

Supplementary material: fit of synthetic to observed waveforms for waveform-modelled earthquakes

Andy Howell, James Jackson, Alex Copley, Dan M^cKenzie and Ed Nissen

Source parameters for each earthquake and sources for epicentres are listed in Table S1. A description of the features of the figures is found in Figure S1. Details of the inversion procedure are found in Section 2 of the main text.

Year	Month	Day	Lon. (°)	Lat. (°)	Depth (km)	Strike (°)	Dip (°)	Rake (°)	M_W	Epicentre
1990	07	18	29.533	37.032	10	96	49	-119	5.4	EHB
1994	11	13	29.058	36.946	8	285	48	-94	5.4	EHB
1995	05	29	32.244	35.058	15	258	28	150	5.2	EHB
1995	02	23	32.269	35.060	11	221	15	120	5.9	EHB
2003	05	03	31.514	36.898	128	356	35	152	5.4	EHB
2005	01	23	29.708	35.894	34	228	61	0	5.7	EHB
2007	10	29	29.342	36.908	20	275	37	-107	5.3	EHB
2009	06	19	28.4806	35.3441	36	245	43	-64	5.8	ISC
2009	07	01	25.5396	34.1472	7	268	23	76	6.5	ISC
2009	12	22	31.5347	35.7334	44	313	27	90	5.2	ISC
2010	04	24	26.0835	34.2407	8	67	58	66	5.4	ISC
2011	04	01	26.5466	35.7317	66	138	69	11	6.1	ISC
2012	06	10	28.9676	36.3847	31	201	83	0	6.2	ISC
2012	07	09	28.9489	35.5969	51	43	79	2	5.7	ISC
2012	09	12	24.0647	34.8285	23	280	19	70	5.5	ISC
2013	06	15	25.0440	34.4507	20	284	2	95	6.2	ISC
2013	06	16	25.1864	34.4242	18	182	8	343	6.0	ISC
2013	12	28	31.3184	36.0497	46	293	28	75	5.9	ISC
2015	04	16	26.82	35.14	20	344	68	103	6.1	PDE
2015	06	09	26.79	35.04	16	23	56	-117	5.3	PDE

Table S1: Dates and source parameters of earthquakes in the eastern Mediterranean obtained by inversion body waveforms. Moment magnitudes (M_W) were calculated using the formula of (*Hanks and Kanamori, 1979*). Epicentres are from the EHB catalogue (*Engdahl et al., 1998*) for earthquakes before 2009 and the reviewed ISC catalogue (*International Seismological Centre, 2016*) between 2009 and January 2014. For earthquakes since February 2014 we use USGS PDE epicentres.

1990 July 18 SW Turkey Mw 5.4

96/49/241/10/1.271E17

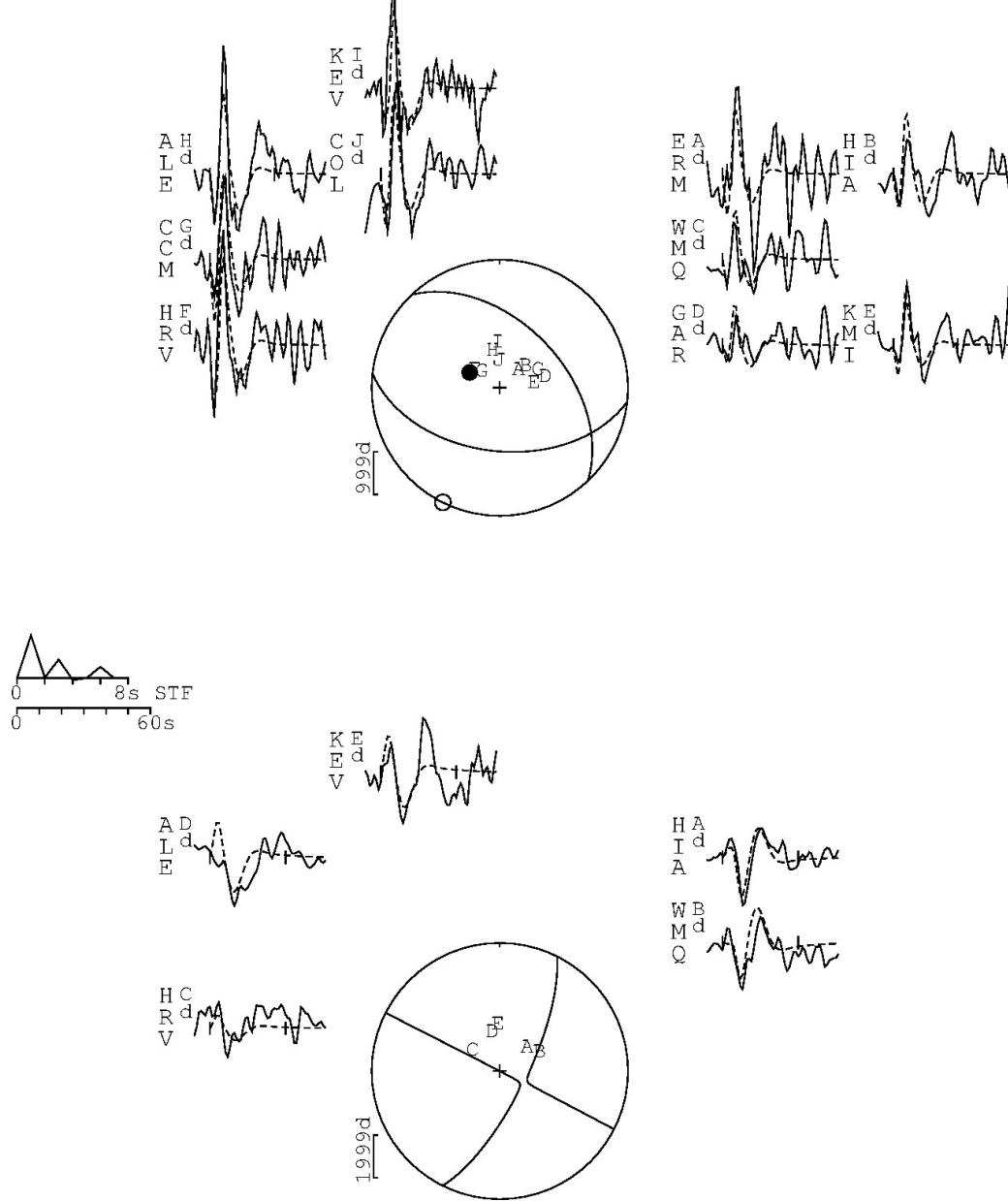


Figure S1: Fit of synthetic to observed waveforms for the 1990 July 18 SW Turkey M_W 5.4 earthquake. The source parameters for this earthquake are listed in Table S1. The event header (below the earthquake header at top) shows the strike, dip, rake, centroid depth and scalar seismic moment (in Nm) of the minimum misfit solution. The top focal sphere shows the lower hemisphere stereographic projection of the P-waveform nodal planes, and the positions of the seismic stations used in the inversion. The lower panel shows the SH focal sphere. Capital letters next to the station codes correspond to the position on the focal sphere, ordered clockwise by azimuth, starting at north. Solid and dashed lines show the observed and synthetic waveforms respectively. The inversion window is marked by vertical lines on each waveform. The source-time function (STF) is shown, with the time scale for the waveforms below it. The amplitude scales for the waveforms are shown below each focal sphere. The P- and T-axes within the P-waveform focal sphere are shown by a solid and an open circle, respectively.

1994 November 13 SW Turkey M_W 5.4
285/48/266/8/1.1E17

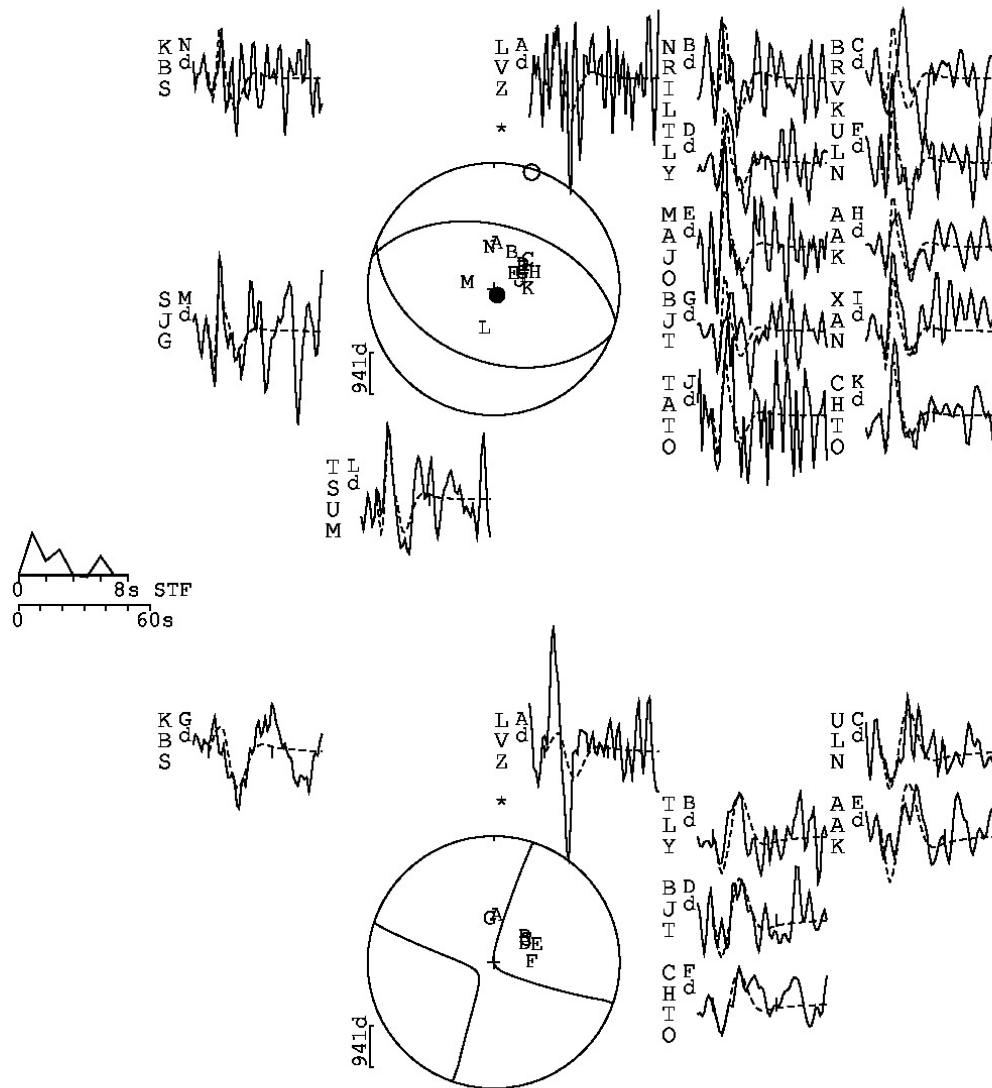


Figure S2: Fit of synthetic to observed waveforms for the 1994 November 13 SW Turkey M_W 5.4 earthquake. The source parameters for this earthquake are listed in Table S1 and the main features of the figure are the same as for Figure S1.

