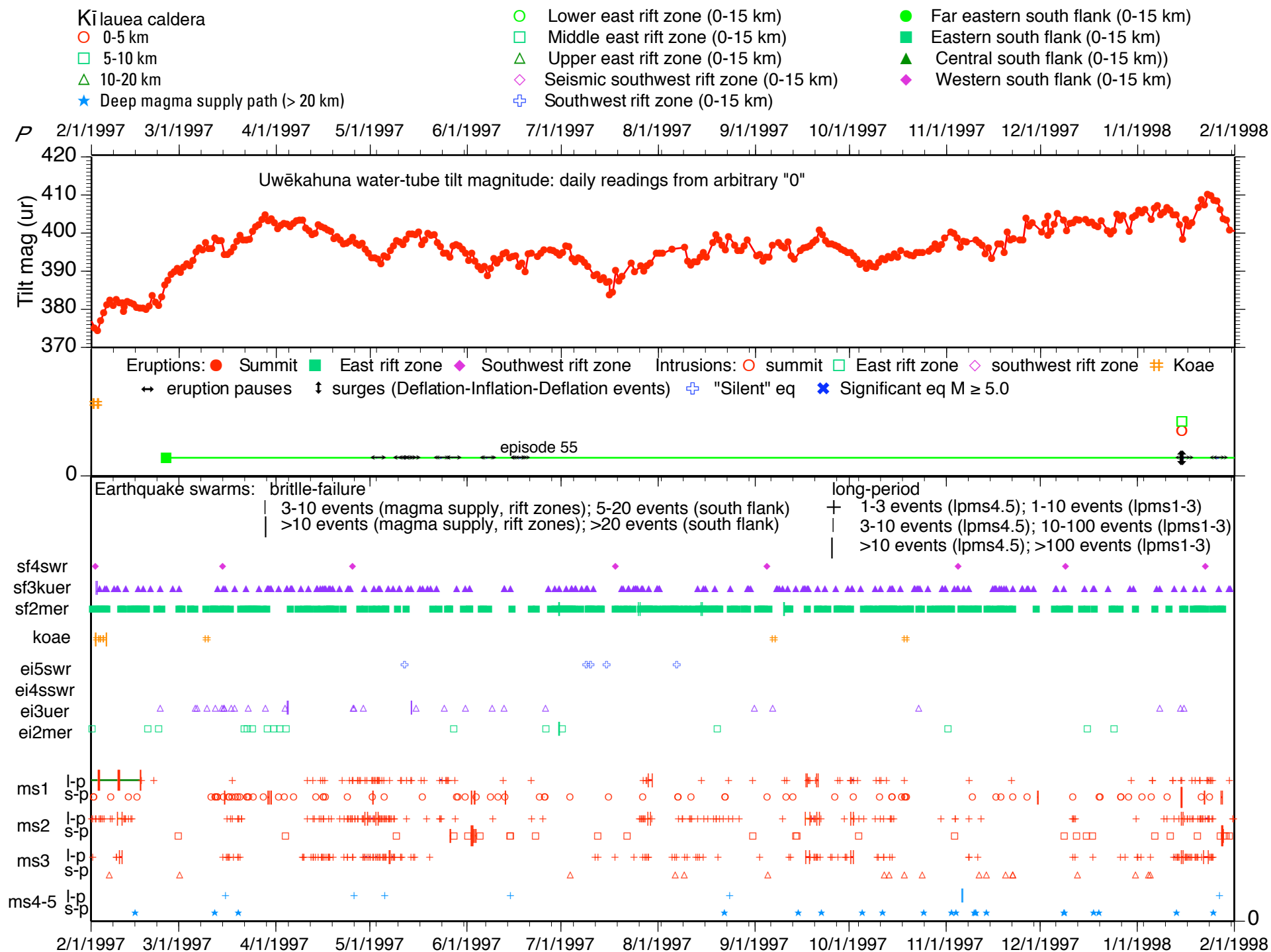
Appendix figure G3 o

Pu'u 'Ō'o-Kupaianaha eruption: 2/1/1996-2-2/1/1997



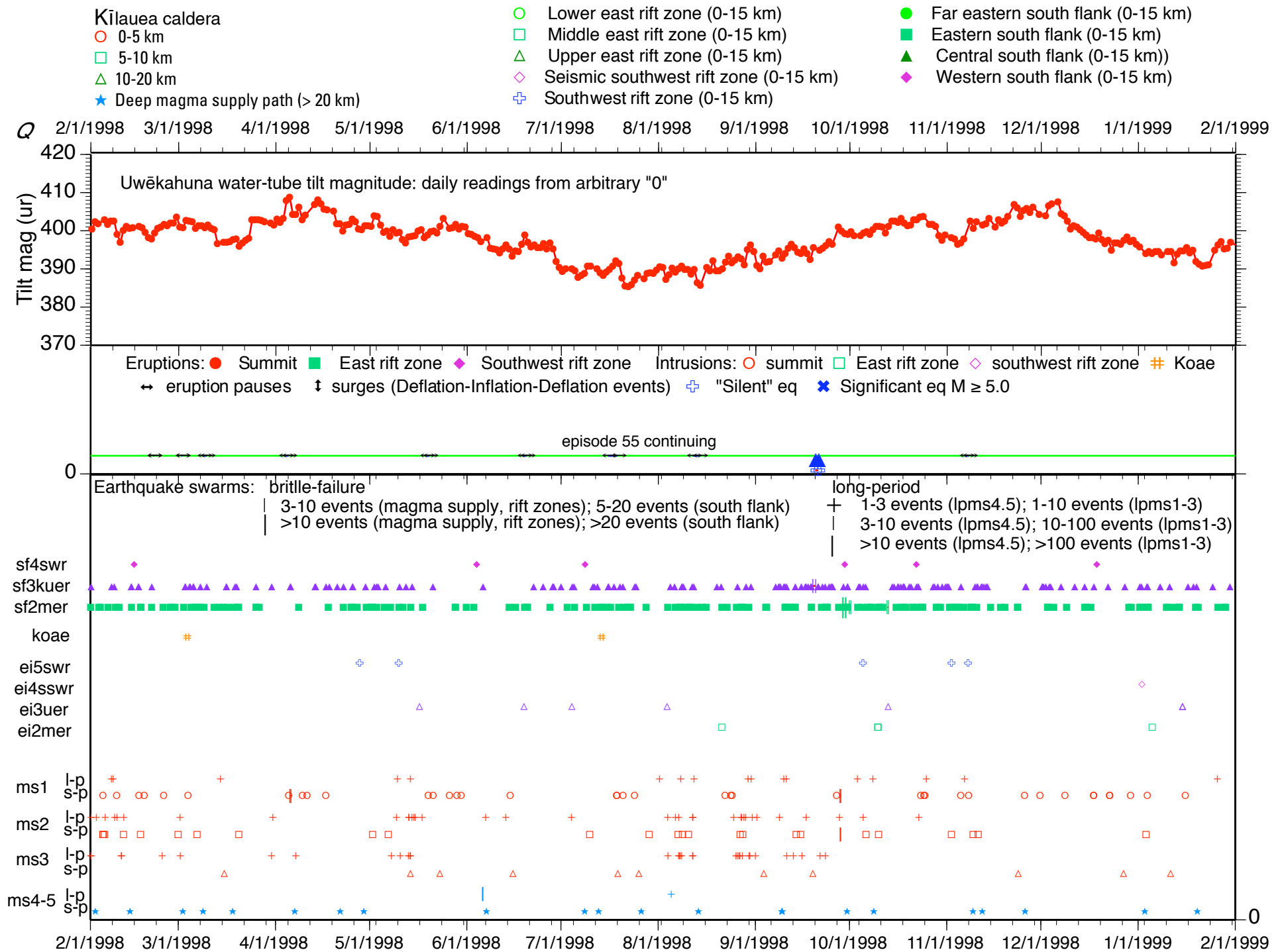
Appendix figure G3 p

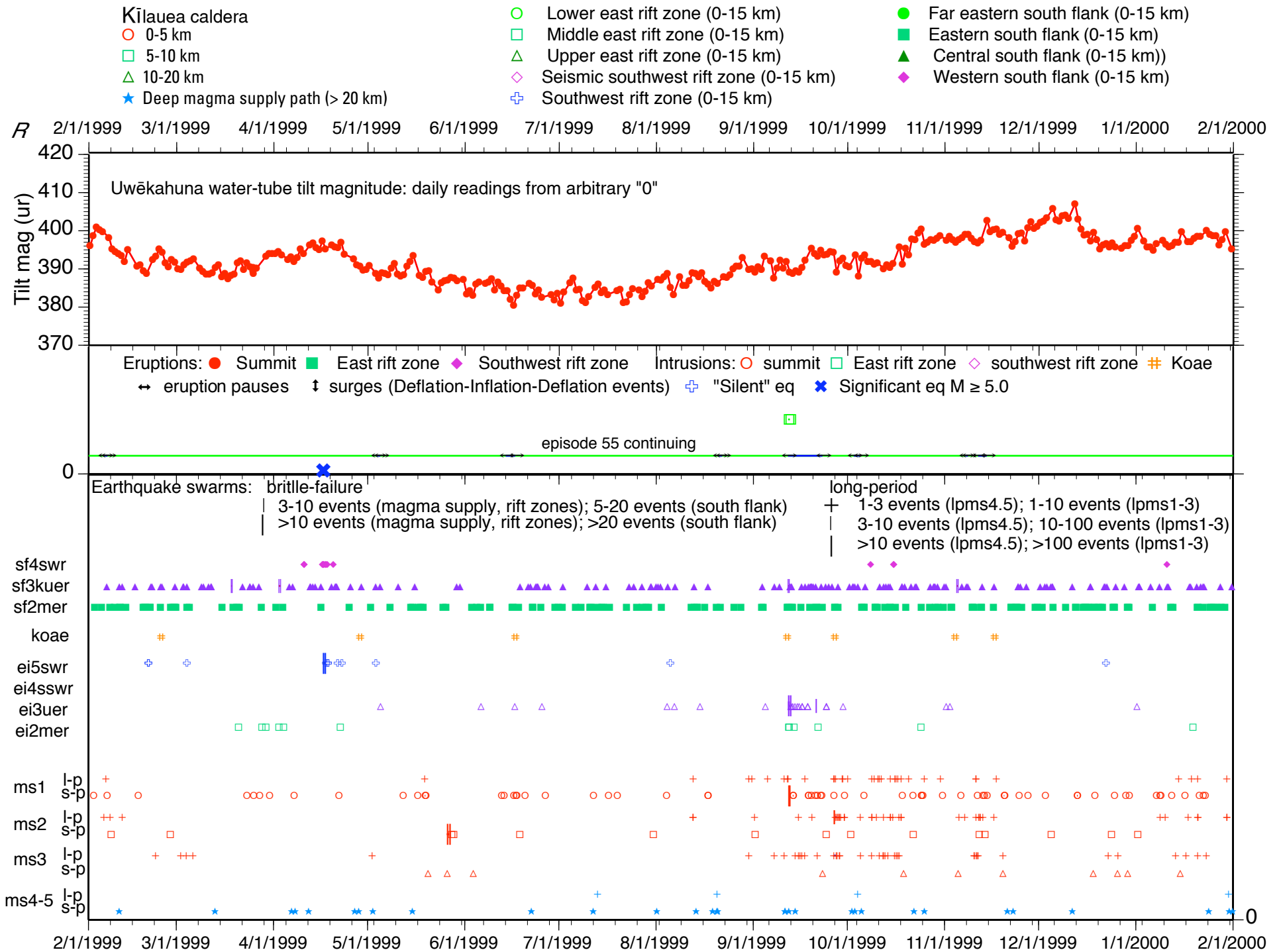
Pu'u Ō'ō-Kupaianaha eruption: 2/1/1997-2/1/1998



Appendix figure G3 q

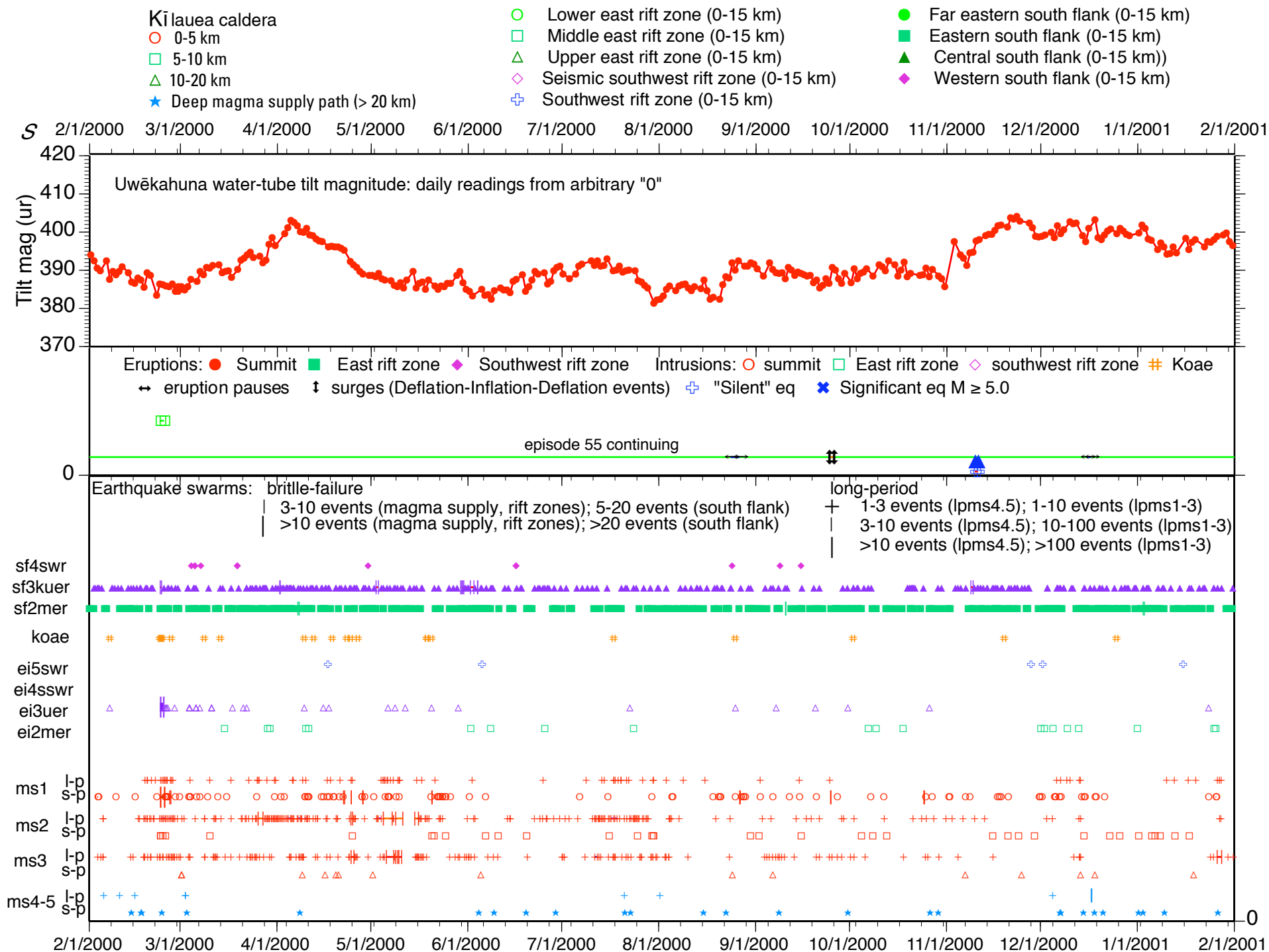
Pu'u 'Ō'o-Kupaianaha eruption: 2/1/1998-2/1/1999





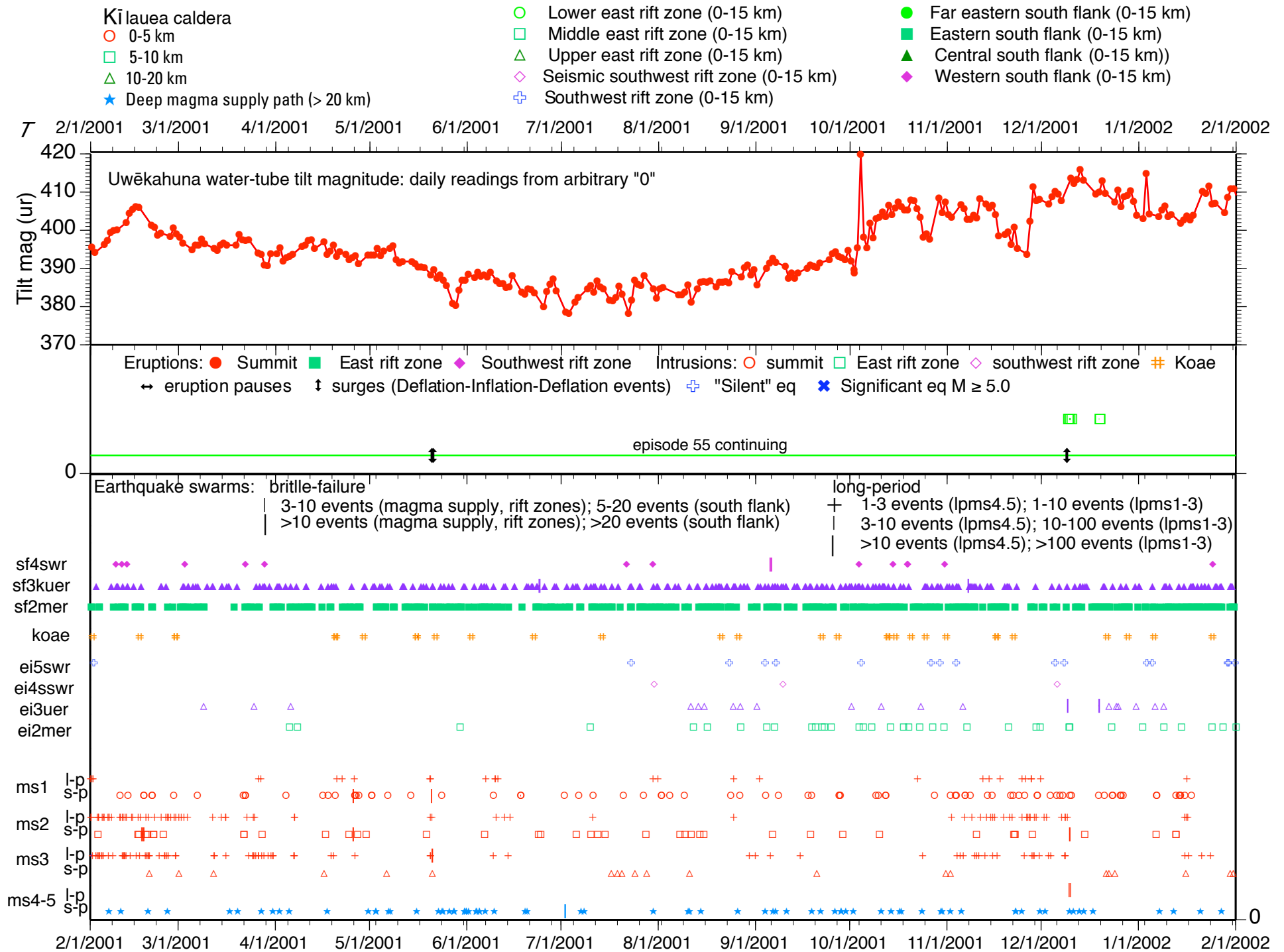
Appendix figure G3 s

Pu'u 'Ō'o-Kupaianaha eruption: 2/1/2000-2/1/2001



Appendix figure G3 t

Pu'u 'Ō'ō-Kupaianaha eruption: 2/1/2001-2/1/2002



Appendix figure G3 u

Pu'u 'Ō'o-Kupaianaha eruption: 2/1/2002-2/1/2003



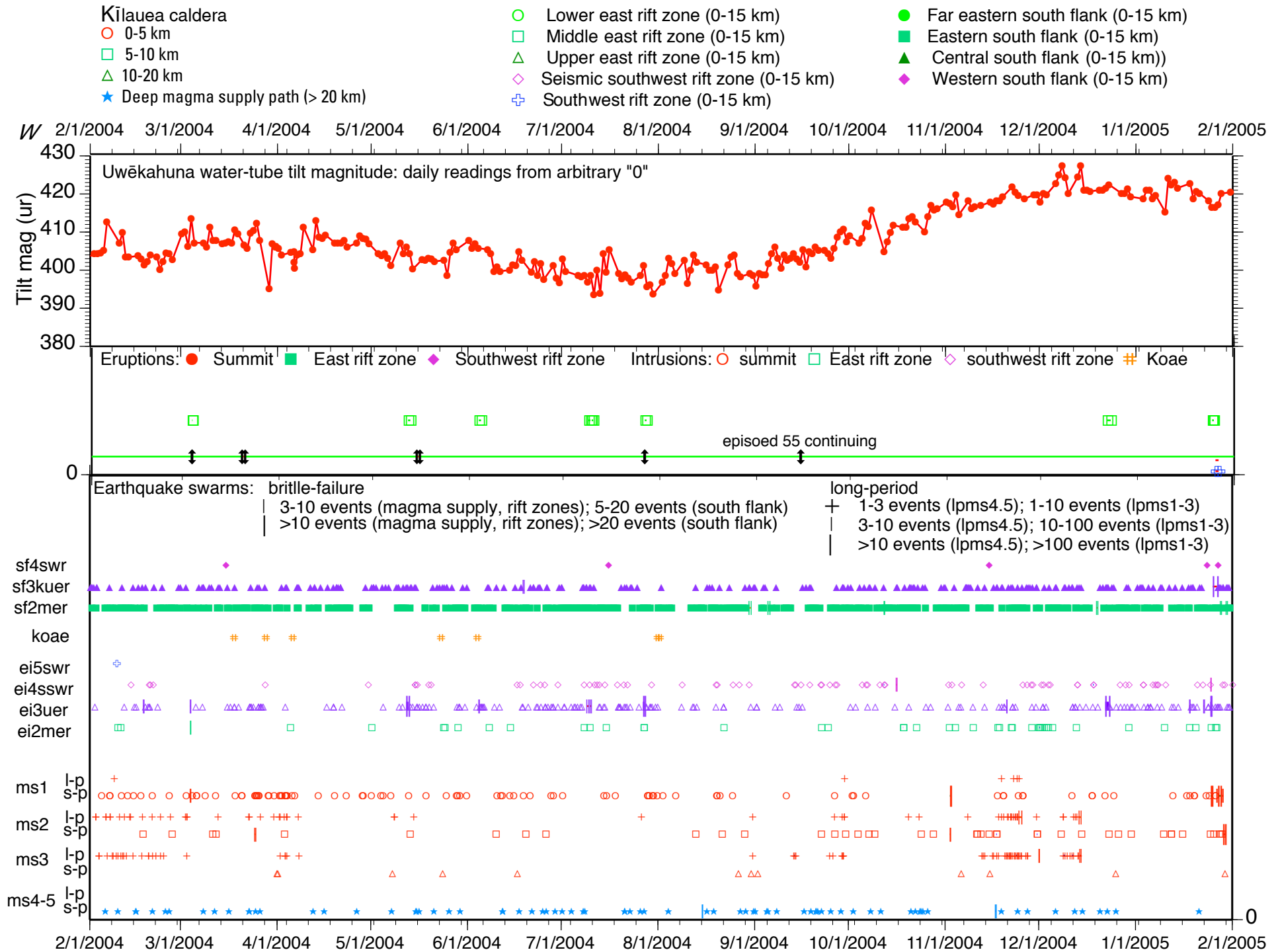
Appendix figure G3 v

Pu'u 'Ō'o-Kupaianaha eruption: 2/1/2003-2/1/2004



Appendix figure G3 w

Pu'u Ō'ō-Kupaianaha eruption: 2/1/2004-2/1/2005



Appendix figure G3 x

Pu'u 'Ō'o-Kupaianaha eruption: 2/1/2005-2/1/2006

Kīlauea caldera

○ 0-5 km

□ 5-10 km

△ 10-20 km

★ Deep magma supply path (> 20 km)

○ Lower east rift zone (0-15 km)

□ Middle east rift zone (0-15 km)

△ Upper east rift zone (0-15 km)

◇ Seismic southwest rift zone (0-15 km)

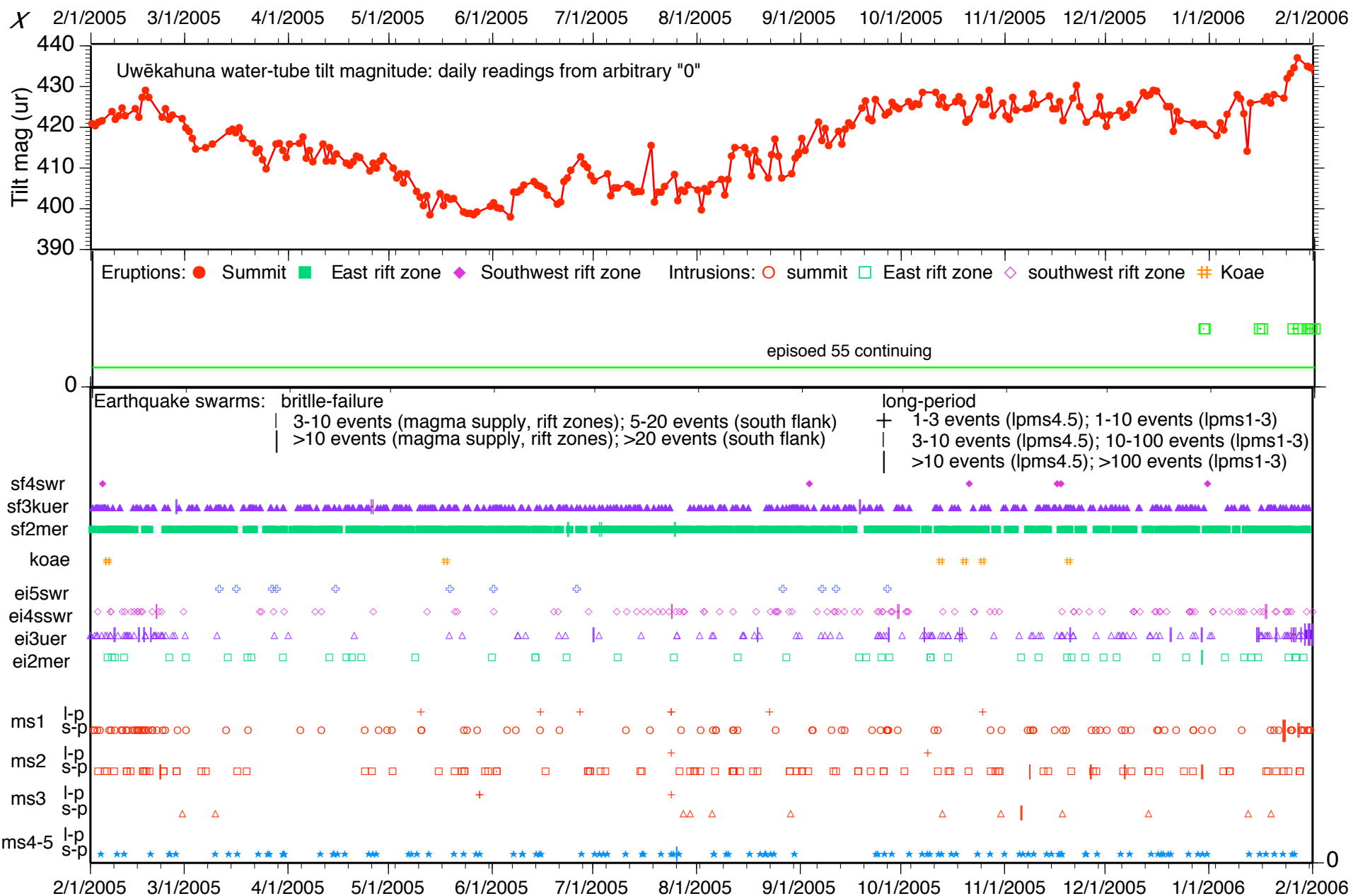
⊕ Southwest rift zone (0-15 km)

● Far eastern south flank (0-15 km)

■ Eastern south flank (0-15 km)

▲ Central south flank (0-15 km)

◆ Western south flank (0-15 km)



Appendix figure G3 y

Pu'u Ō'ō-Kupaianaha eruption: 2/1/2006-2/1/2007



Appendix figure G3 z

Pu'u 'Ō'ō-Kupaianaha eruption: 2/1/2007-2/1/2008

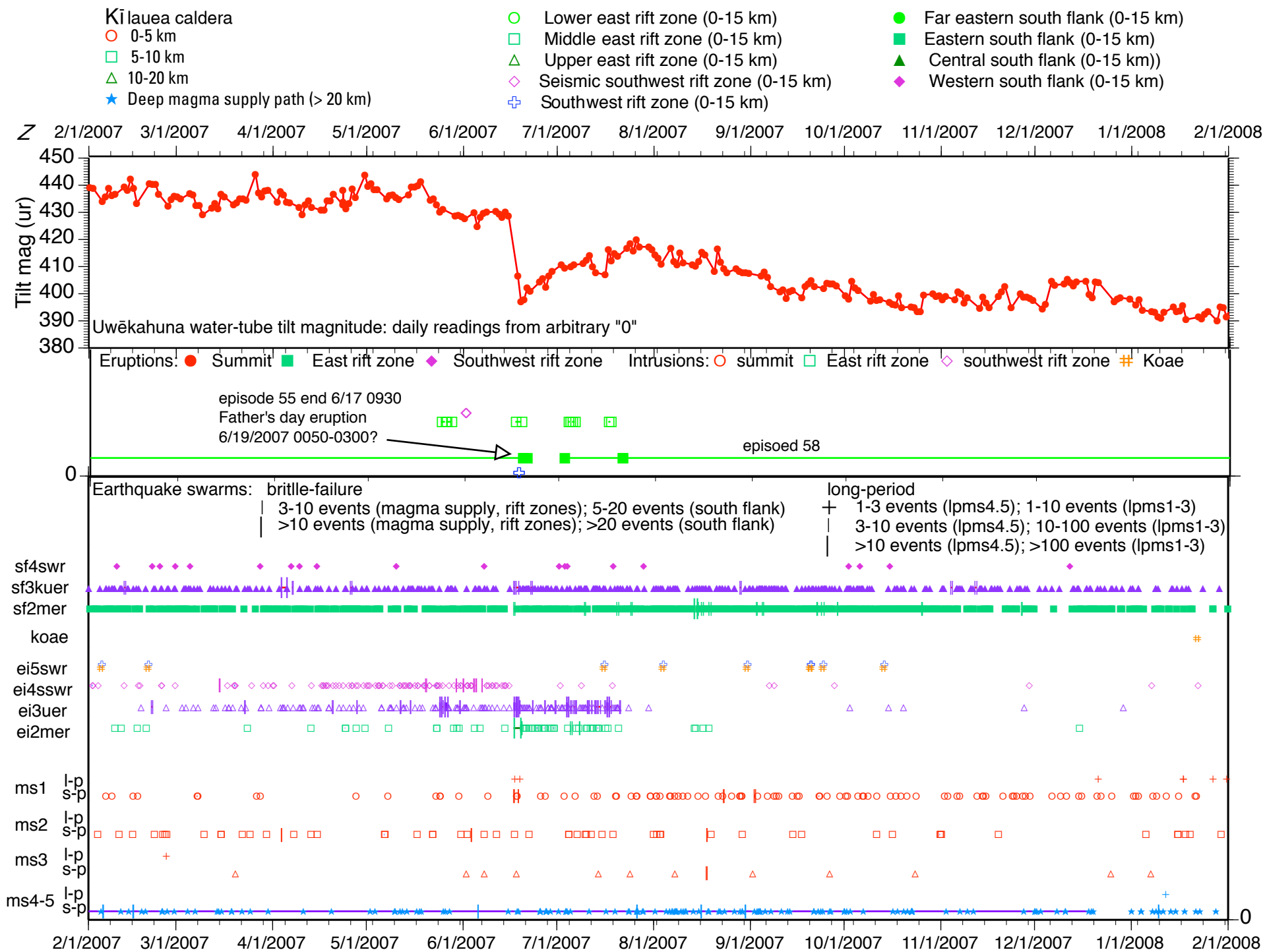
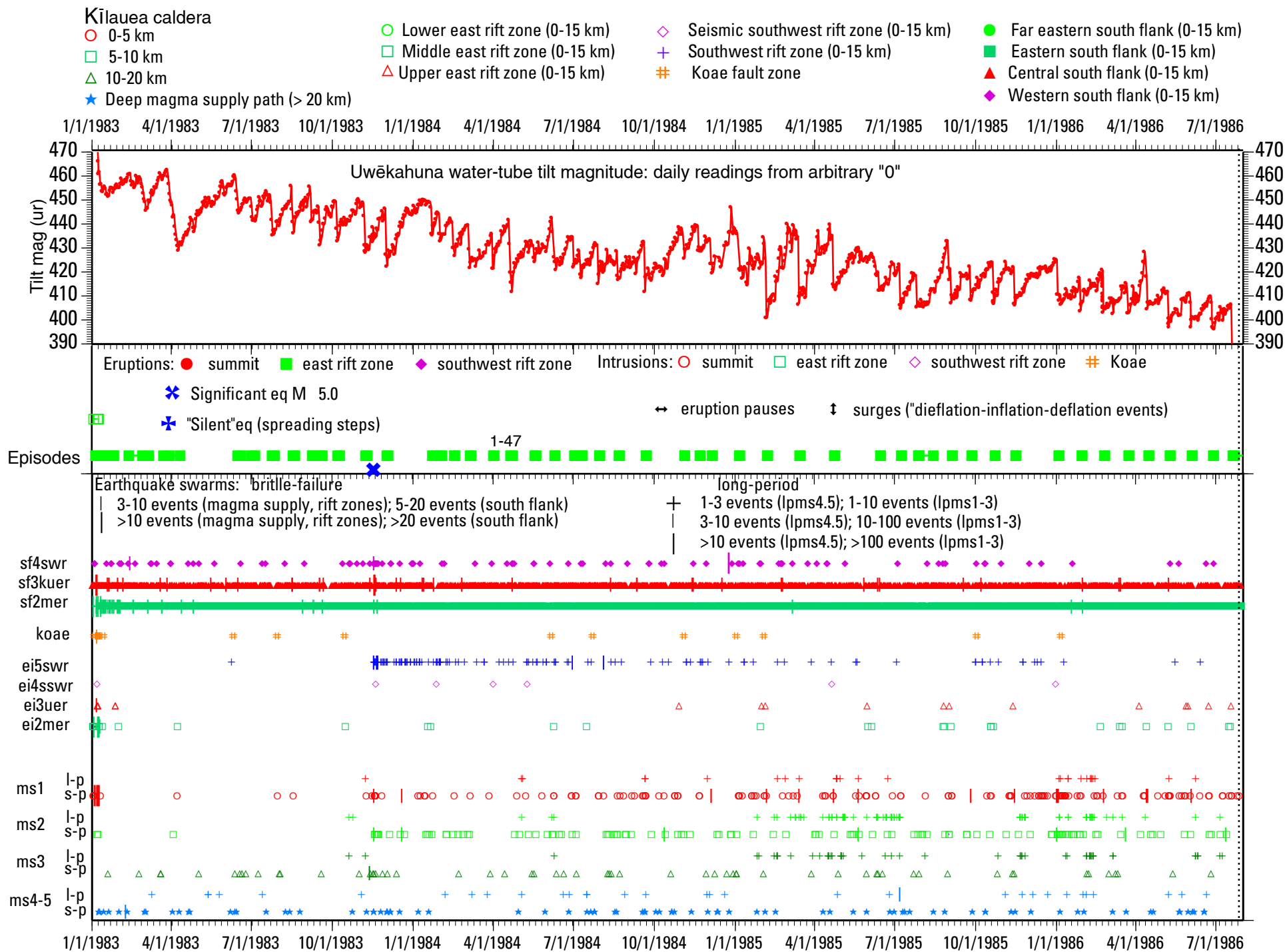


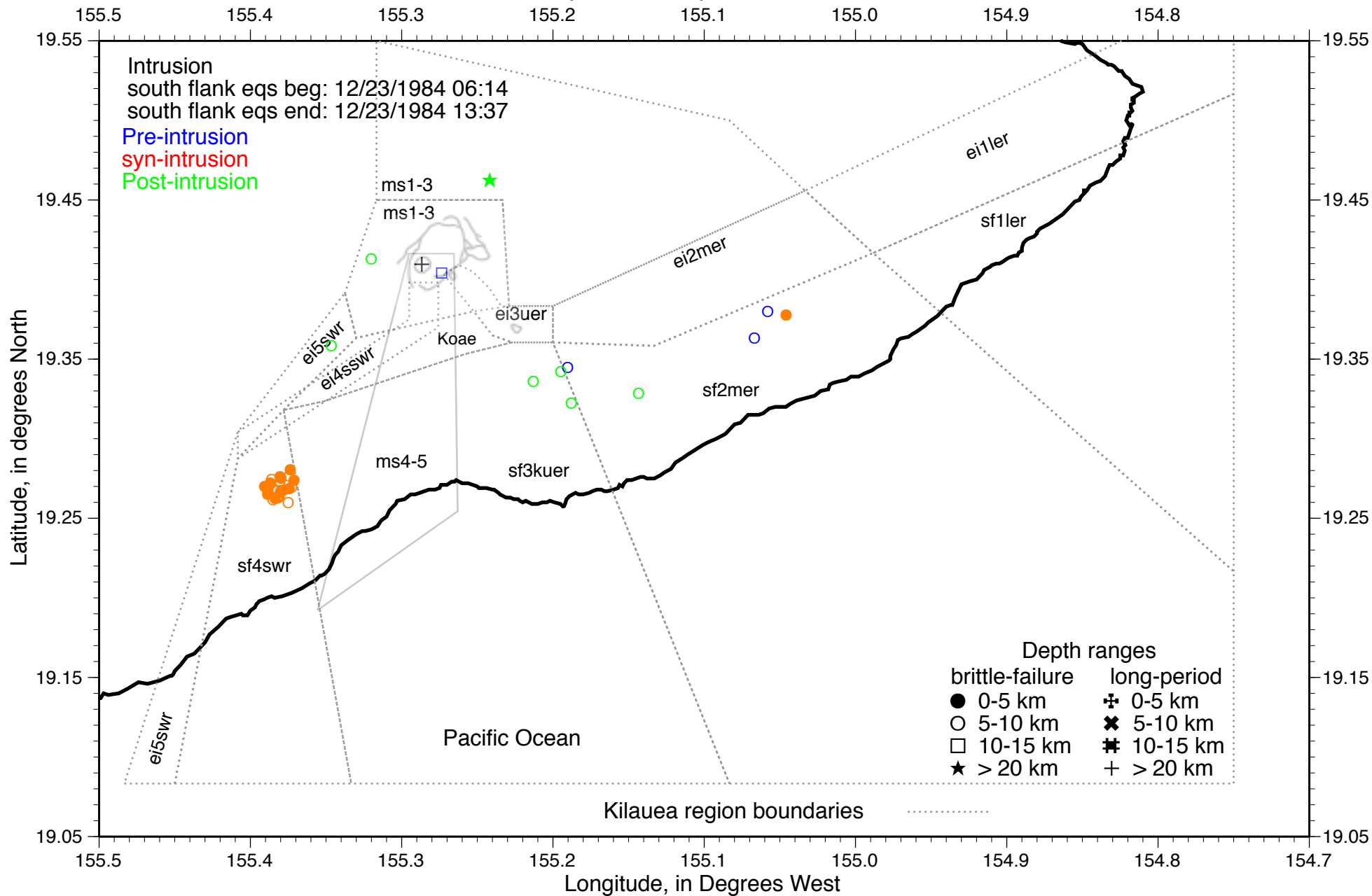
Figure G4

Pu'u 'Ō'o-Kupaianaha eruption: Stage IA, episodes 1-47



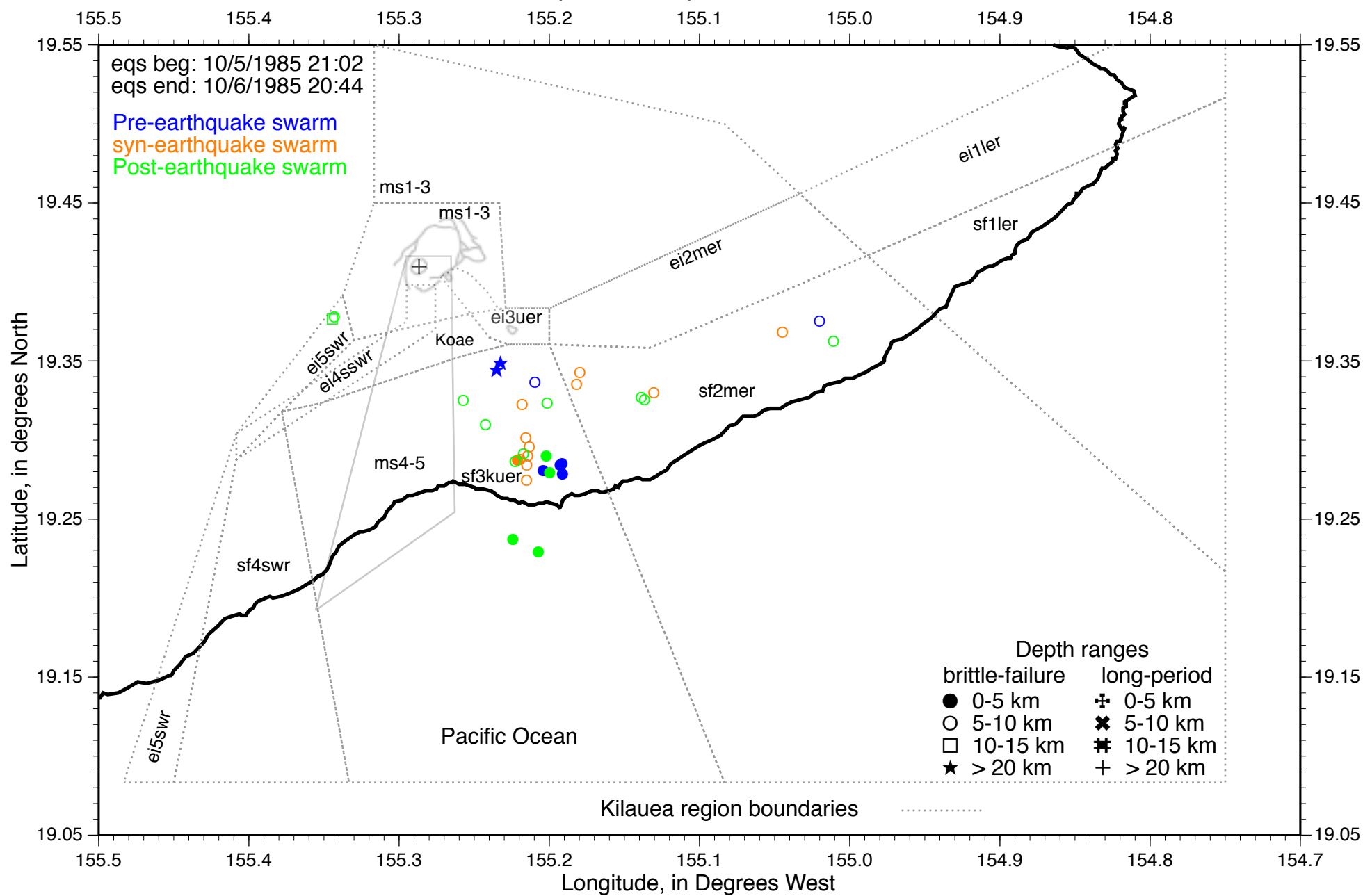
Appendix figure G5

12/23/1984 suspected deep intrusion data from 12/22-24/1984



Appendix figure G6

10/5-6/1985 suspected deep intrusion?: data from 10/4-8/1985



Appendix figure G7 Episode 48 fissure eruption leading to continuous eruption: data from 7/14-24/1986