1995 May 29 Cyprus Mw 5.2

258/28/150/15/6.346E16

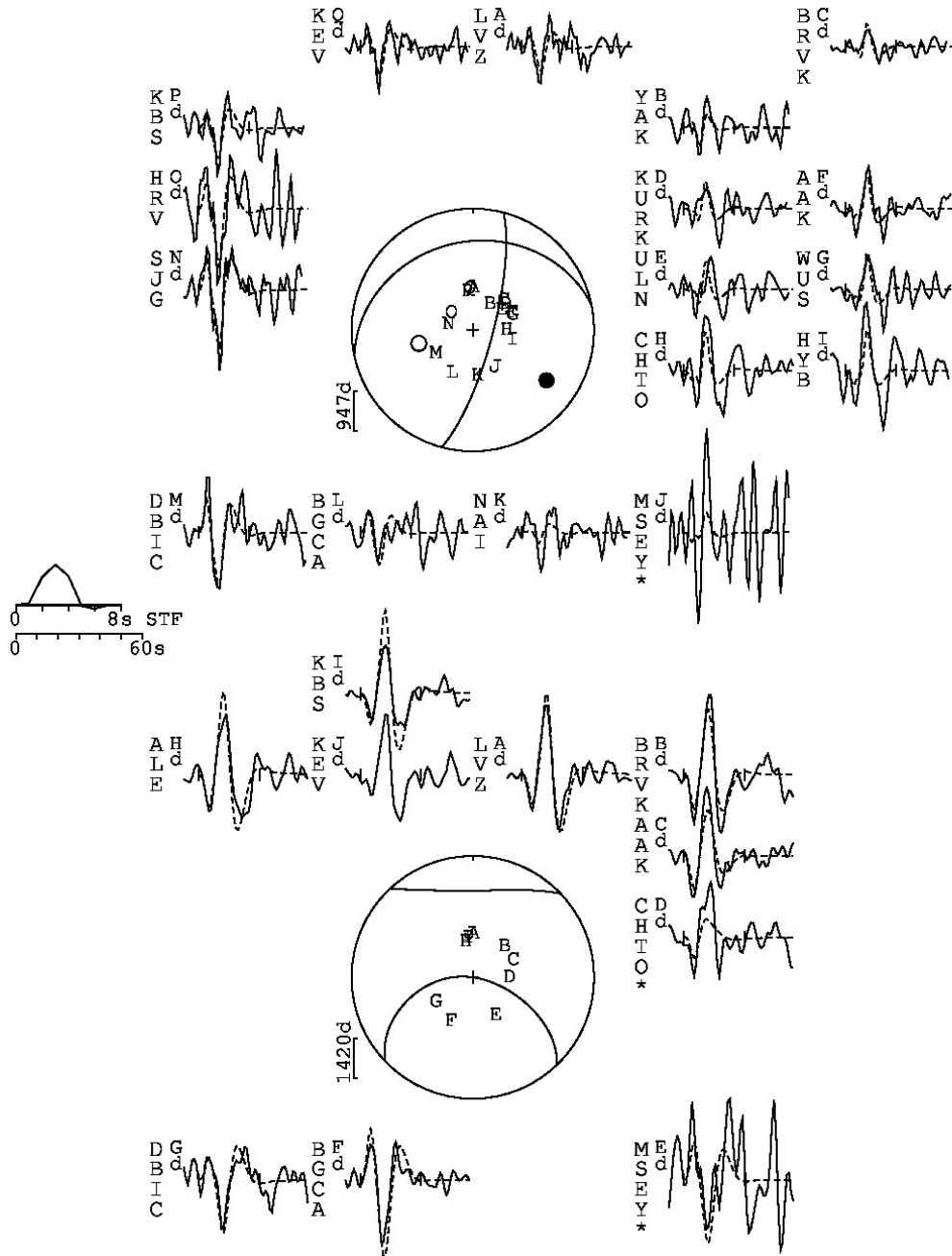


Figure S3: Fit of synthetic to observed waveforms for the 1995 May 29 Cyprus M_W 5.2 earthquake. The source parameters for this earthquake are listed in Table S1 and the main features of the figure are the same as for Figure S1.

1995 May 29 Cyprus Mw 5.2

258/28/150/15/6.346E16

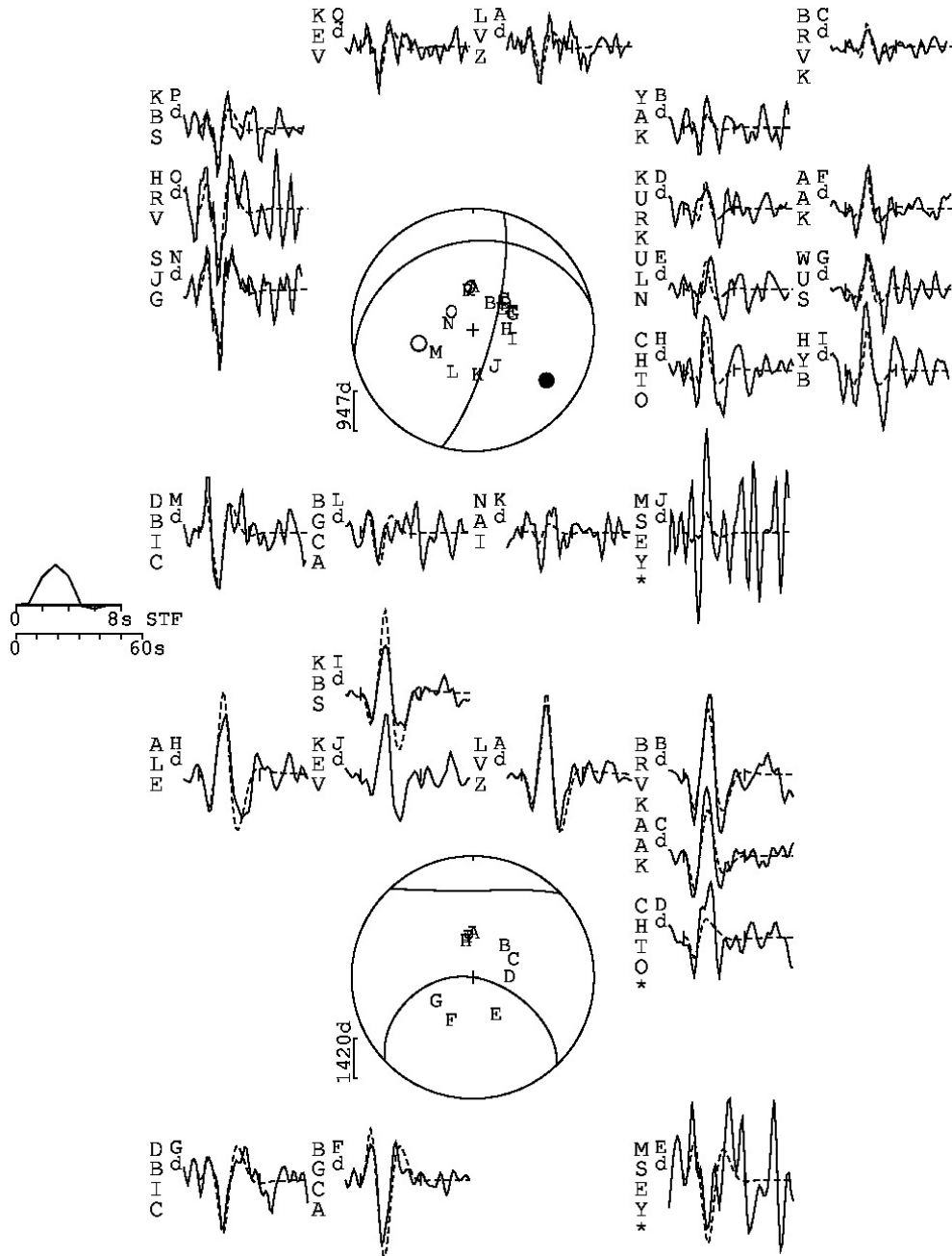


Figure S4: Fit of synthetic to observed waveforms for the 1995 February 23 Methoni M_W 5.9 earthquake. The source parameters for this earthquake are listed in Table S1 and the main features of the figure are the same as for Figure S1.