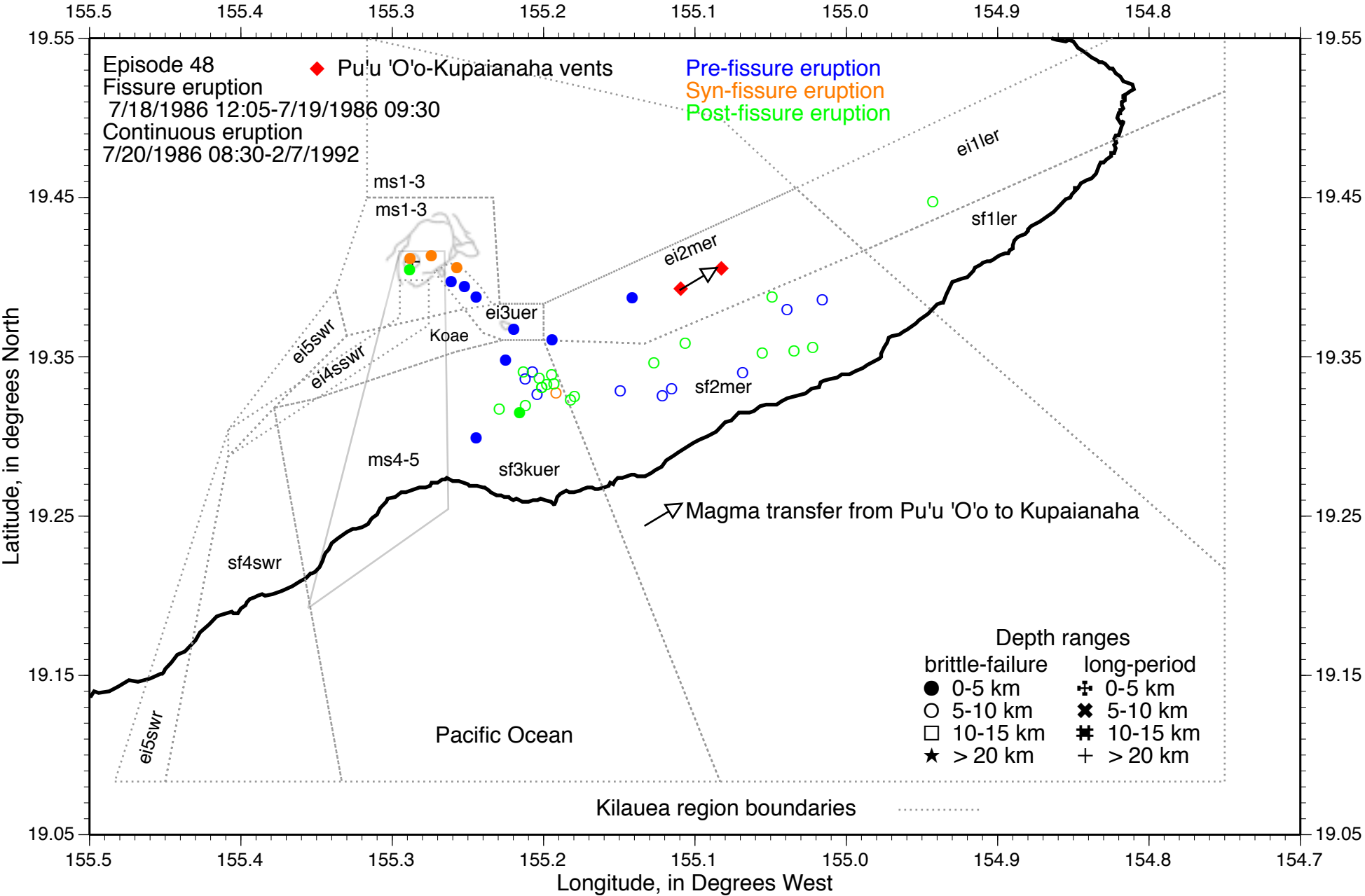
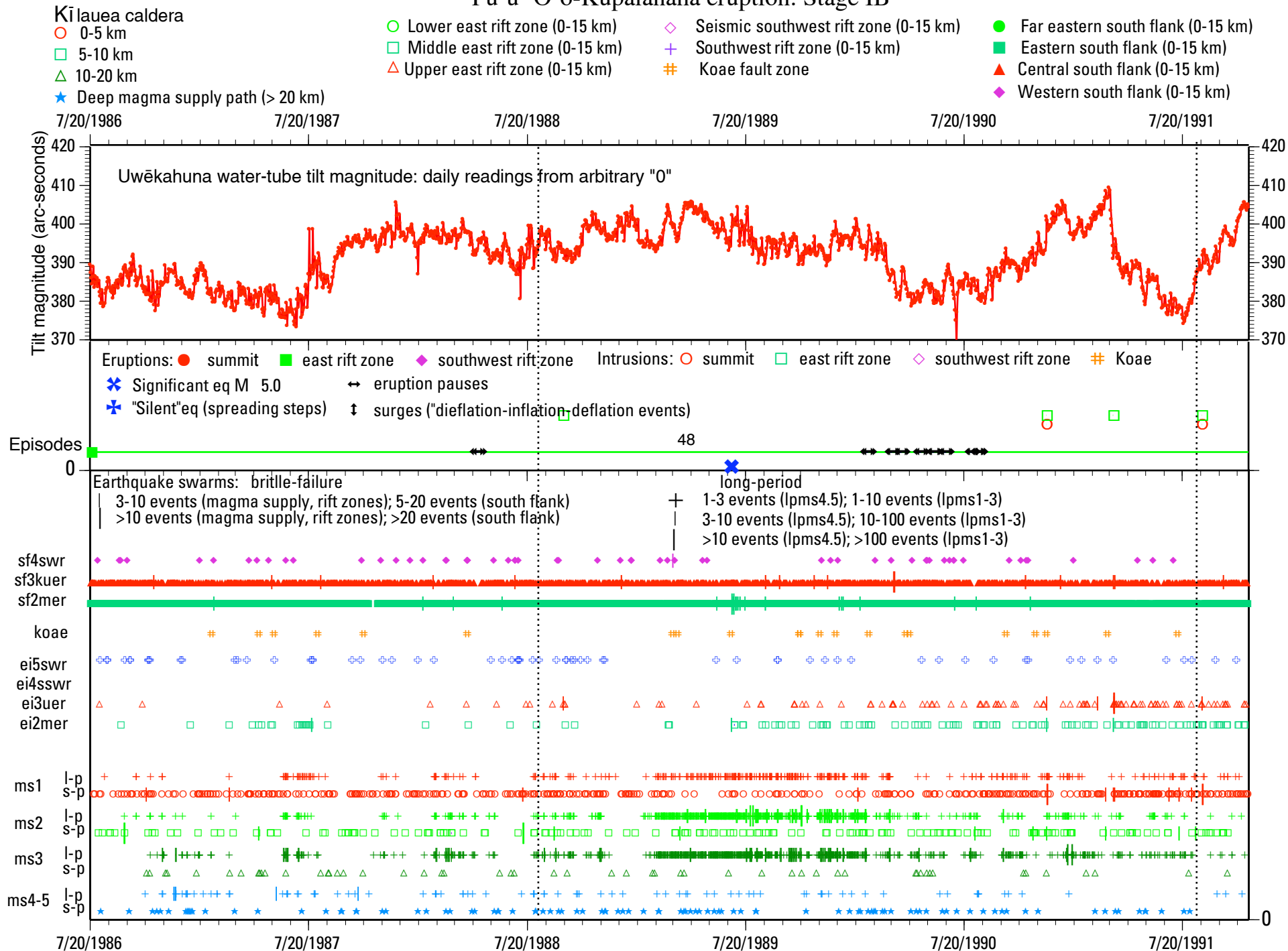


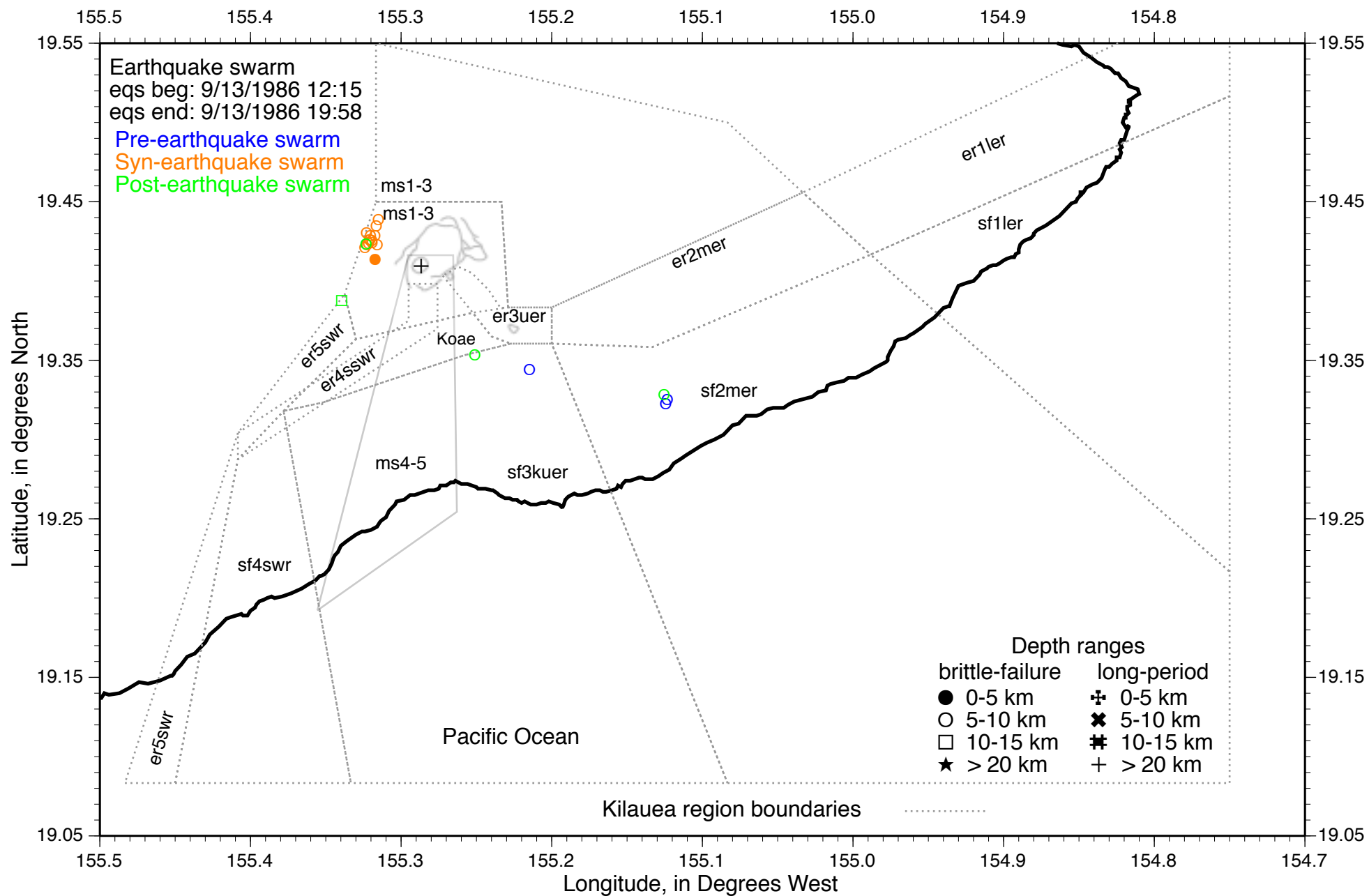
Figure G8

Pu'u 'Ō'o-Kupaianaha eruption: Stage IB

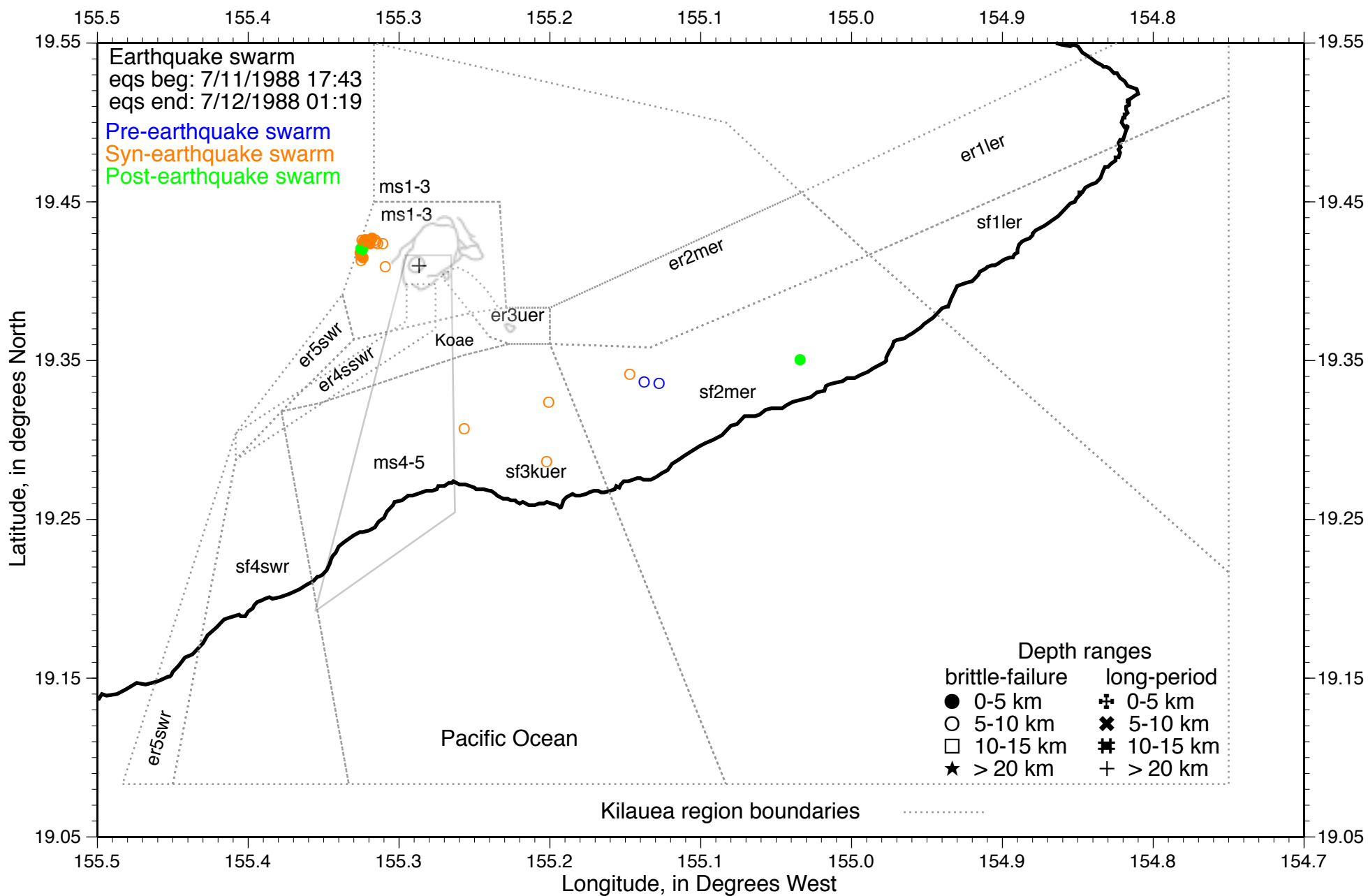


Appendix figure G9

9/13/1986 Namakani Paio sequence: data from 9/13-14/1986

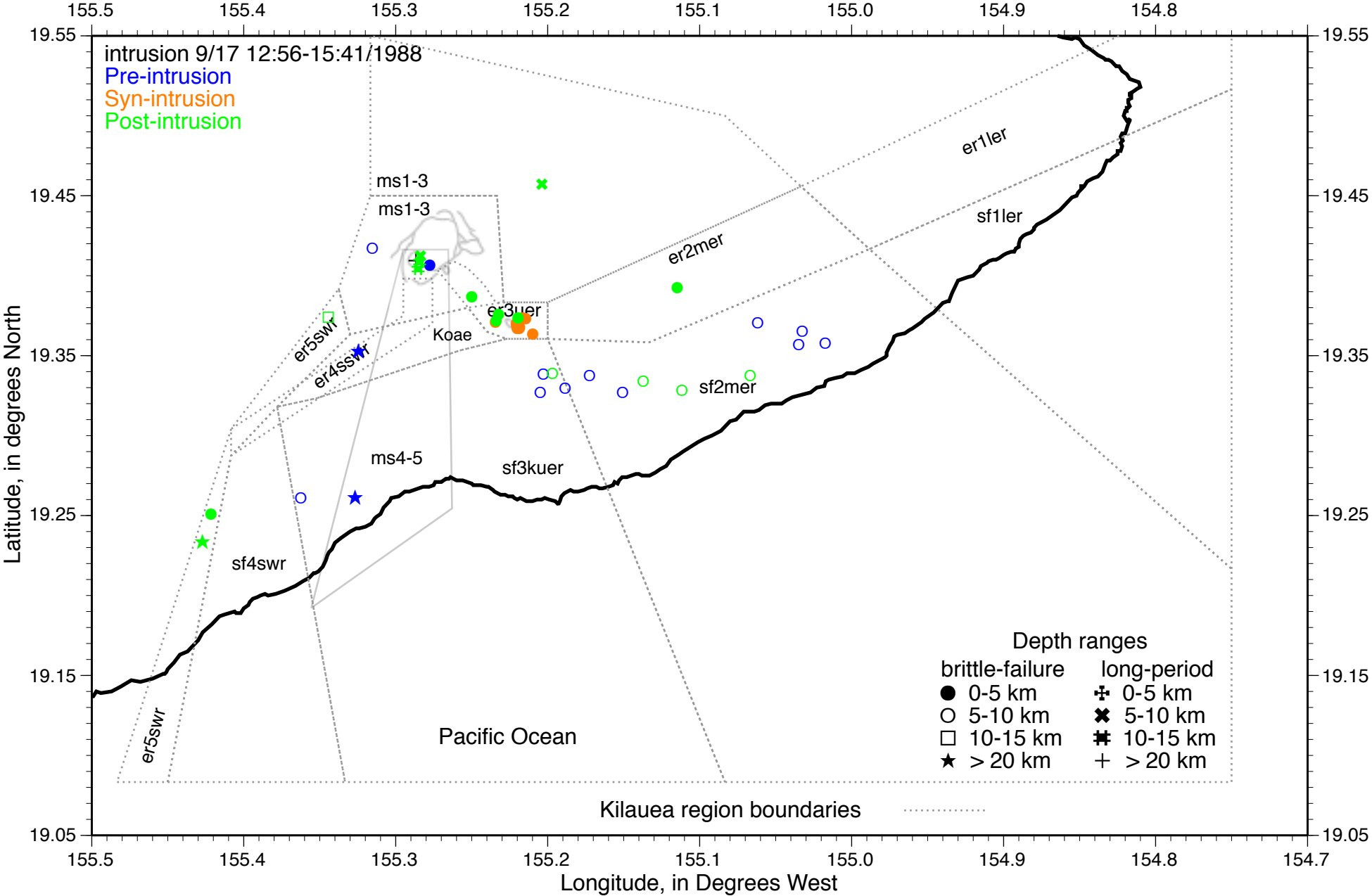


Appendix figure G10 7/11-12/1988 Namakani Paio sequence: data from 7/11-12/1988



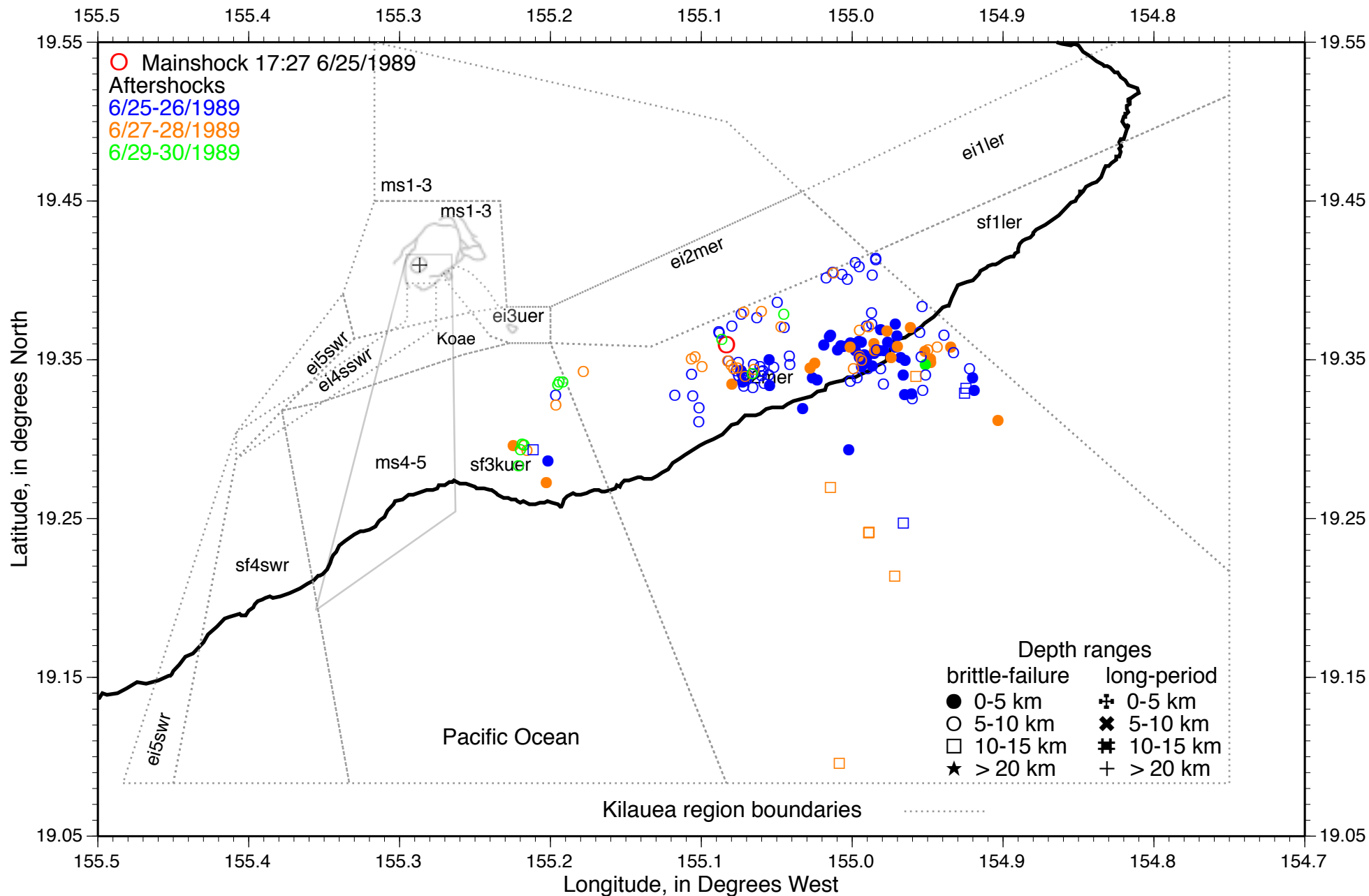
Appendix figure G11

9/17/1988 intrusion: data from 9/12-21/1988



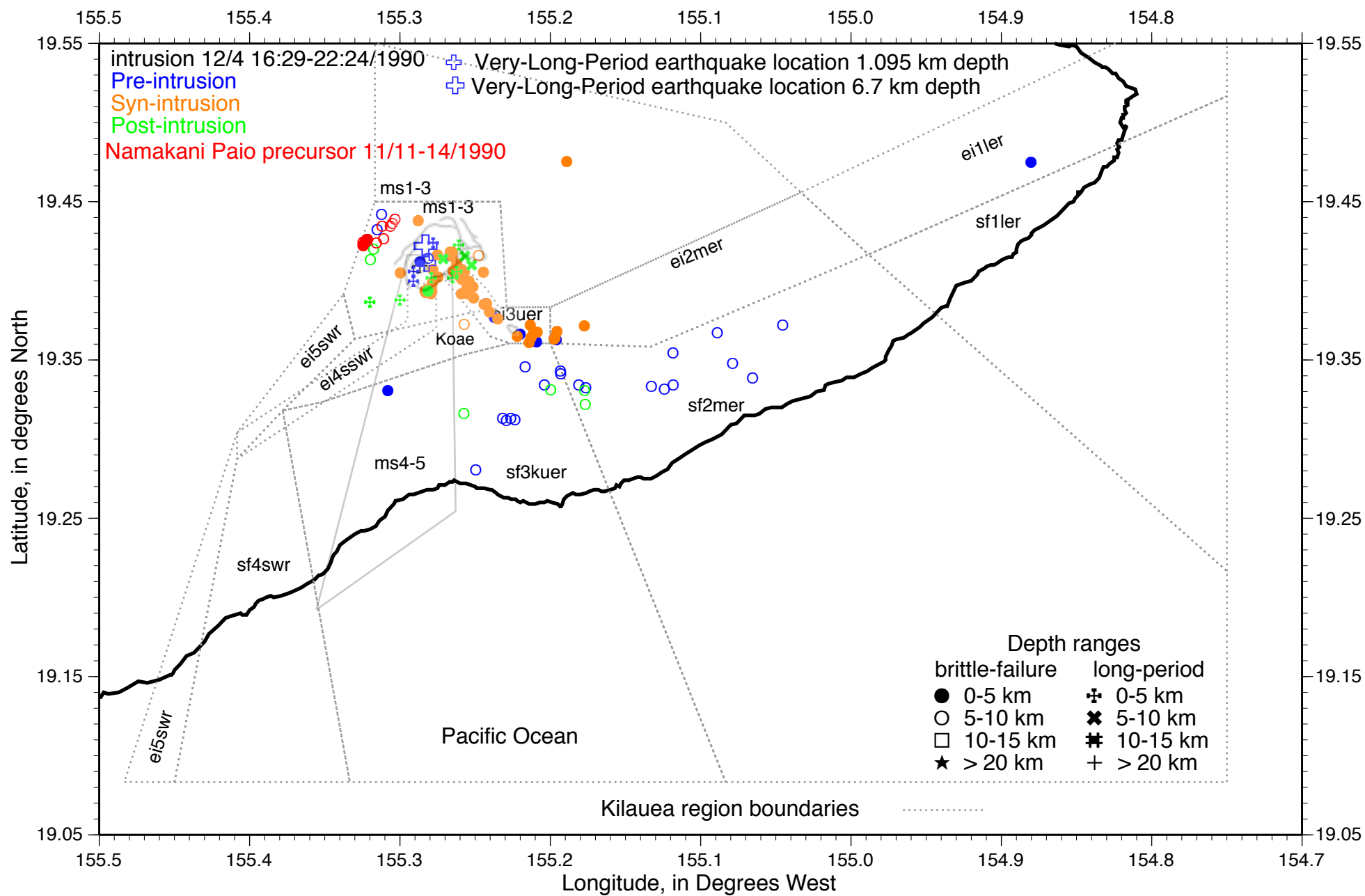
Appendix figure G12

6/25/1989 M 6.2 south flank earthquake: data from 6/25-30/1989



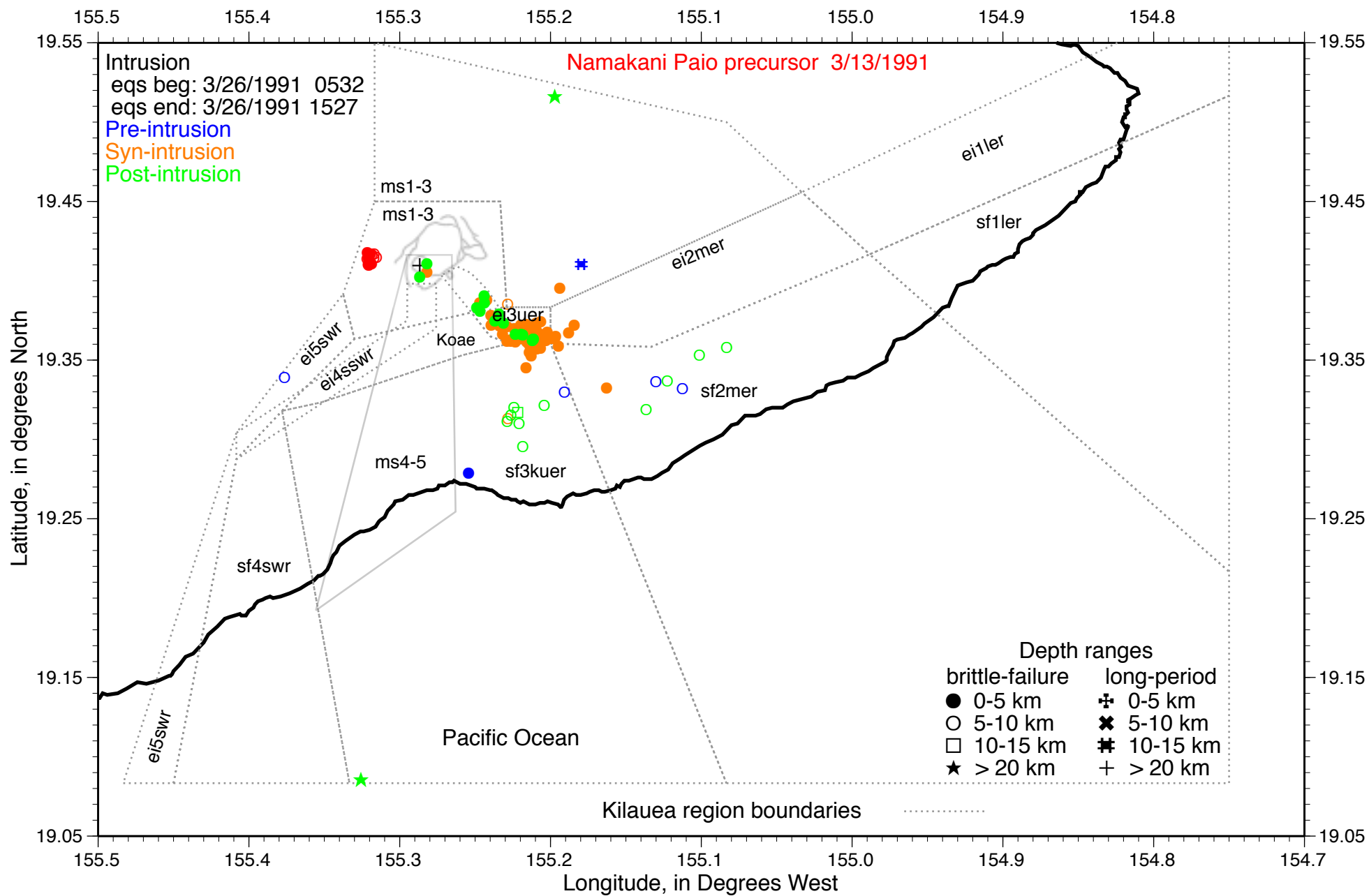
Appendix figure G13

Intrusion 12/4/1990: data from 11/11-12/6/1990



Appendix figure G14

3/26/1991 intrusion: data from 3/25-30/1991



Appendix figure G15

Intrusion 8/21/1991: data from 8/17-25/1991

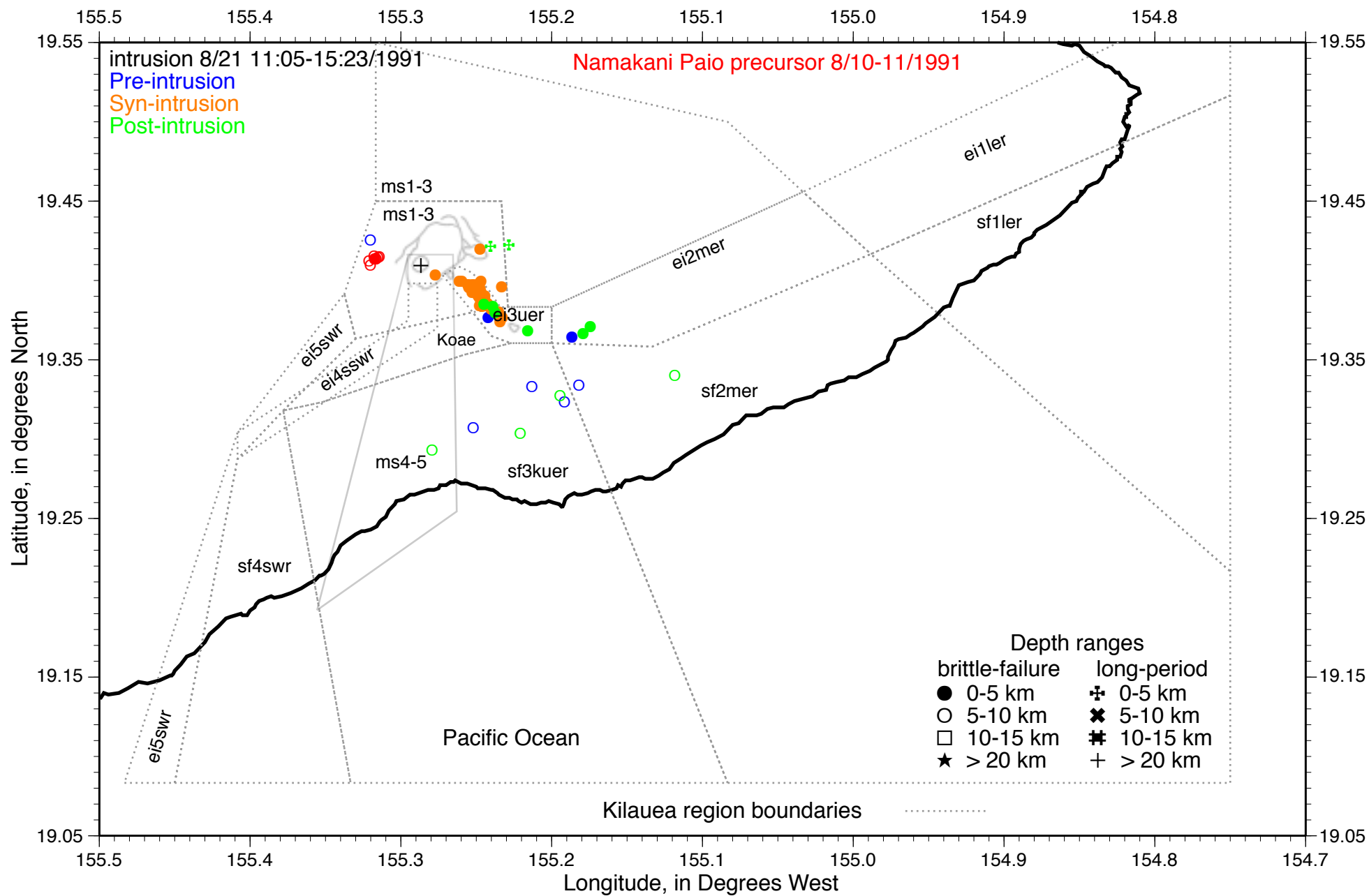
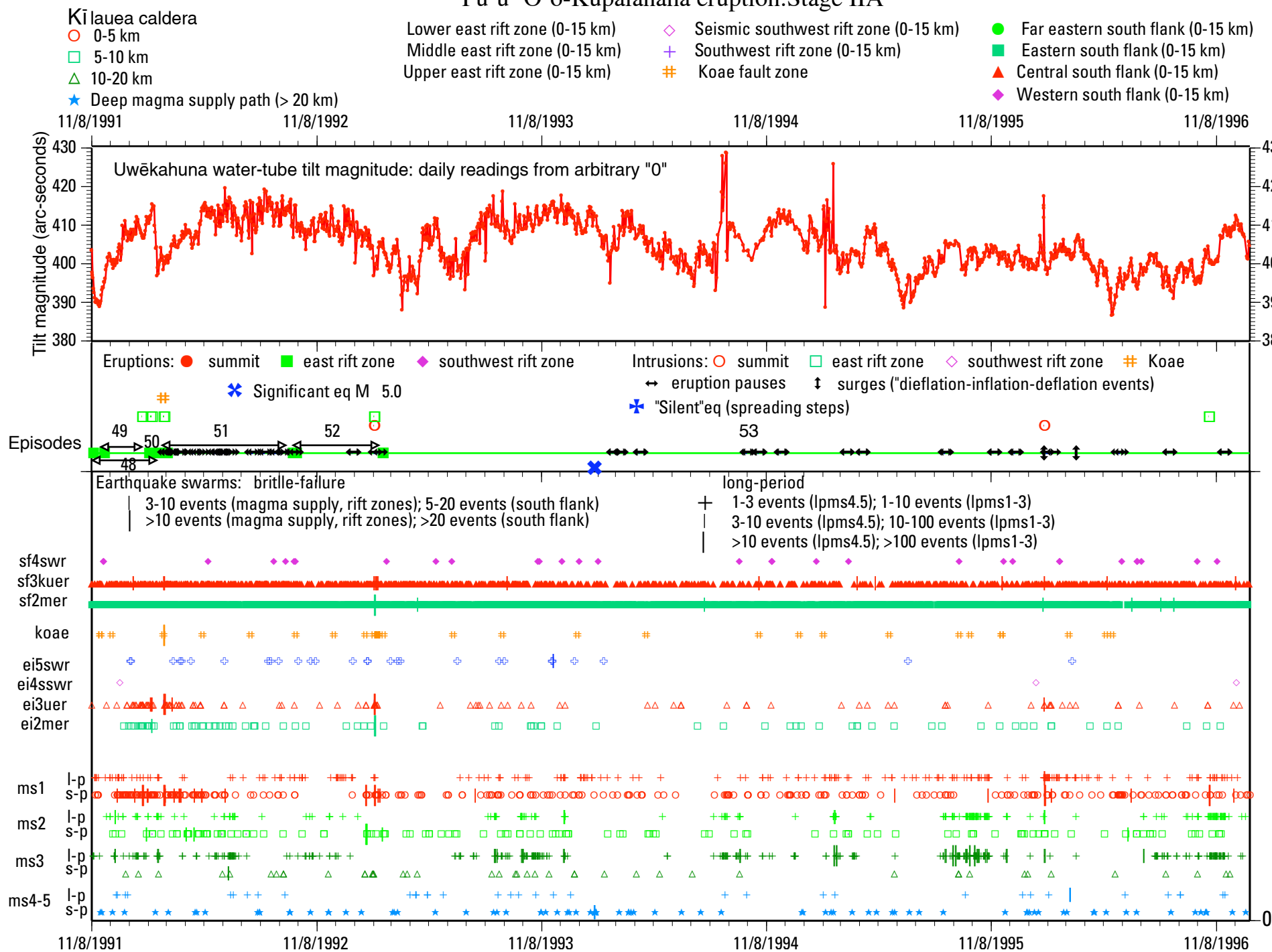
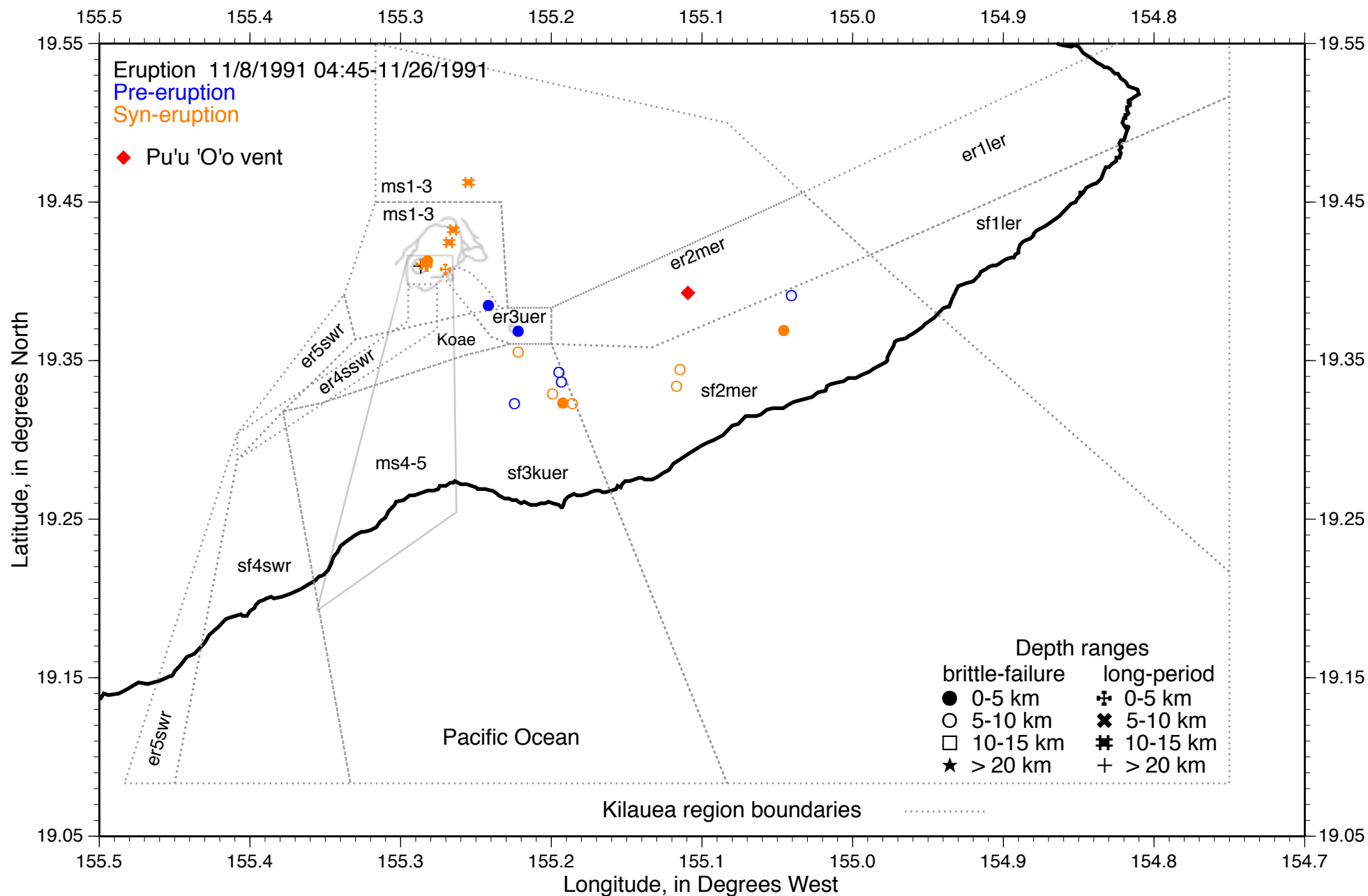


Figure G16

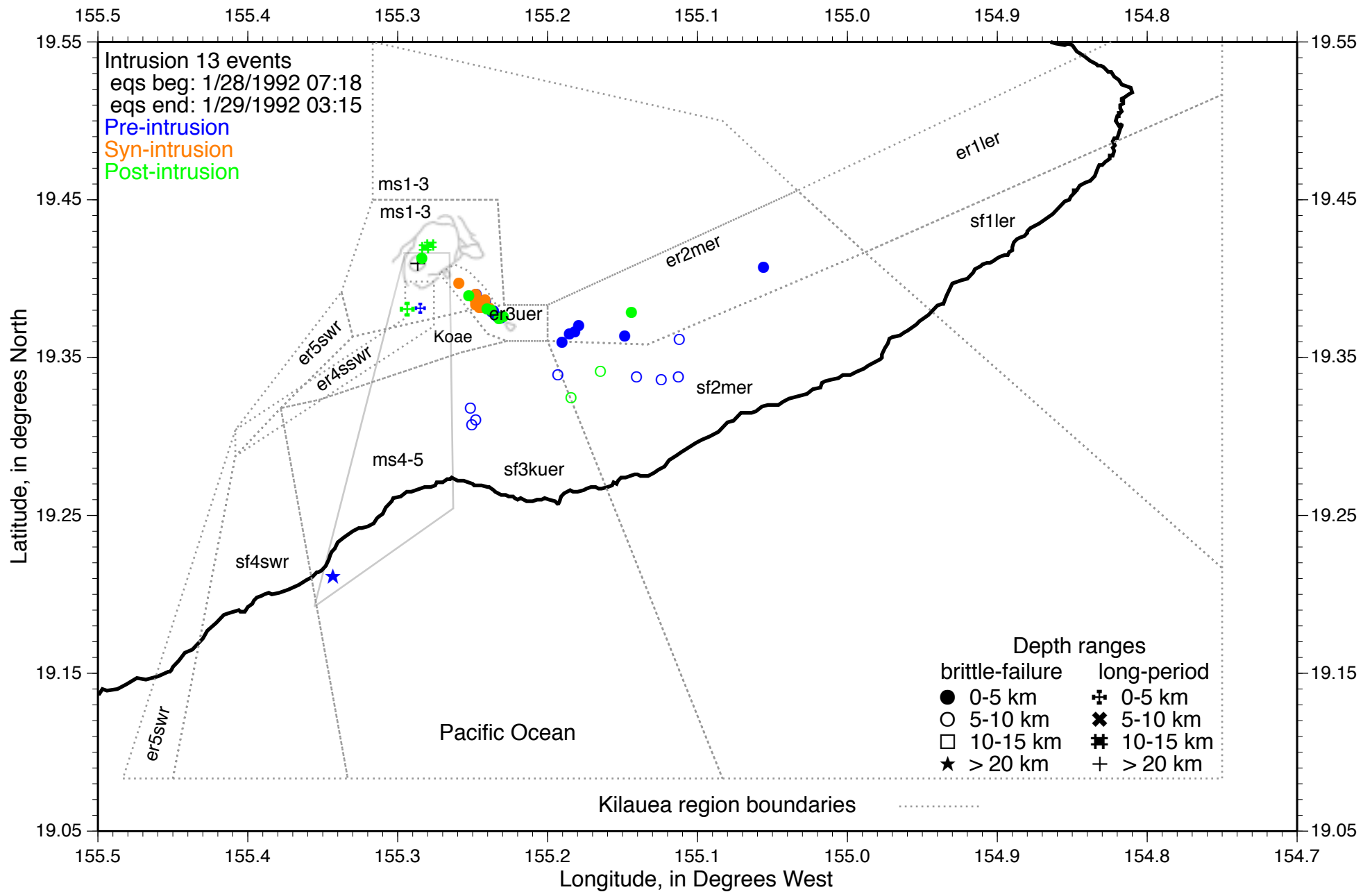
Pu'u Ō'o-Kupaianaha eruption: Stage IIA

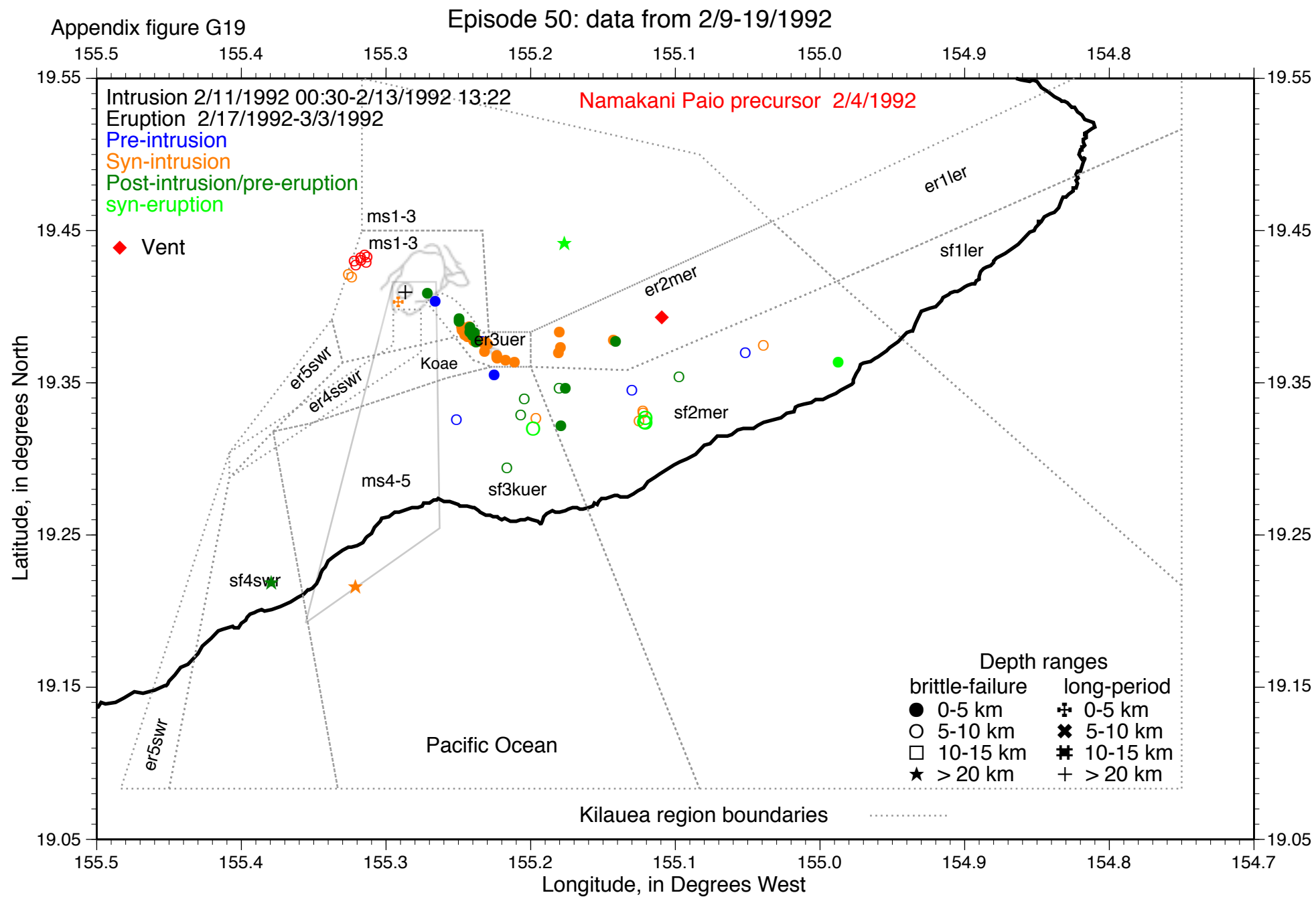




Appendix figure G18

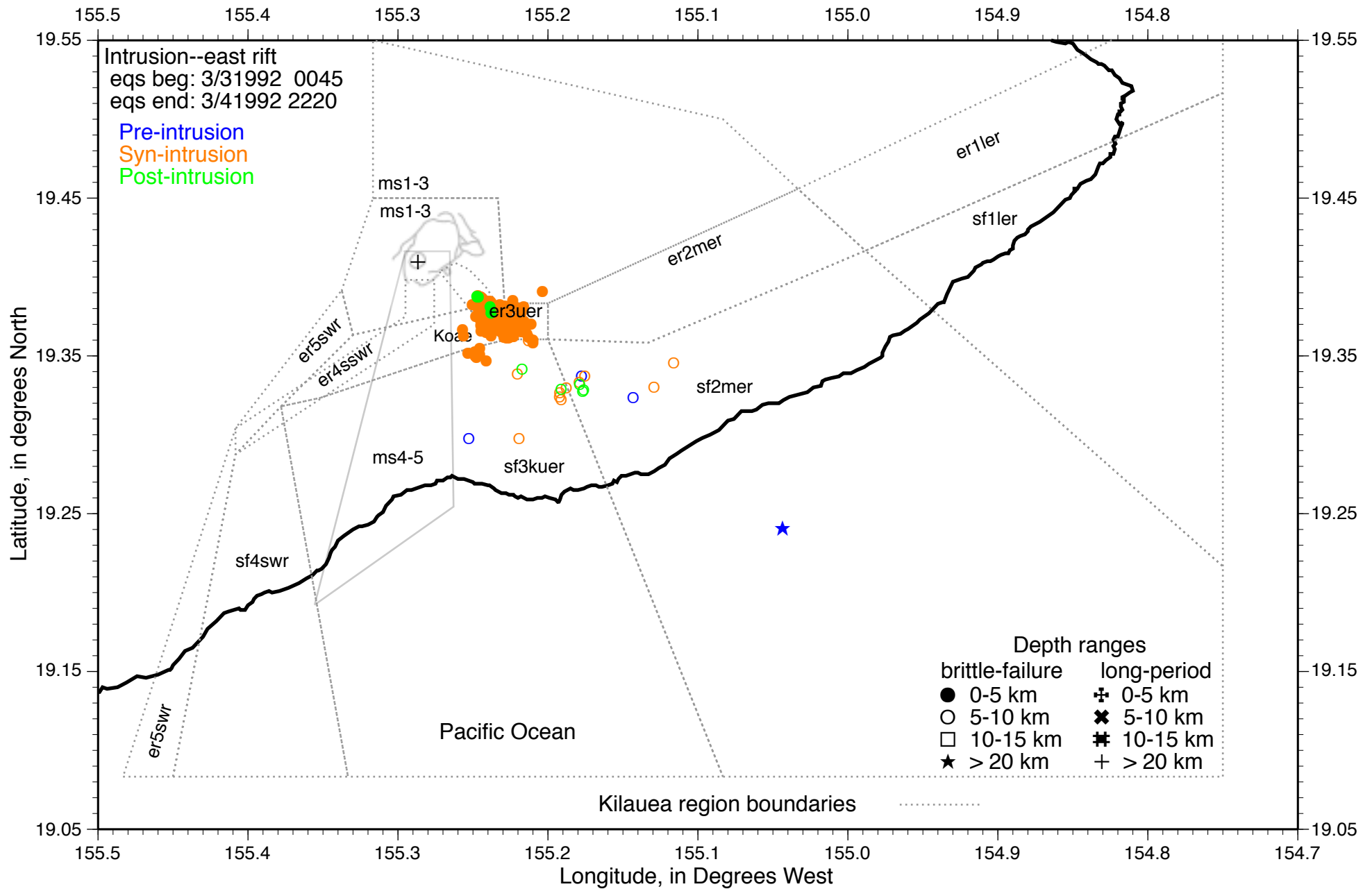
1/28-29/1992 intrusion: data from 1/25-31/1992





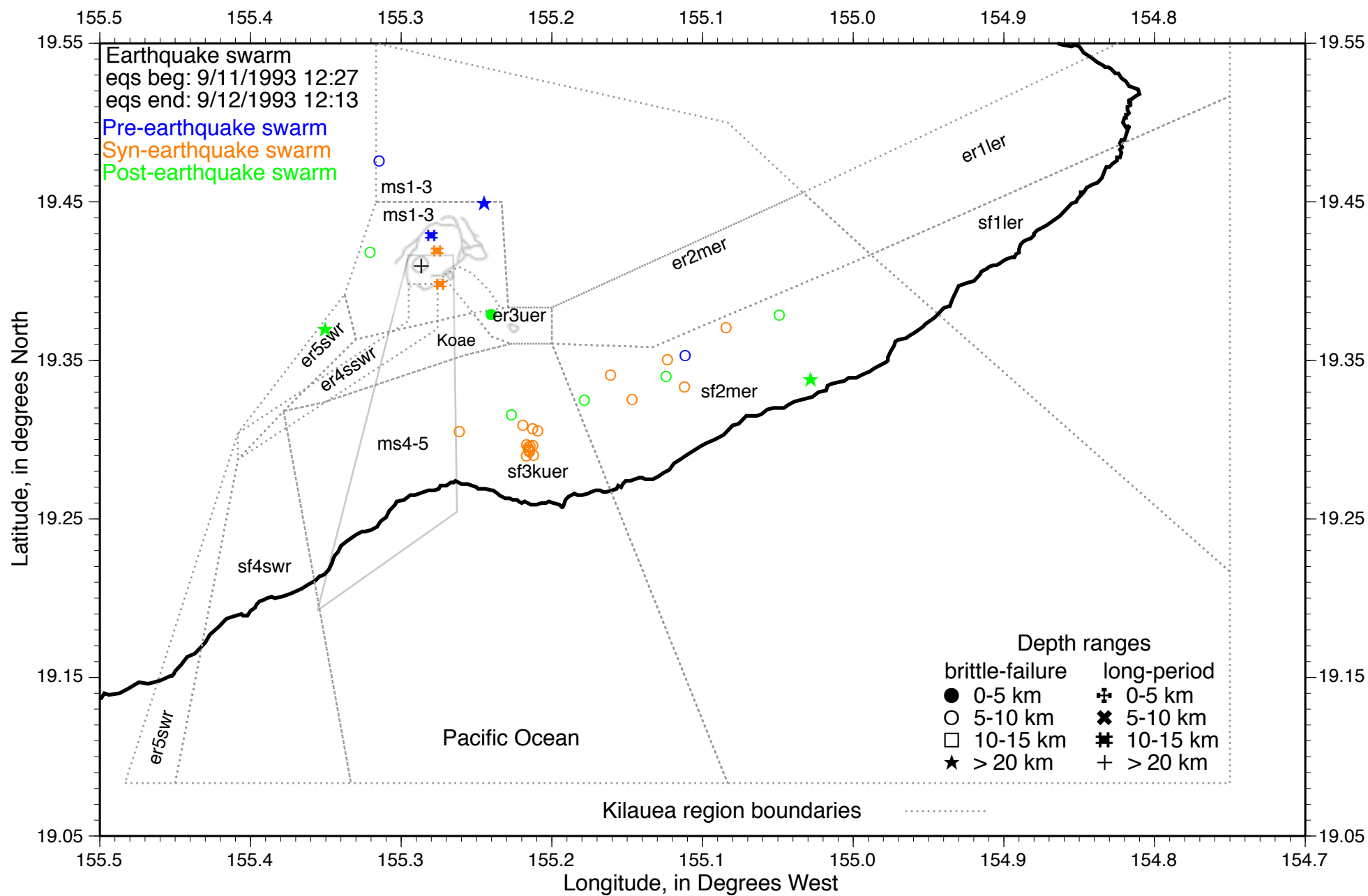
Appendix figure G20

3/3-4/1992 intrusion: data from 3/1-5/1992

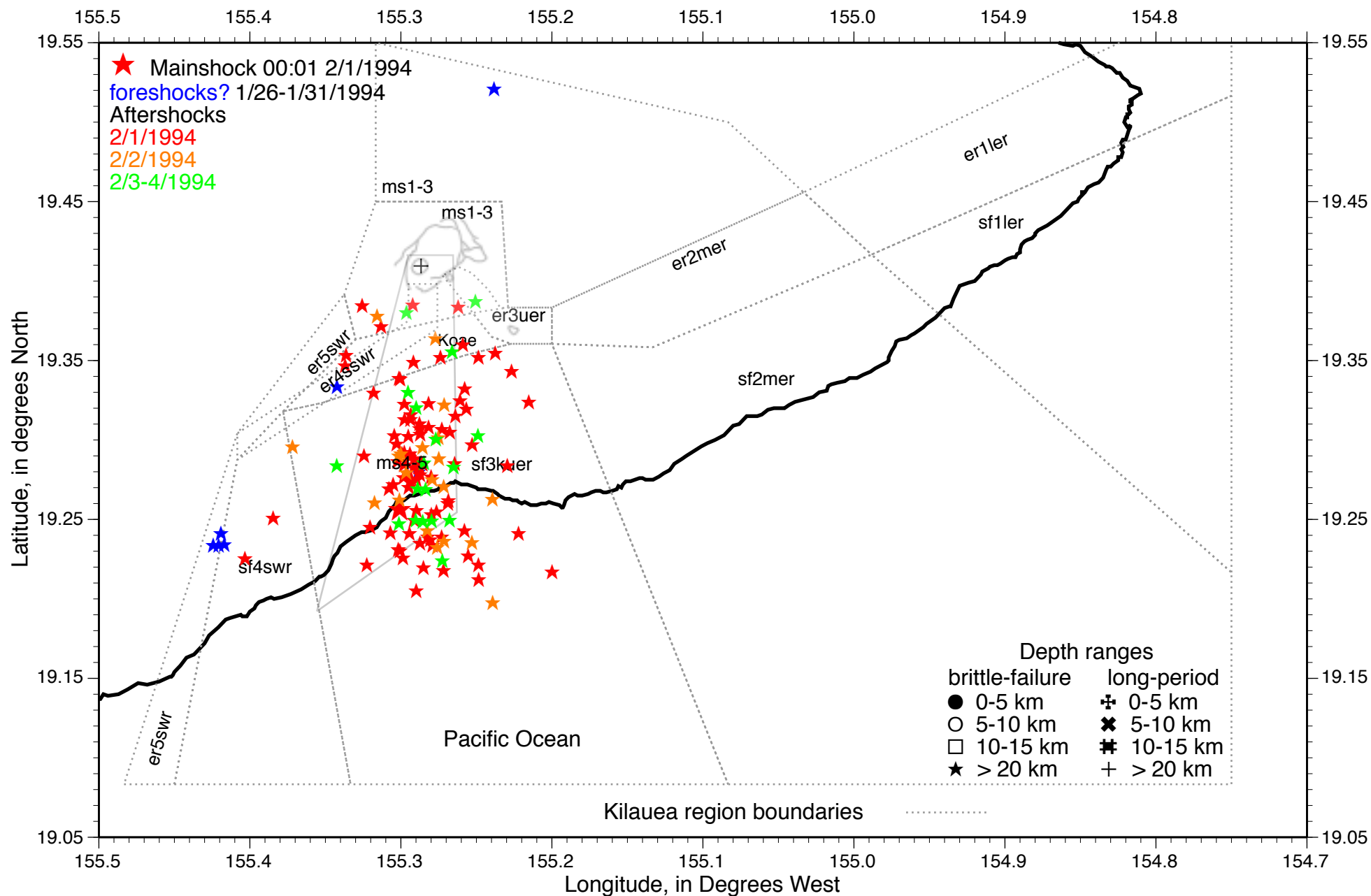


Appendix figure G21

9/11-12/1993 suspected deep intrusion?: Data from 9/9-14/1993

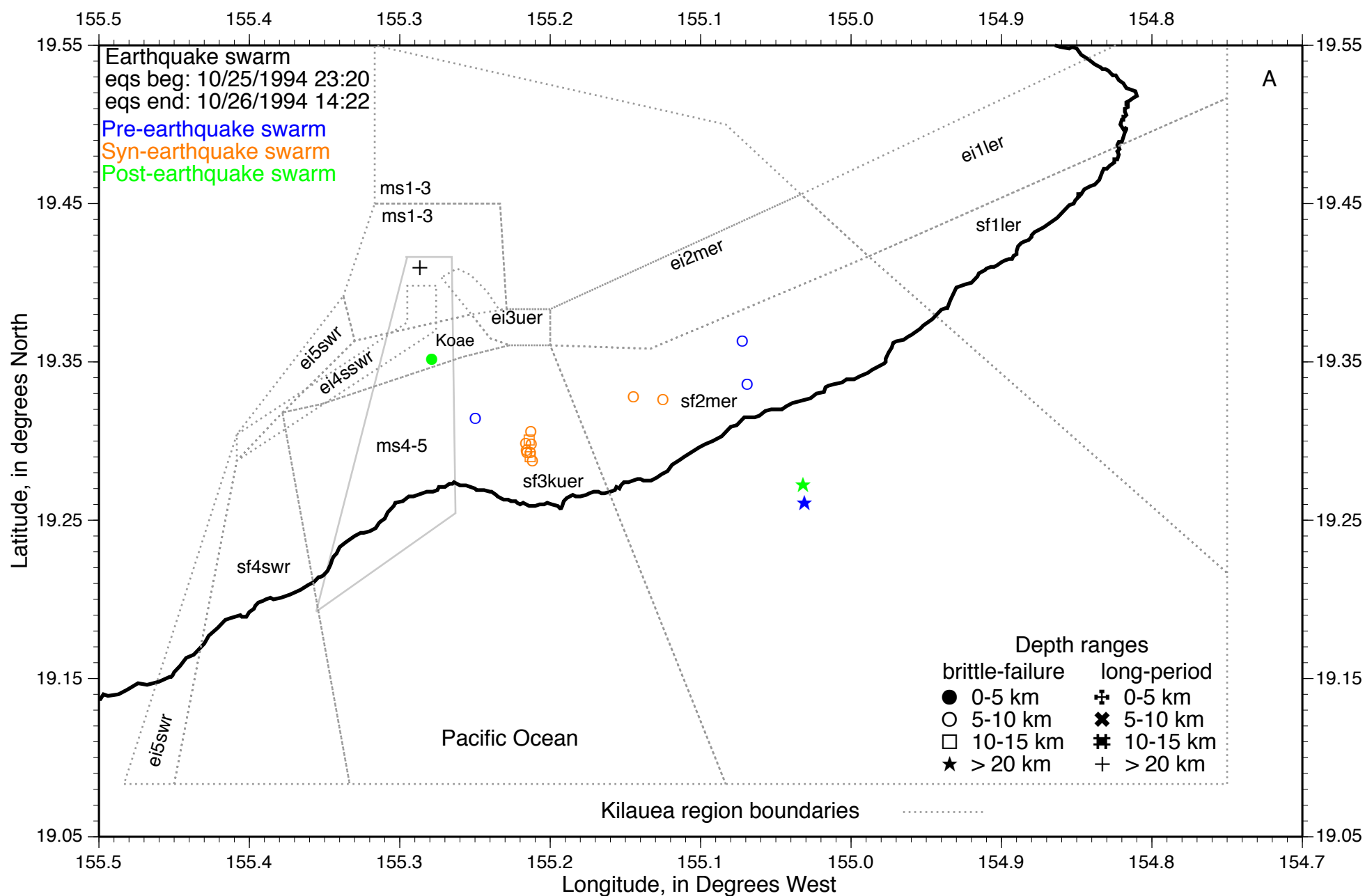


Appendix figure G22 2/1/1994 M 5.2 deep magma supply earthquake: data from 1/26-2/4/1994

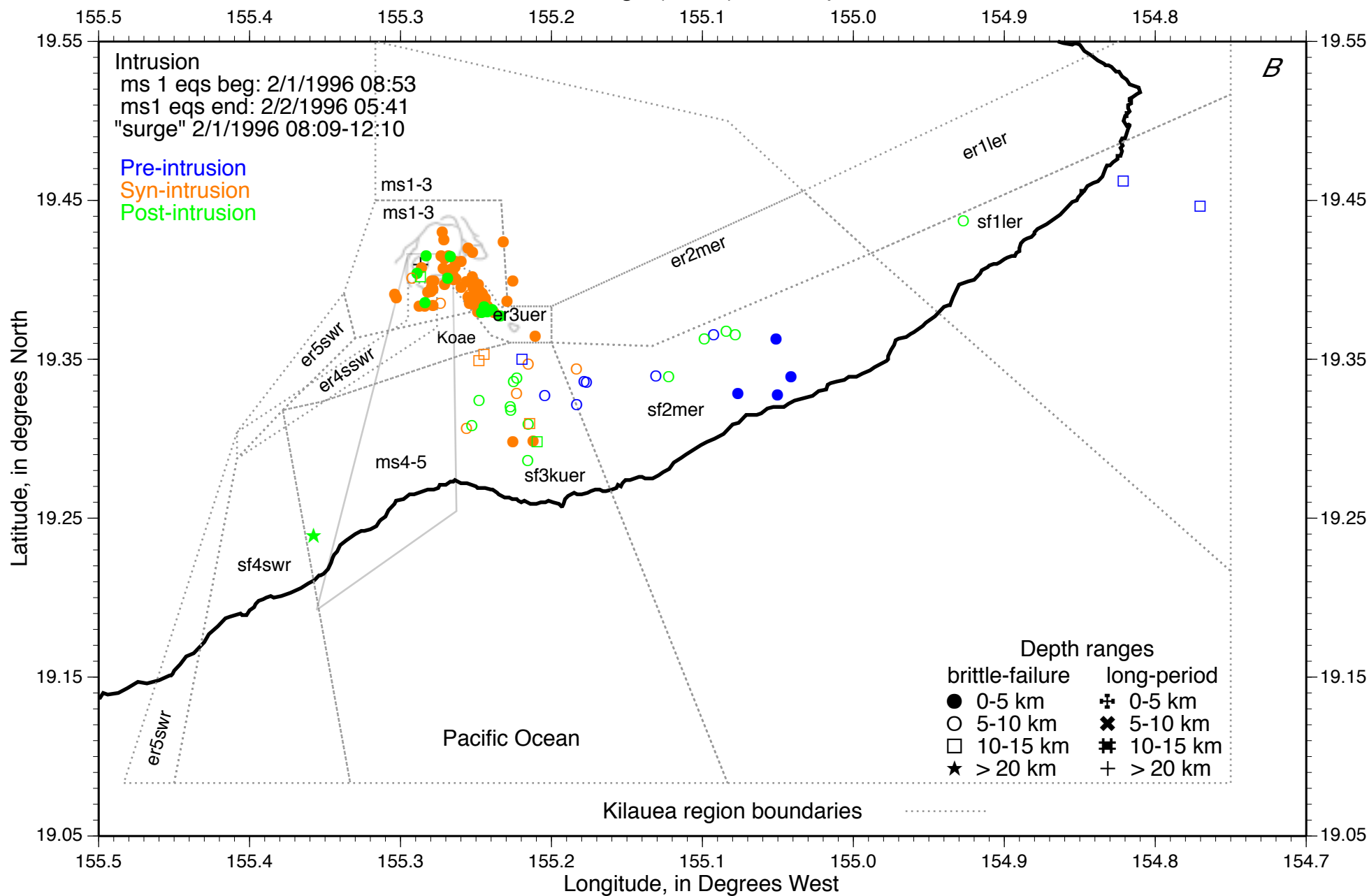


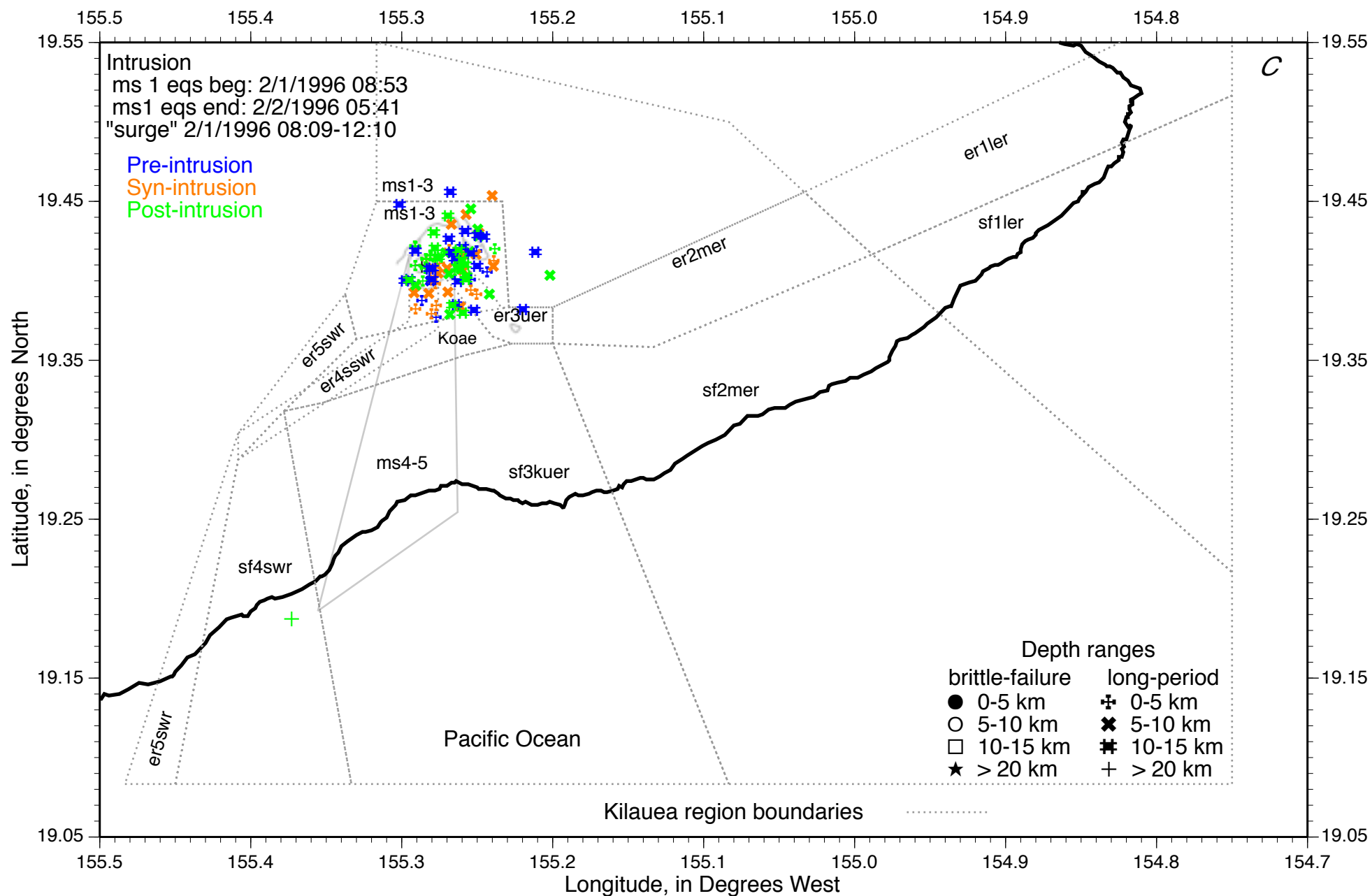
Appendix figure G23 a

10/25-26/1994 suspected deep intrusion: Data from 10/23-27/1994



Appendix figure G23 b 2/1-21996 intrusion and "surge (D-I-D)": short-period data from 1/27-2/11/1996





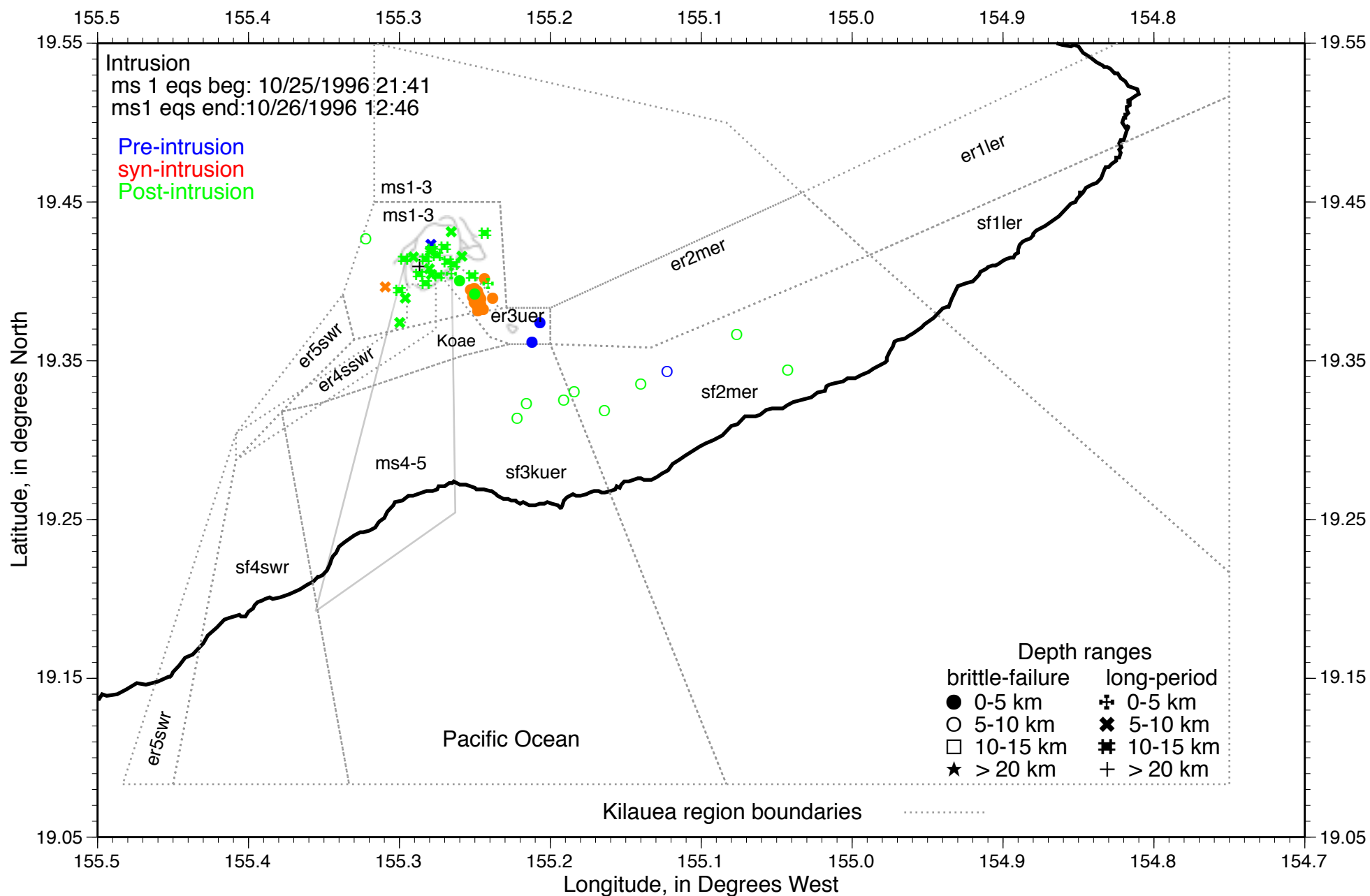
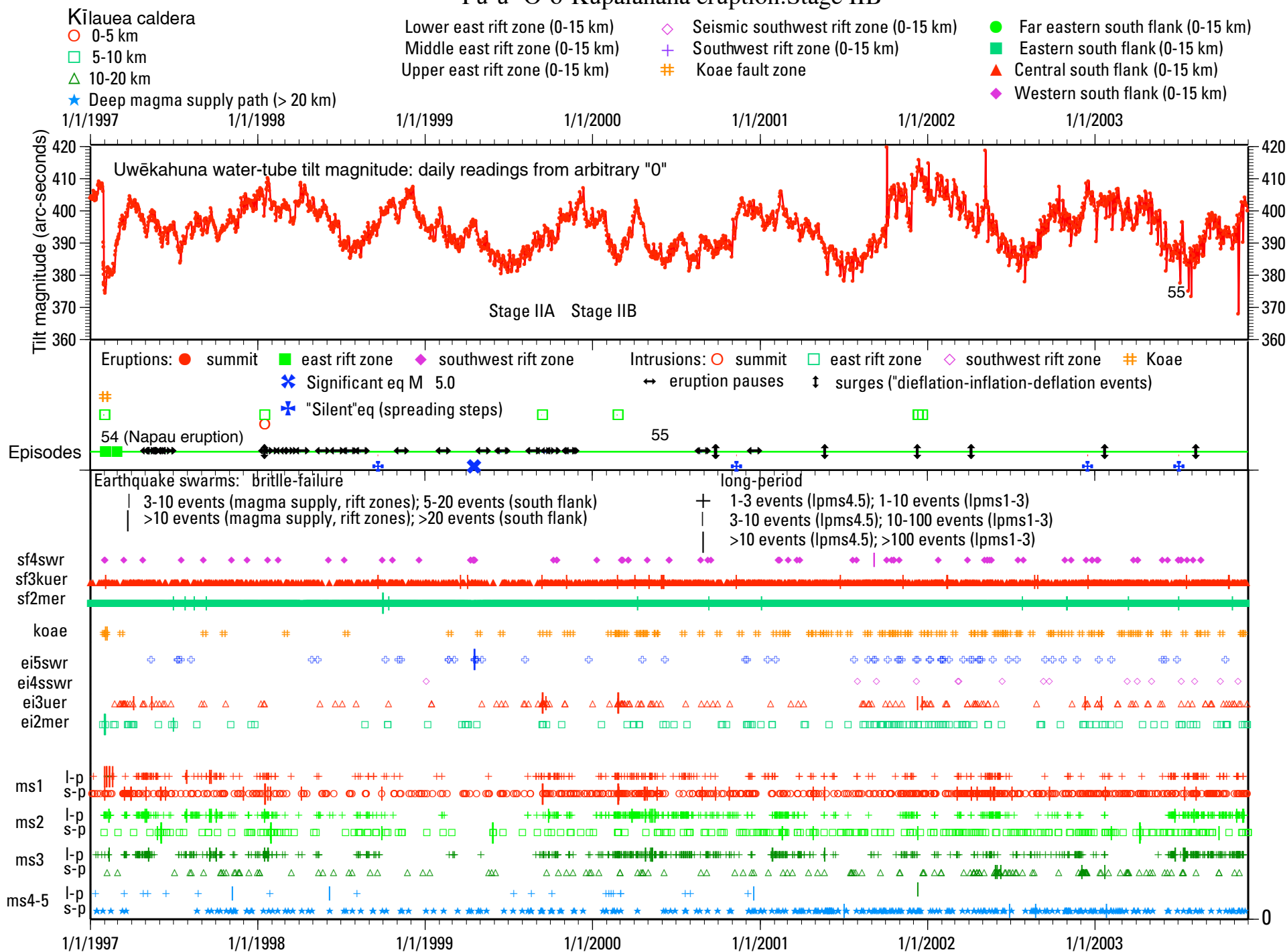


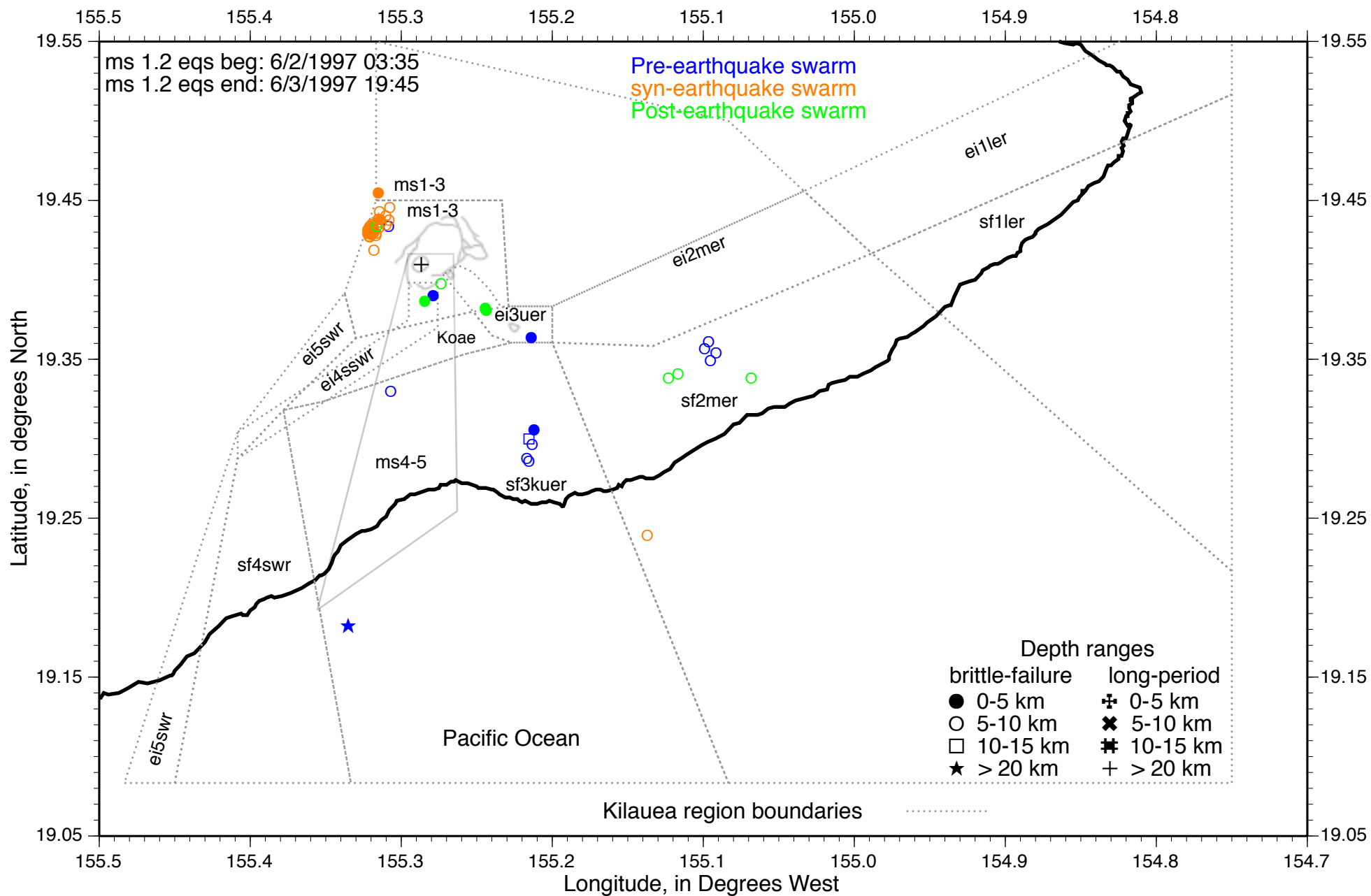
Figure G25

Pu'u 'Ō'o-Kupaianaha eruption: Stage IIB

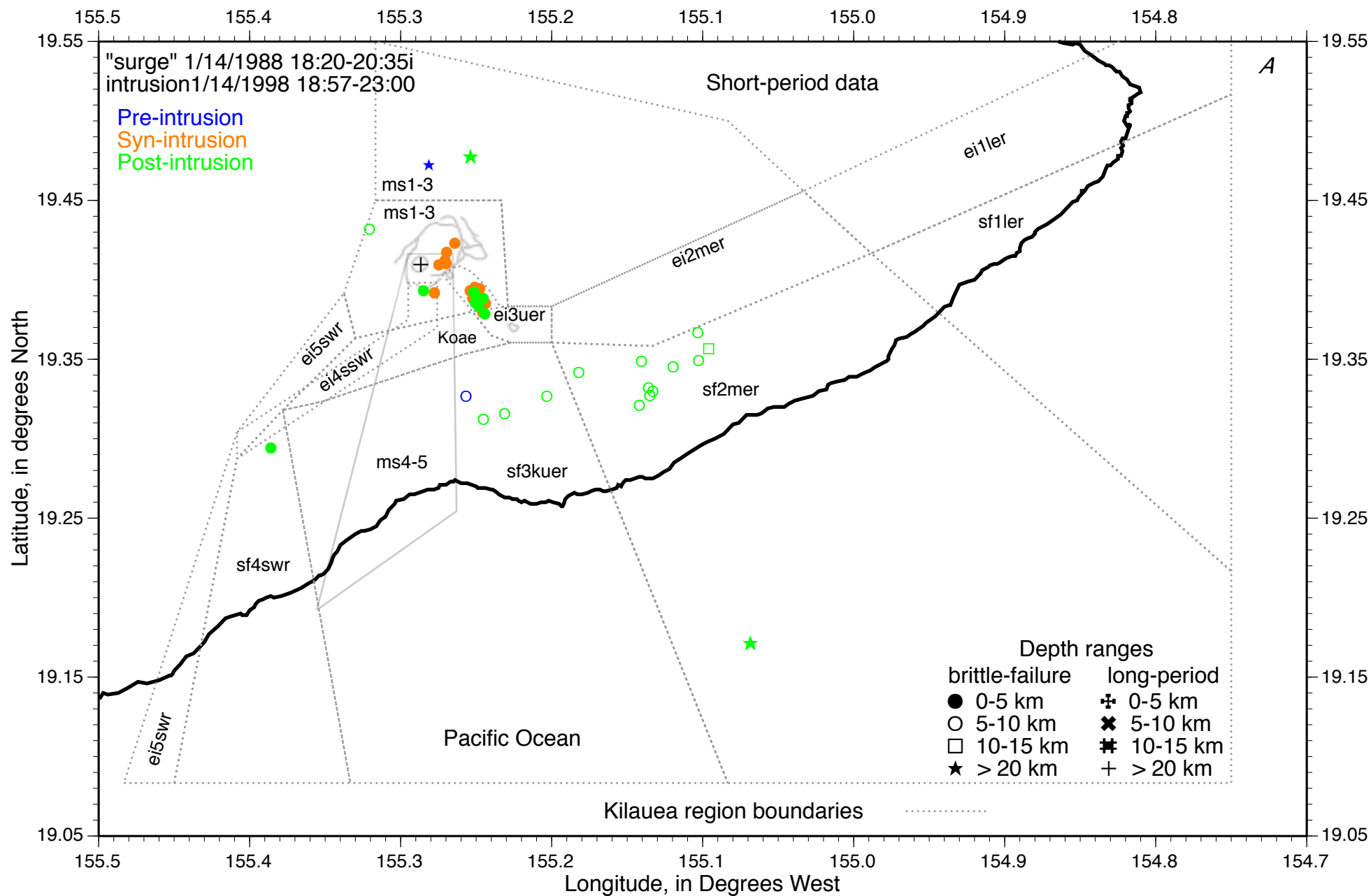


Appendix figure G26

Namakani Paio sequence: data from 5/30/-6/10/1997

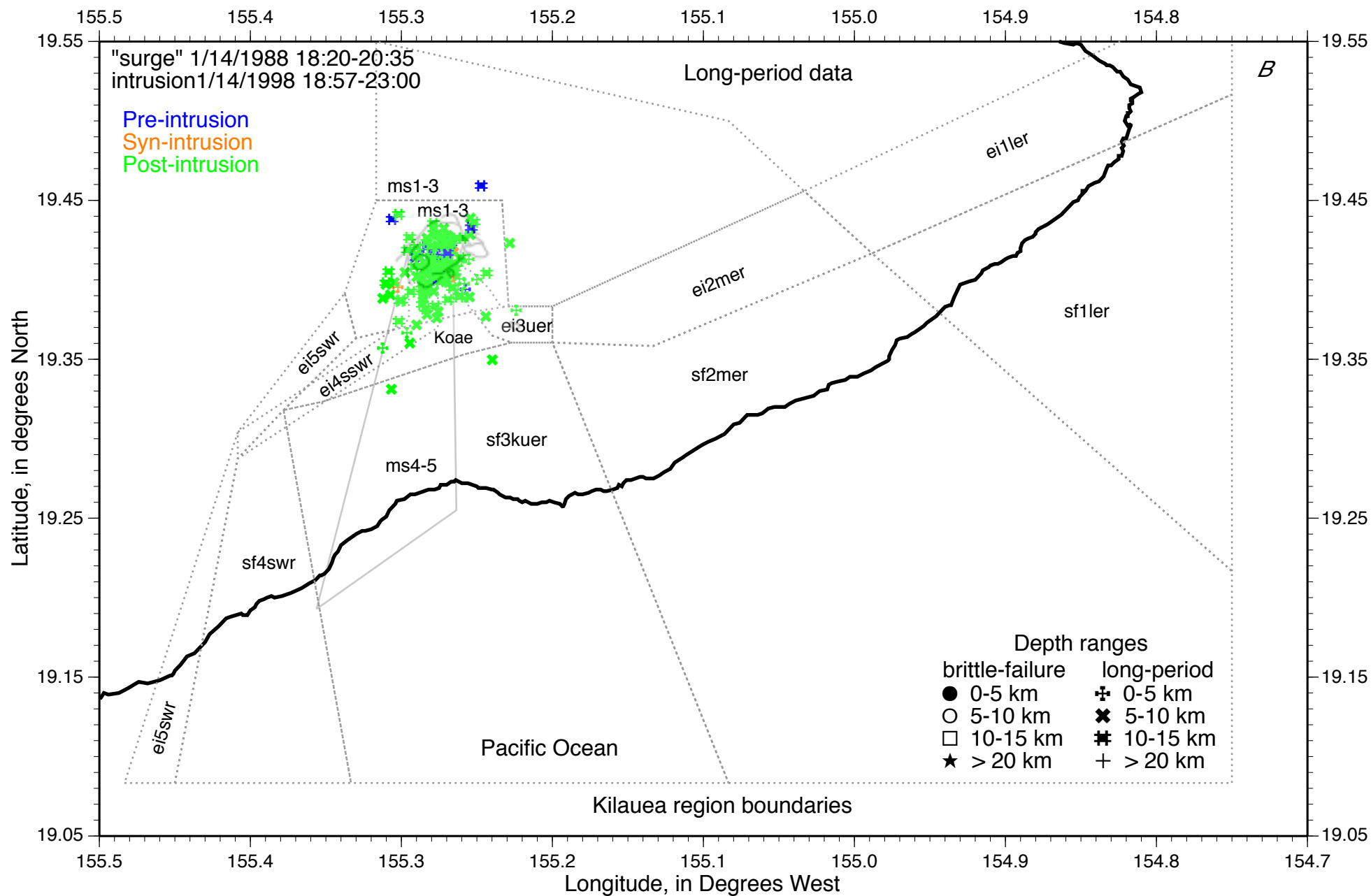


Appendix figure G27 a 1/14/1998 intrusion and "surge (D-I-D)": data from 1/12-25/1998