1995 May 29 Cyprus Mw 5.2

258/28/150/15/6.346E16

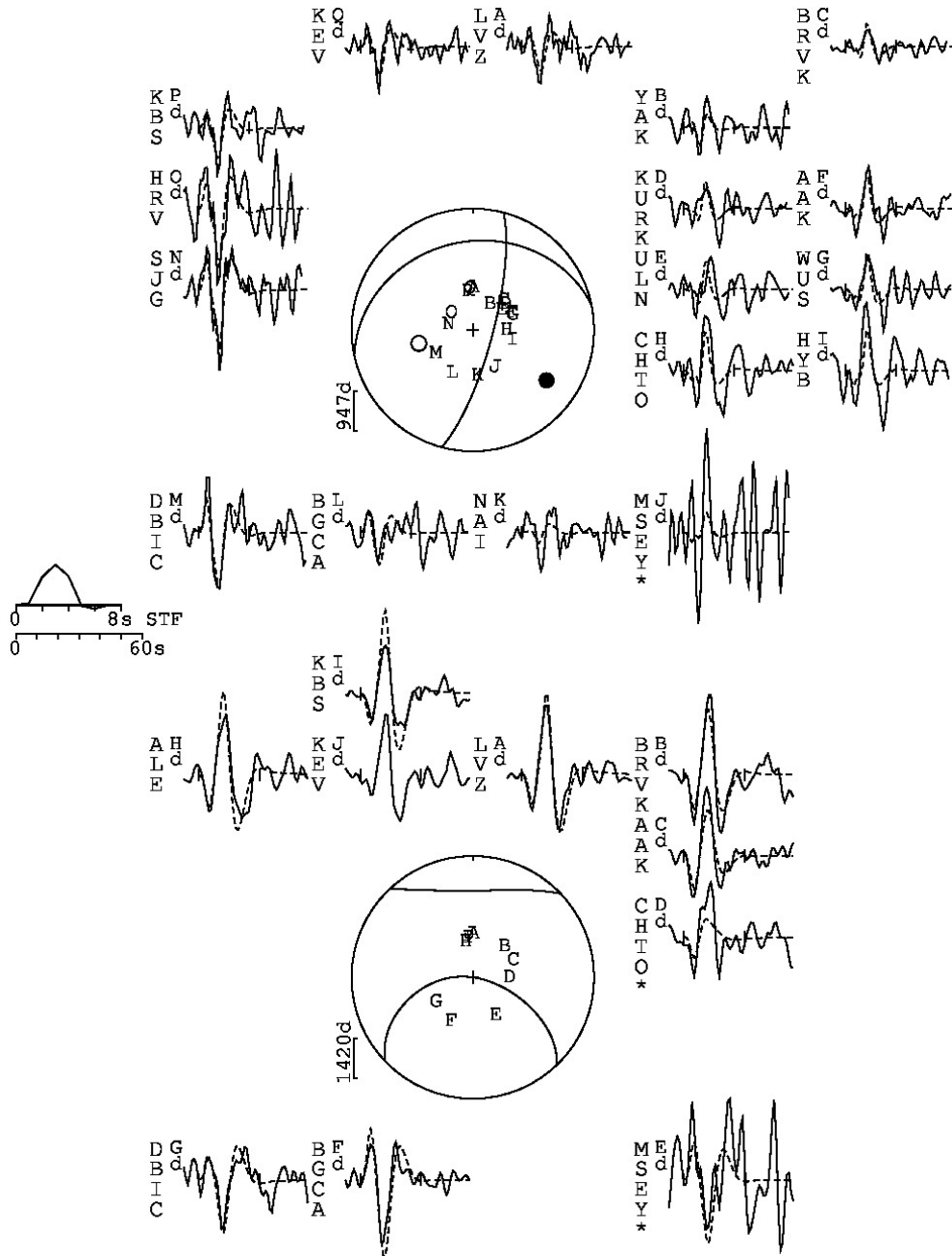


Figure S5: Fit of synthetic to observed waveforms for the 2003 May 03 Anaximander mountains M_W 5.4 earthquake. The source parameters for this earthquake are listed in Table S1 and the main features of the figure are the same as for Figure S1.

2005 Jan 23 Anaximander Mountains Mw 5.7

228/61/0/34/3.045E17

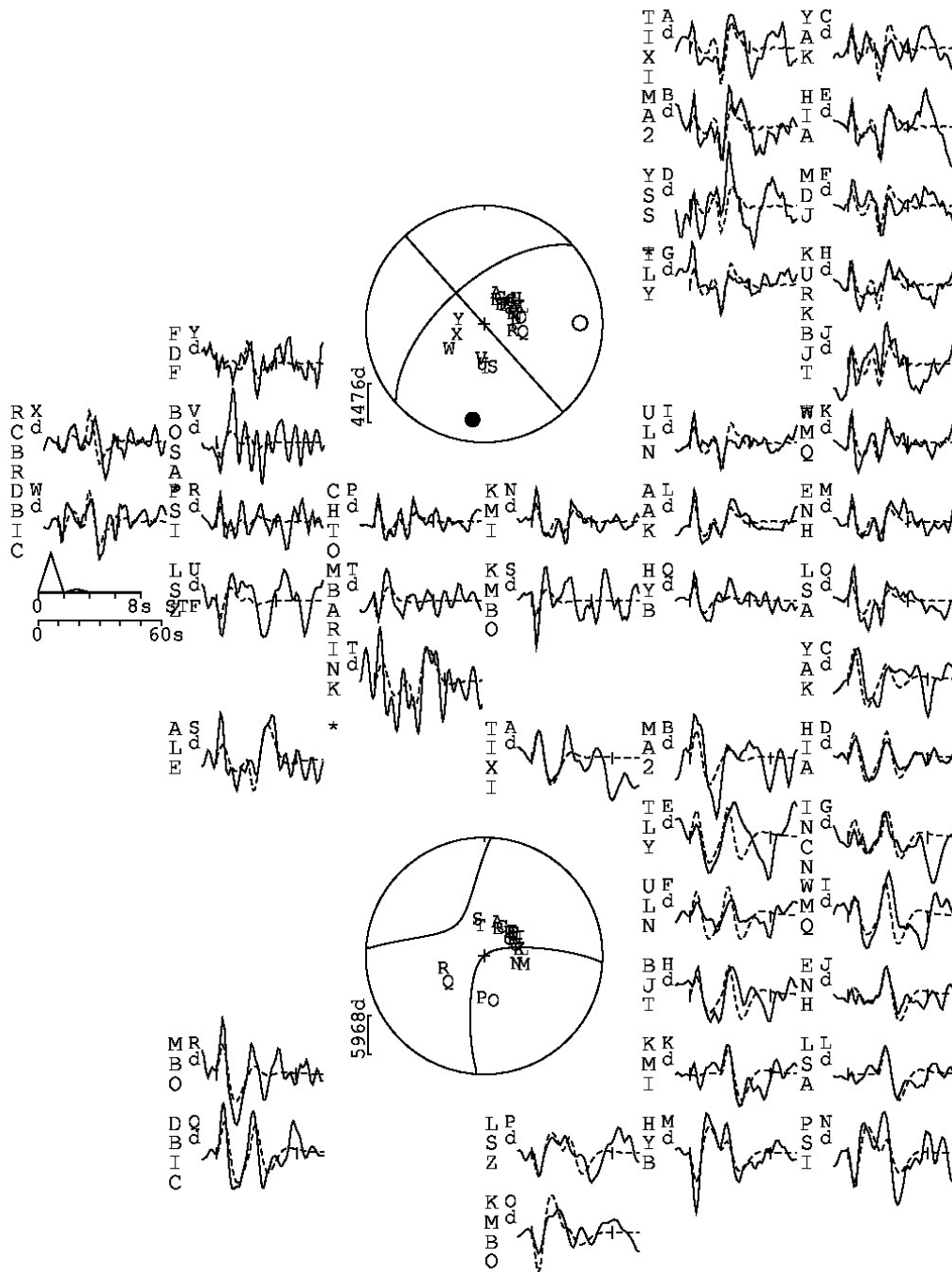


Figure S6: Fit of synthetic to observed waveforms for the 2005 January 23 S Turkey M_W 5.7 earthquake. The source parameters for this earthquake are listed in Table S1 and the main features of the figure are the same as for Figure S1.

2007 October 29 SW Turkey Mw 5.3
 275/37/253/9/7.736E16

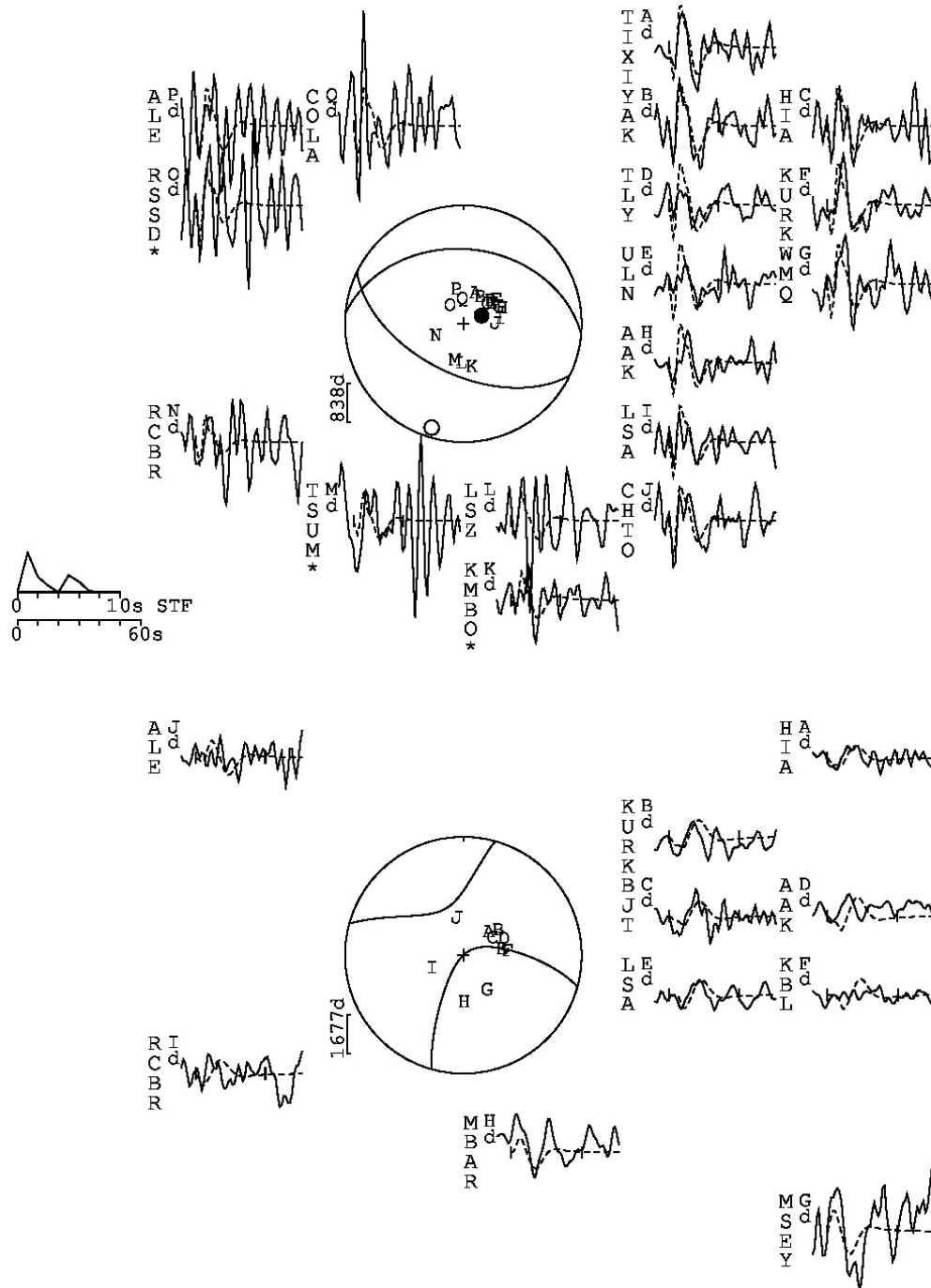


Figure S7: Fit of synthetic to observed waveforms for the 2007 October 29 Methoni M_W 5.3 earthquake. The source parameters for this earthquake are listed in Table S1 and the main features of the figure are the same as for Figure S1.