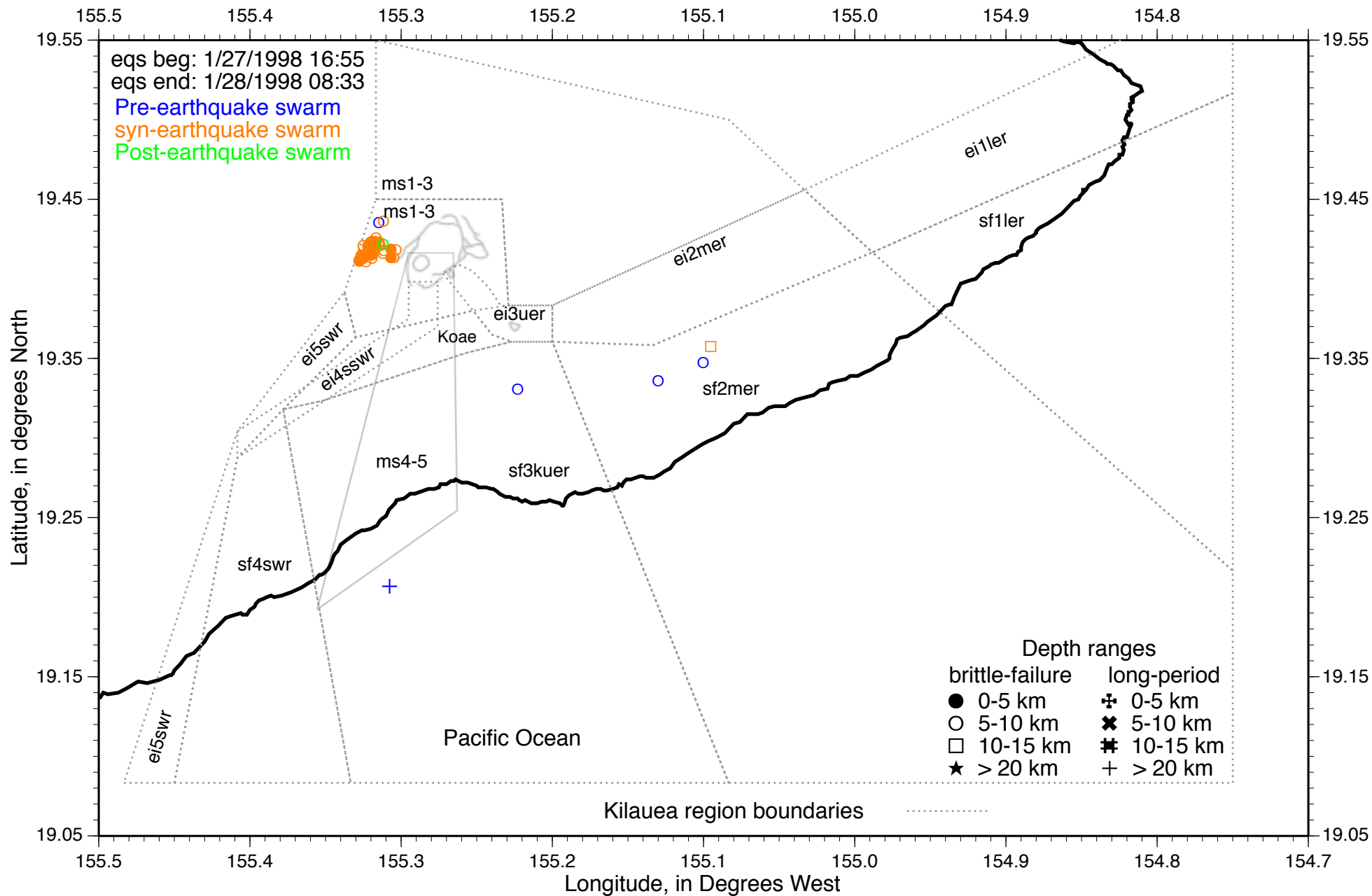
Appendix figure G27 b

1/14/1998 "surge (D-I-D)": data from 1/12-25/1998



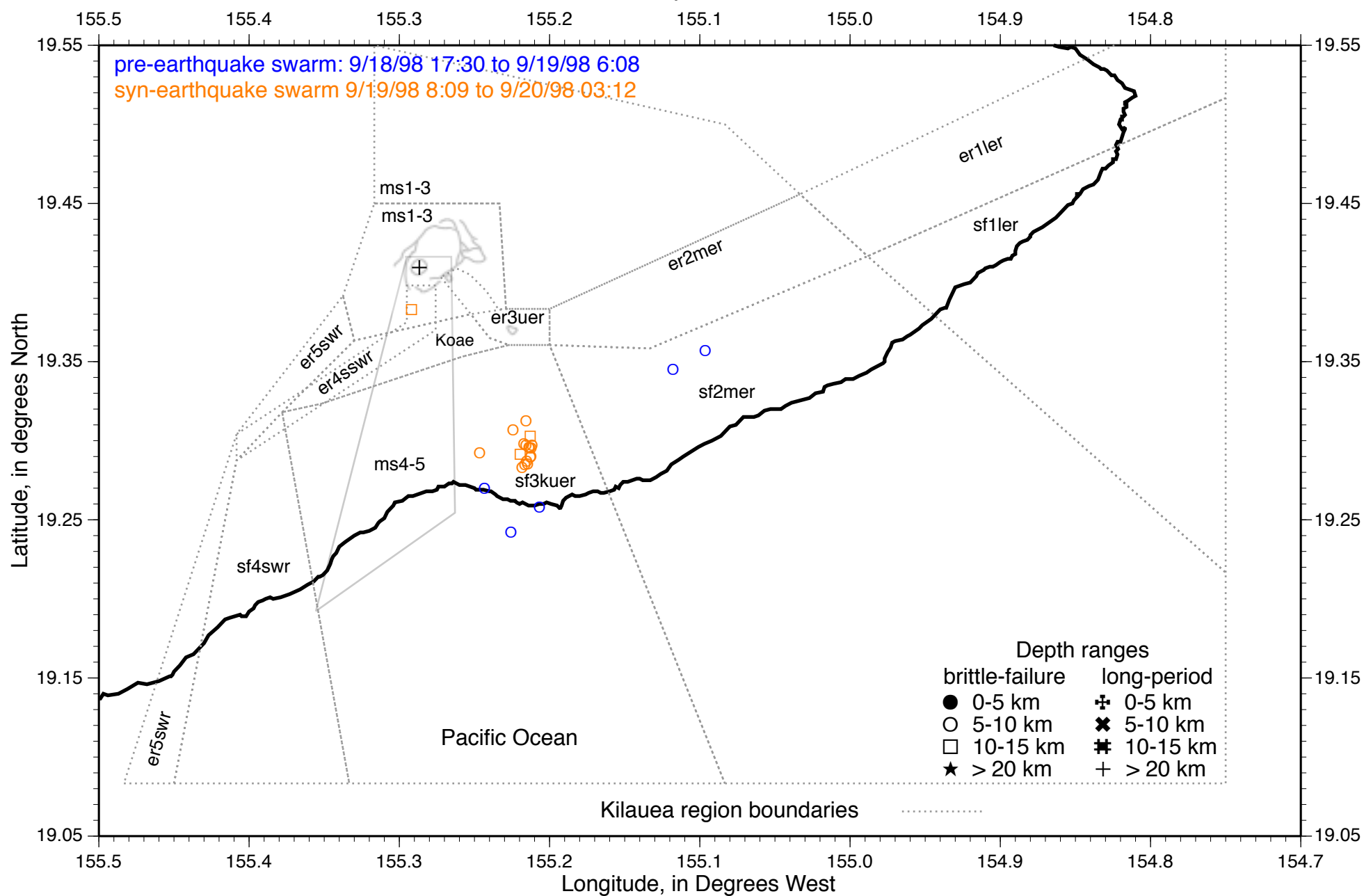
Appendix figure G28

Namakani earthquake swarm: data from 1/26-28/1998

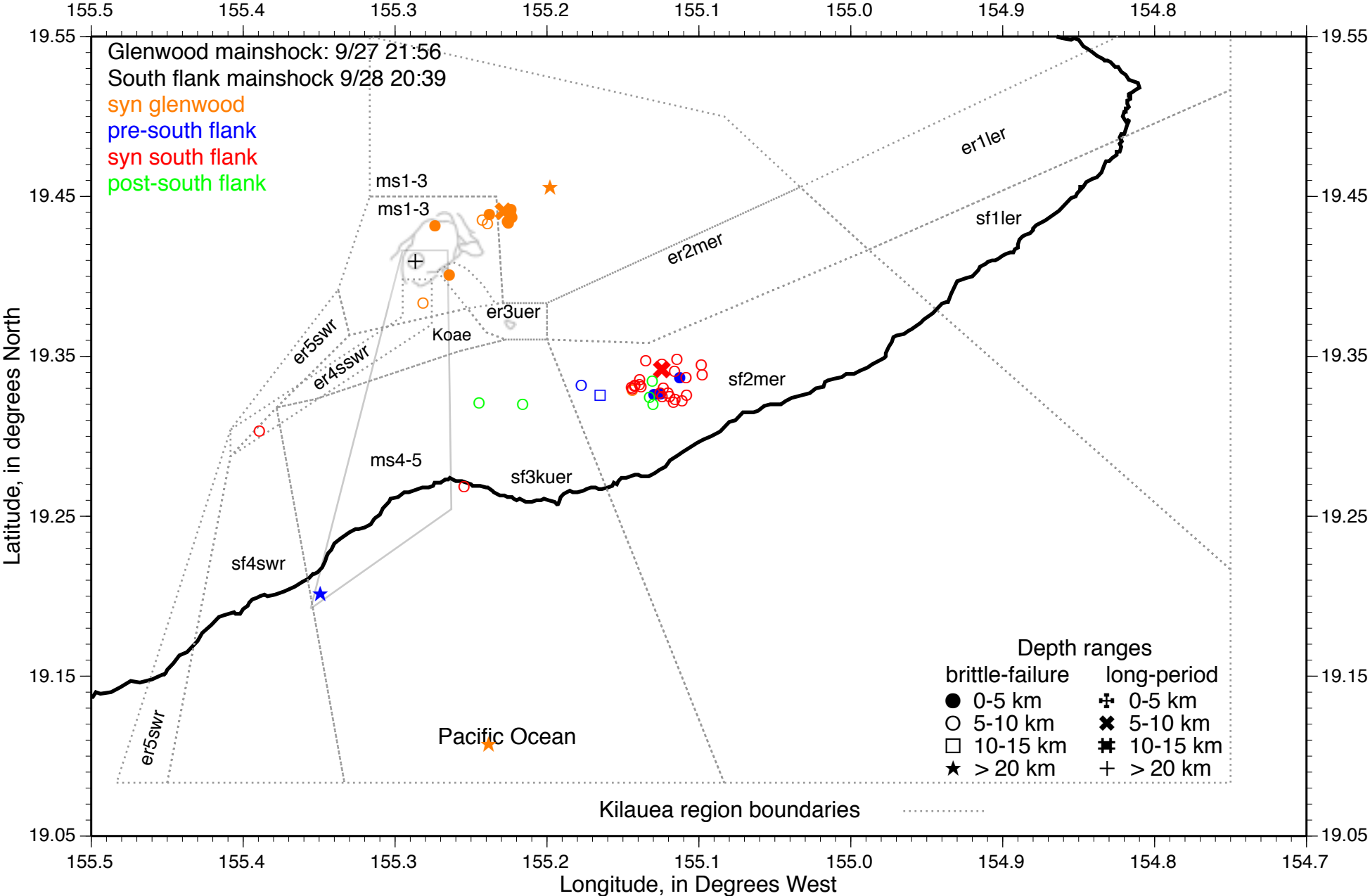


Appendix figure G29

9/19/1998 silent earthquake: data from 9/18-20/1998

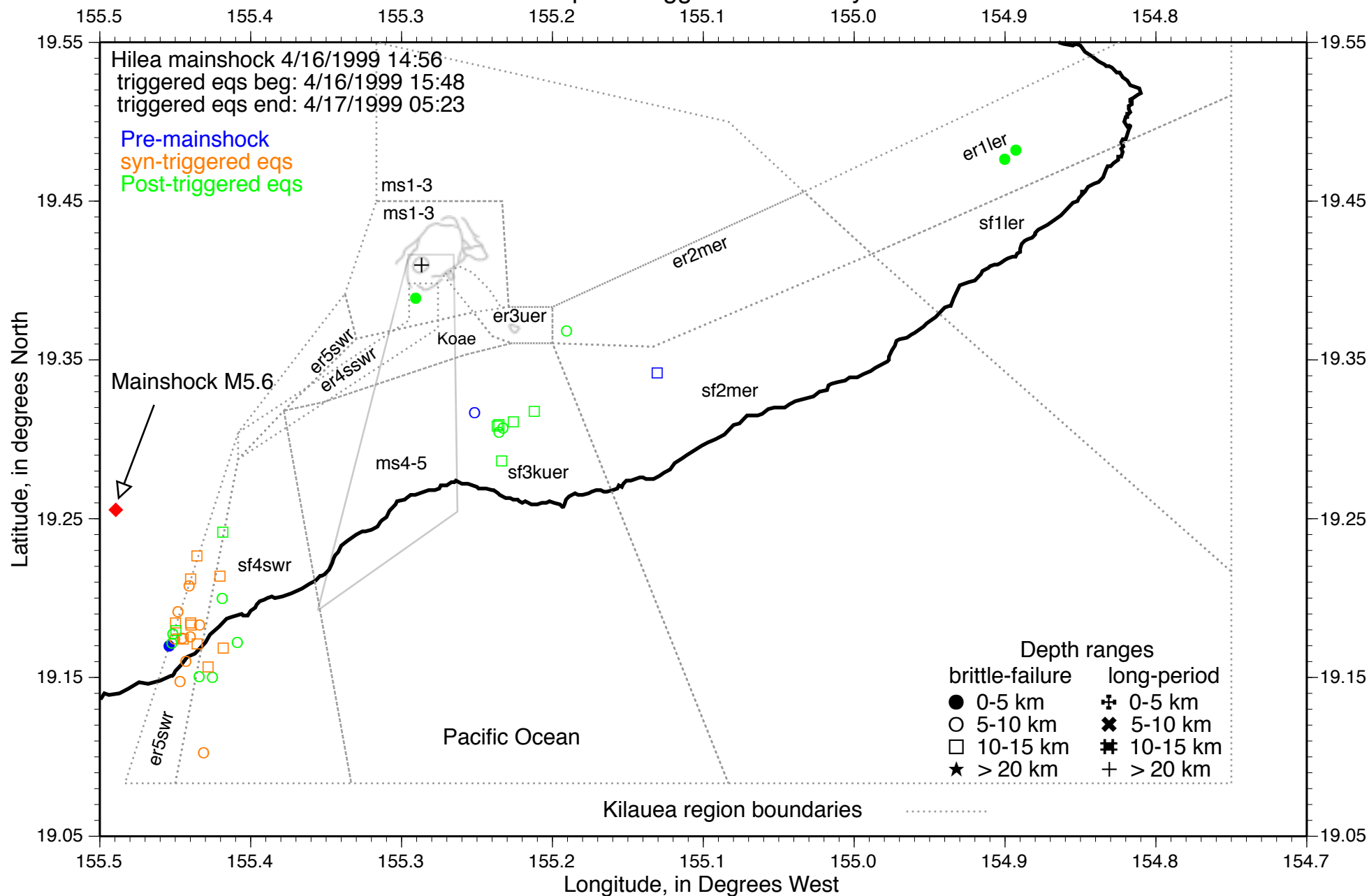


Appendix figure G30 Glenwood (M 4.6) and south flank (M 4.8) earthquakes data from 9/27-30/1998



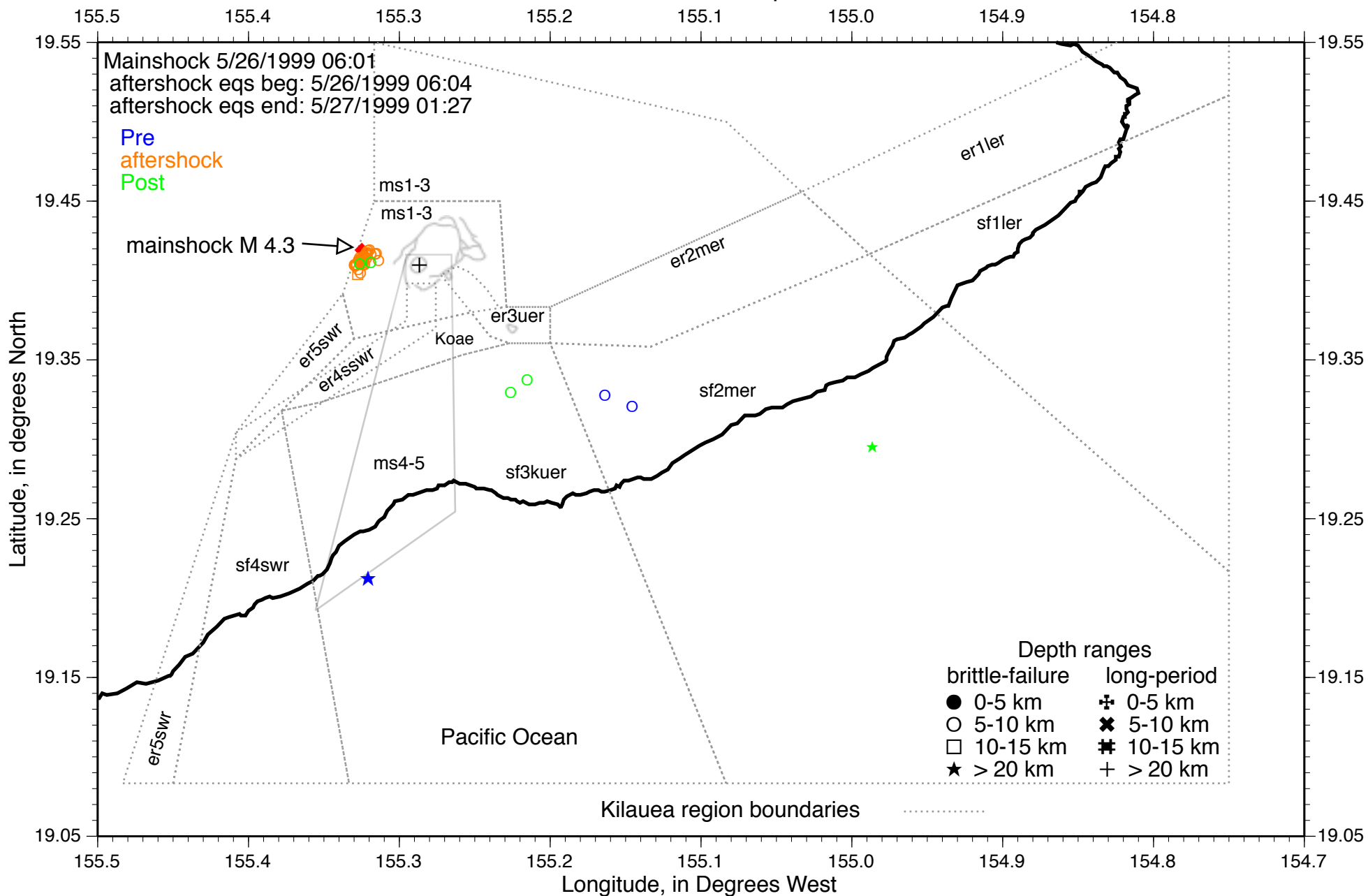
Appendix figure G31

4/16/1999 Hilea earthquake triggered seismicity: data from 4/16-23/1999



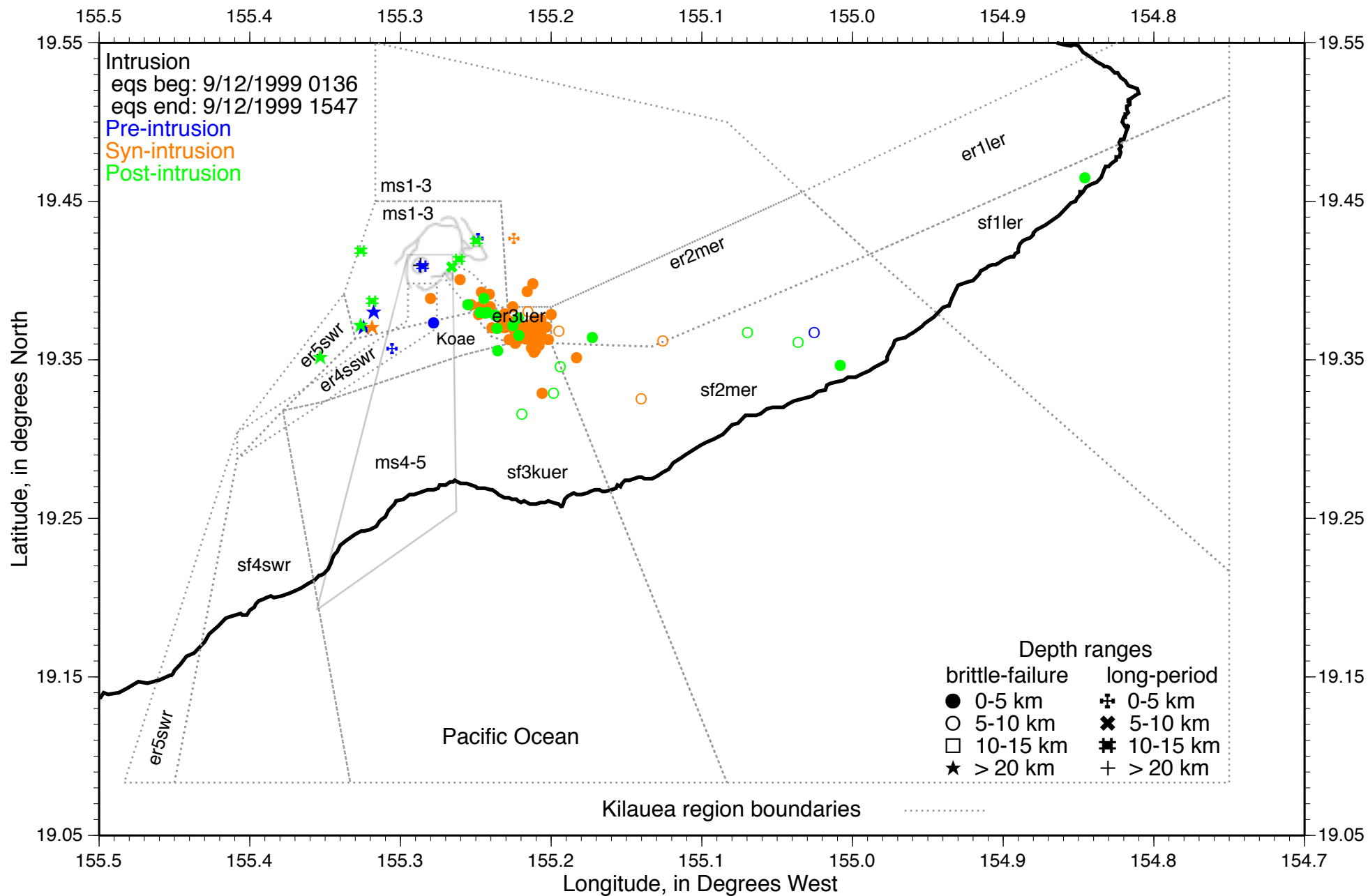
Appendix figure G32

Namakani Paio mainshock-aftershock sequence: data from 5/25-30/1999



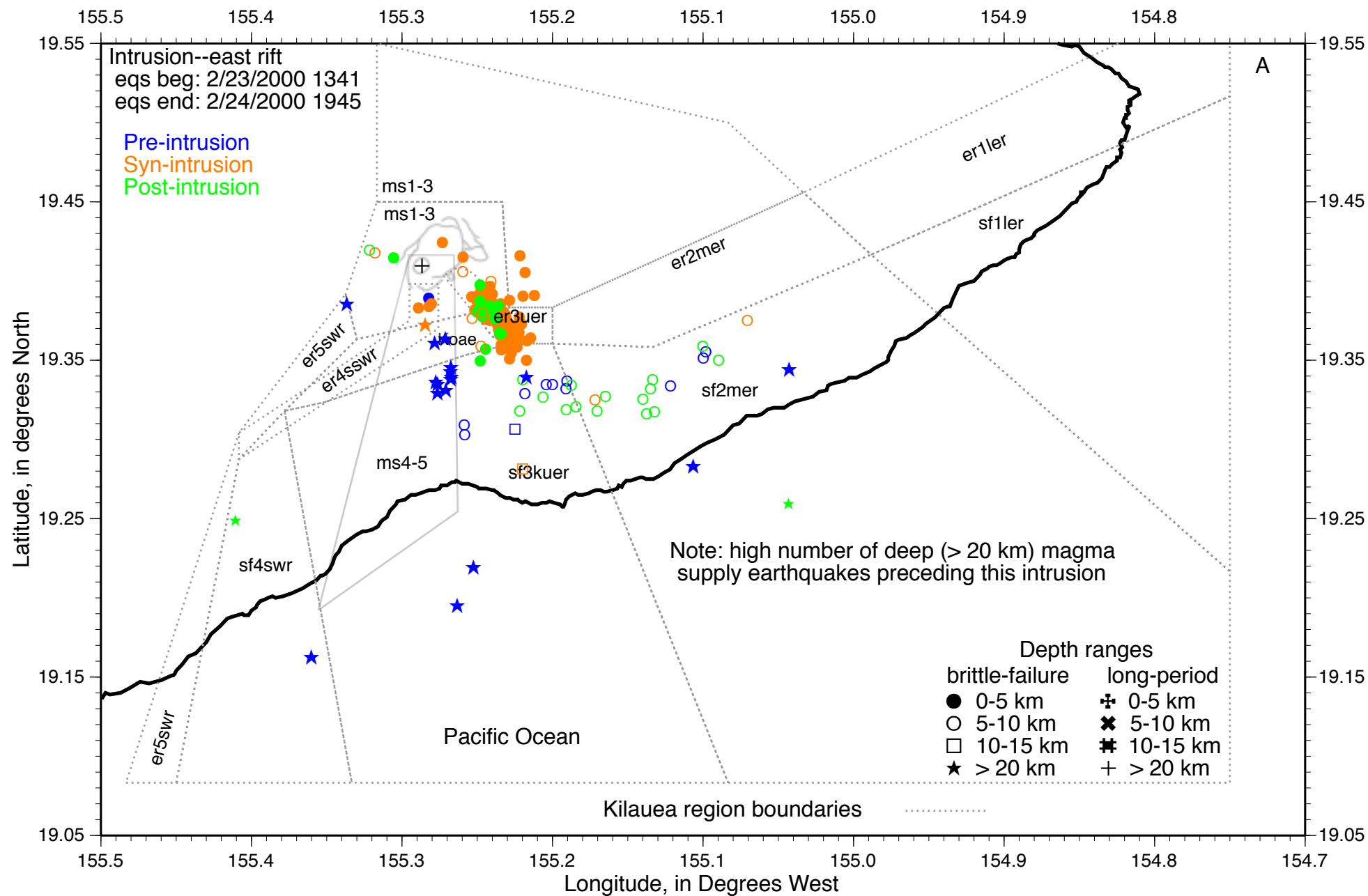
Appendix figure G33

9/12/1999 intrusion: data from 9/10-16/1999



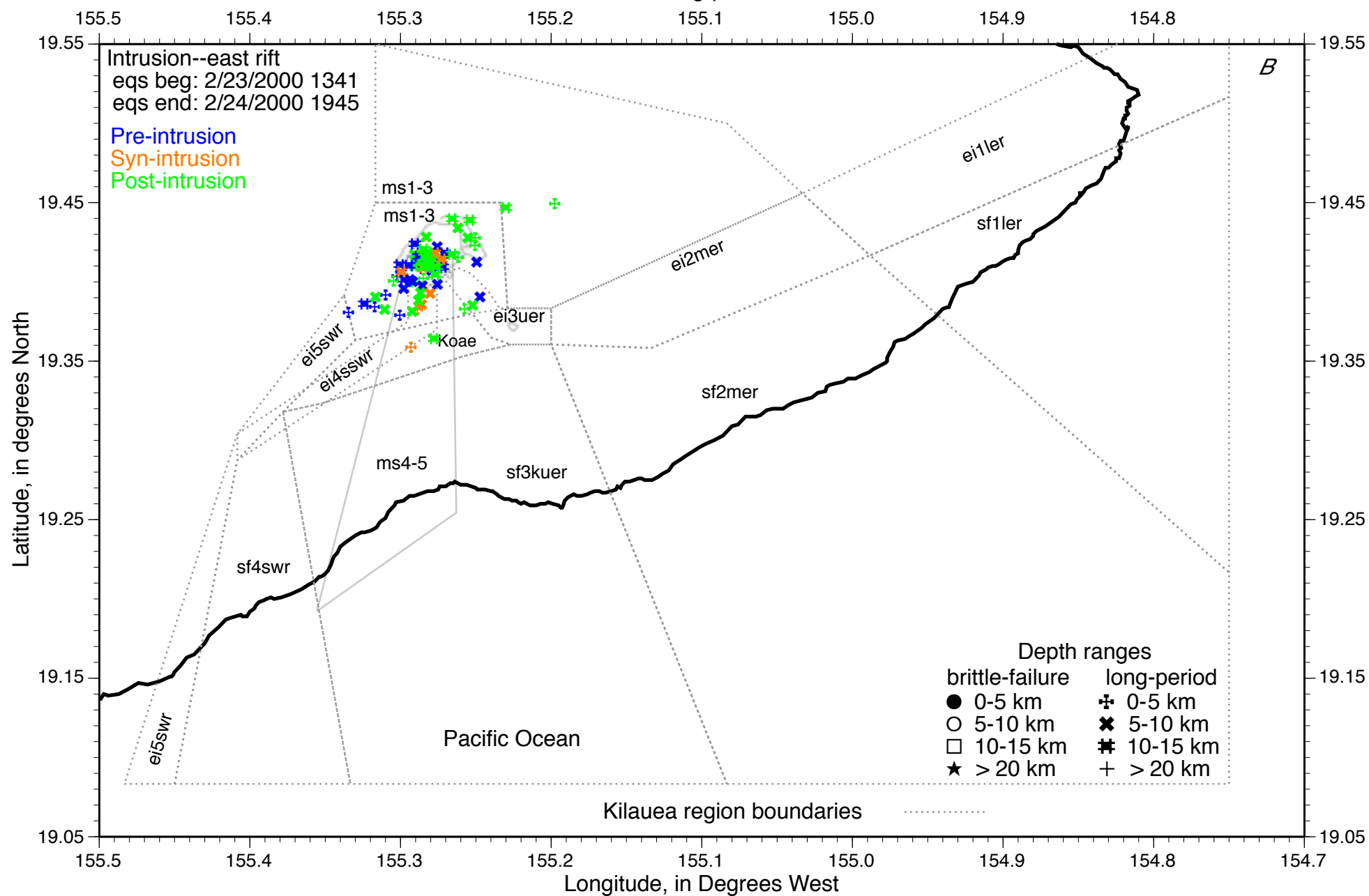
Appendix figure G34 a

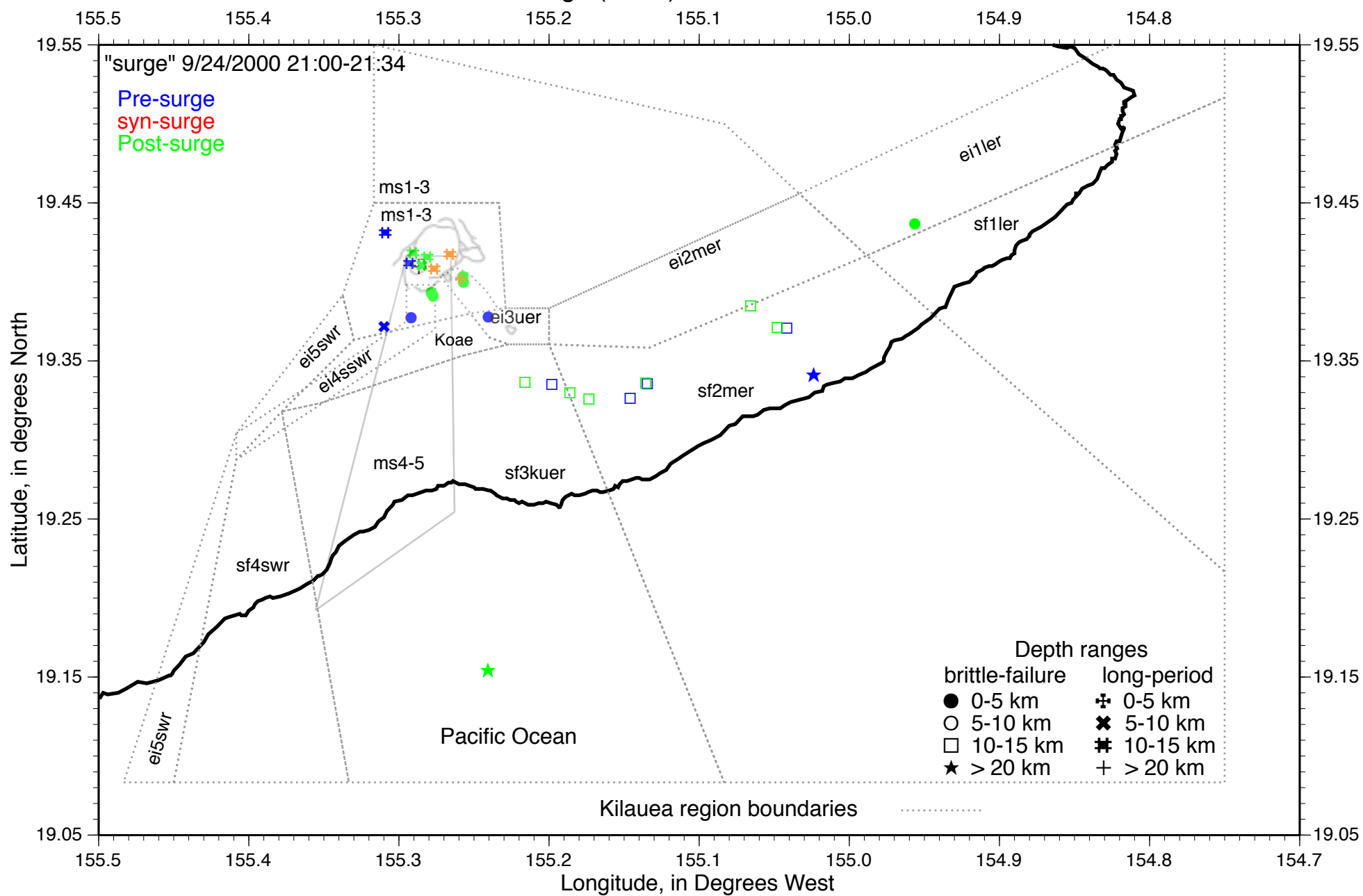
2/23-24/2000 intrusion: short-period data from 2/17-29/2000



Appendix figure G34 b

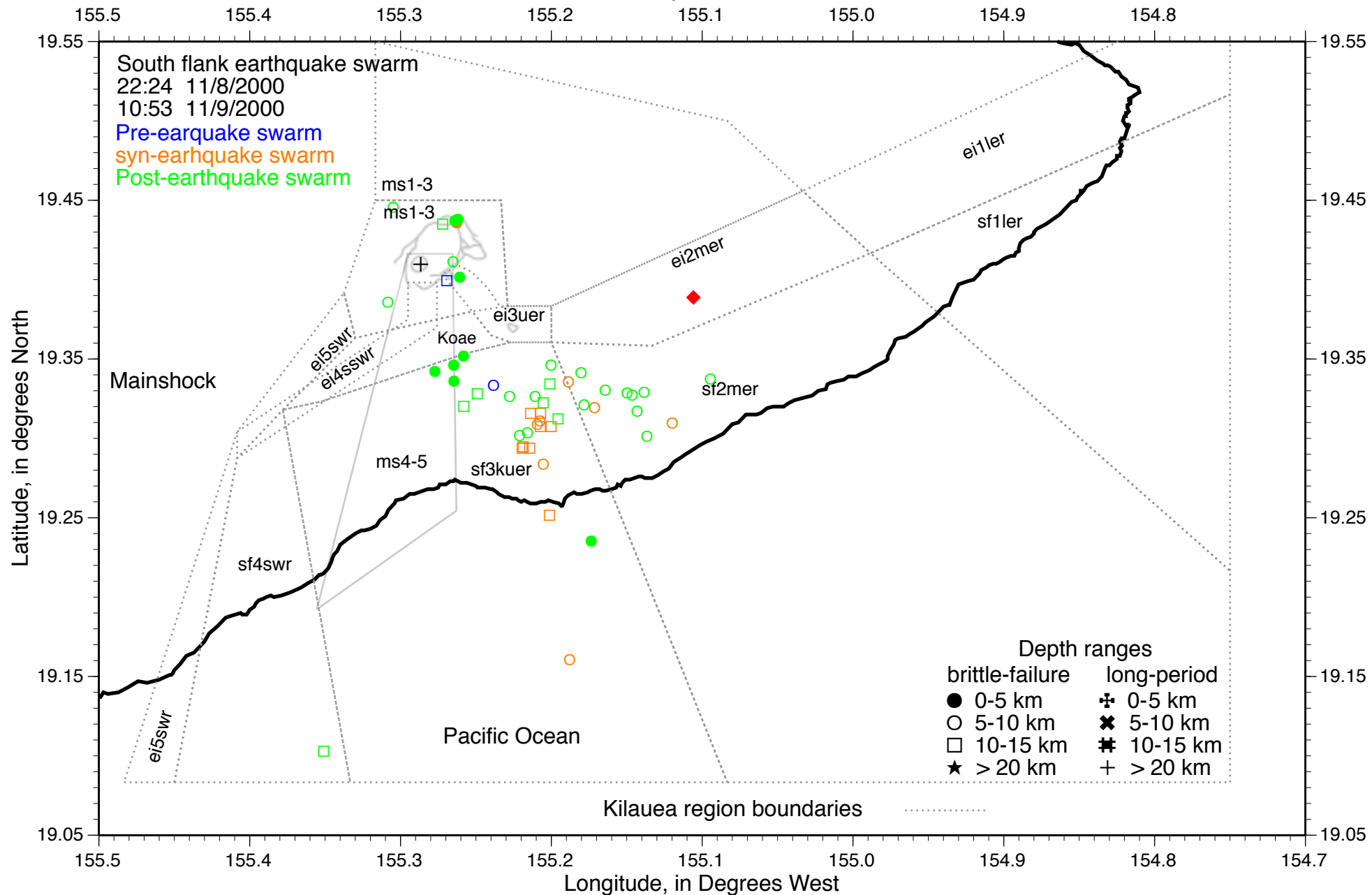
2/23-24/2000 intrusion: long-period data from 2/17-29/2000