2009 June 19 S of Rhodes Mw 5.8

245/43/296/36/4.463E17

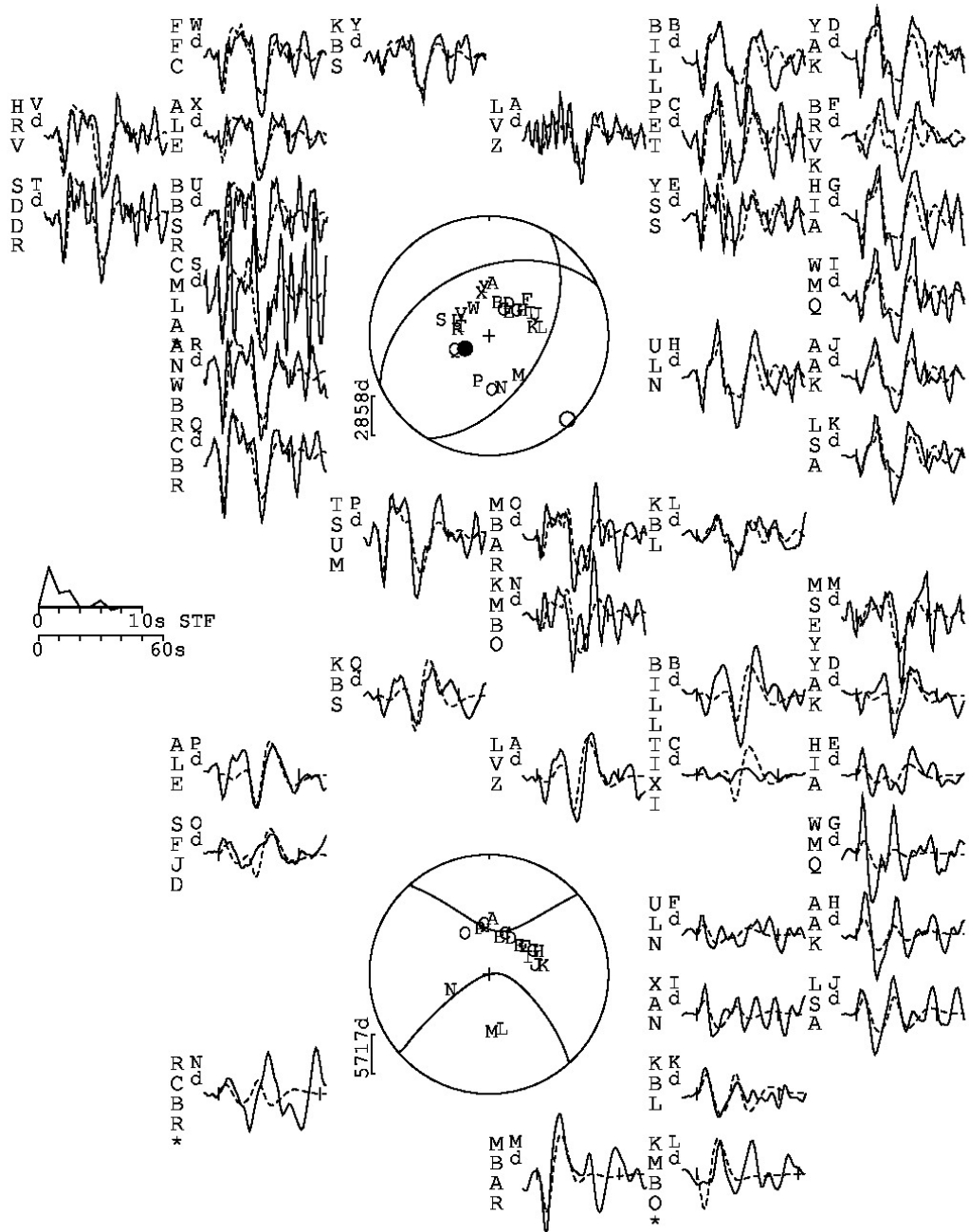


Figure S8: Fit of synthetic to observed waveforms for the 2009 June 19 S of Rhodes M_W 5.8 earthquake. The source parameters for this earthquake are listed in Table S1 and the main features of the figure are the same as for Figure S1.

2009 July 01 Crete Mw 6.5 268/23/76/16.975E18

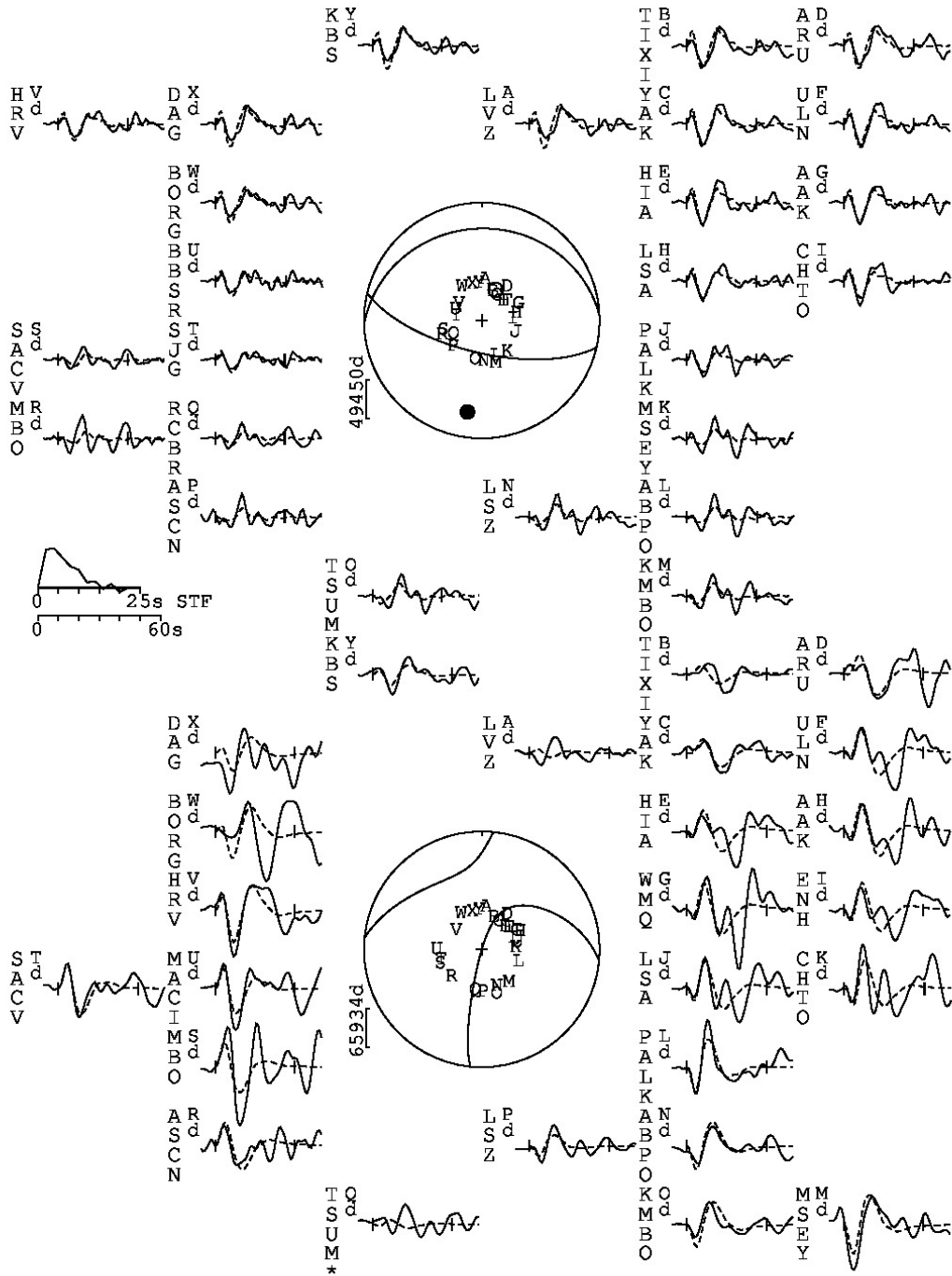


Figure S9: Fit of synthetic to observed waveforms for the 2009 July 01 Crete M_W 6.5 earthquake. The source parameters for this earthquake are listed in Table S1 and the main features of the figure are the same as for Figure S1.

2009 December 22 Florence Rise Mw 5.2
313/27/90/44/6.786E16

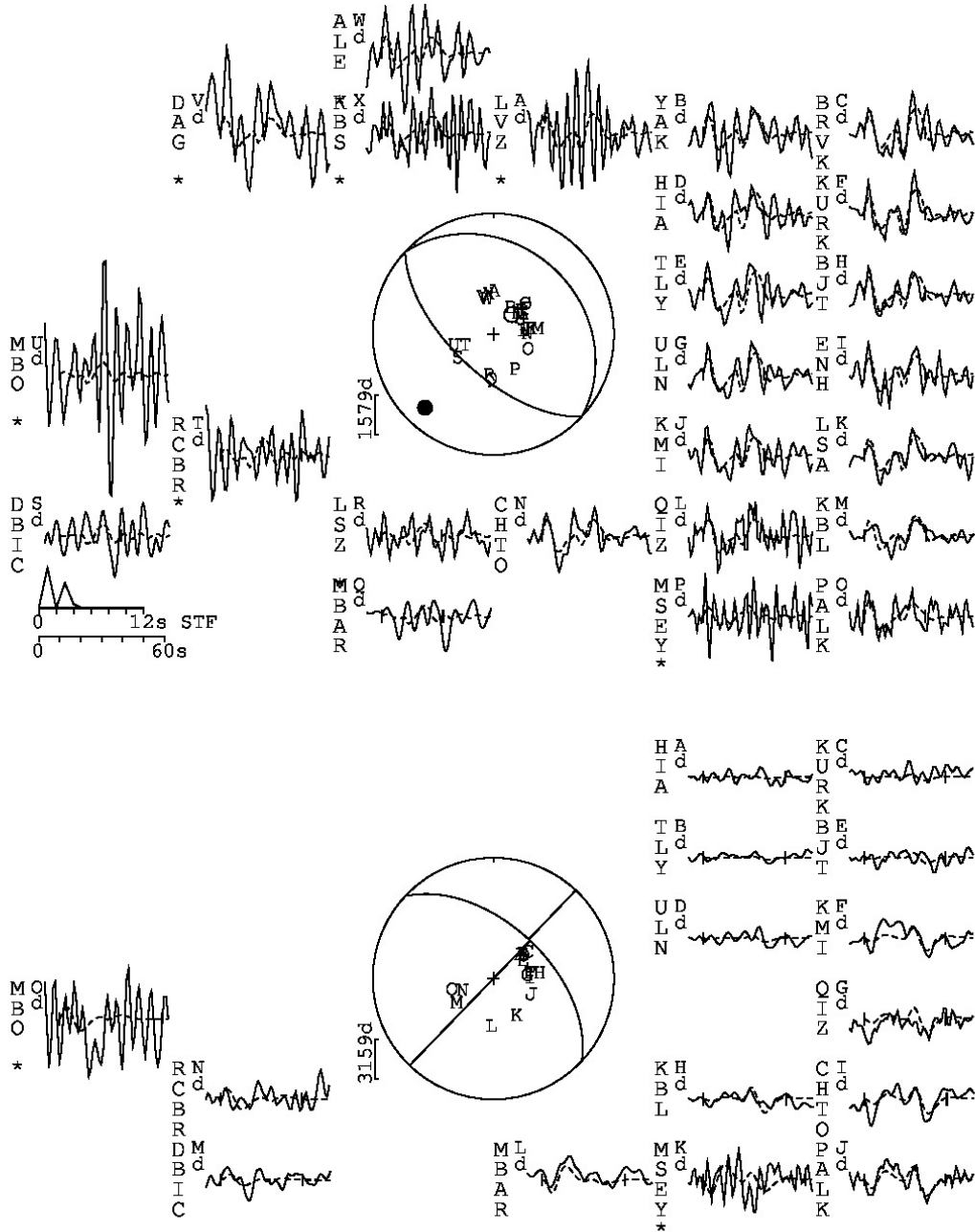


Figure S10: Fit of synthetic to observed waveforms for the 2009 December 22 Zakynthos M_W 5.2 earthquake. The source parameters for this earthquake are listed in Table S1 and the main features of the figure are the same as for Figure S1.

2010 April 24 Crete Mw 5.3 67/58/66/8/8.414E16

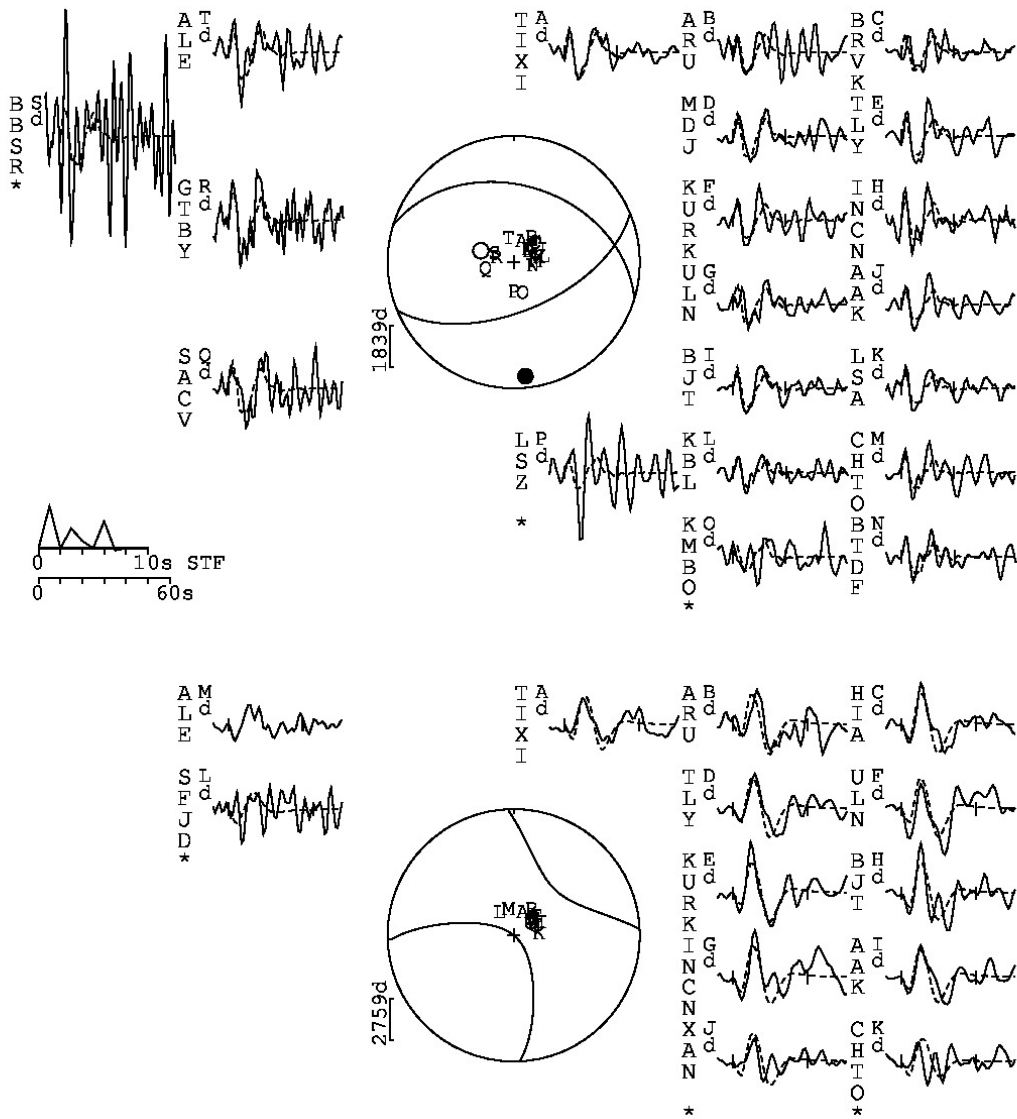


Figure S11: Fit of synthetic to observed waveforms for the 2010 April 24 Florence Rise M_W 5.4 earthquake. The source parameters for this earthquake are listed in Table S1 and the main features of the figure are the same as for Figure S1.

2011 April 01 Mw 6.1 Karpathos
138/69/11/66/1.548E18

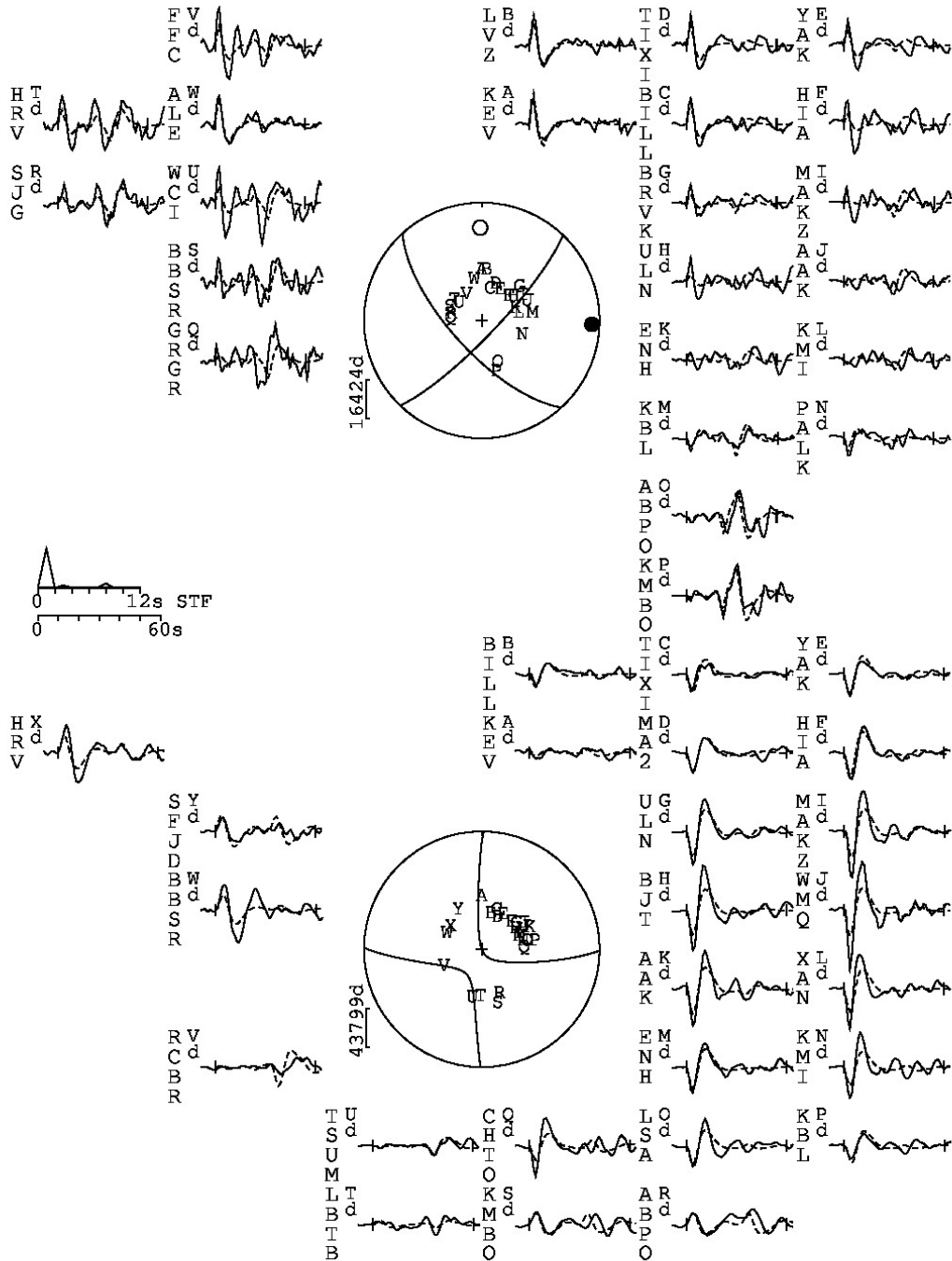


Figure S12: Fit of synthetic to observed waveforms for the 2011 April 01 Crete M_W 6.1 earthquake. The source parameters for this earthquake are listed in Table S1 and the main features of the figure are the same as for Figure S1.