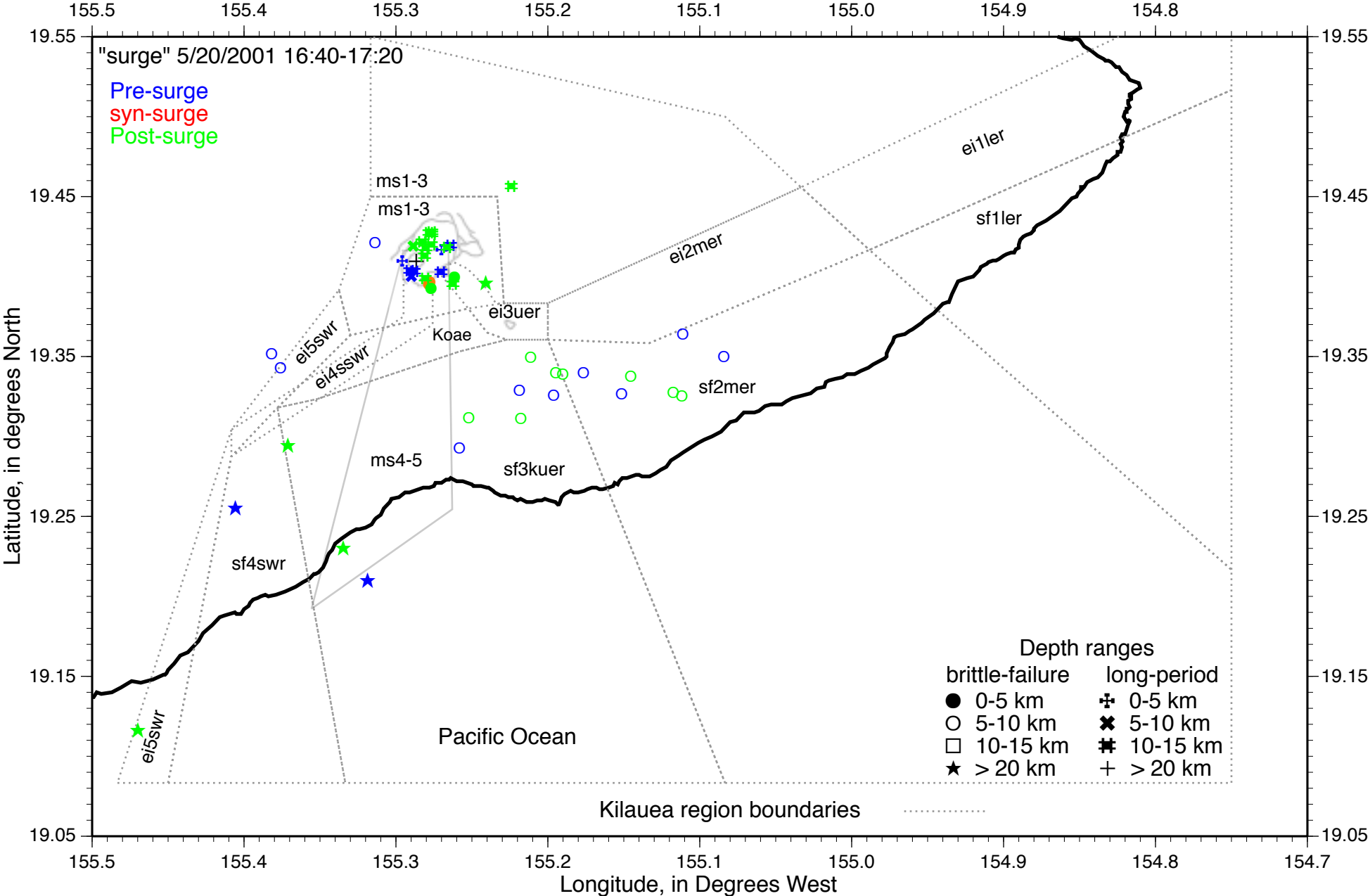
Appendix figure G36

11/9/2000 silent earthquake: data from 11/8-18/2000



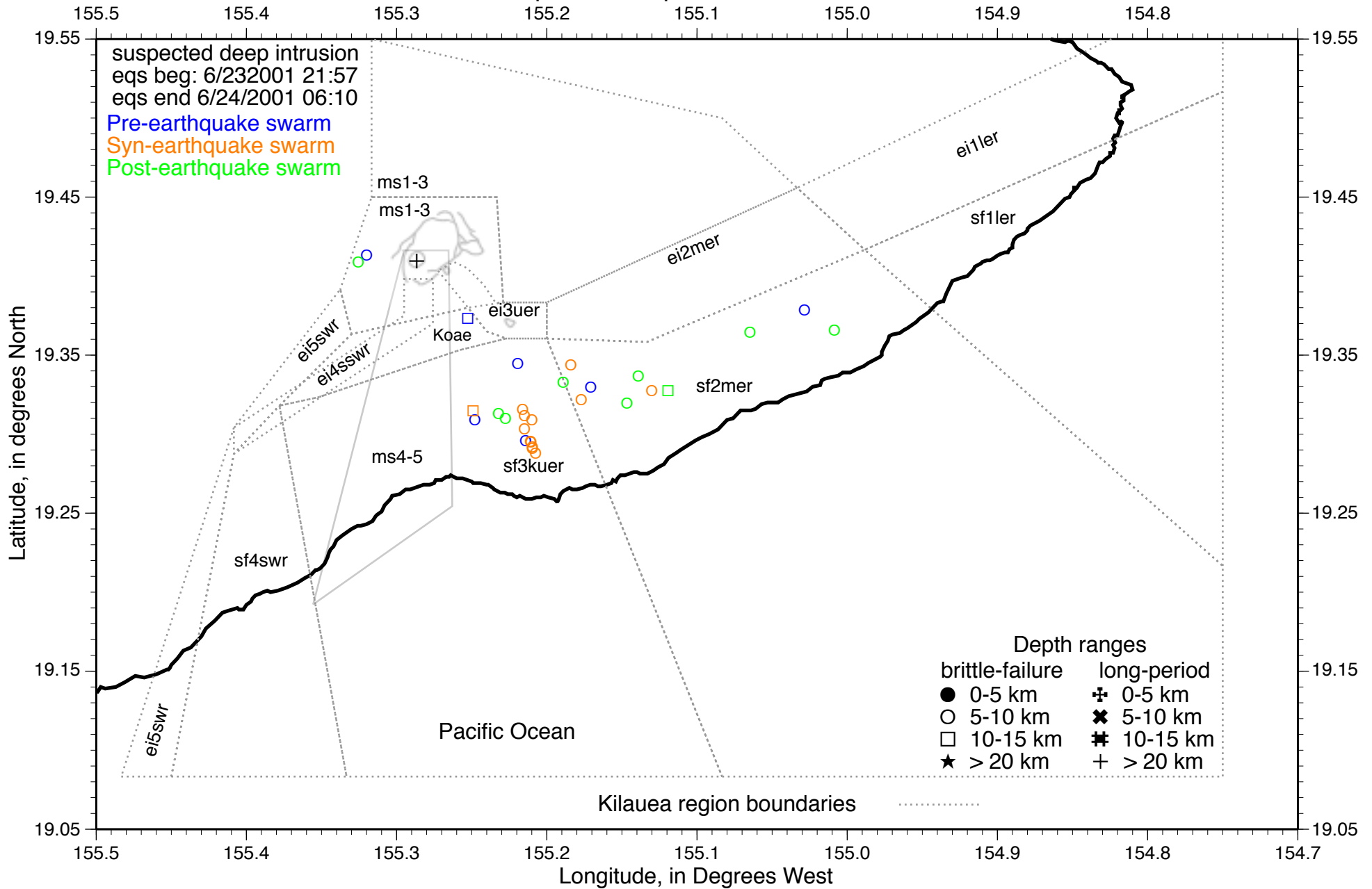
Appendix figure G37

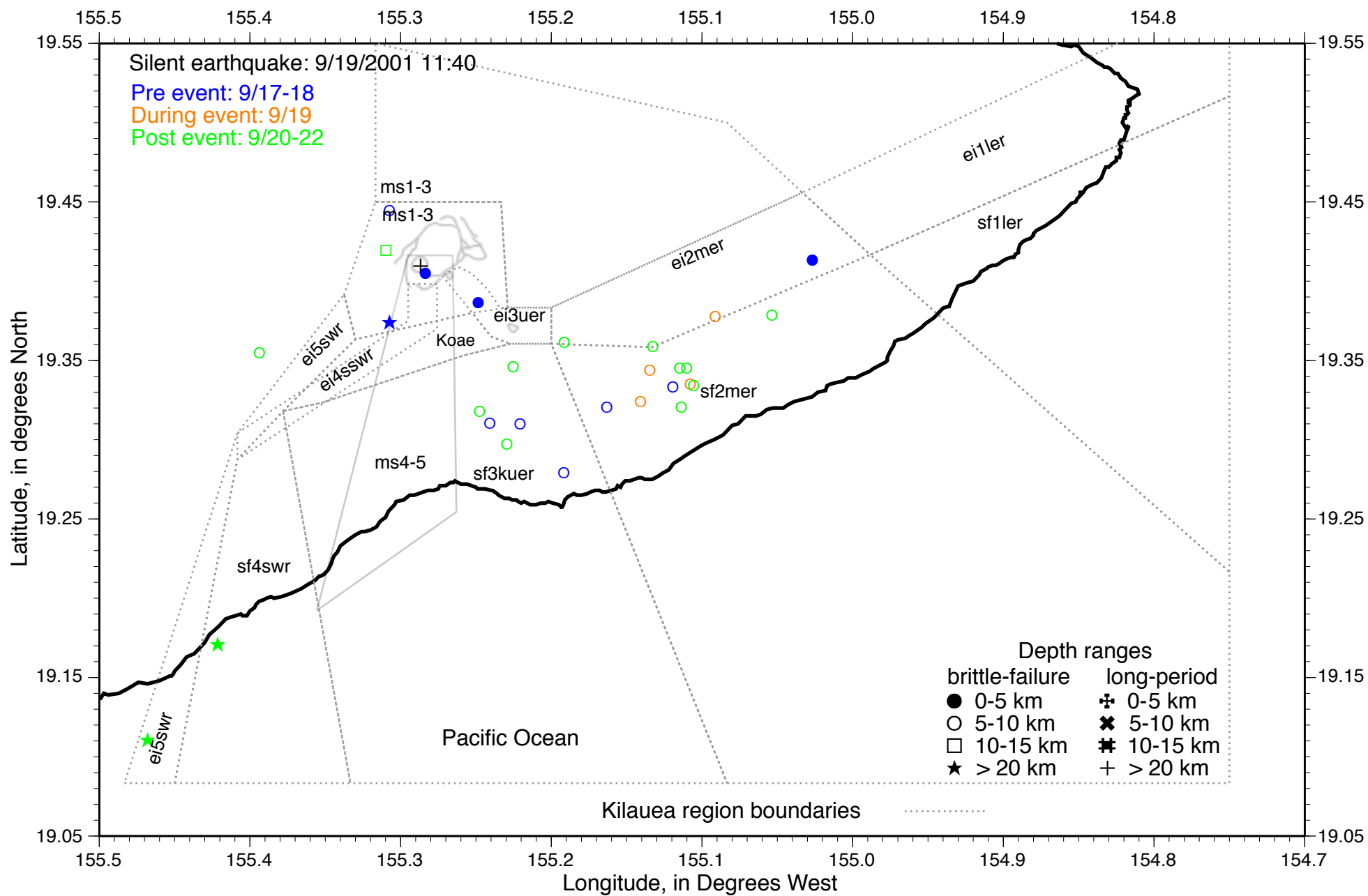
5/20/2001 "surge (D-I-D)": data from 5/16-24/2001



Appendix figure G38

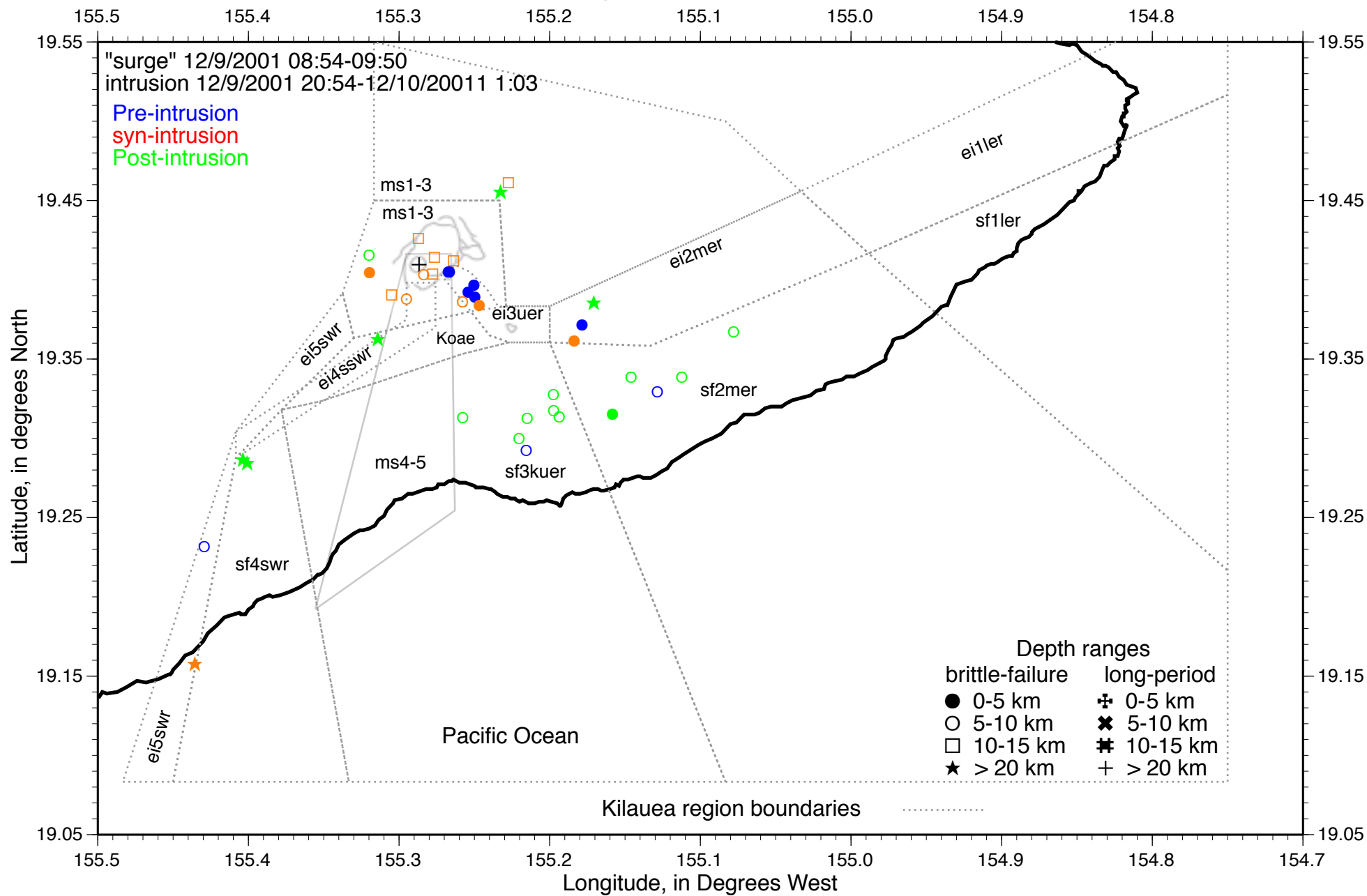
6/23-24/2001 suspected deep intrusion: data from 6/22-30/2001





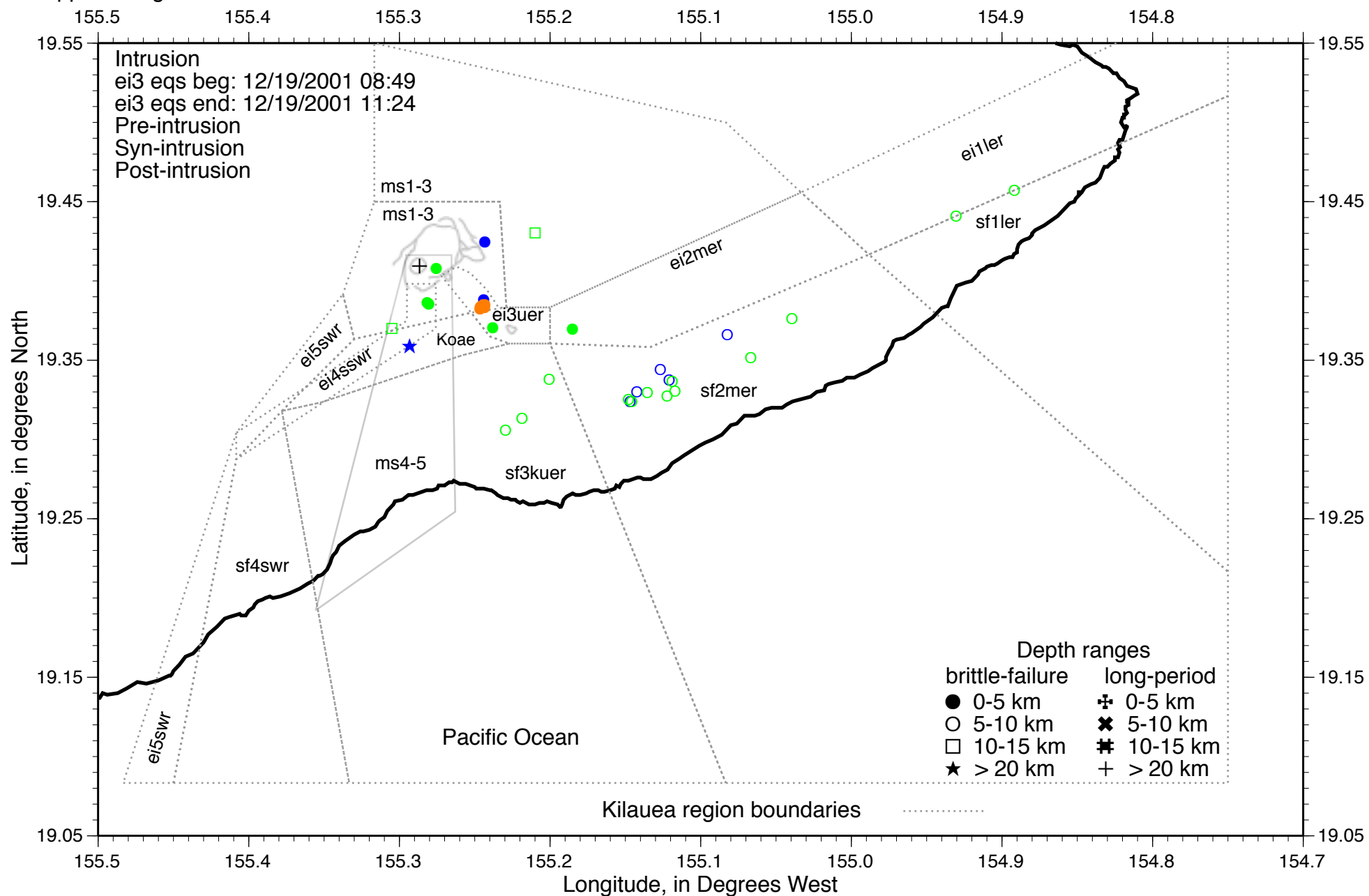
Appendix figure G40

12/9/2001 "surge (D-I-D)": data from 12/8-15/2001



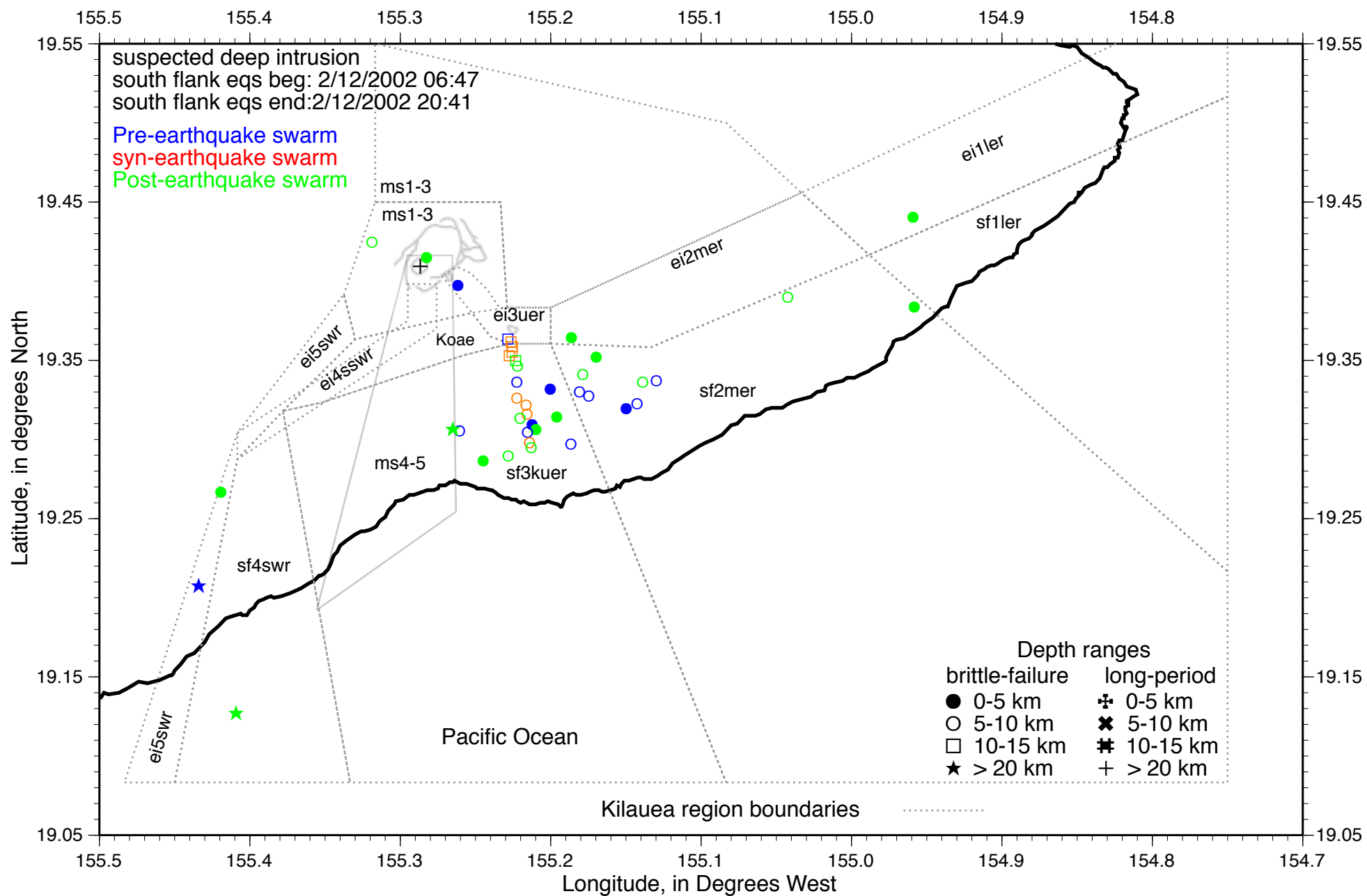
Appendix figure G41

12/19/2001 East rift intrusion: data from 12/17-23/2001

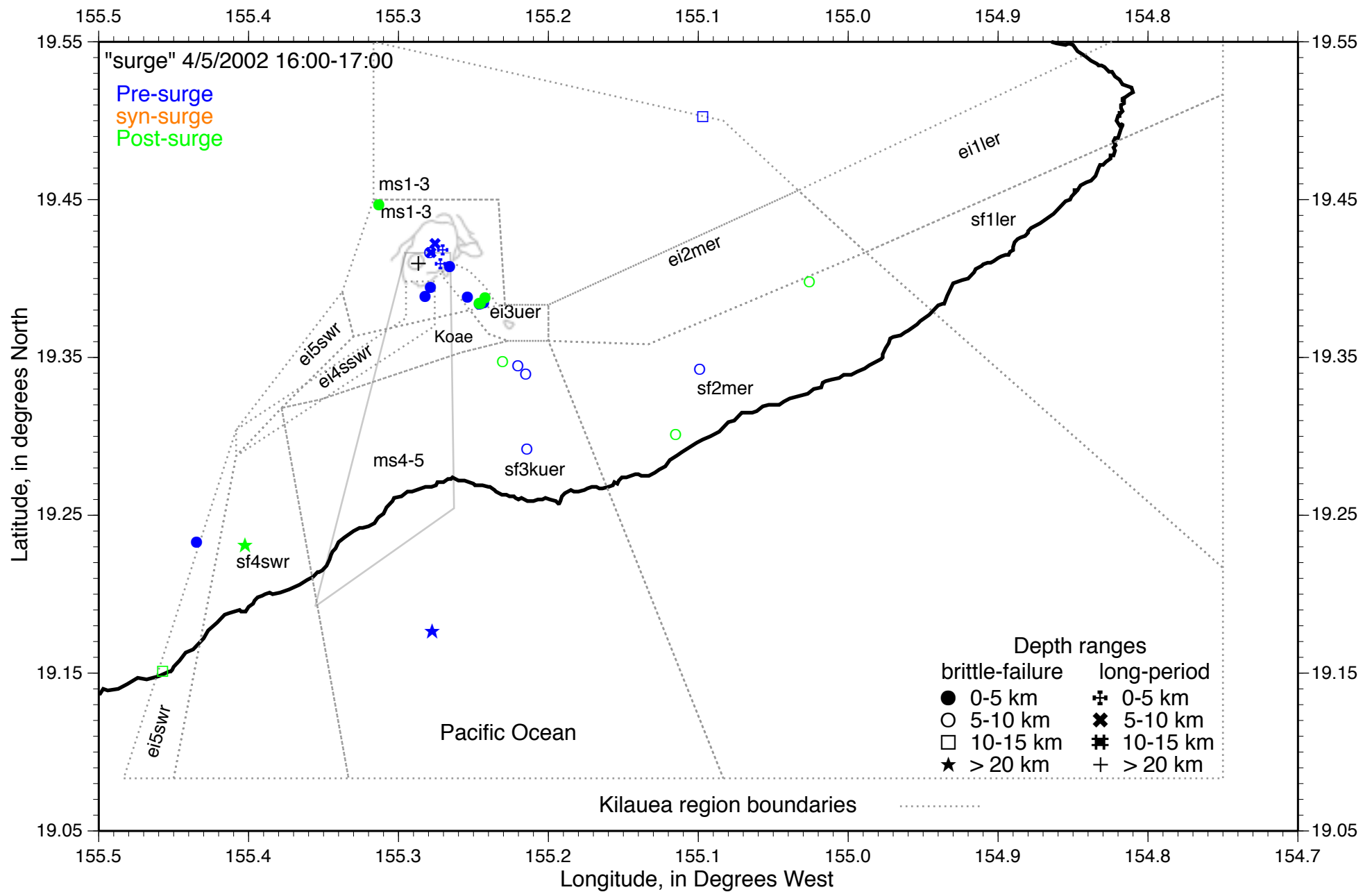


Appendix figure G42

2/12/2002 suspected deep intrusion: data from 2/10-16/2002

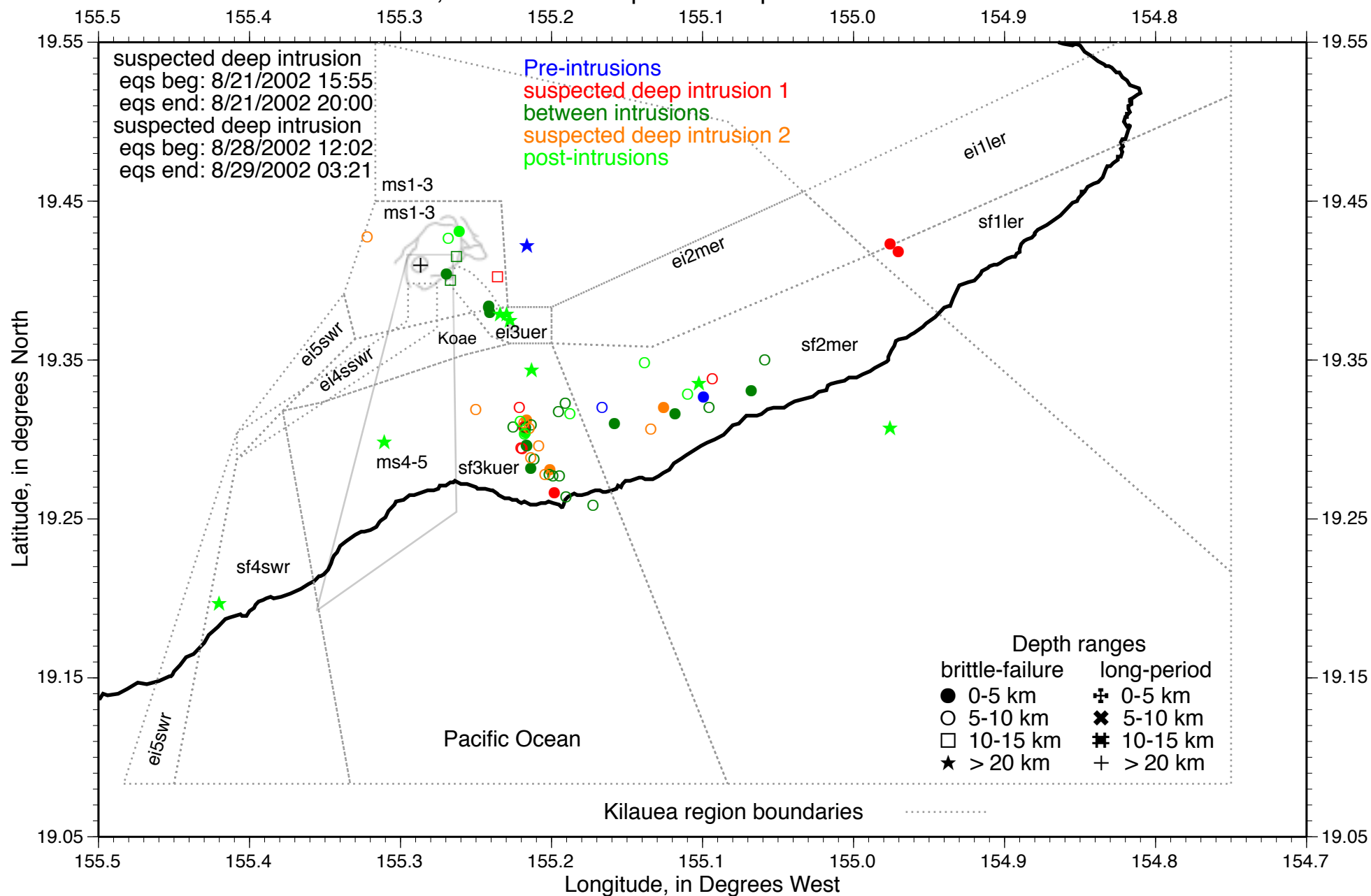


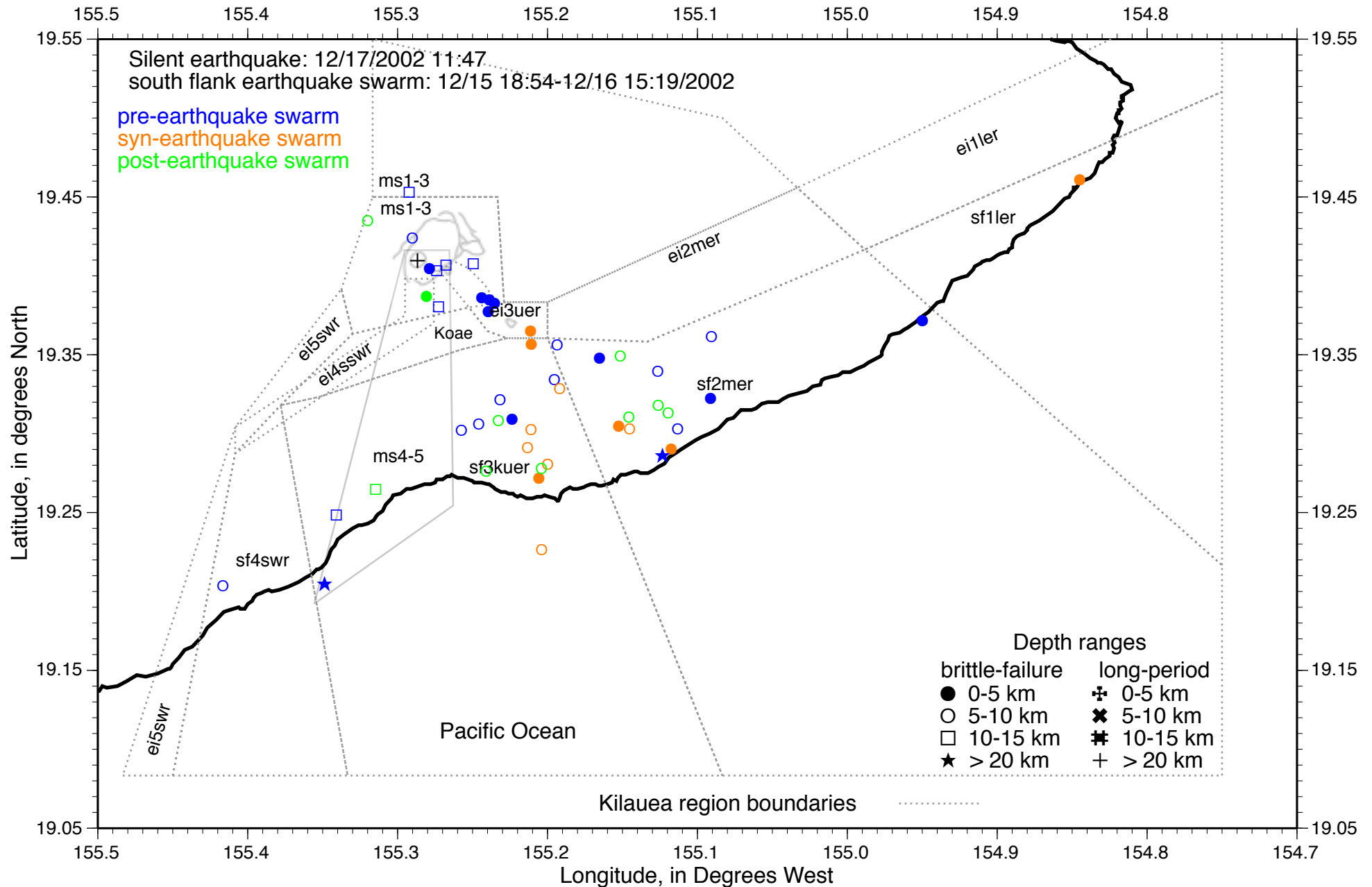
4/5/2002 "surge (D-I-D)": data from 4/2-8/2002

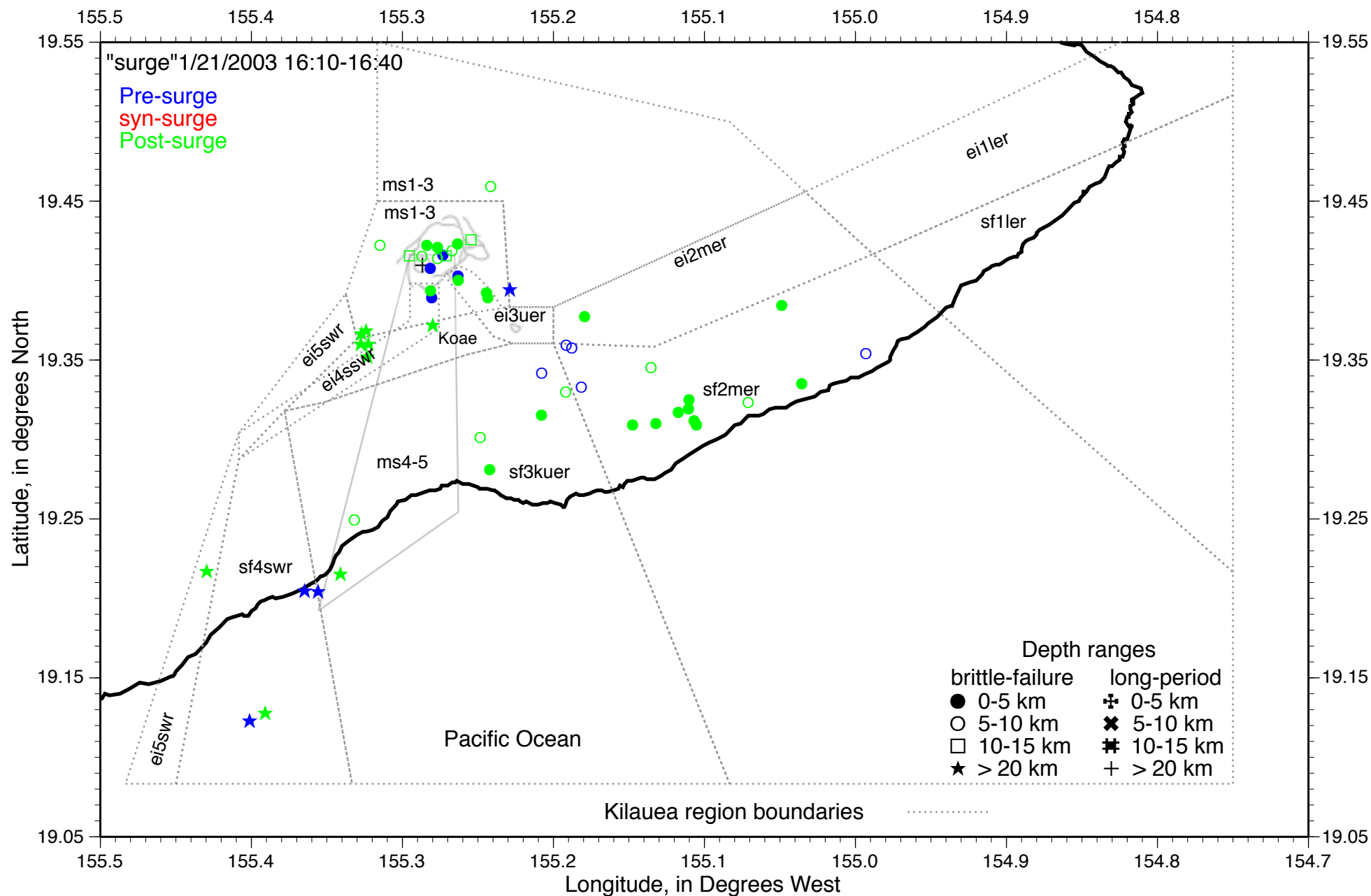


Appendix figure G44

8/21-22, 28-29/2002 suspected deep intrusions data from 8/20-31/2002

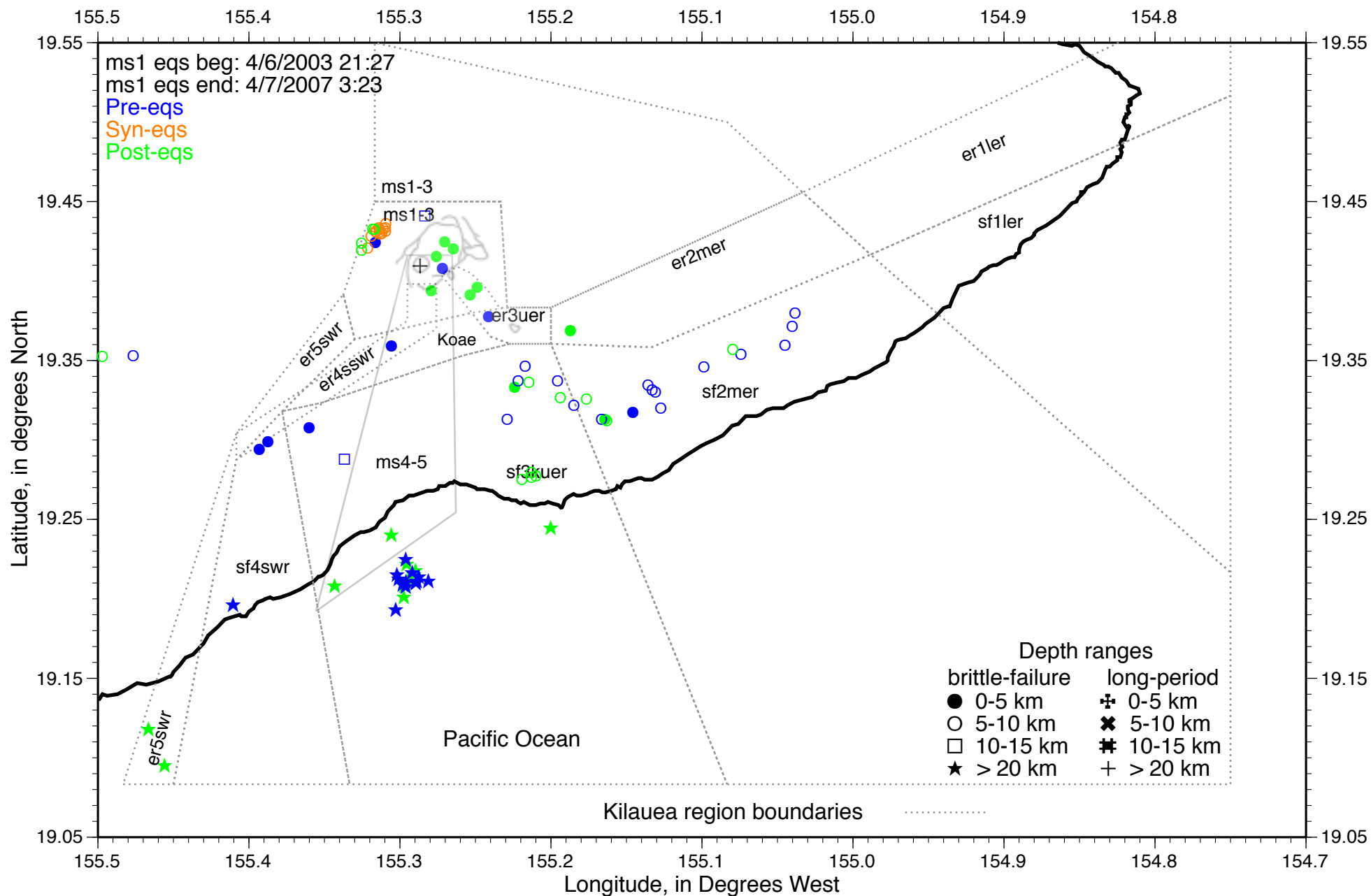






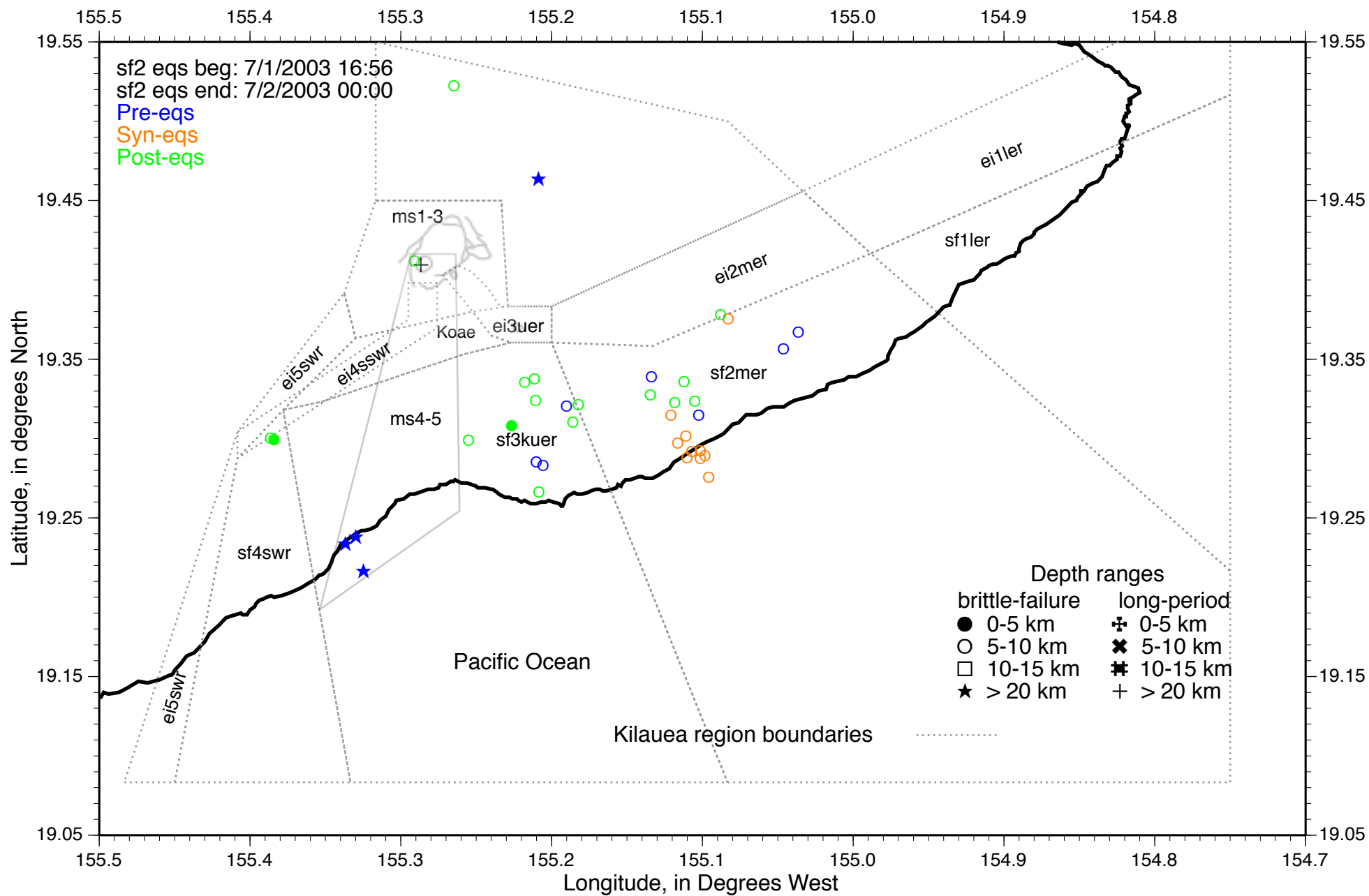
Appendix figure G47

Namakani Paio sequence: data from 3/31-4/14/2003



Appendix figure G48

7/3/2003 silent earthquake: data from 6/28-7/5/2003



Appendix figure G49

Pu'u 'O'o-Kupaianaha eruption 8/8/2003 "surge (D-I-D)": data from 8/6-10/2003

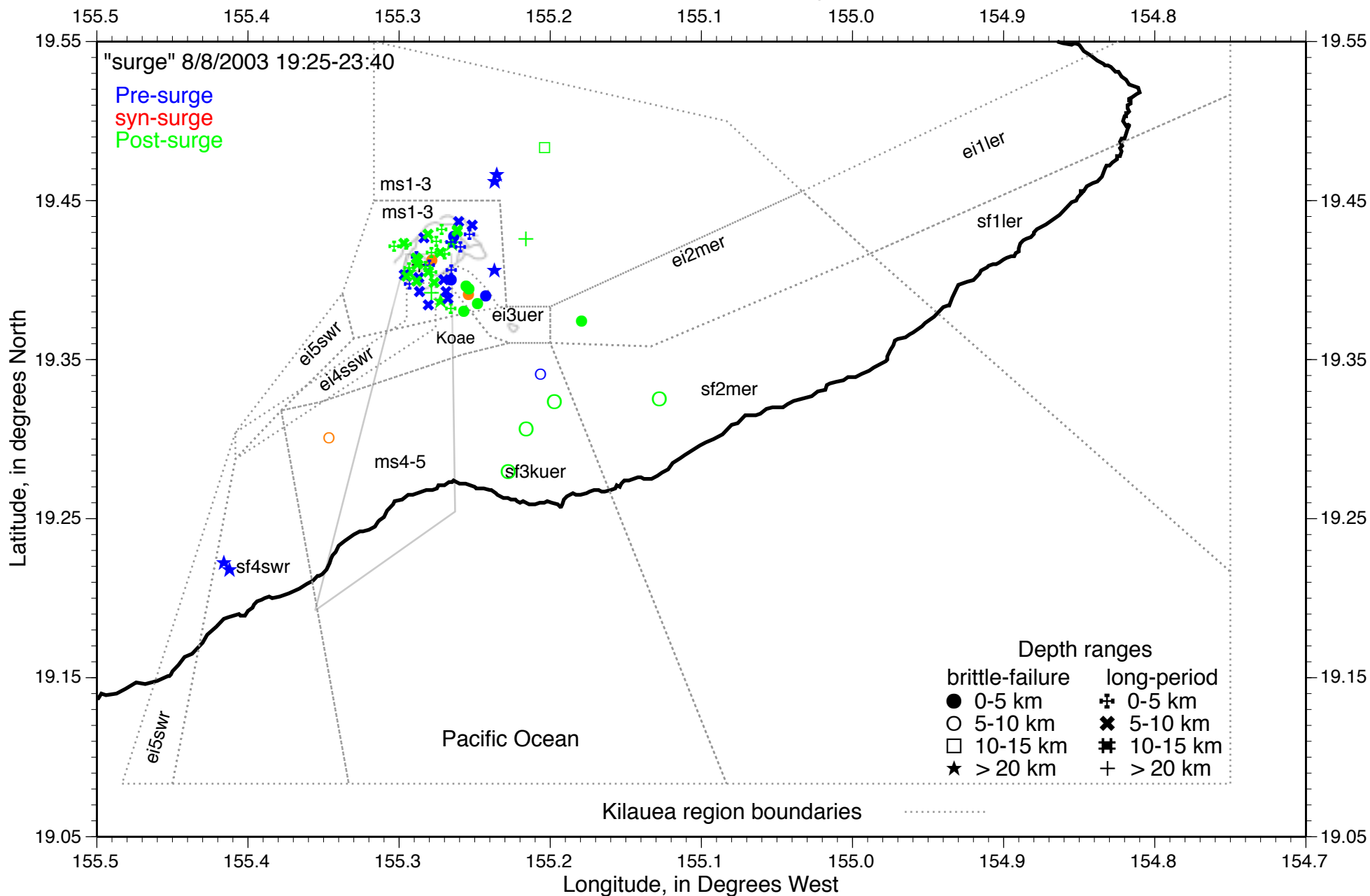
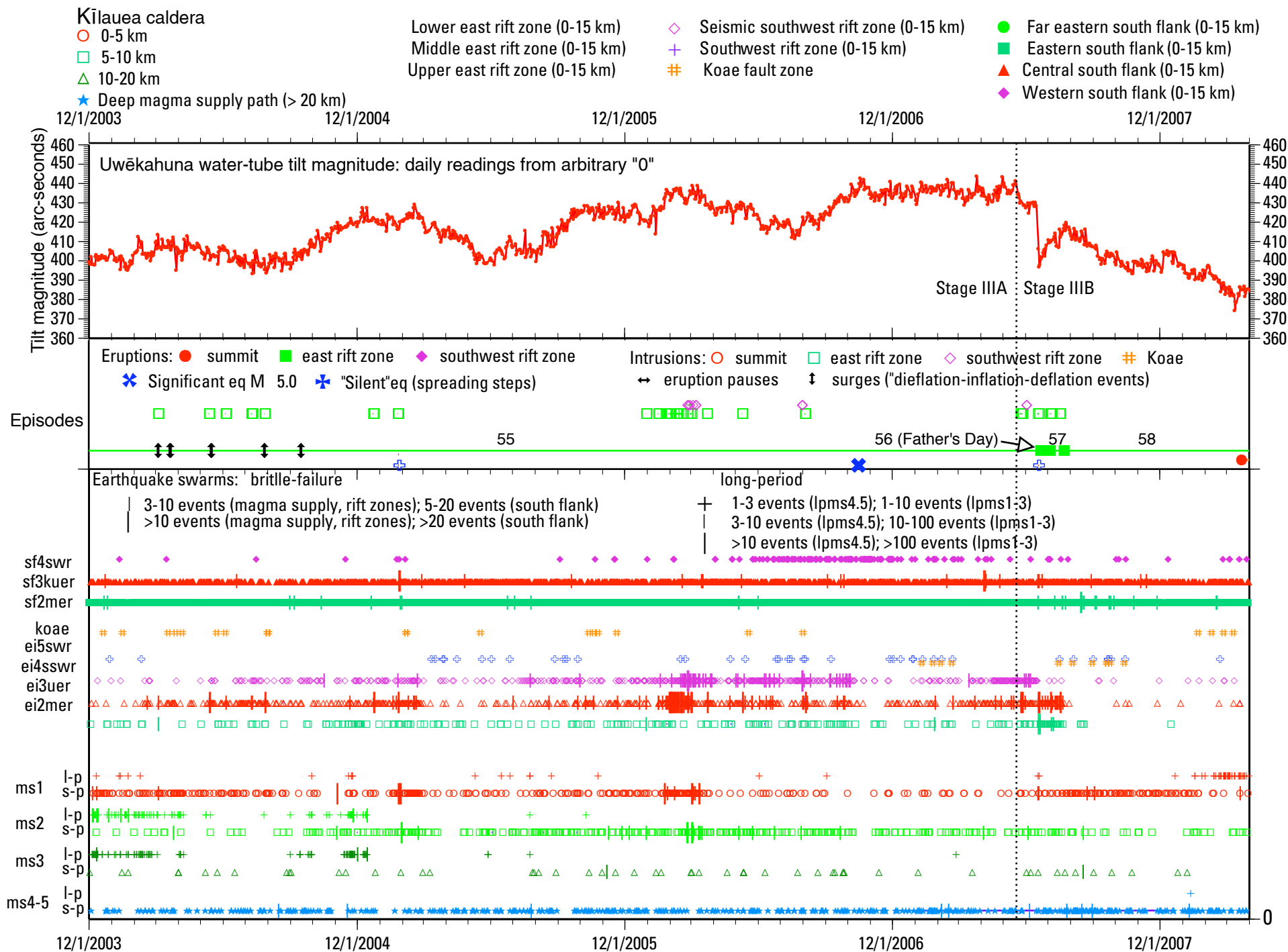