2012 June 10 Rhodes Basin Mw 6.2
201/83/0/31/2.062E18

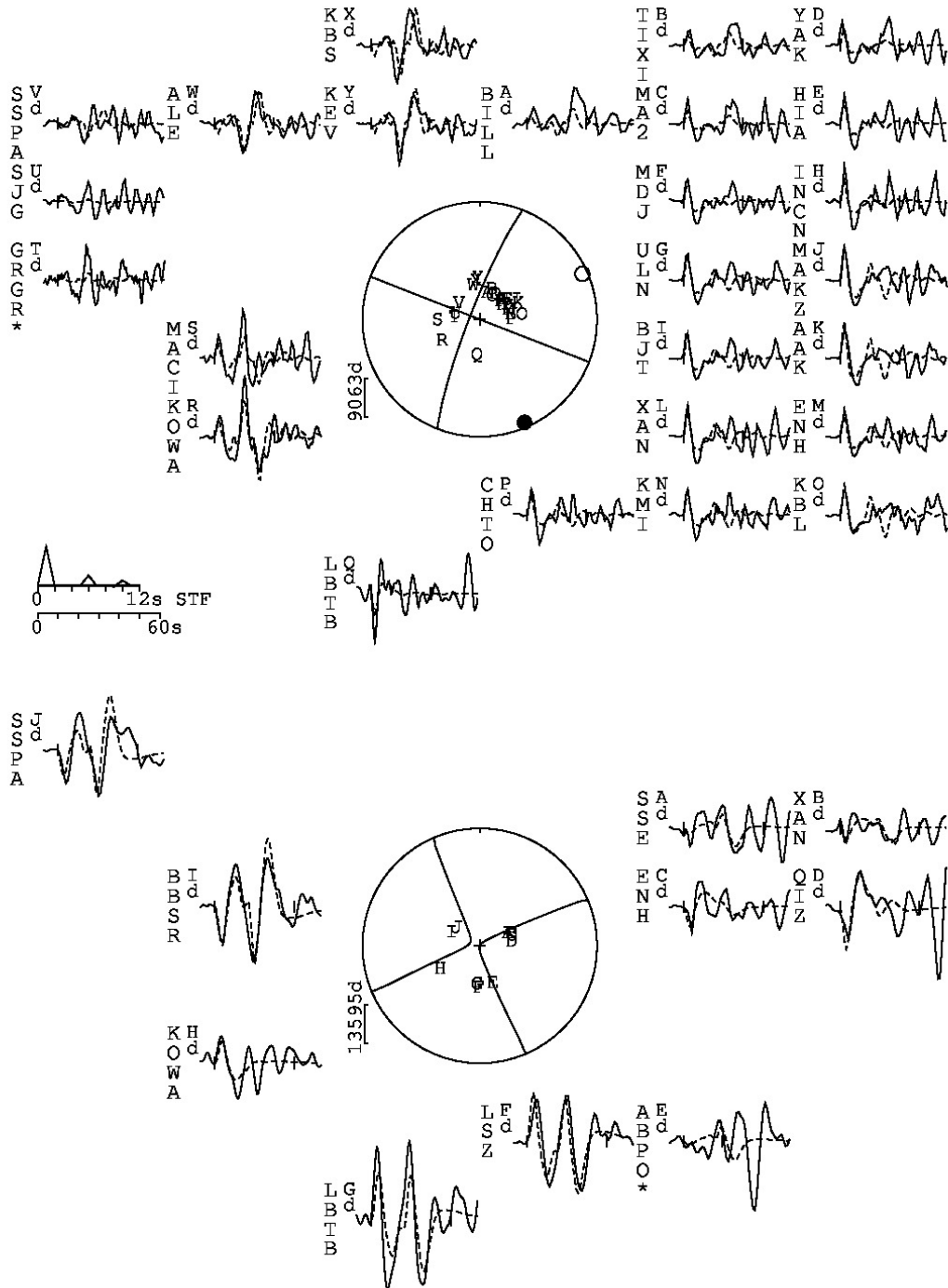


Figure S13: Fit of synthetic to observed waveforms for the 2012 June 10 Karpachos M_W 6.2 earthquake. The source parameters for this earthquake are listed in Table S1 and the main features of the figure are the same as for Figure S1.

2012 Jul 09 13:55 Rhodes Basin
43/79/2/51/3.65E17

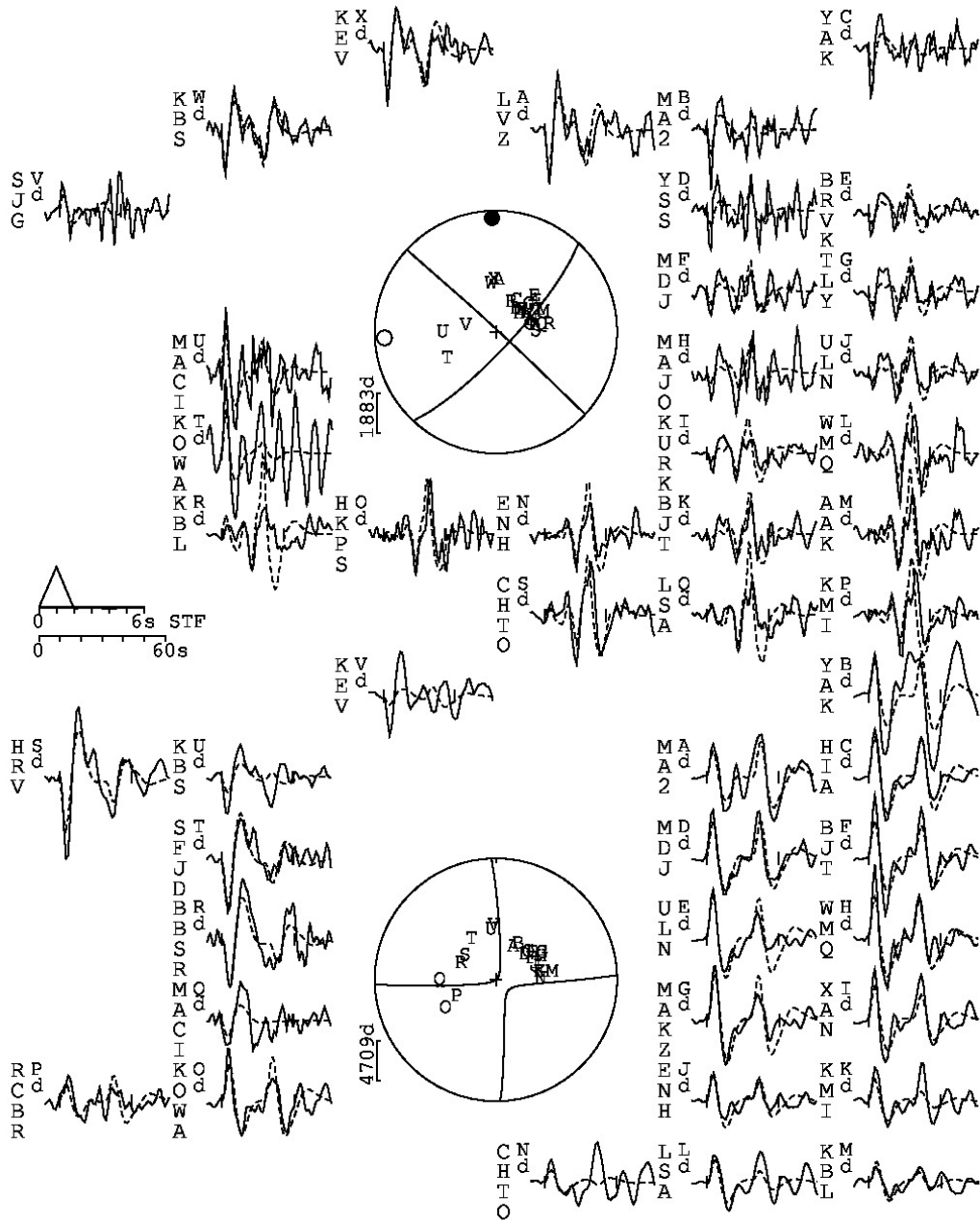


Figure S14: Fit of synthetic to observed waveforms for the 2012 July 09 Southern Greece M_W 5.7 earthquake. The source parameters for this earthquake are listed in Table S1 and the main features of the figure are the same as for Figure S1.

2012 September 12 Crete Mw 5.5
280/19/70/23/1.508E17

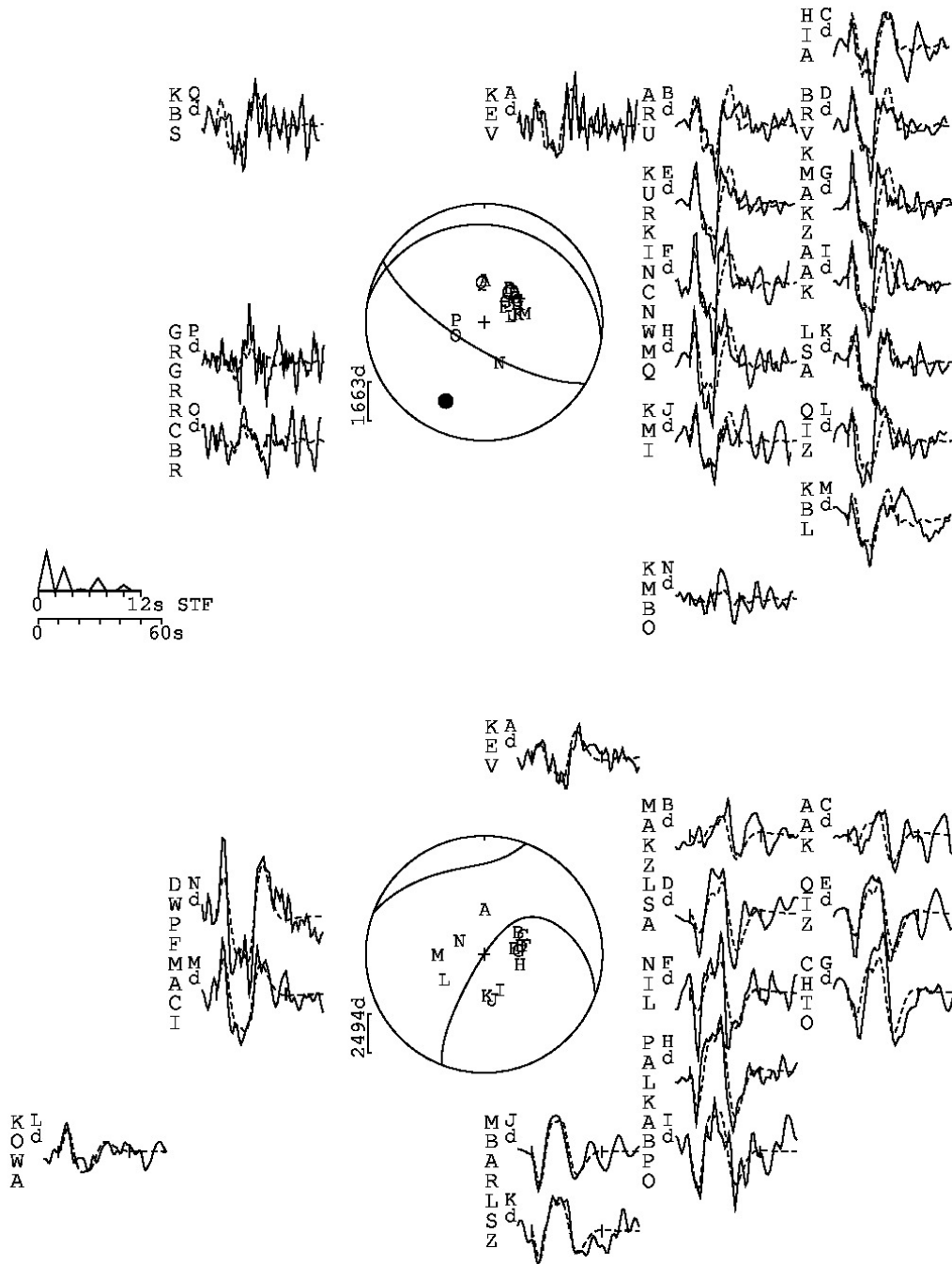


Figure S15: Fit of synthetic to observed waveforms for the 2012 September 12 Rhodes Basin M_W 5.5 earthquake. The source parameters for this earthquake are listed in Table S1 and the main features of the figure are the same as for Figure S1.