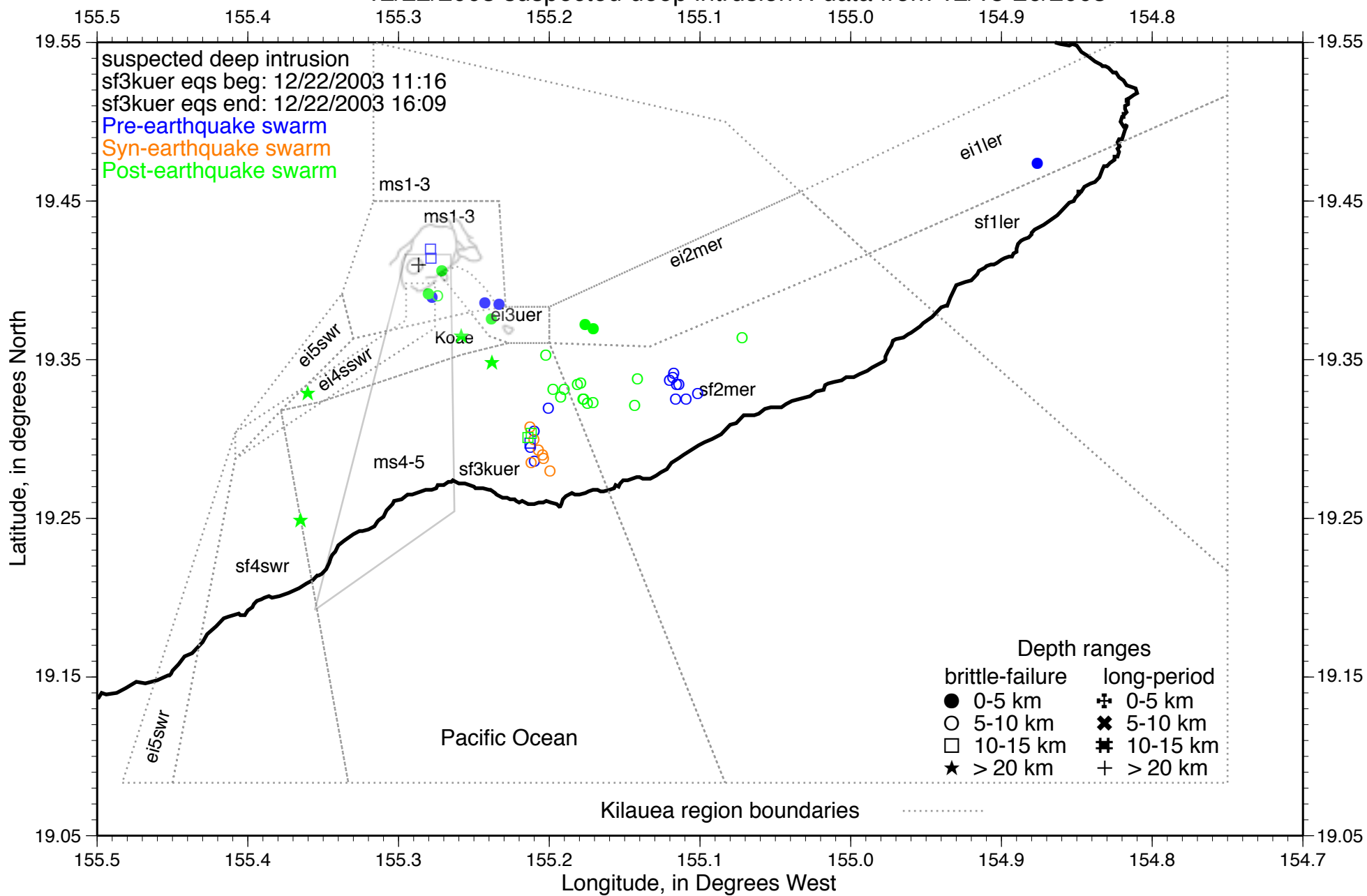
Figure G50

Pu'u 'Ō'ō-Kupaianaha eruption: Stage III



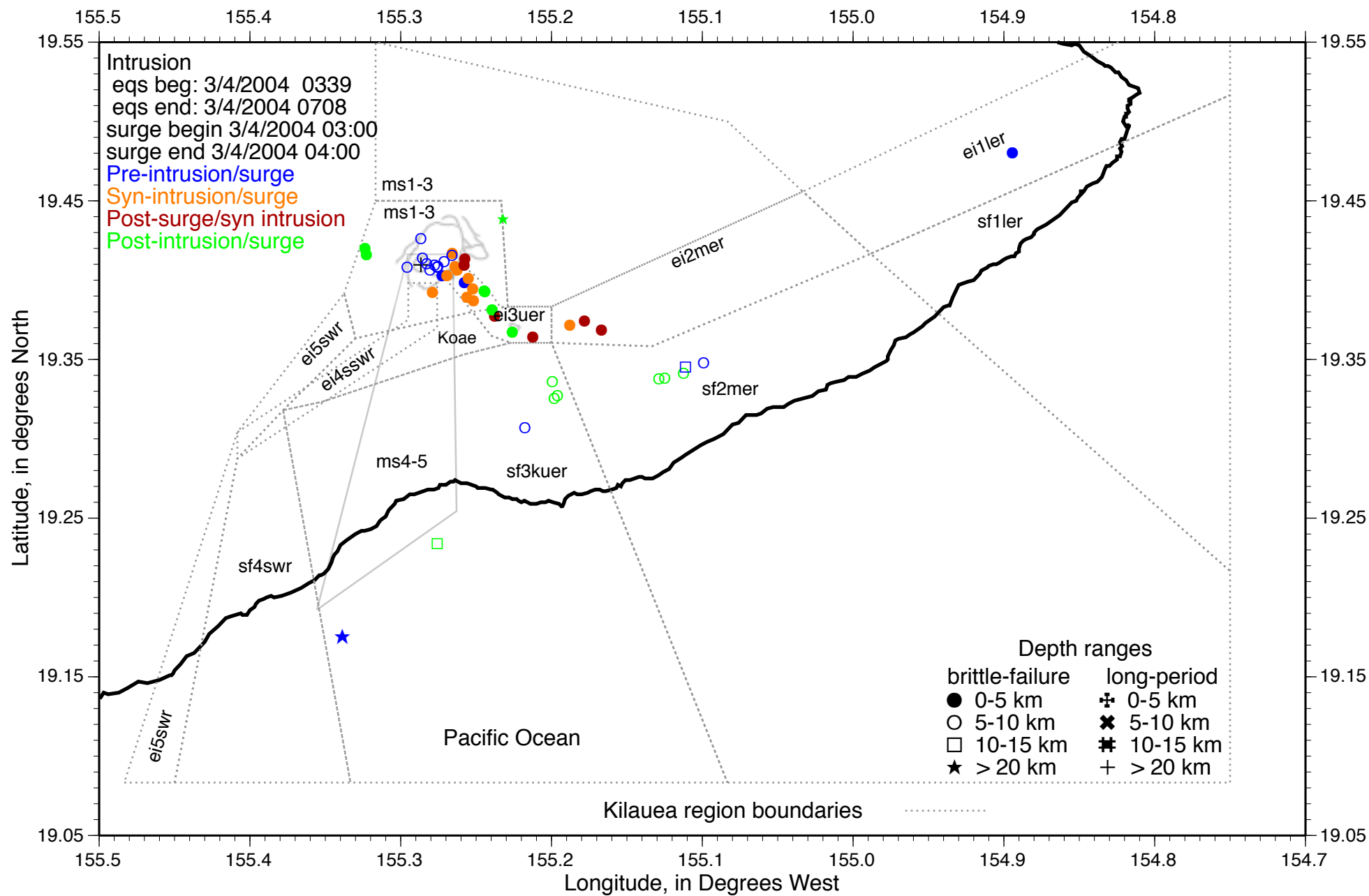
Appendix figure G51

12/22/2003 suspected deep intrusion?: data from 12/18-26/2003



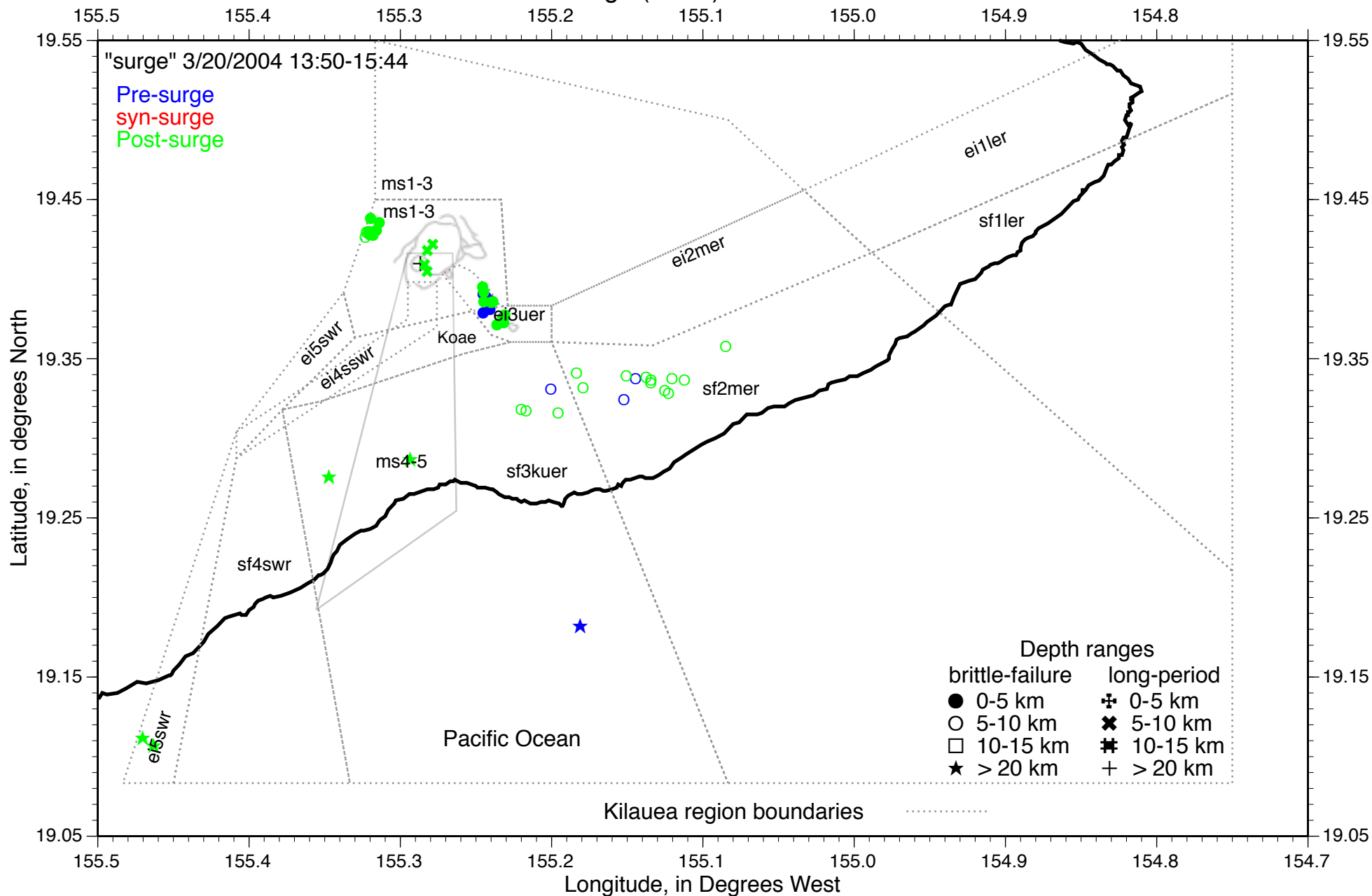
Appendix figure G52

3/4/2004 intrusion: data from 3/2-8/2004



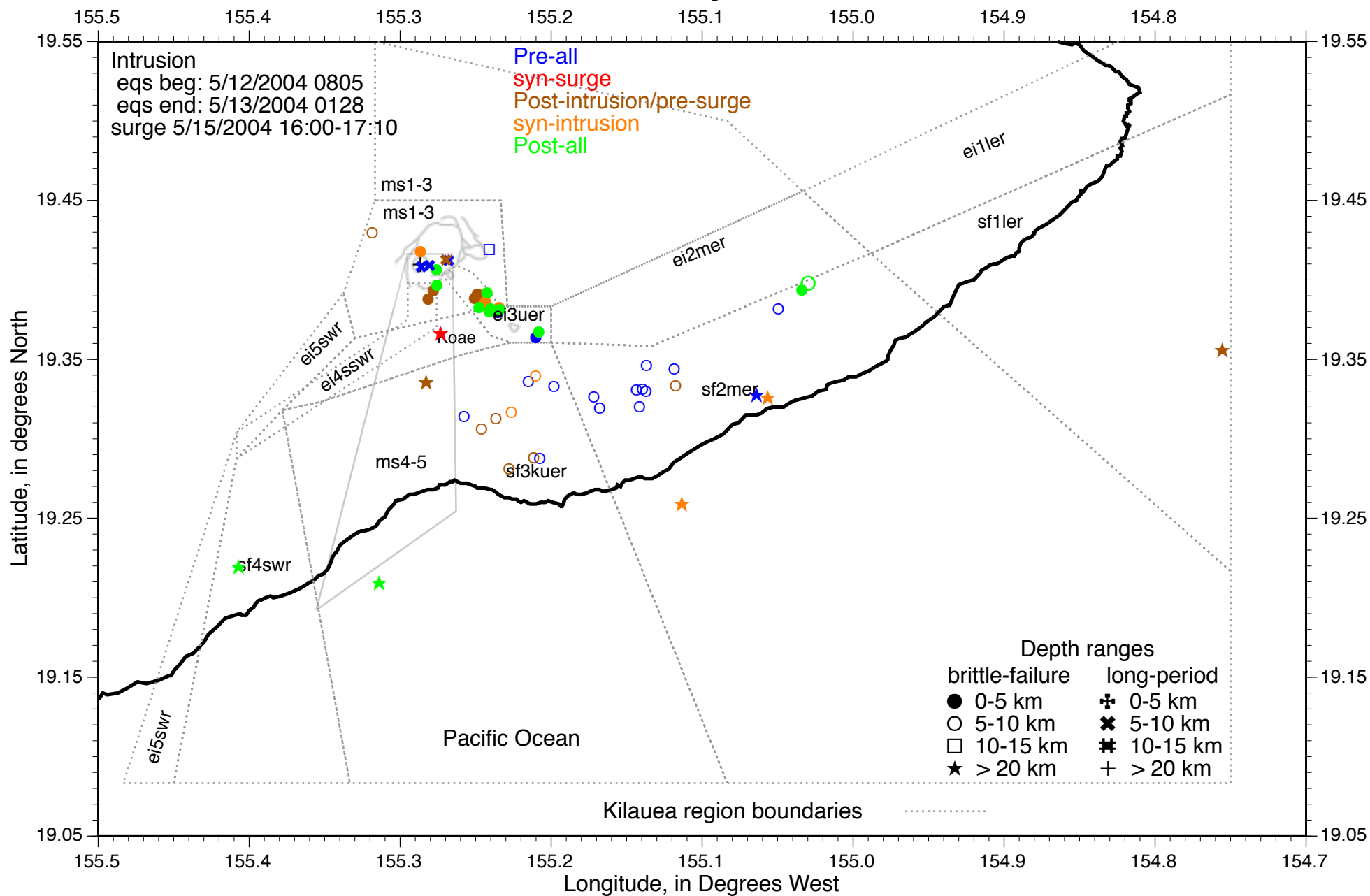
Appendix figure G53

3/20/2004 "surge (D-I-D)": data from 3/18-26/2004



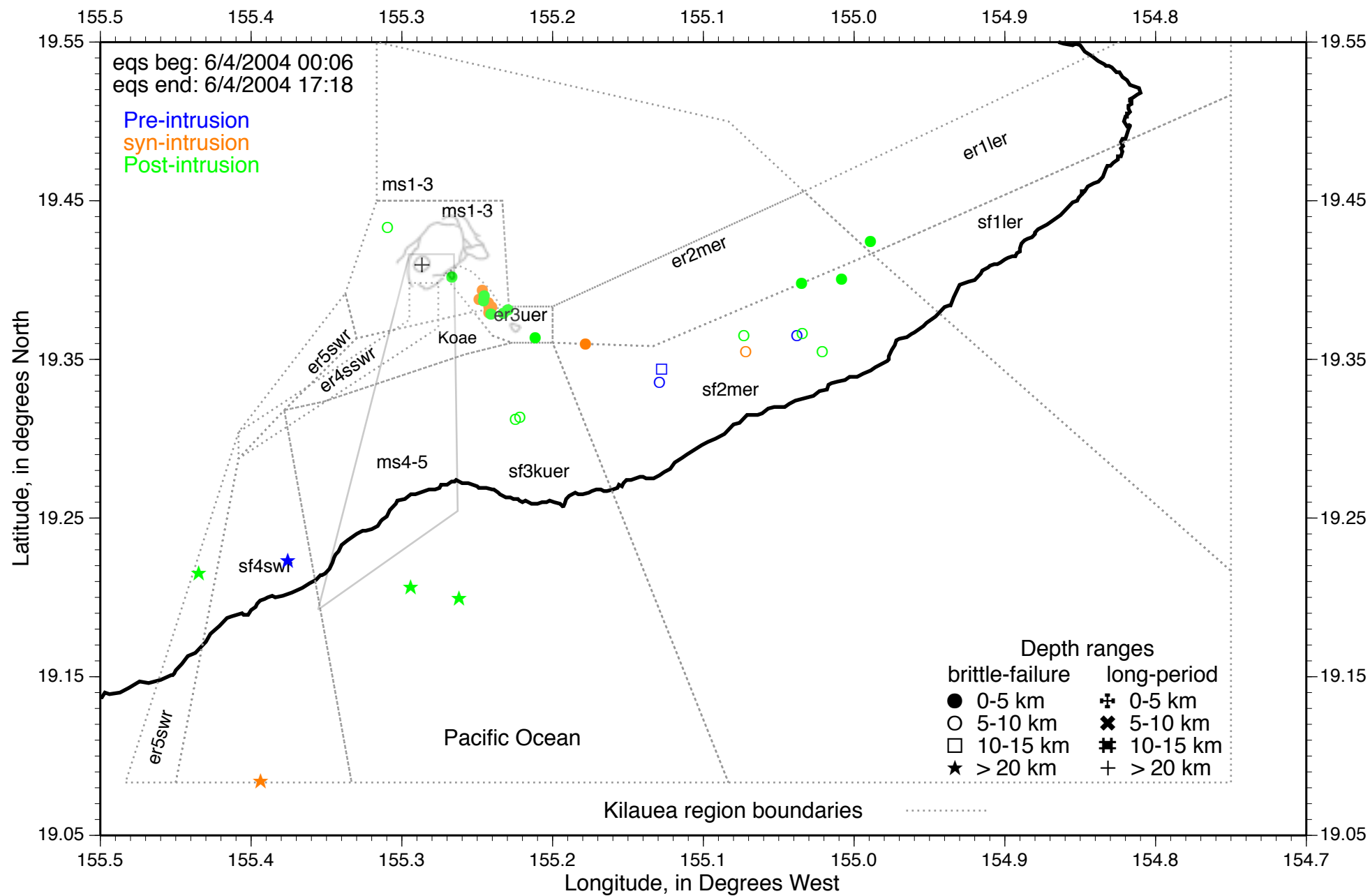
Appendix figure G54

5/12-13/2004 intrusion/"surge": data from 5/8-18/2004



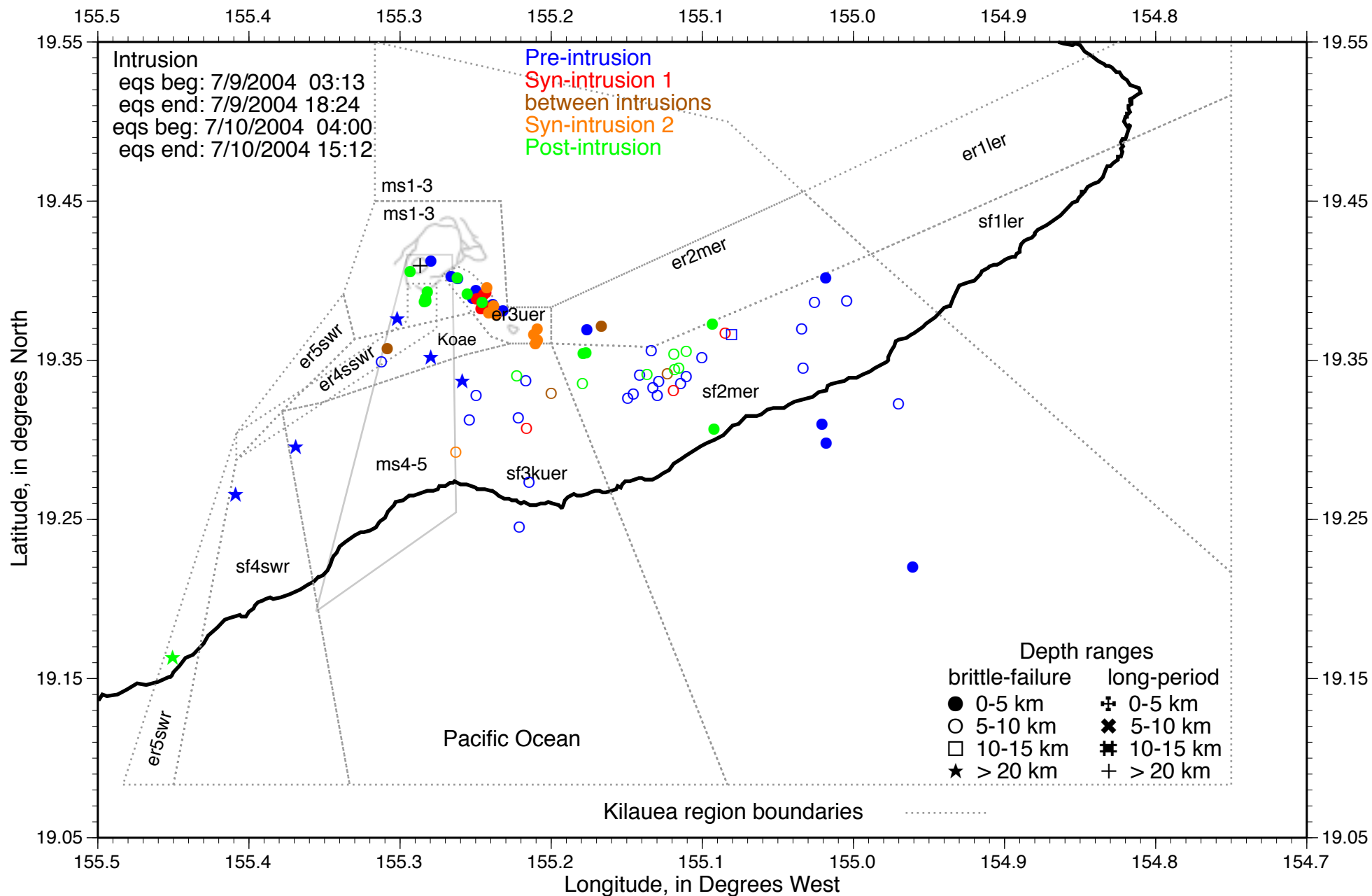
Appendix figure G55

6/4/2004 intrusion: data from 6/3-9/2004



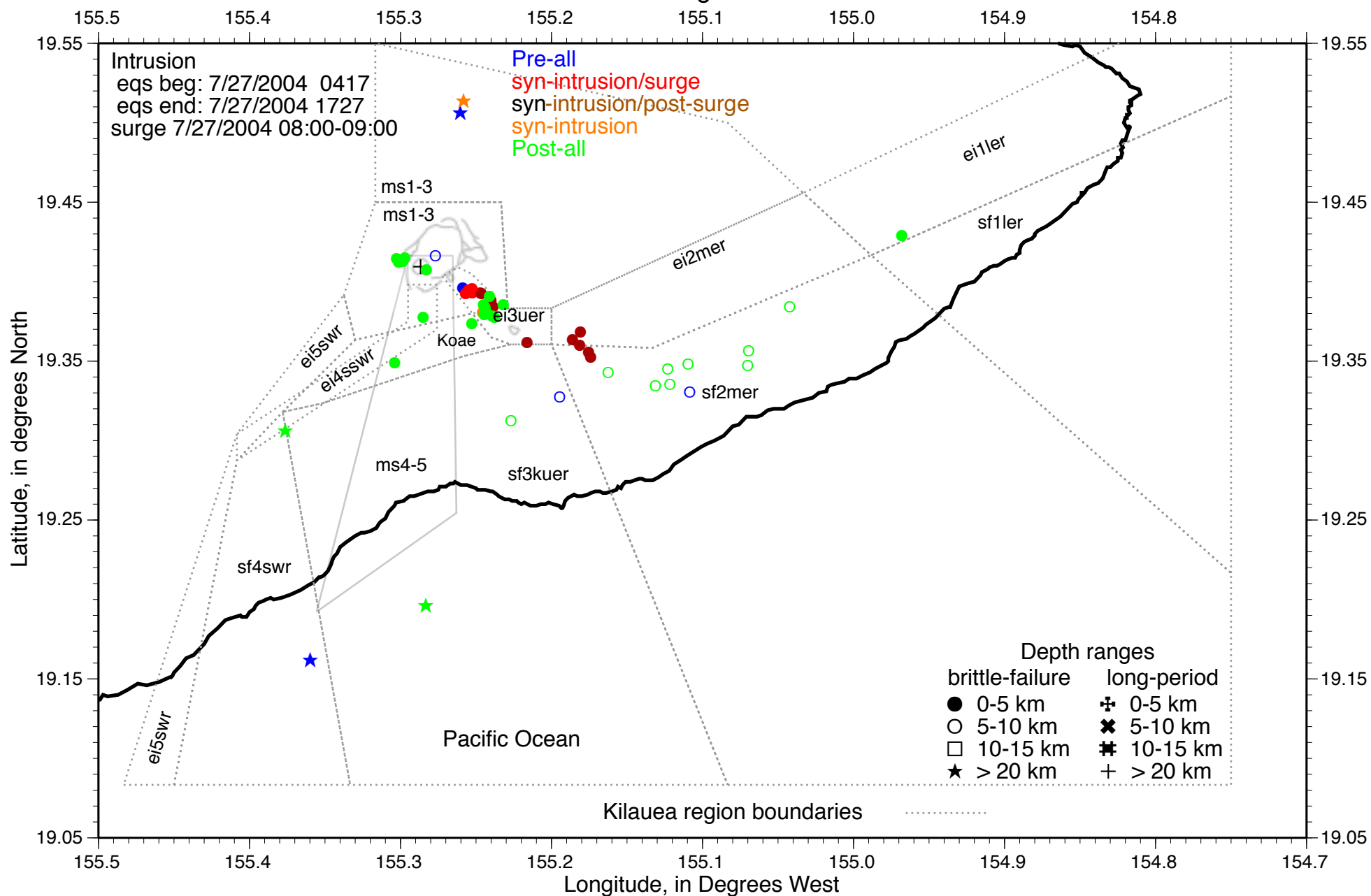
Appendix figure G56

7/9-10/2004 intrusion: data from 7/1-14/2004



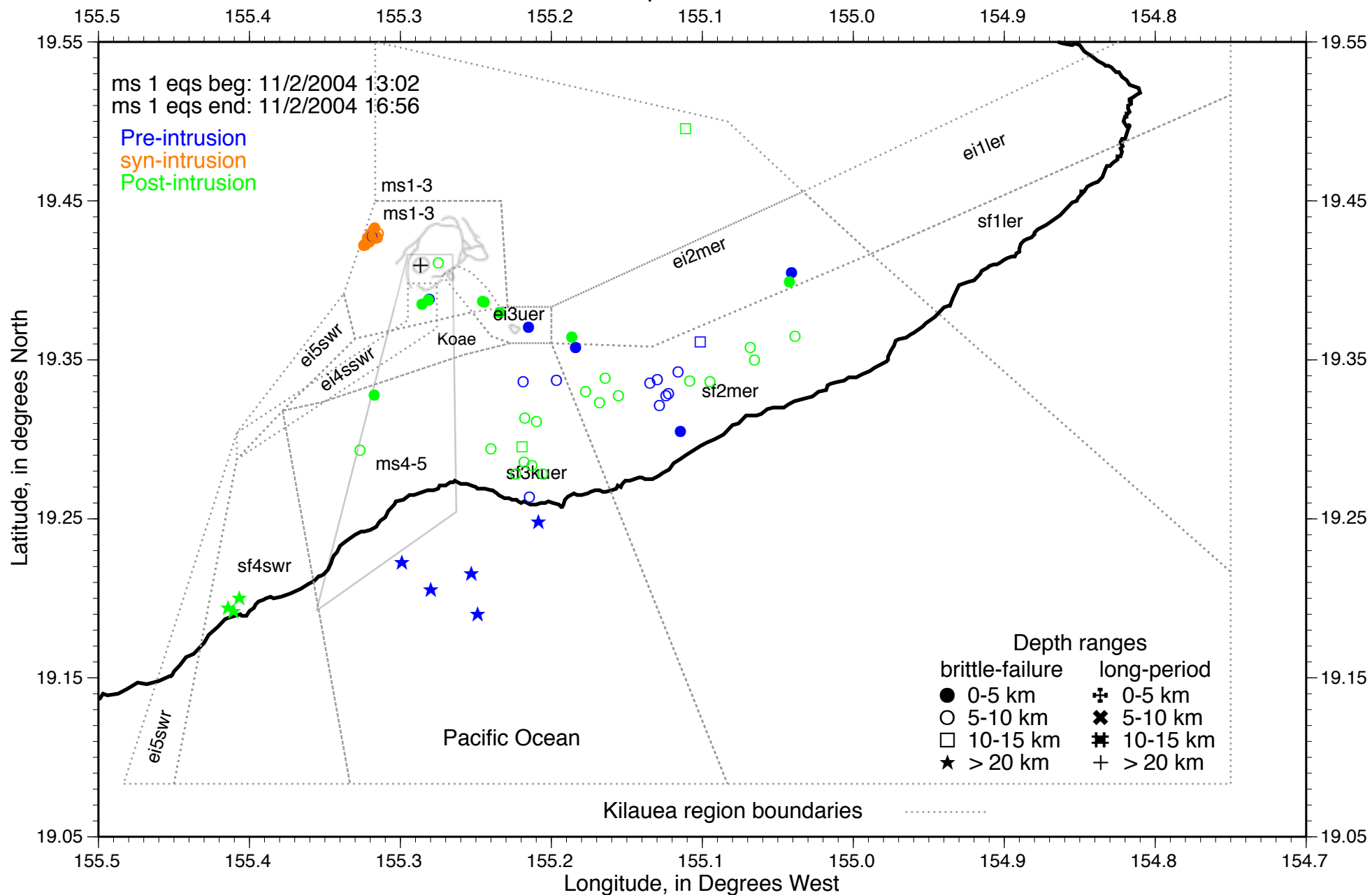
Appendix figure G57

7/27/2004 intrusion/surge: data from 7/25-8/2/2004



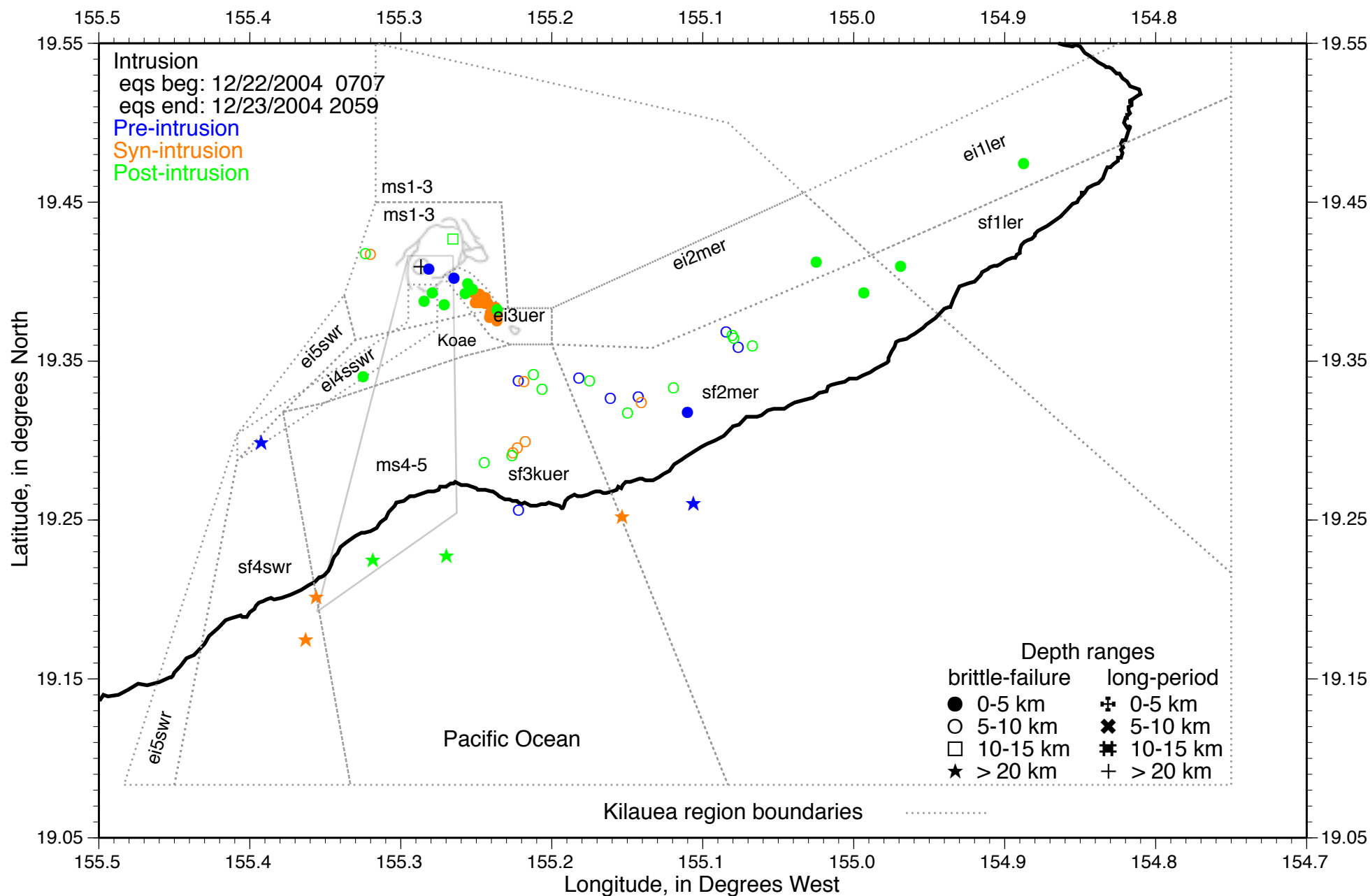
Appendix figure G58

11/2/2004 nāmakanipaio data from 10/29-11/9/2004



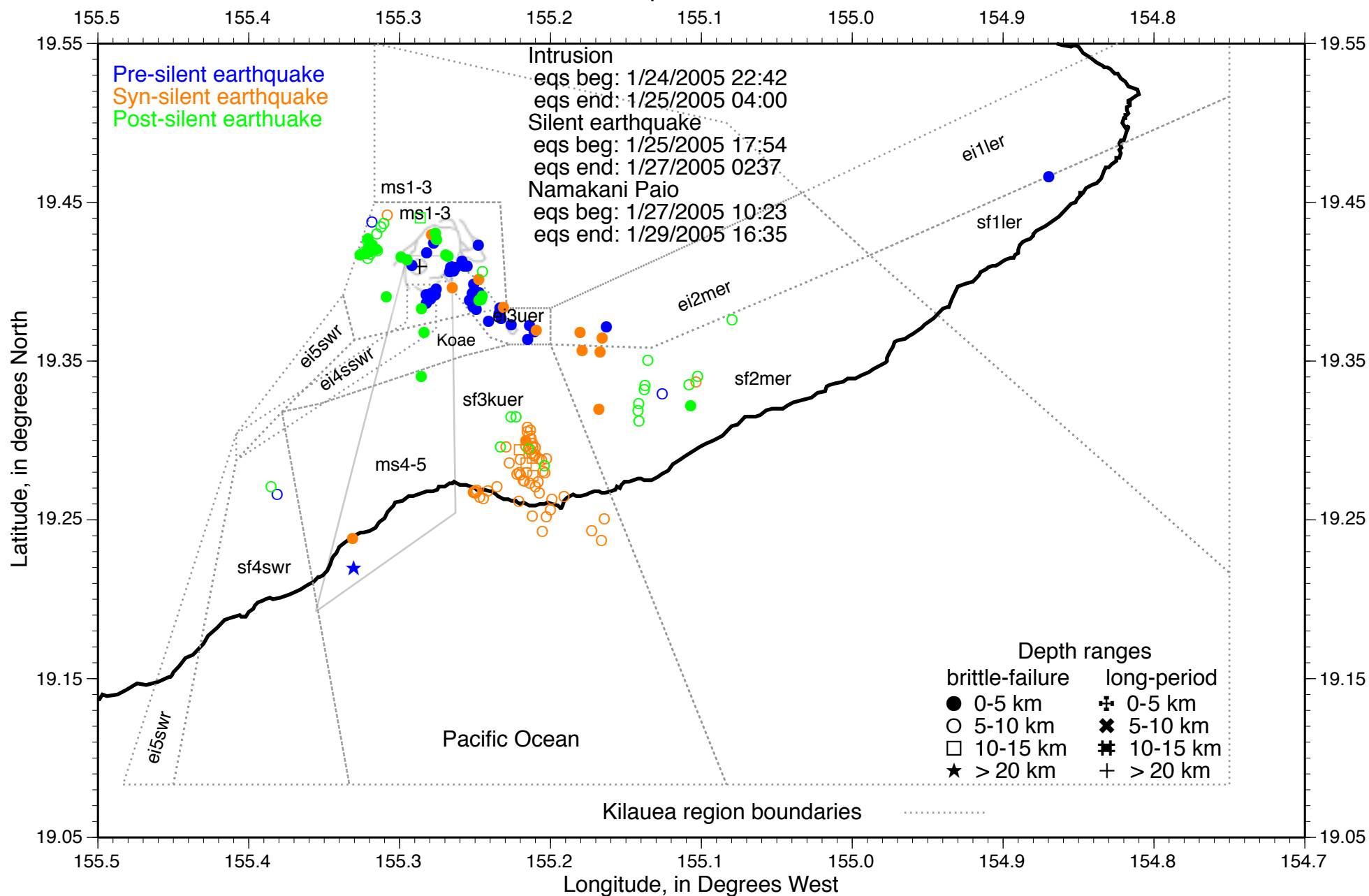
Appendix figure G59

12/22-23/2004 intrusion: data from 12/19-29/2004



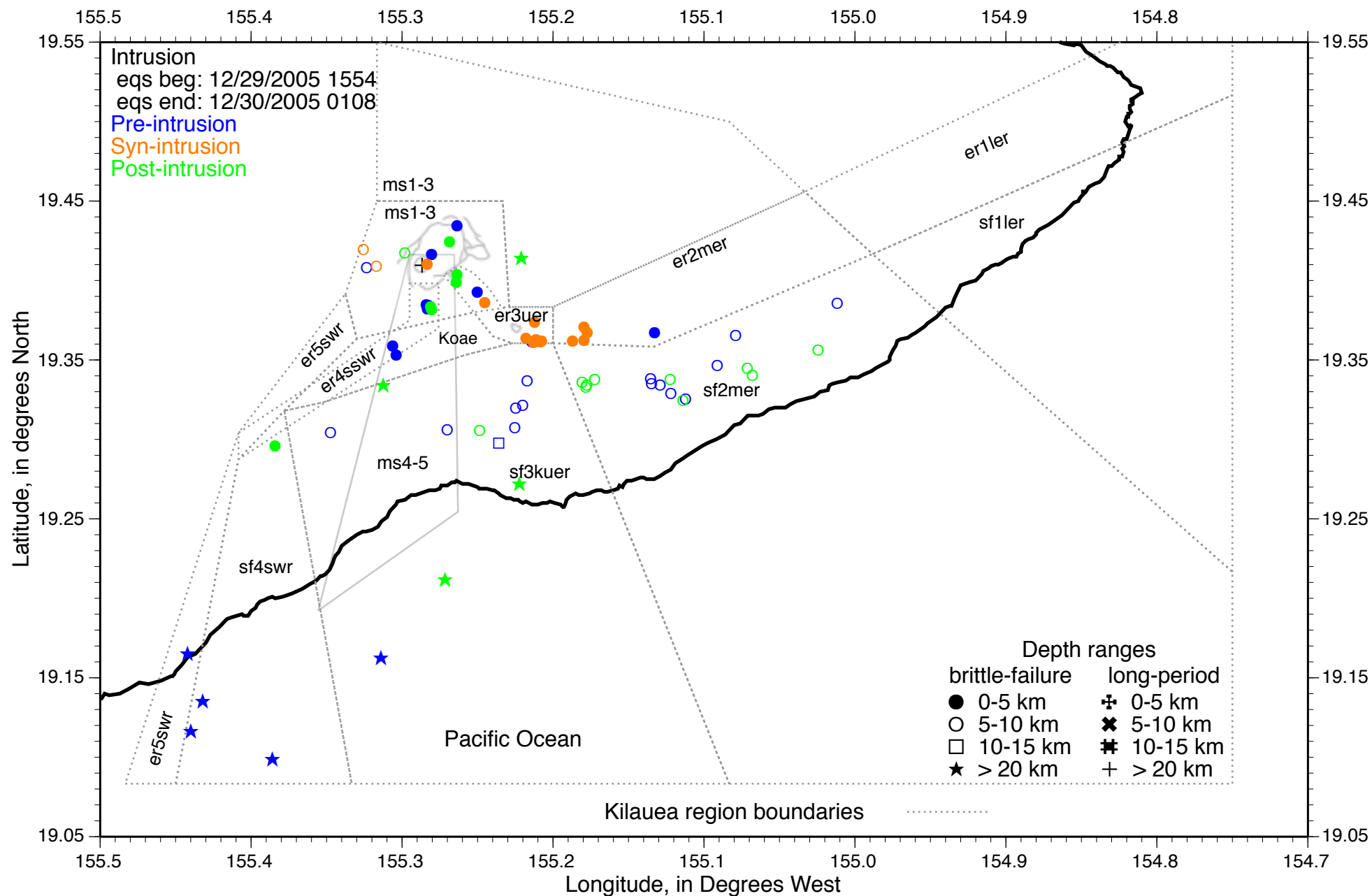
Appendix figure G60

1/26/2005 silent earthquake: data from 1/24-1/29/2005



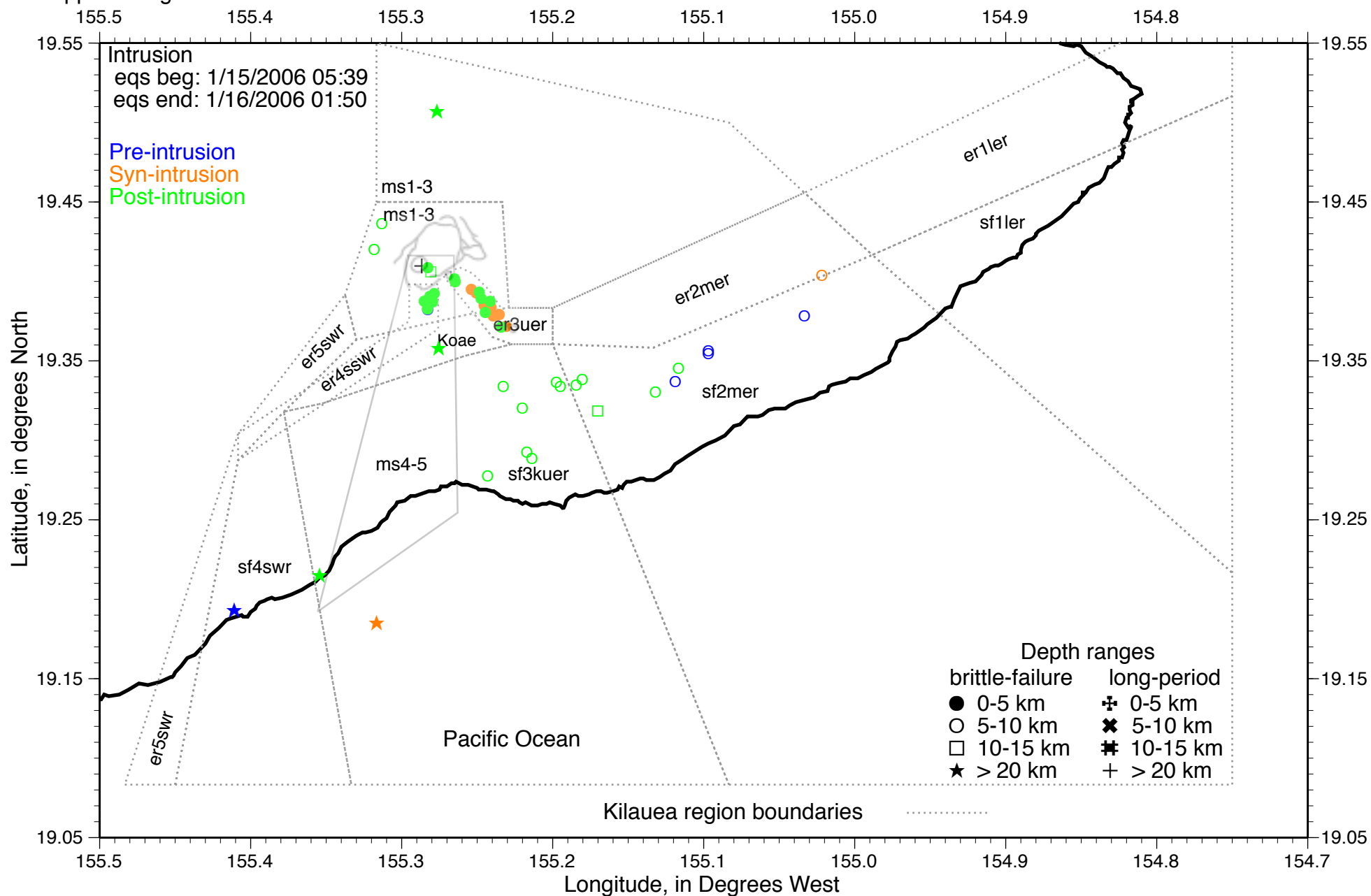
Appendix figure G61

12/29-30/2005 intrusion: data from 12/25/2005-1/2/2006



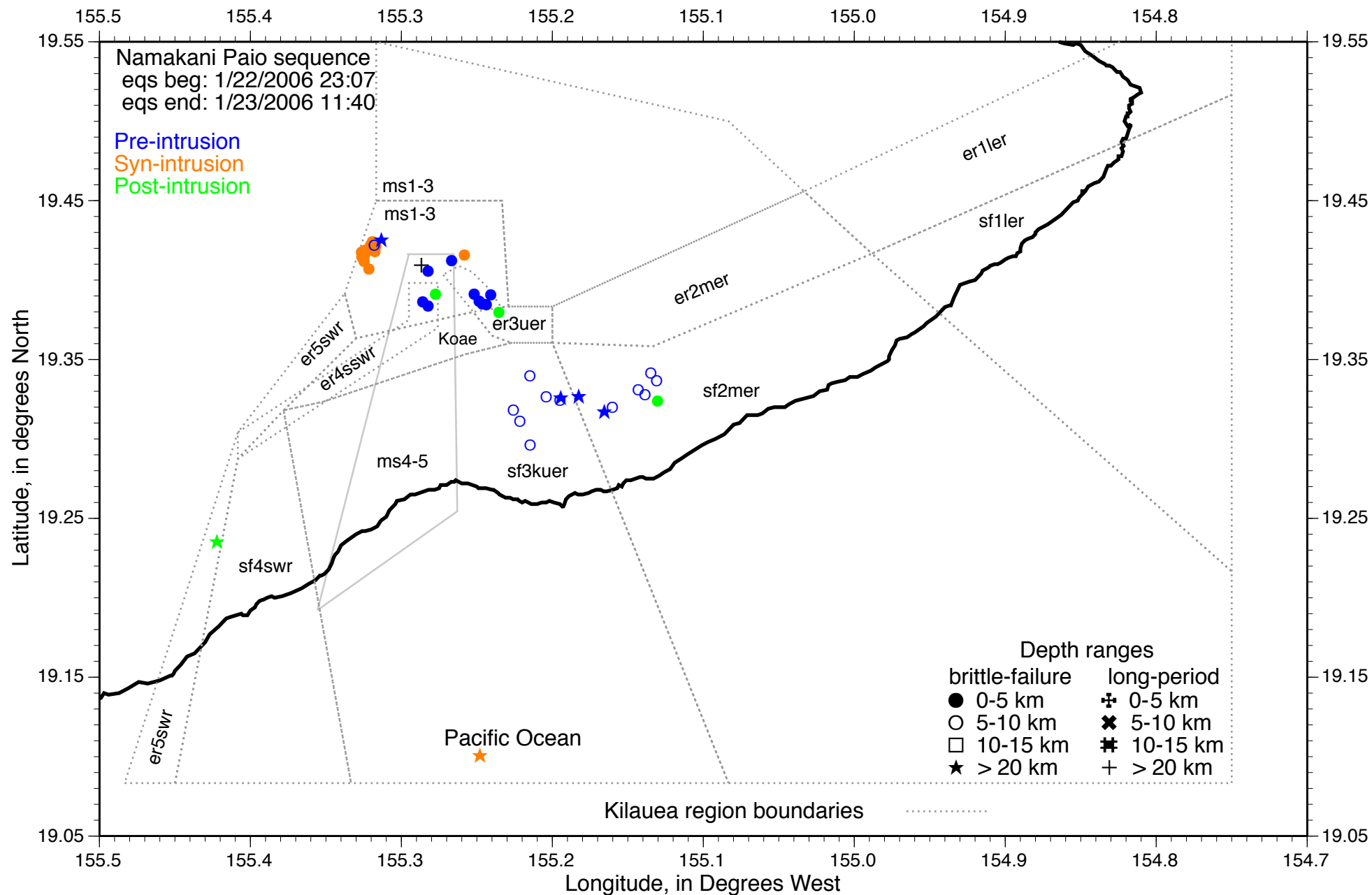
Appendix figure G62

1/15-16/2006 intrusion: data from 1/14-19/2006



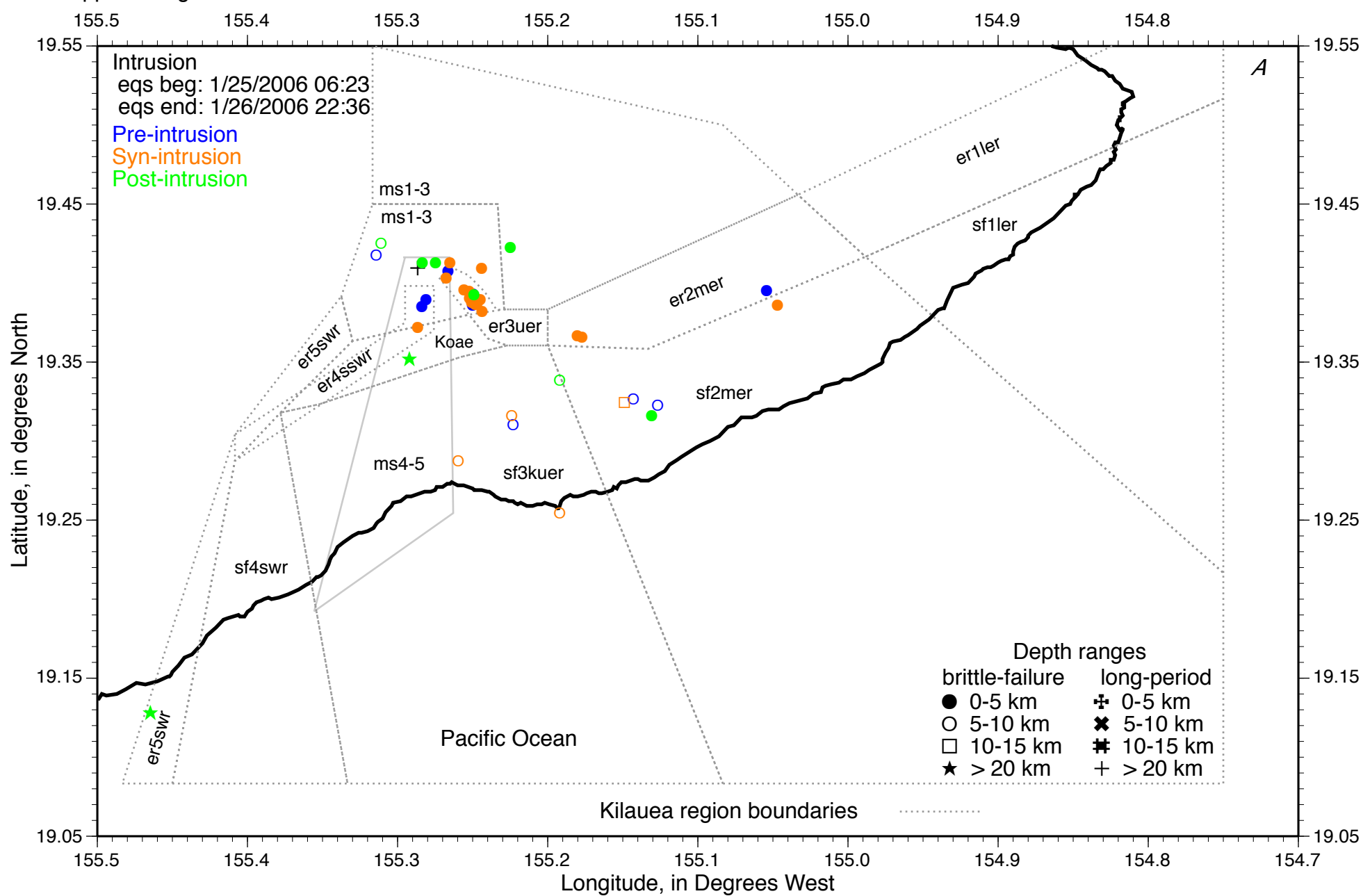
Appendix figure G63

1/22-23/2006 Namakani Paio: data from 1/20-23/2006



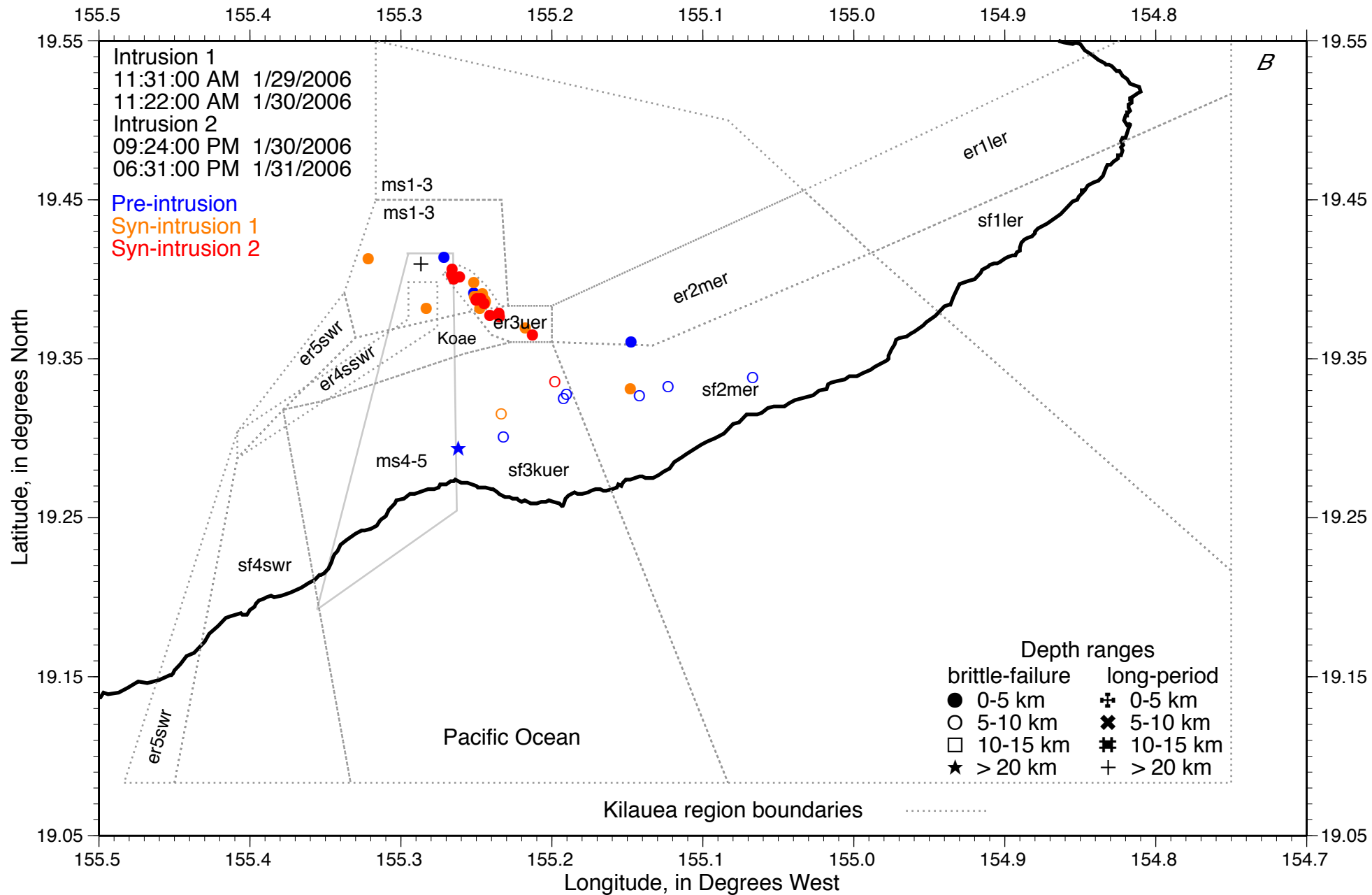
Appendix figure G64 a

1/25-26/2006 intrusion: data from 1/24-28/2006



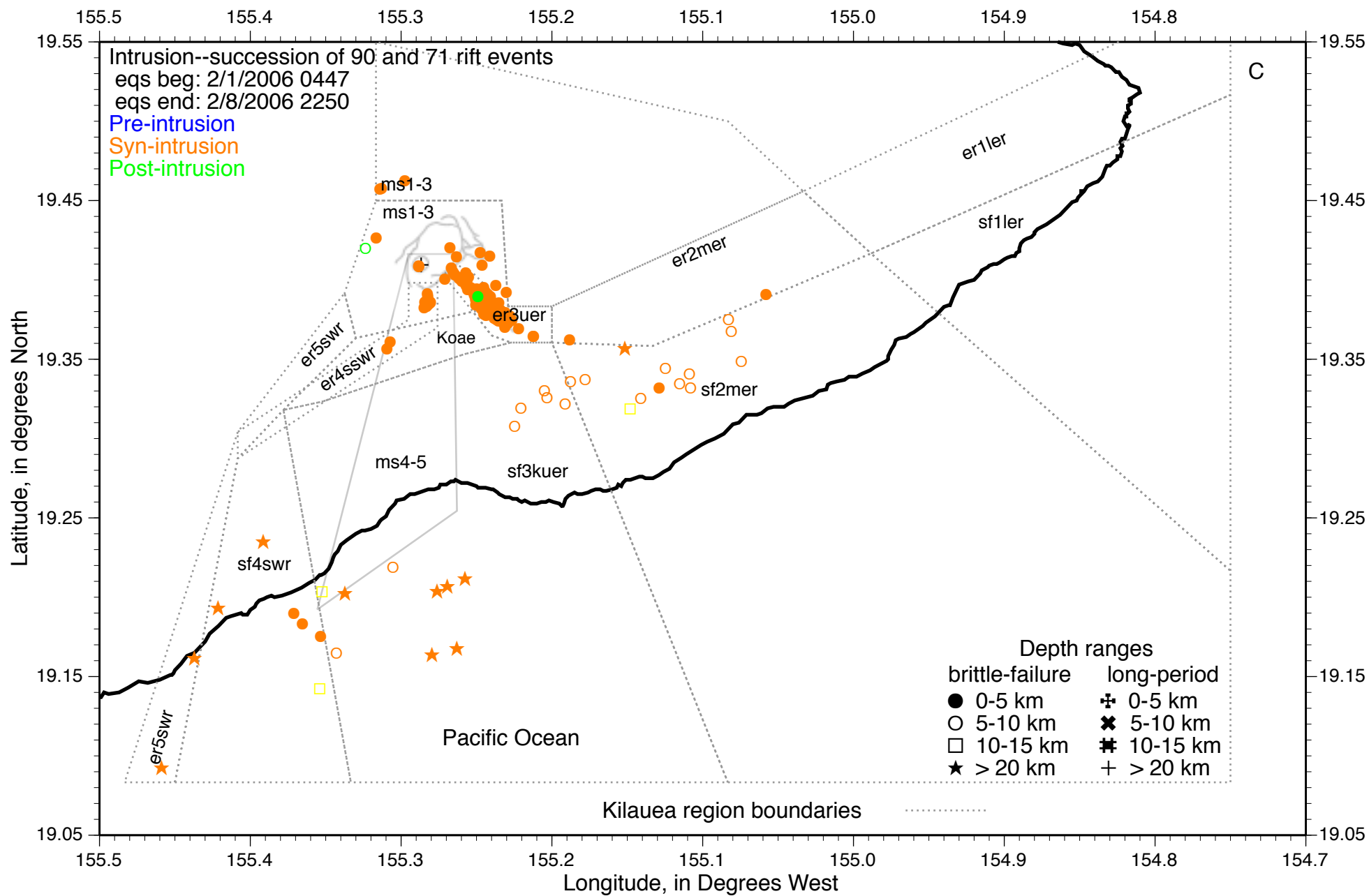
Appendix figure G64 b

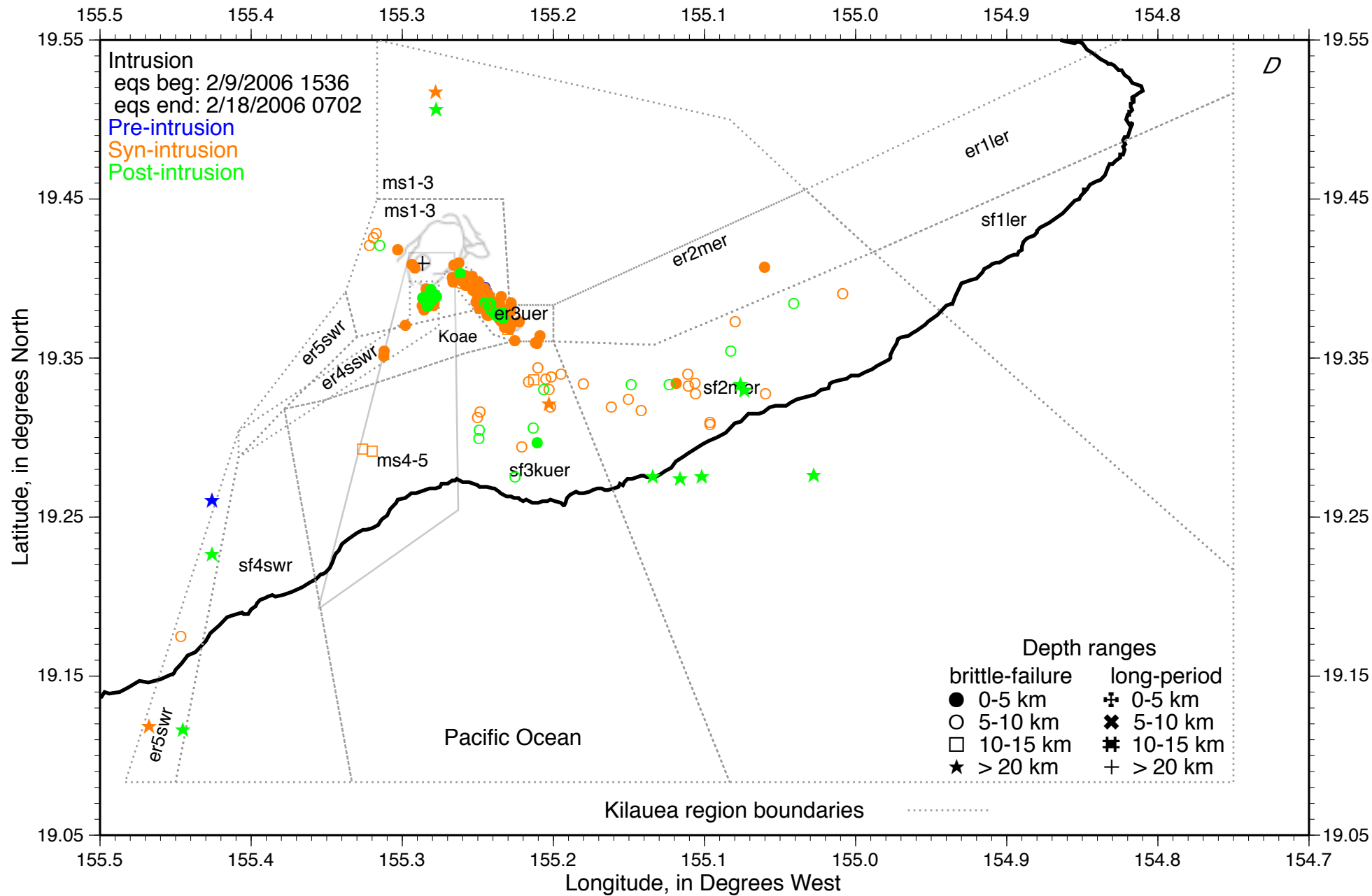
1/29-30/2006 intrusion: data from 1/29-31/2006



Appendix figure 64 c

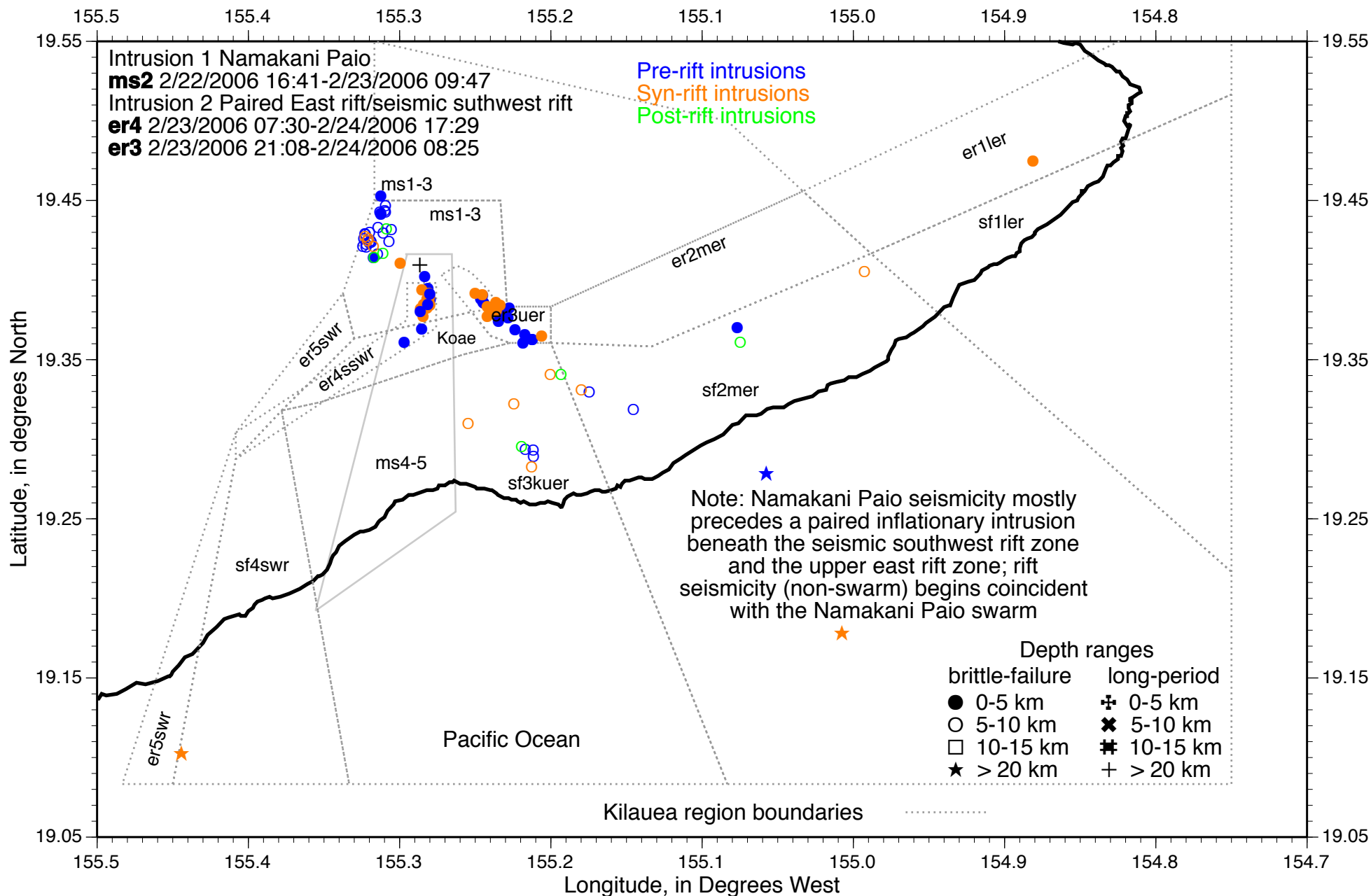
2/1-8/2006 intrusion: data from 2/1-9/2006