2013 June 15 Crete Mw 6.2 284/2/95/20/2.477E18

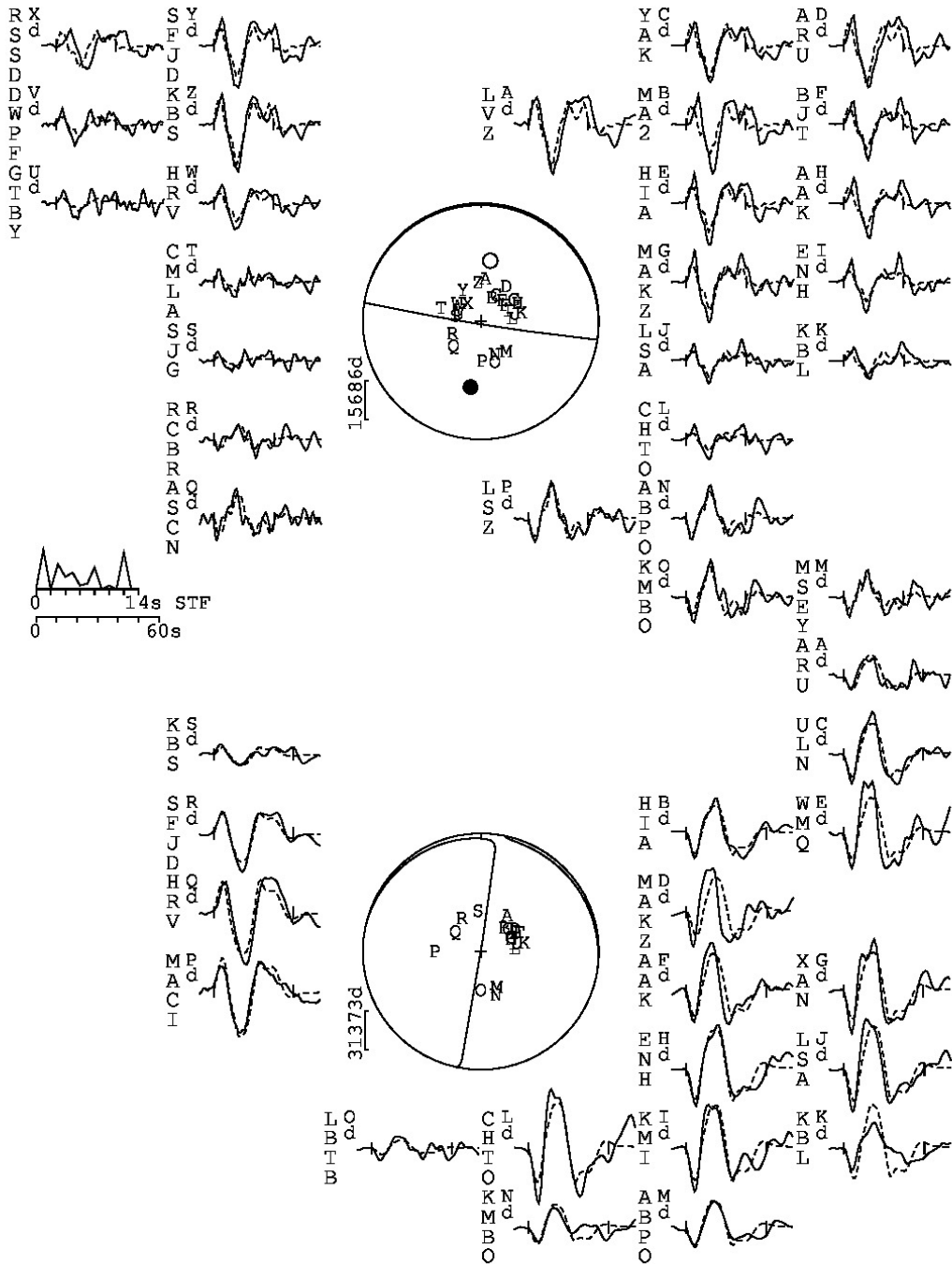


Figure S16: Fit of synthetic to observed waveforms for the 2013 June 15 Rhodes Basin M_W 6.2 earthquake. The source parameters for this earthquake are listed in Table S1 and the main features of the figure are the same as for Figure S1.

2013 June 16 Crete Mw 6.0 182/8/343/18/1.41E18

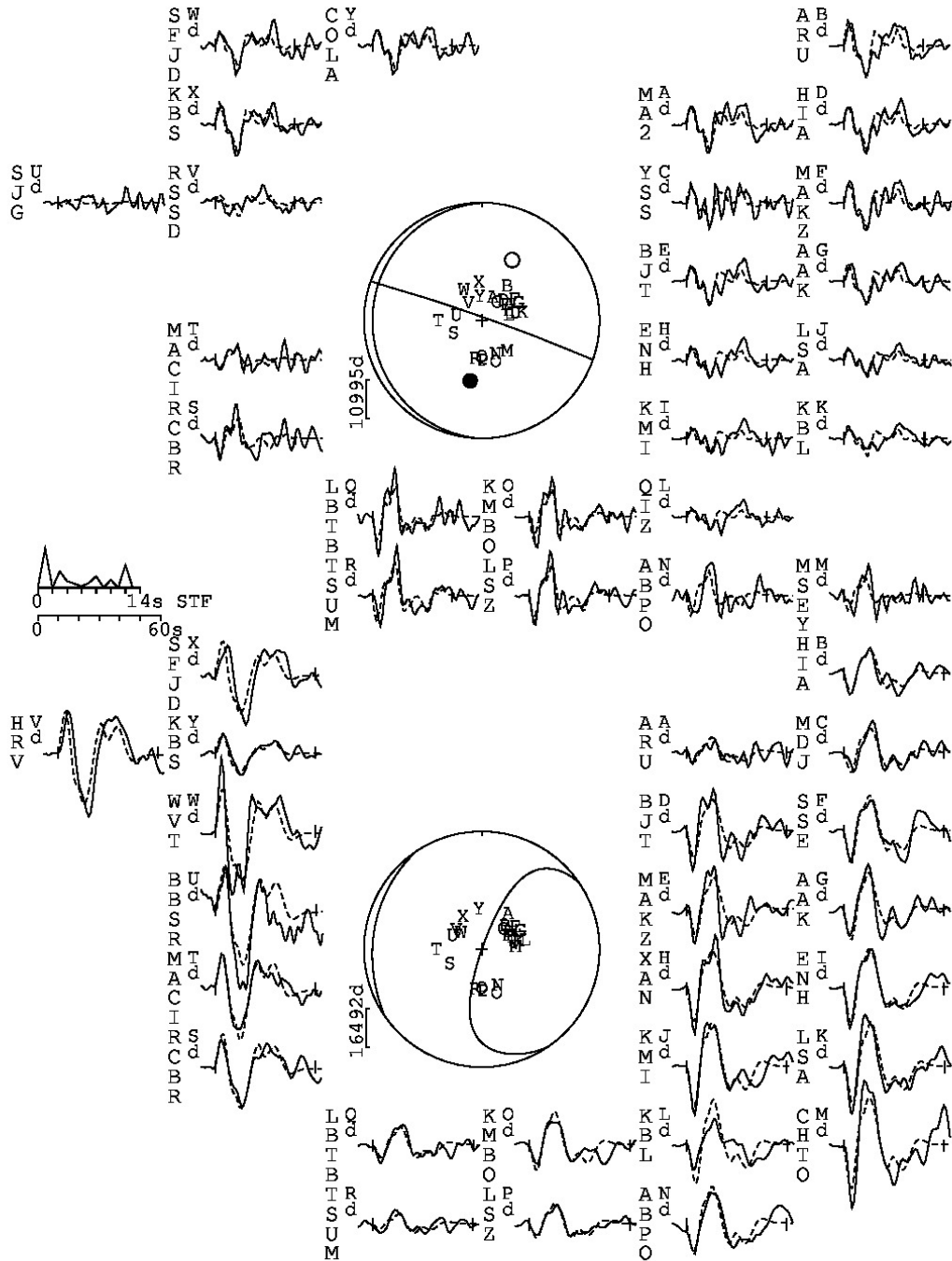


Figure S17: Fit of synthetic to observed waveforms for the 2013 June 16 Crete M_W 6.0 earthquake. The source parameters for this earthquake are listed in Table S1 and the main features of the figure are the same as for Figure S1.