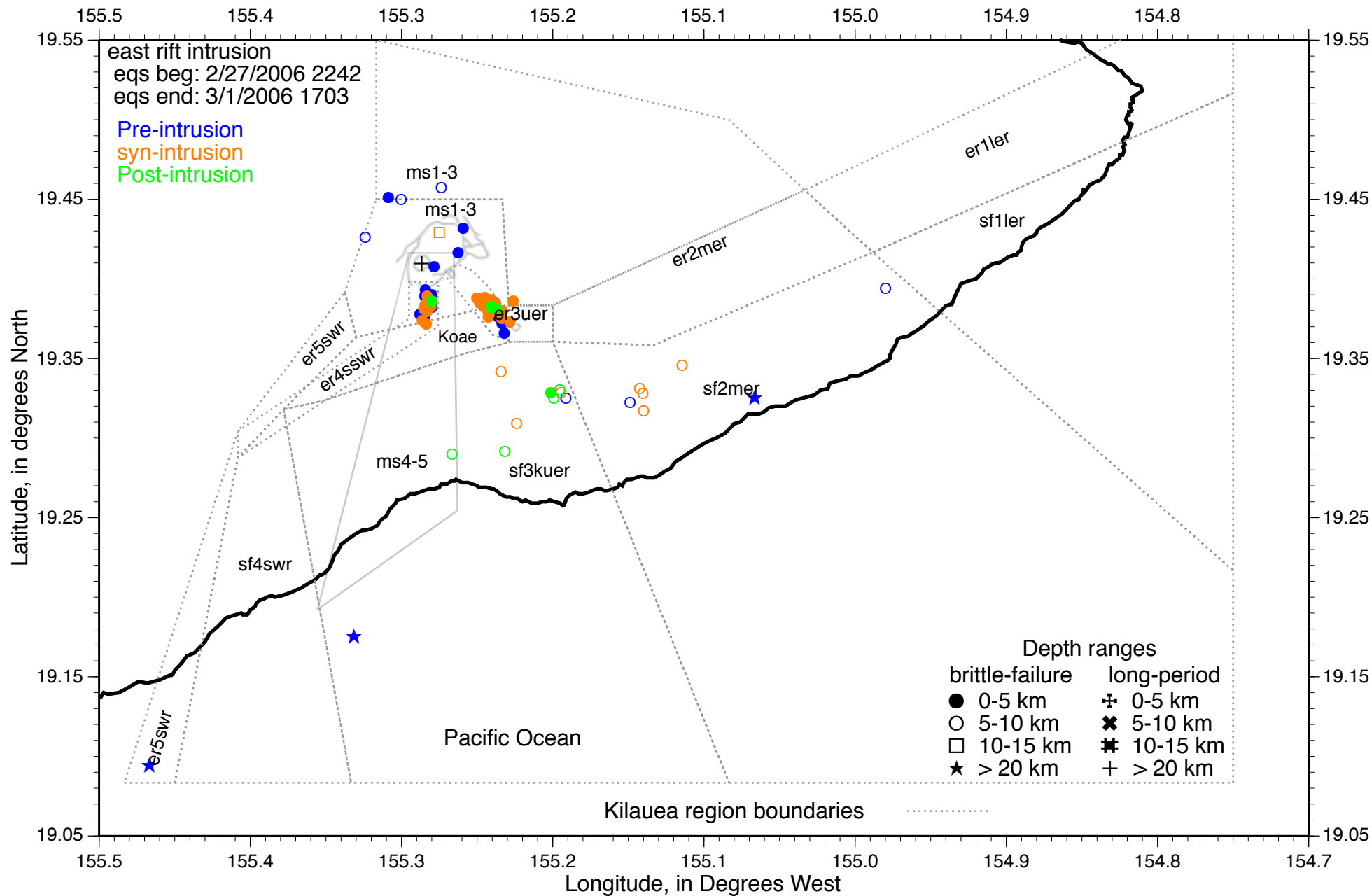
Appendix figure G65

2/22-24/2006 intrusions: data from 2/21-25/2006



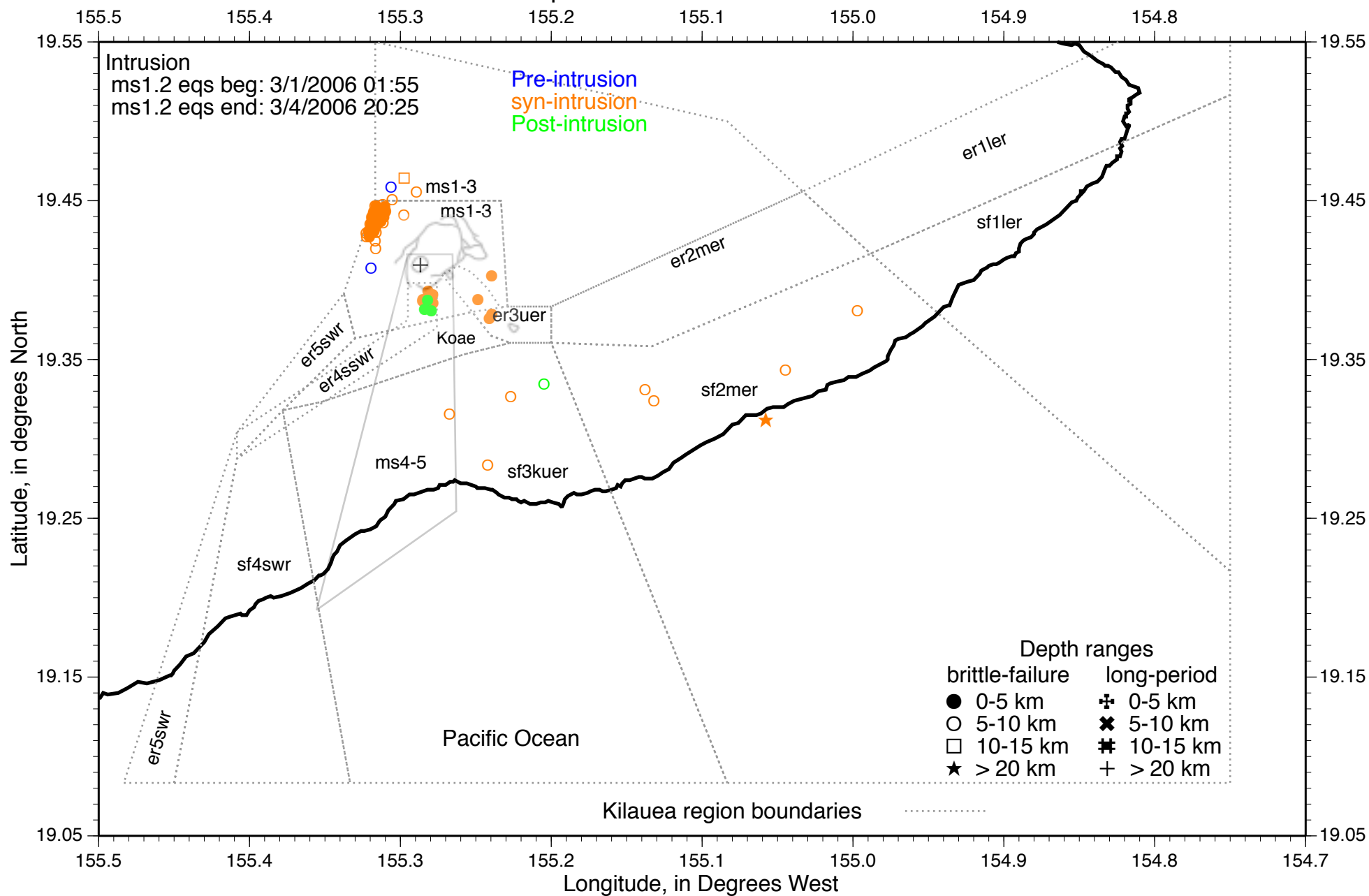
Appendix figure G66

2/27-3/1/2006 intrusion: data from 2/26-3/2/2006



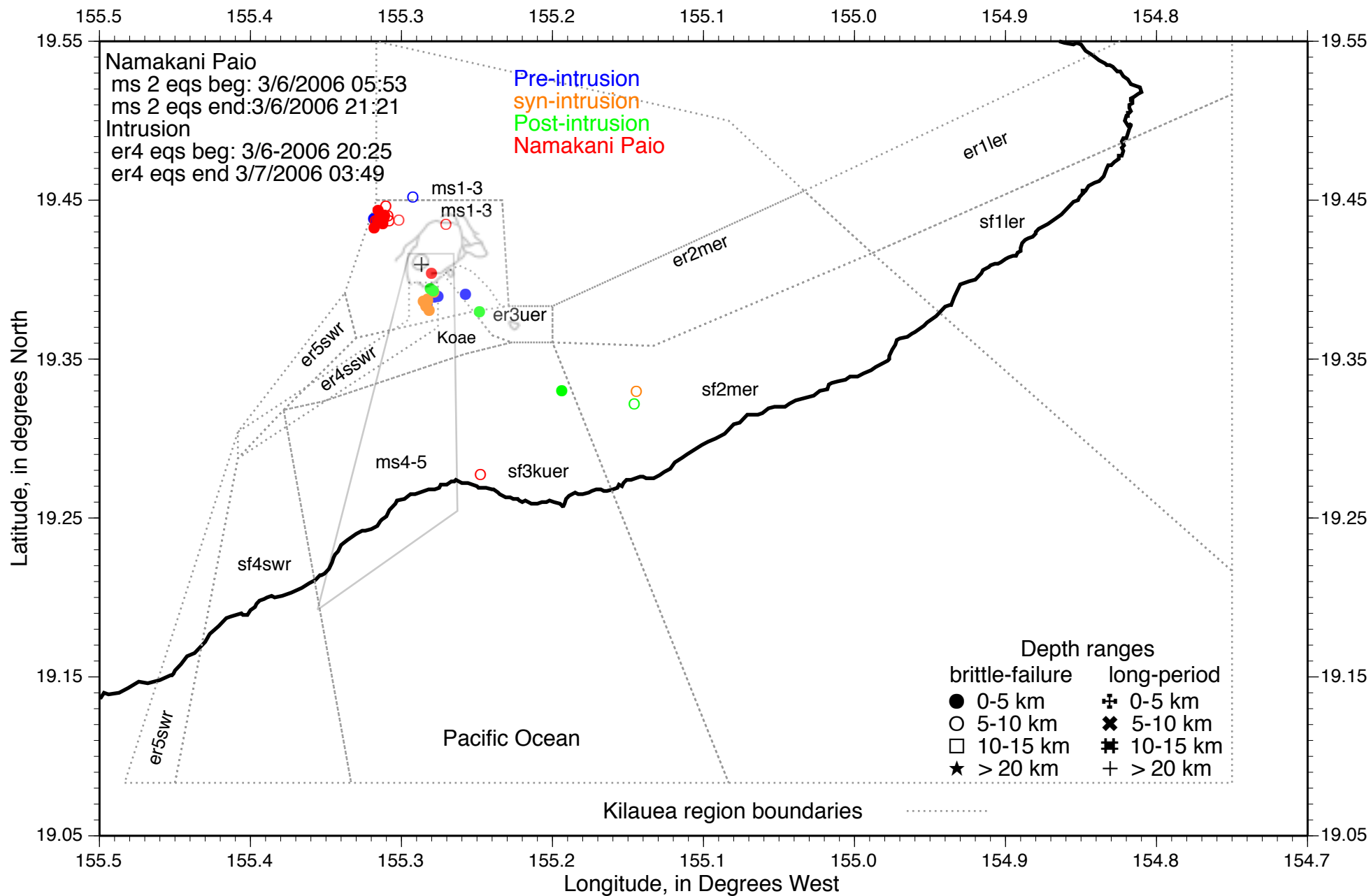
Appendix figure G67

Namakani Paio sequence 3/1-4/2006 intrusion: data from 3/1-5/2006



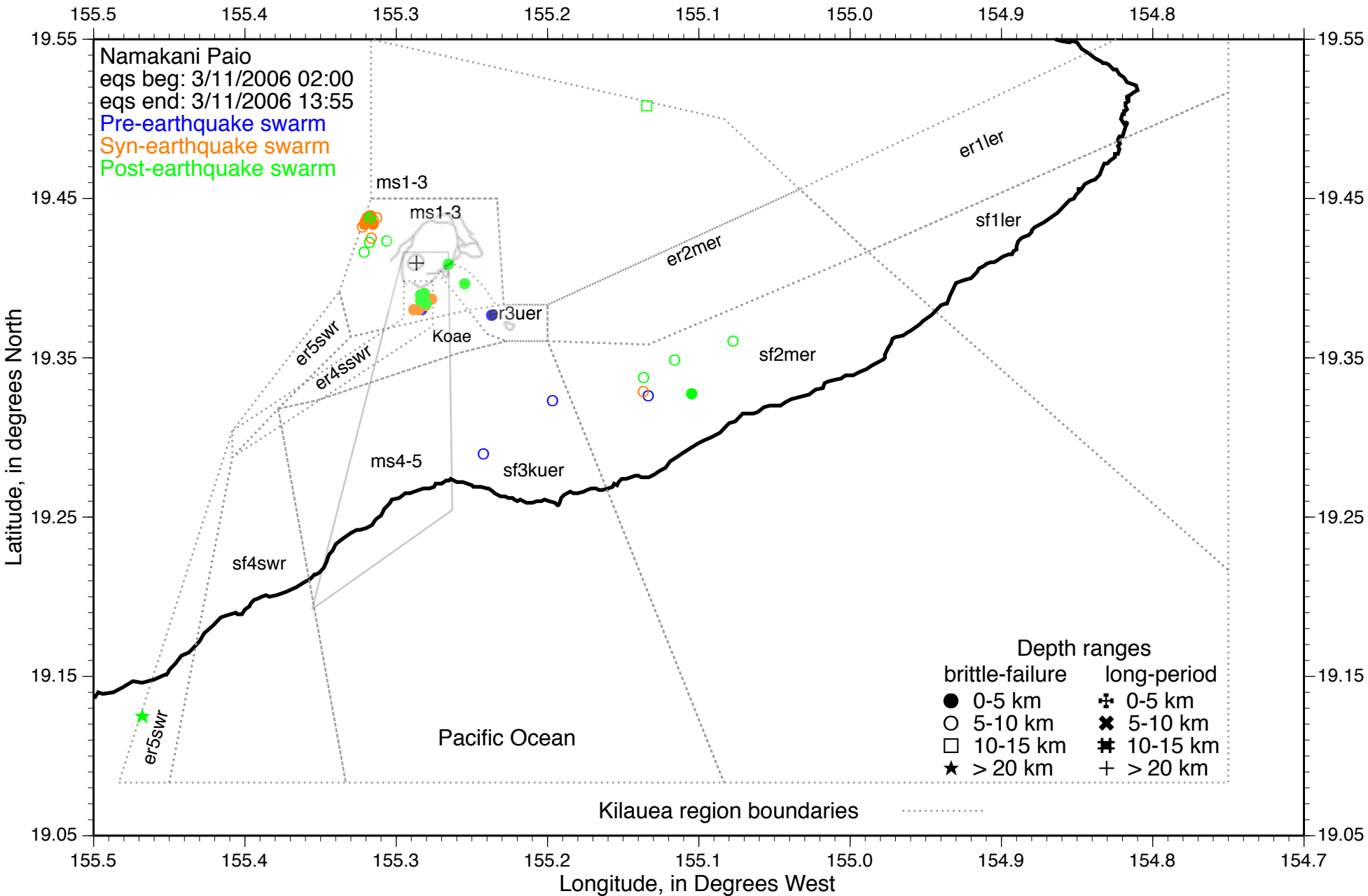
Appendix figure G68

3/6/2006 intrusion: data from 3/5-7/2006



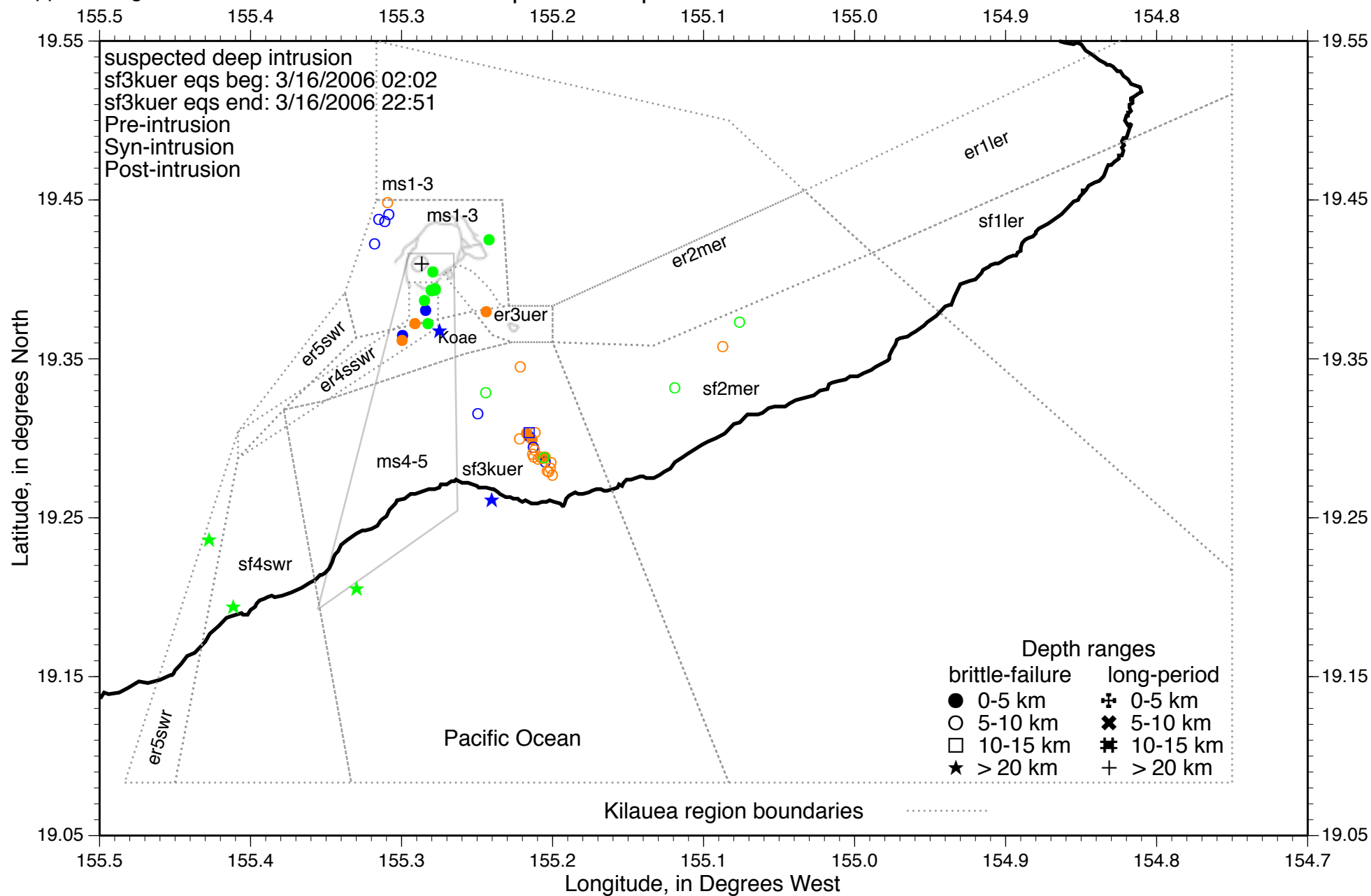
Appendix figure G69

3/11/2006 summit Namakani Paio seismicity: data from 3/10-12/2006



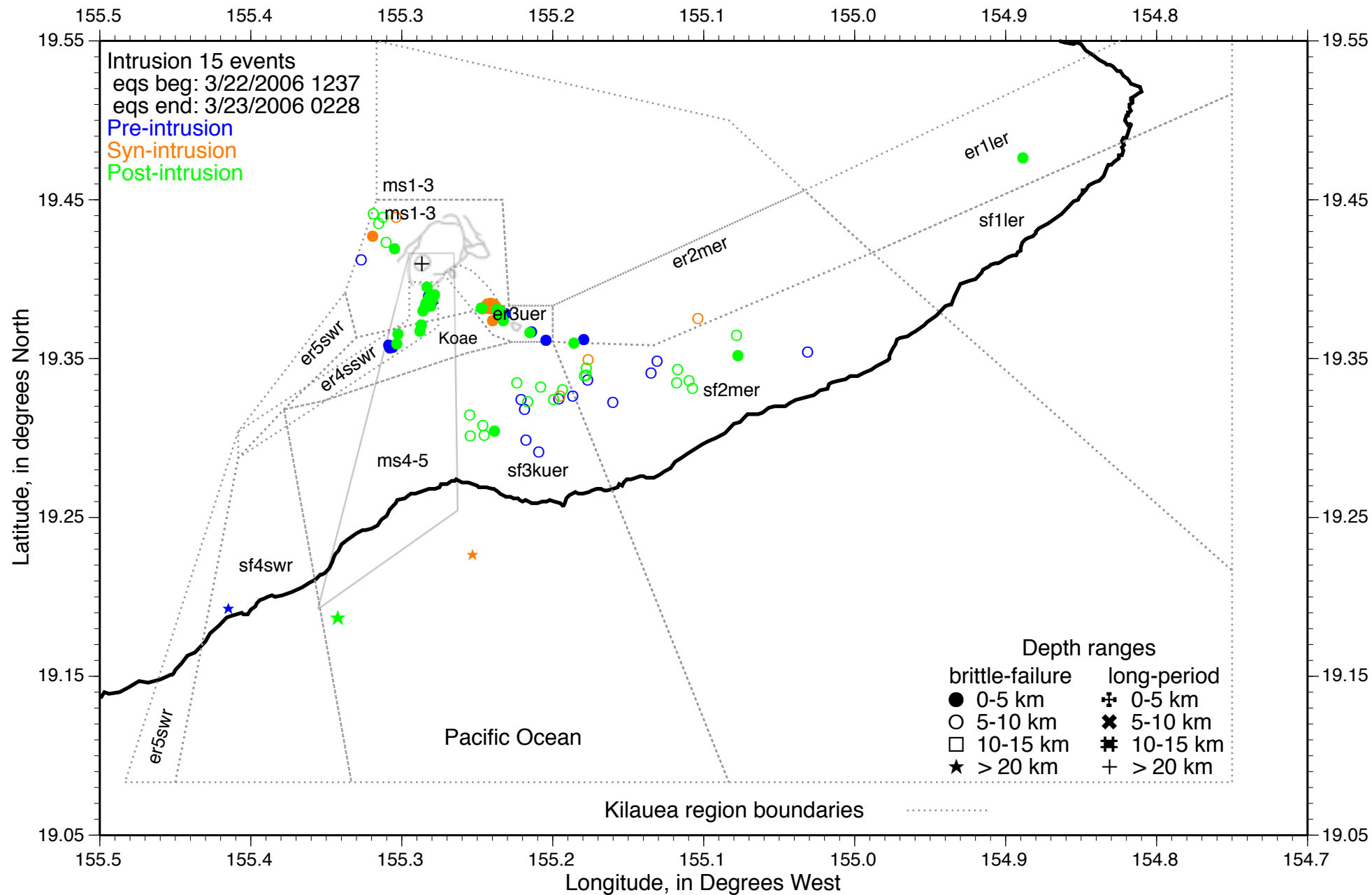
Appendix figure G70

3/16/2006 suspected deep intrusion?: data from 3/15-17/2006



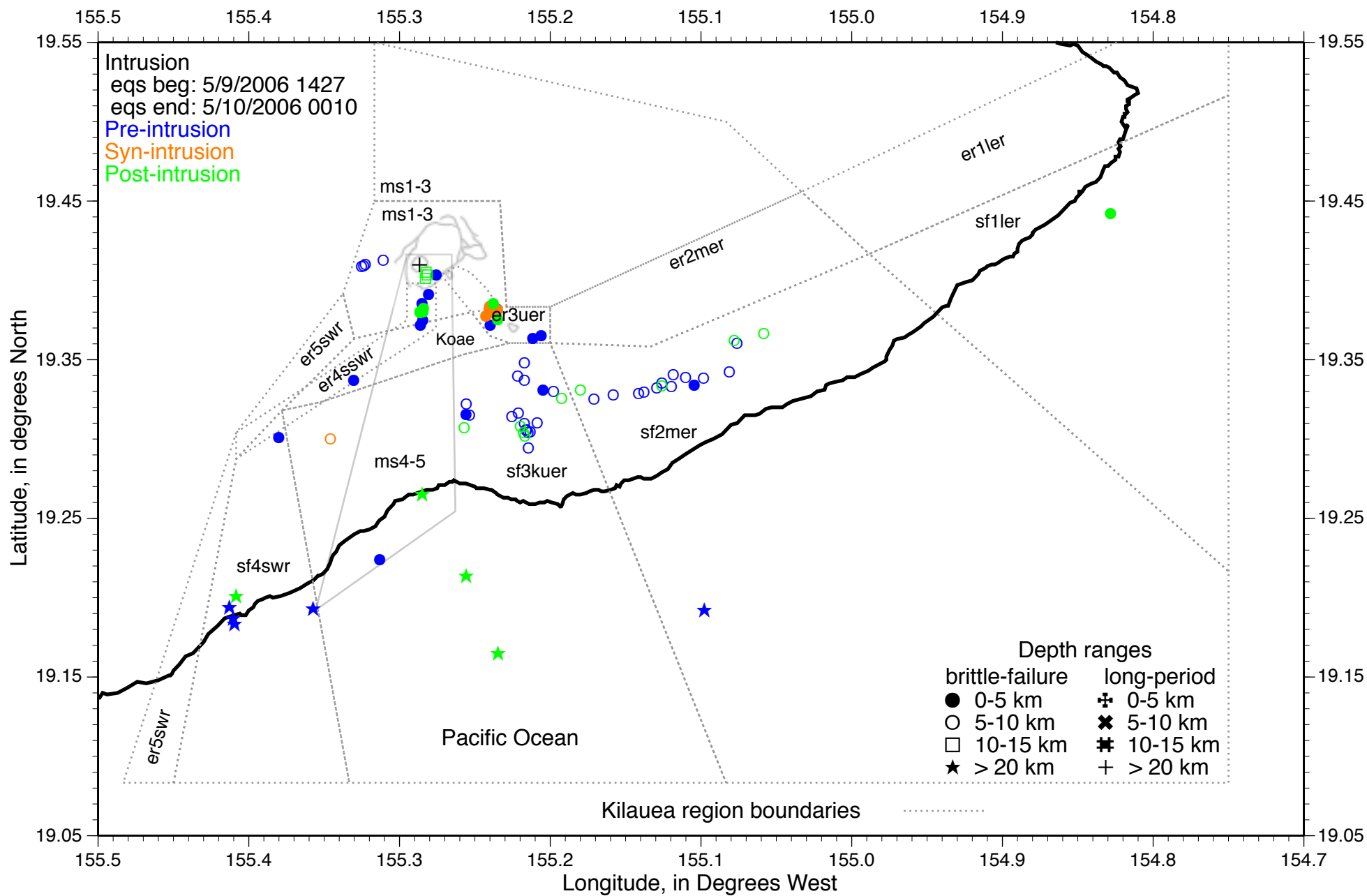
Appendix figure G71

3/22-23/2006 intrusion: data from 3/19-29/2006



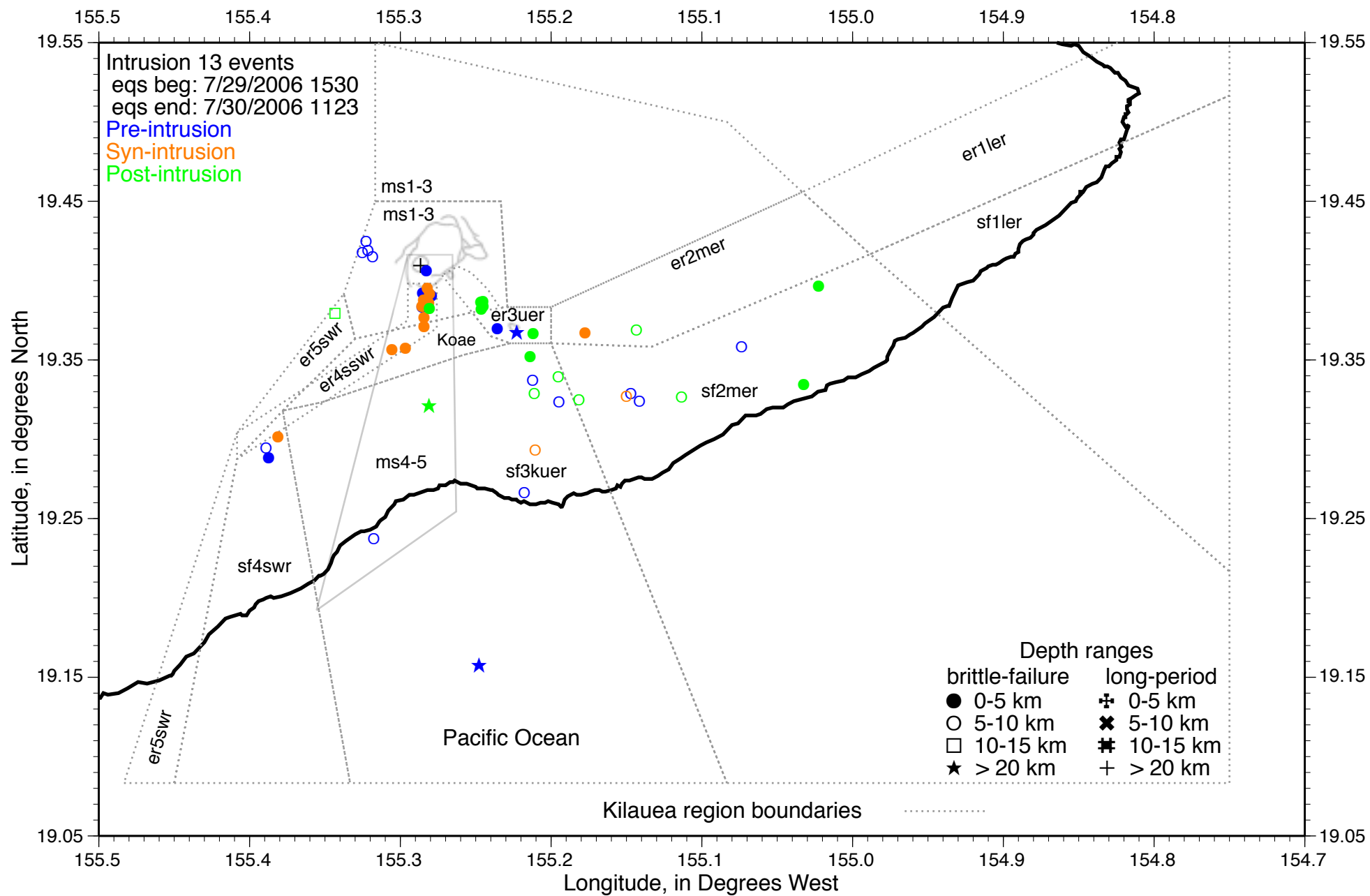
Appendix figure G72

5/9-10/2006 intrusion: data from 5/4-12/2006



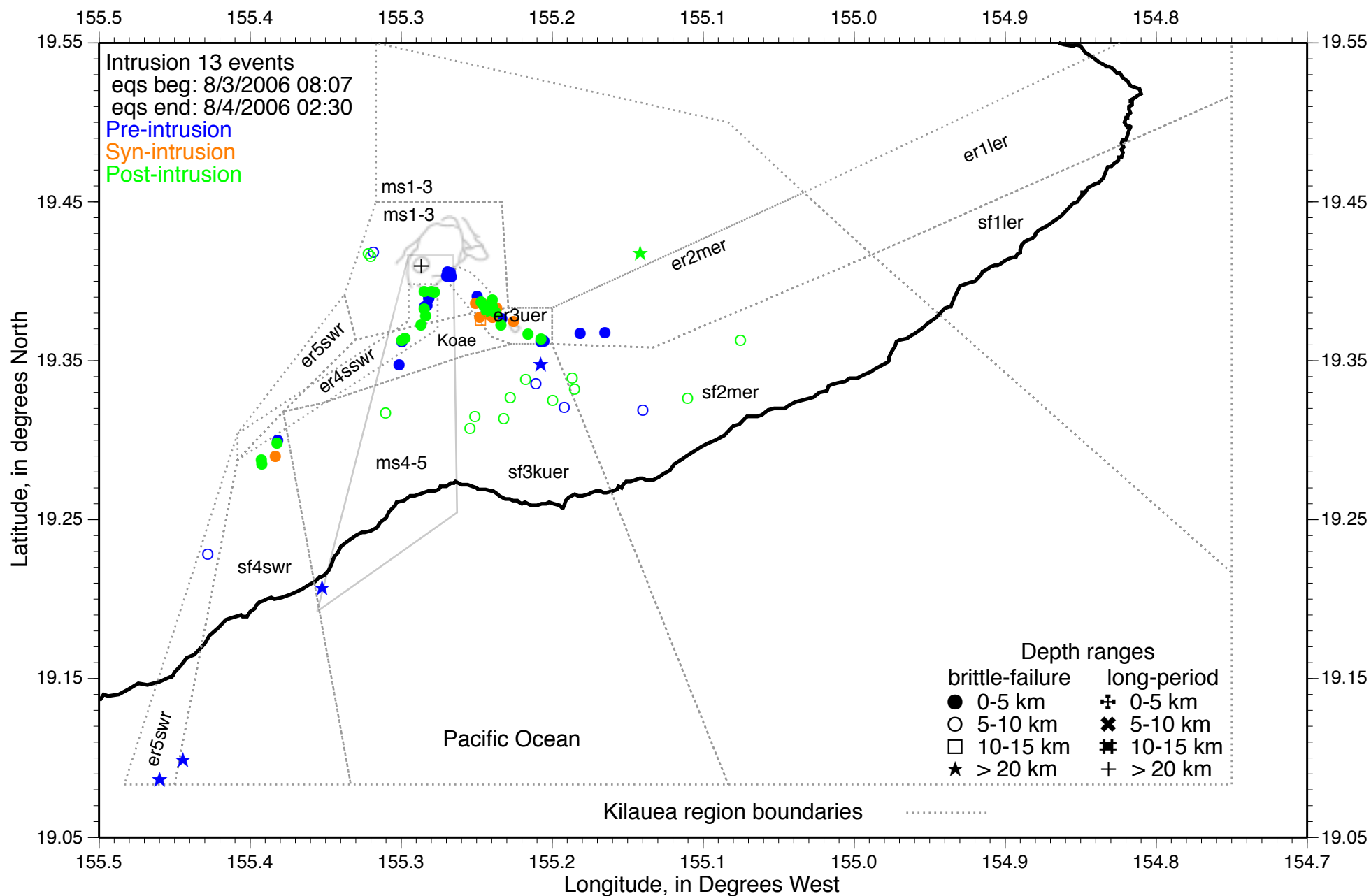
Appendix figure G73

7/29-30/2006 intrusion: data from 7/28-31/2006



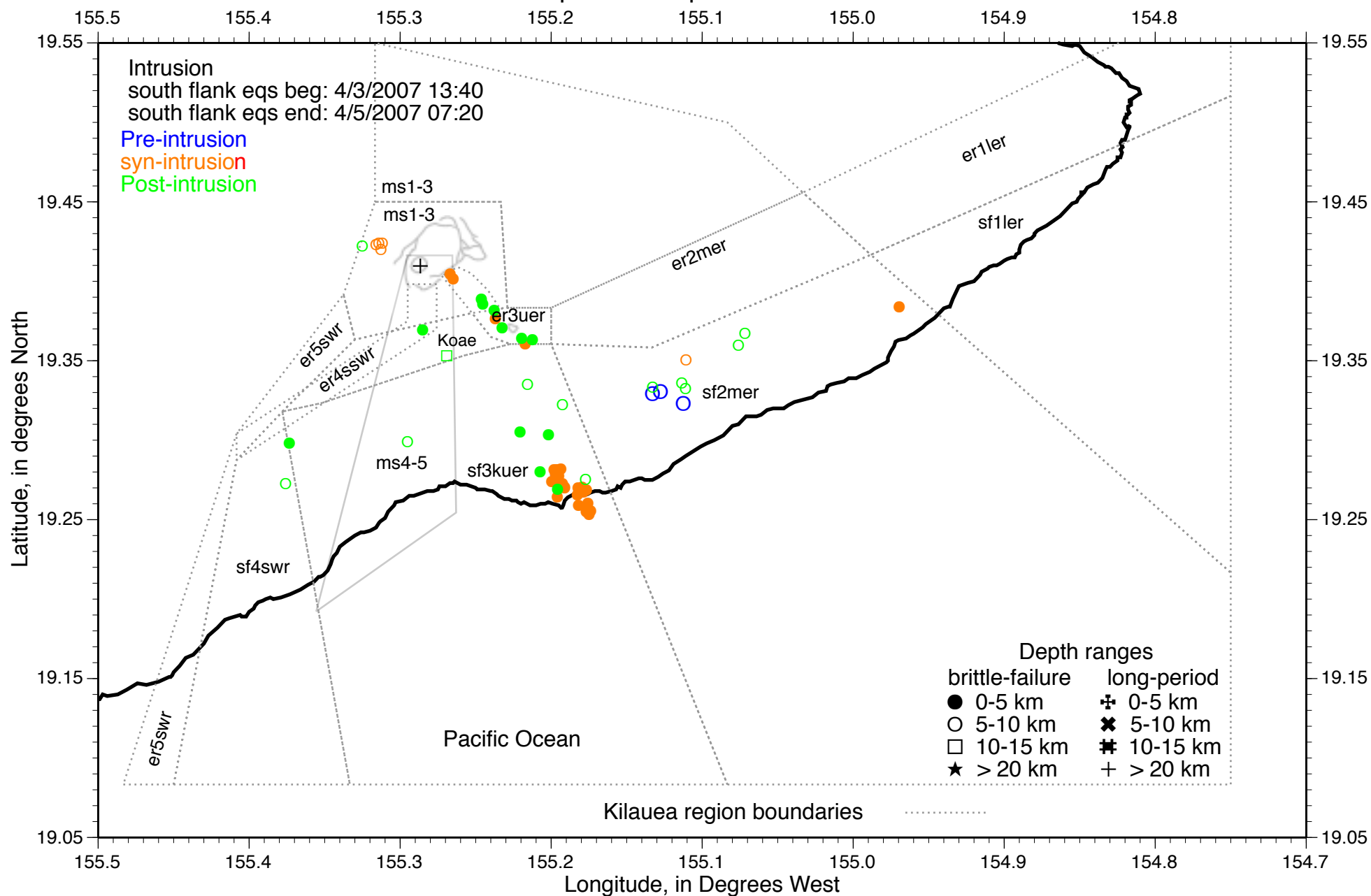
Appendix figure G74

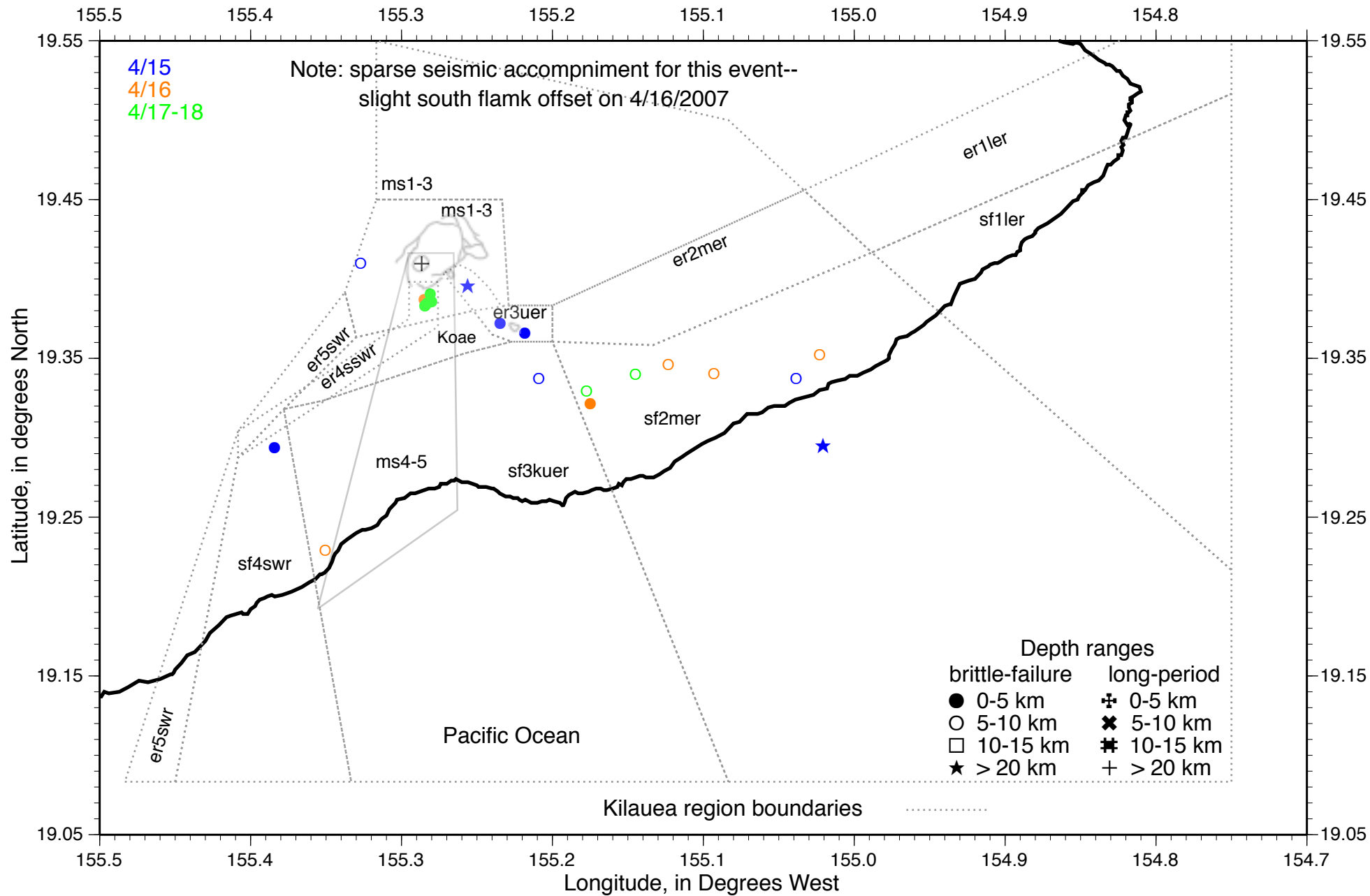
8/3-4/2006 intrusion: data from 8/1-8/2006



Appendix figure G75

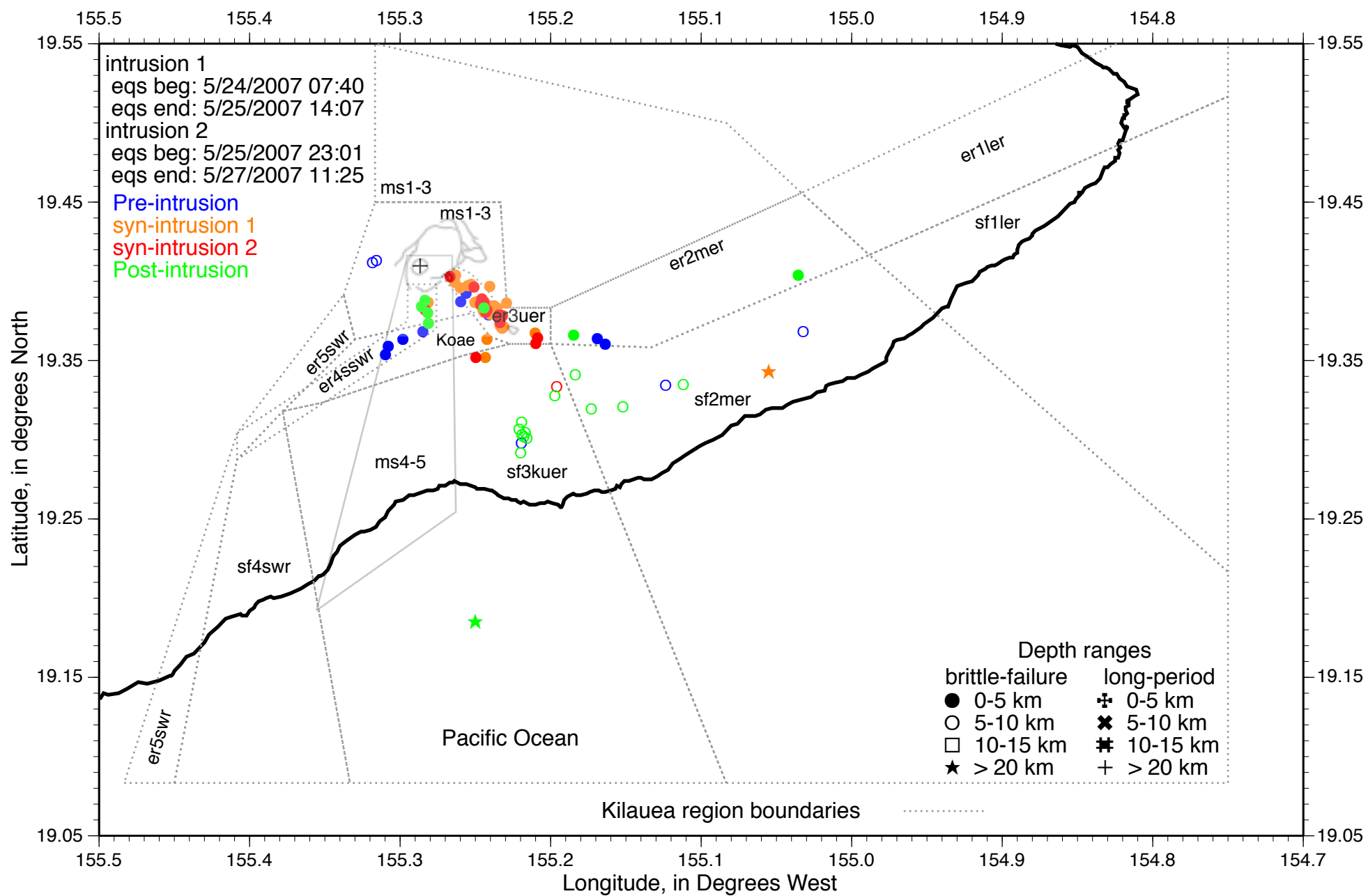
4/3-5/2007 suspected deep intrusion data from 4/1-10/2007





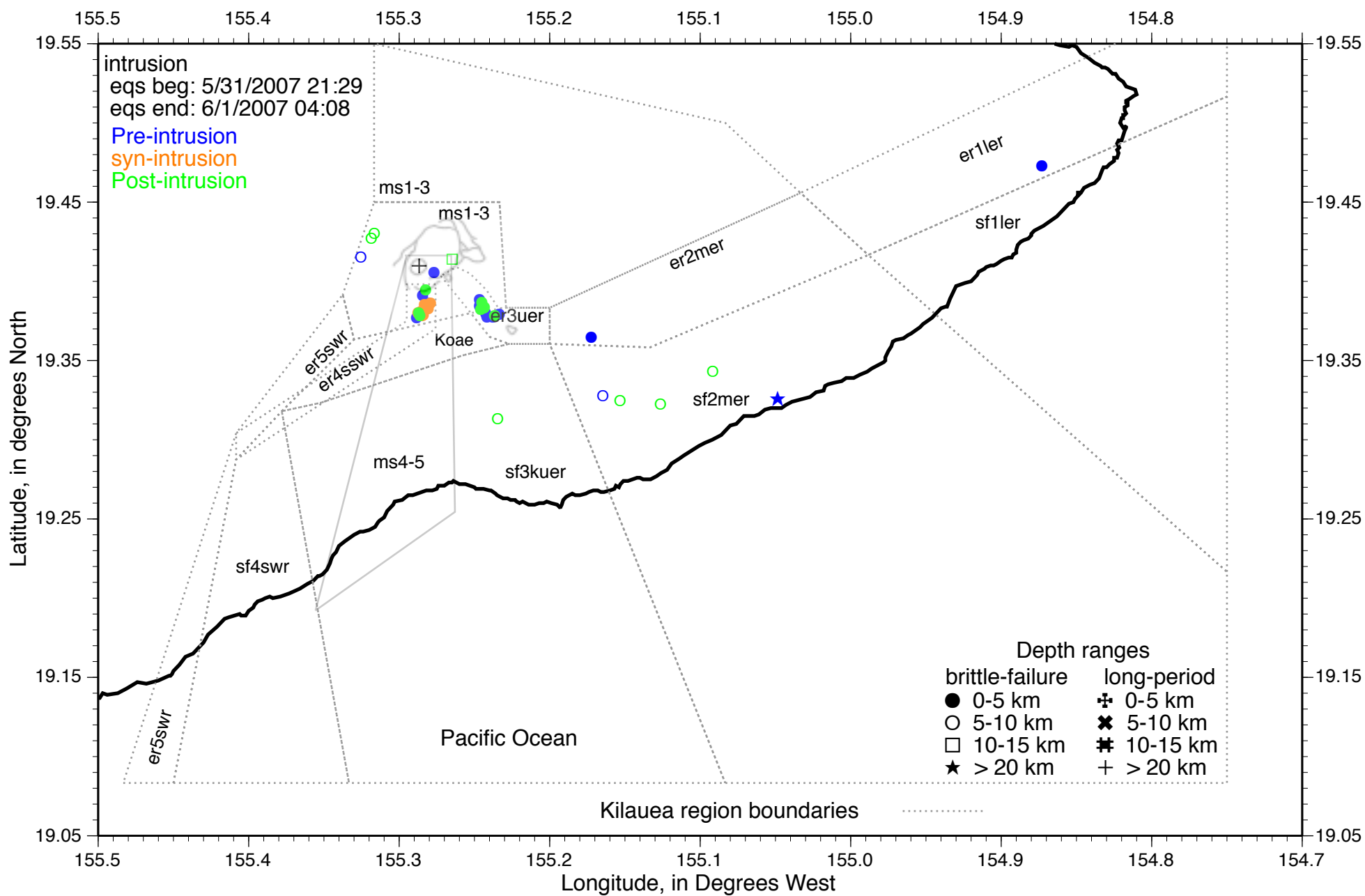
Appendix figure G77

5/24-27/2007 intrusions: data from 5/22-29/2007



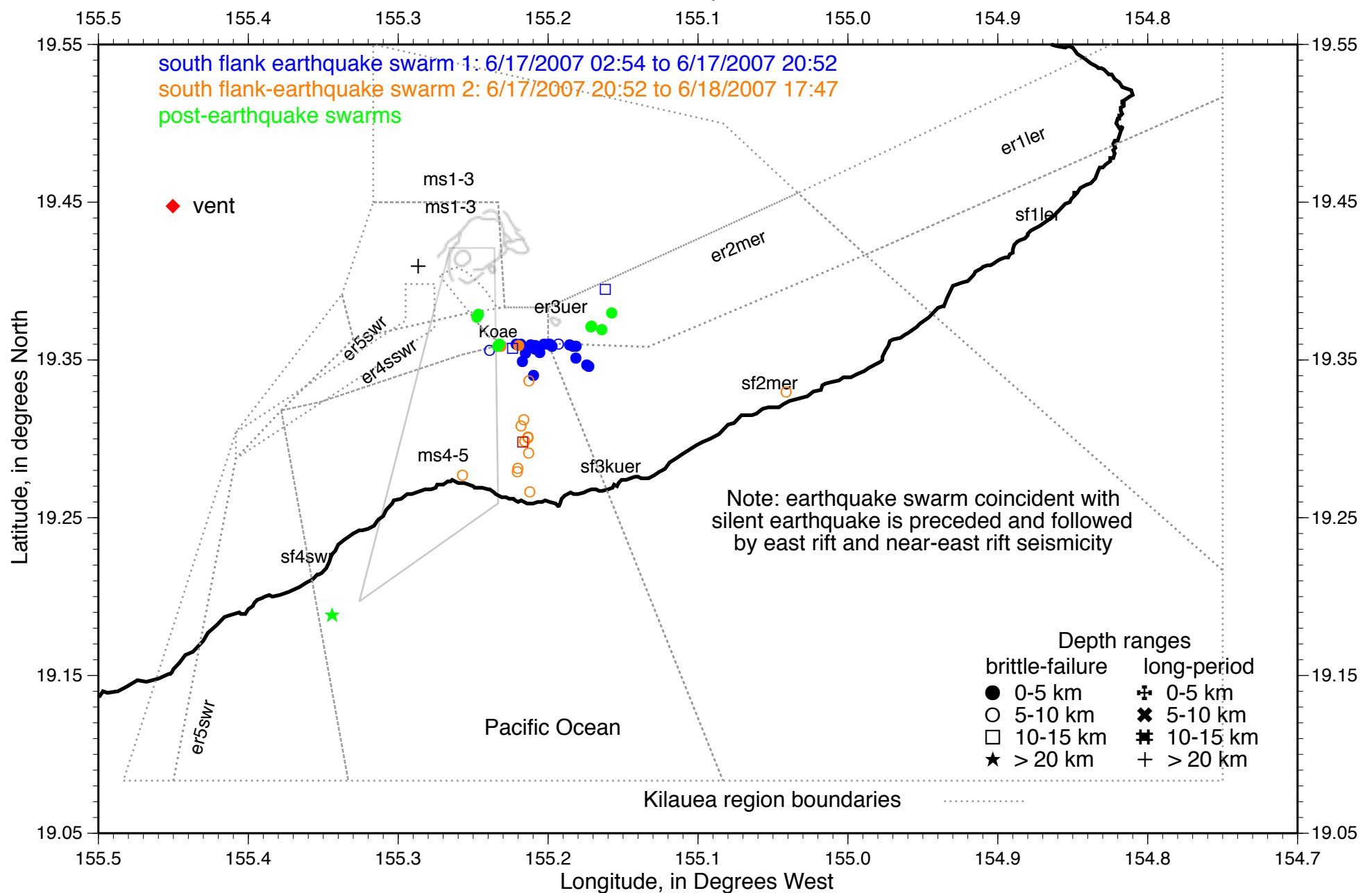
Appendix figure G78

5/31-6/1/2007 intrusion: data from 5/30-6/2/2007



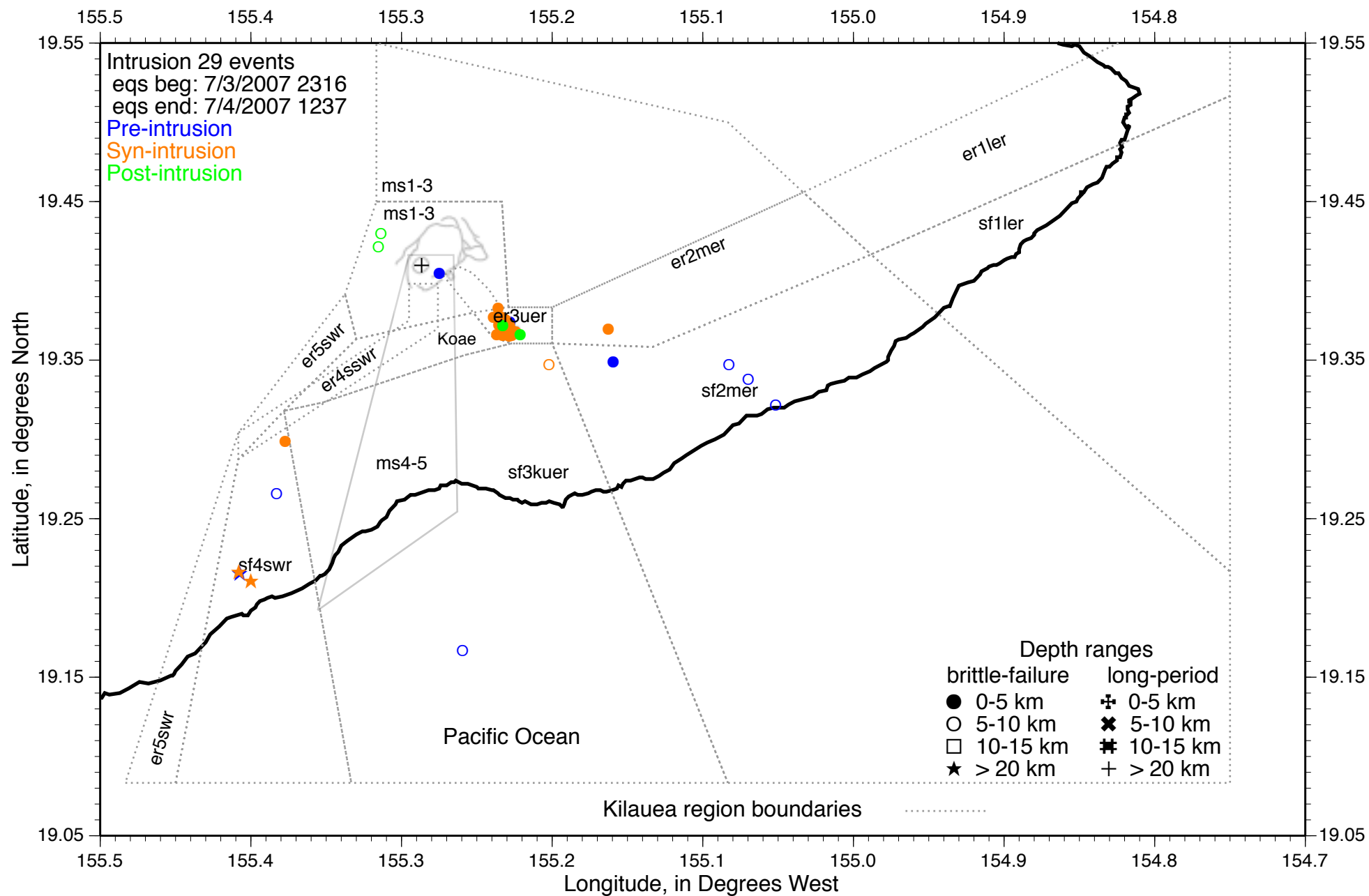
Appendix figure G79

6/18/2007 silent earthquake: data from 6/17-18/2007



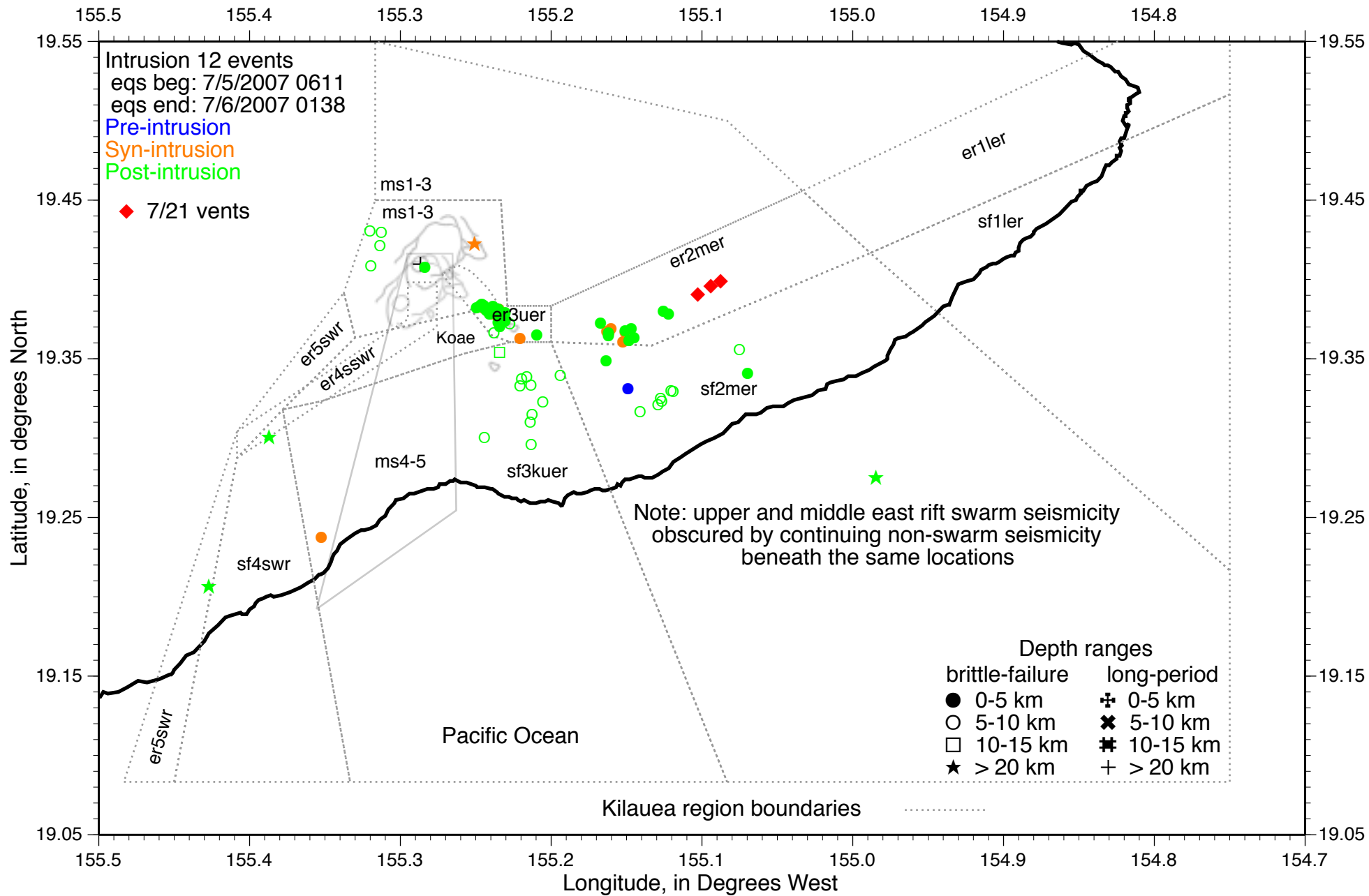
Appendix figure G80

7/3-4/2007 intrusion: data from 7/2-4/2007



Appendix figure G81

7/5-6/2007 intrusion: data from 7/5-11/2007



Appendix figure G82

7/16-17/2007 intrusion: data from 7/12-21/2007