2013 December 28 Florence Rise Mw 5.9
293/28/75/46/7.336E17

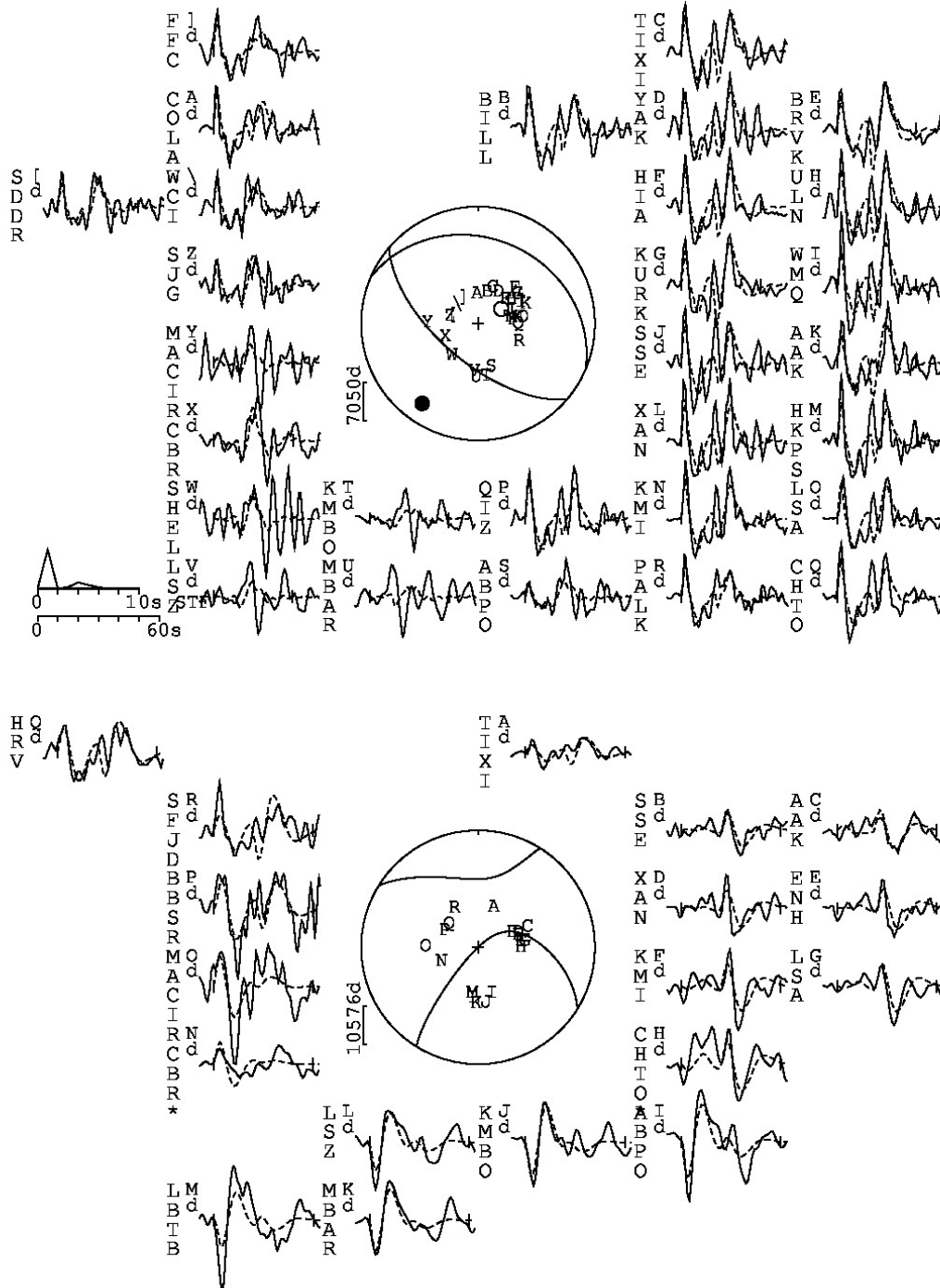


Figure S18: Fit of synthetic to observed waveforms for the 2013 December 28 Crete M_W 5.9 earthquake. The source parameters for this earthquake are listed in Table S1 and the main features of the figure are the same as for Figure S1.

2015 Apr 16 Karpathos Mw6.1
344/68/103/20/1.451E18

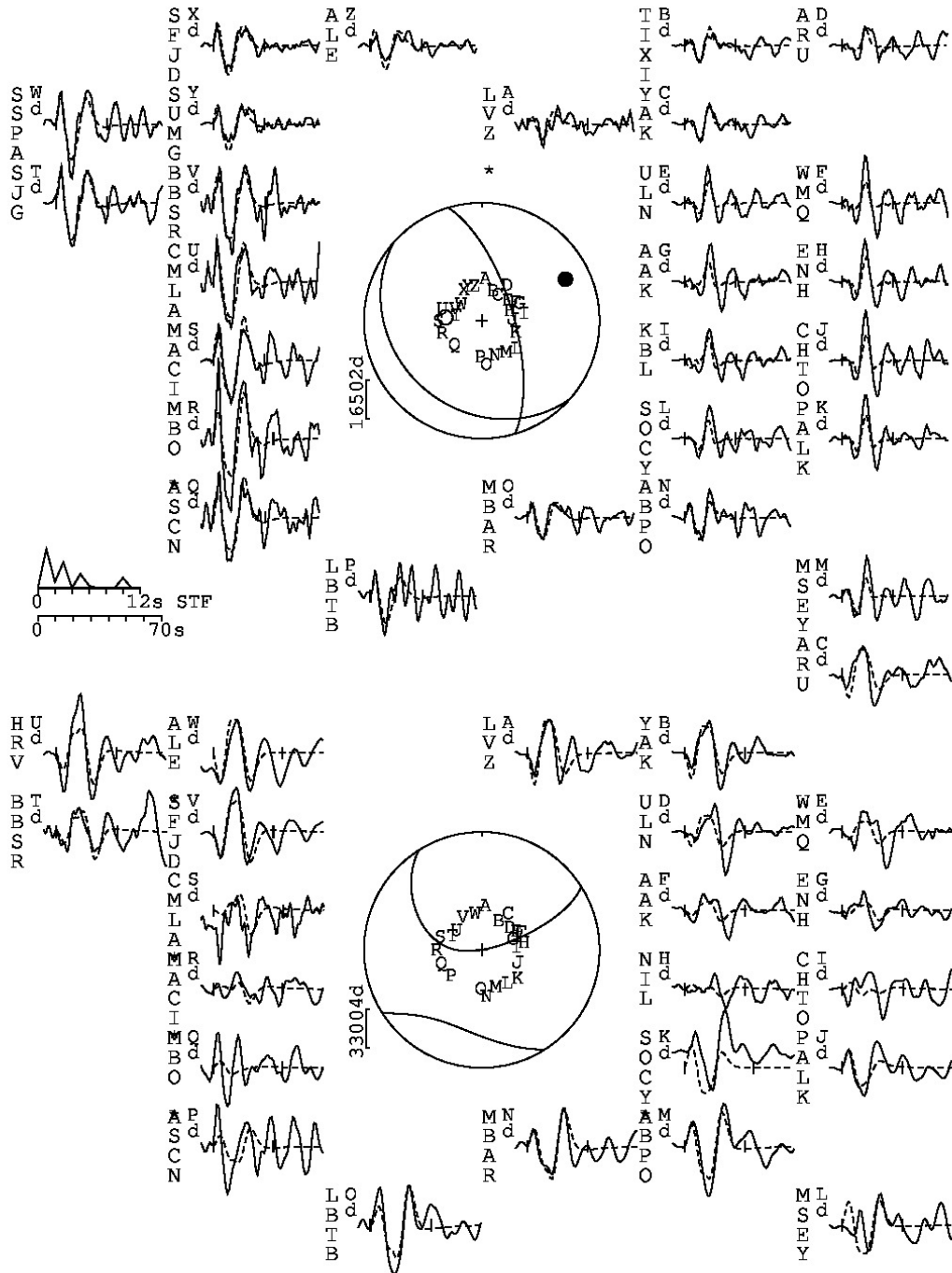


Figure S19: Fit of synthetic to observed waveforms for the 2015 April 16 Crete M_W 6.1 earthquake. The source parameters for this earthquake are listed in Table S1 and the main features of the figure are the same as for Figure S1.

2015 June 9 Karpathos Mw5.3
 23/56/253/16/9.667E16

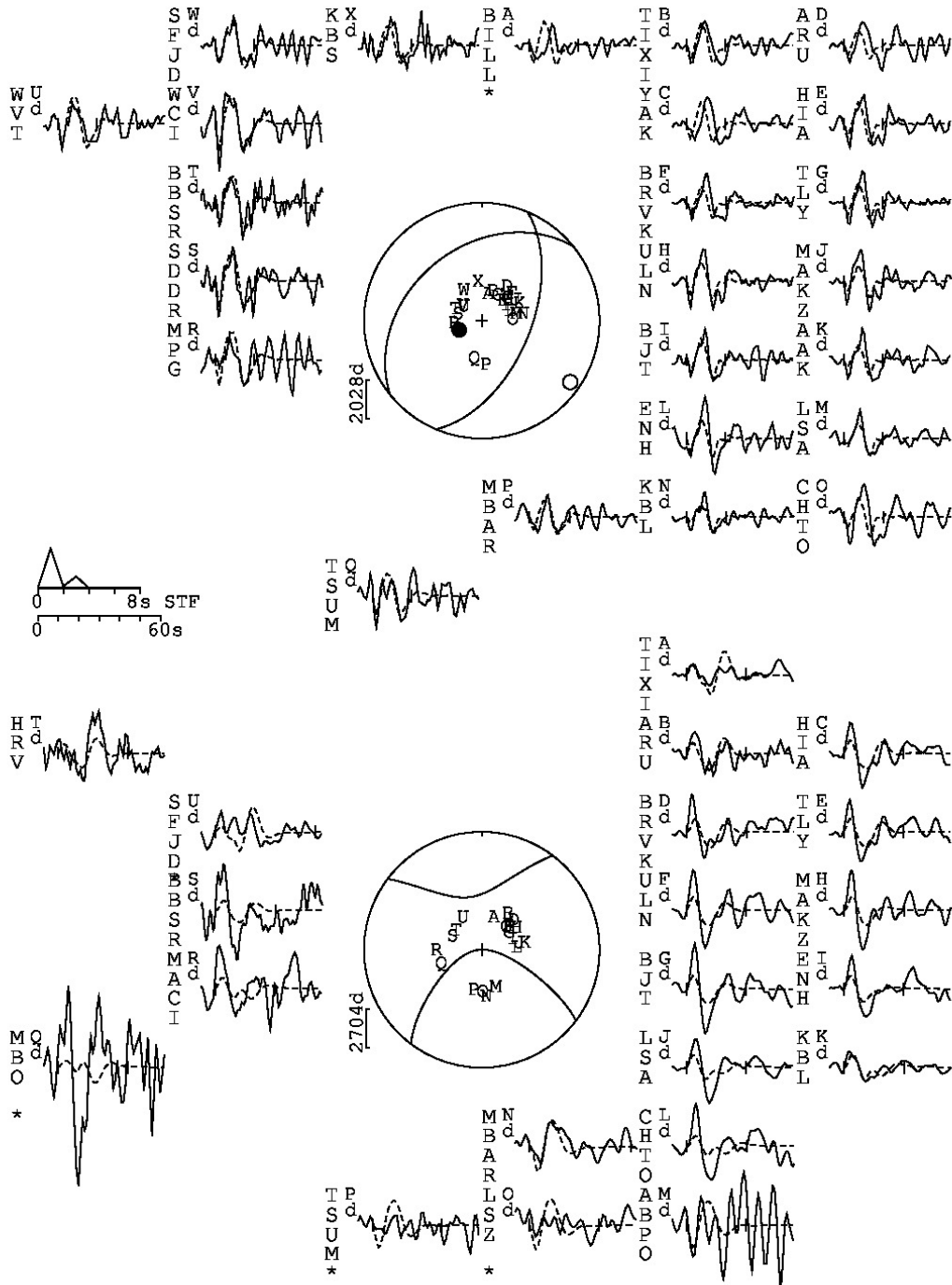


Figure S20: Fit of synthetic to observed waveforms for the 2015 June 09 Crete M_W 5.3 earthquake. The source parameters for this earthquake are listed in Table S1 and the main features of the figure are the same as for Figure S1.

References

- Engdahl, E. R., R. van der Hilst, and R. Buland, Global teleseismic earthquake relocation with improved travel times and procedures for depth determination, *Bull. Seism. Soc. Am.*, 88, 722–743, 1998.
- Hanks, T. C., and H. Kanamori, A moment magnitude scale, *J. Geophys. Res. Solid Earth*, 84(B5), 2348–2350, 1979.
- International Seismological Centre, On-line Bulletin, 2016.