Table DR1: Station list, including station names, coordinates, elevation, instrument type and number of processed events.

Station name	Latitude [°]	Longitude [°]	Elevation [m]	Instrument	Number of events
01A	**72.930**	**-28.830**	**1524**	**Güralp 3TD**	**40**
02A	**72.755**	**-28.082**	**1047**	**Güralp 3EX**	**43**
03A	**72.911**	**-27.586**	**44**	**Güralp 3TD/3TD***	**7**
04A	**72.844**	**-27.115**	**1110**	**Güralp 3TD**	**44**
05A	**72.798**	**-26.213**	**1115**	**Güralp 3TD/3EX***	**27**
06A	**72.880**	**-25.118**	**36**	**Güralp 3TD**	**31**
07A	**73.030**	**-24.351**	**90**	**Güralp 3TD**	**49**
08A	**73.065**	**-23.057**	**55**	**Güralp 3TD**	**17**
09A	**73.104**	**-21.437**	**127**	**Güralp 3TD**	**62**
10A	**73.503**	**-20.805**	**193**	**Güralp 3TD**	**42**
11A	**73.274**	**-26.452**	**1260**	**Güralp 3EX**	**34**

* This instrument got exchanged during the maintenance in summer 2010.

Table DR2: List of processed events, showing date, magnitude, epicentral distance, backazimuth and for which station. Data from National Earthquake Information Center Earthquake Catalog

				Used at stations										
Date	**Mag**	**Lat**	**Lon**	**01A**	**02A**	**03A**	**04A**	**05A**	**06A**	**07A**	**08A**	**09A**	**10A**	**11A**
09/08/2009	7.1	33.17	137.94			X			X					
10/08/2009	7.5	14.10	92.90		X	X			X	X	X	X	X	
12/08/2009	6.6	32.82	140.40		X	X	X		X		X	X		
16/08/2009	6.7	-1.48	99.49						X	X				
17/08/2009	6.7	23.50	123.50		X	X	X		X	X	X	X	X	
03/09/2009	6.2	31.14	130.01		X		X		X		X	X		
07/09/2009	6.0	42.66	43.44									X	X	
10/09/2009	6.0	48.32	154.19		X		X				X		X	
12/09/2009	6.0	10.71	-67.93				X							
21/09/2009	6.1	27.33	91.44							X				
24/09/2009	5.0	46.64	90.20			X	X						X	
30/09/2009	7.6	-0.72	99.87		X	X				X	X	X	X	
03/10/2009	6.1	23.63	121.45									X	X	
13/10/2009	6.4	52.60	-167.12										X	
22/10/2009	6.2	31.14	130.01		X				X	X		X	X	
30/10/2009	6.8	29.22	129.78				X		X					
17/11/2009	6.6	52.12	-131.40		X	X	X		X	X	X	X	X	
17/12/2009	5.6	36.46	-9.90								X			
19/12/2009	6.4	23.80	121.61				X						X	
26/02/2010	7.0	25.93	128.43		X		X					X	X	
13/03/2010	5.2	52.79	160.36										X	
14/03/2010	6.5	37.75	141.59	X	X		X		X	X		X	X	
30/03/2010	6.7	13.67	92.83		X		X		X	X		X	X	
04/04/2010	7.2	32.30	-115.28	X	X		X		X			X	X	
06/04/2010	7.8	2.38	97.05	X	X		X		X	X		X	X	
13/04/2010	6.9	33.17	96.55		X		X		X	X		X	X	
16/04/2010	5.7	54.49	-161.04	X			X						X	
26/04/2010	6.5	22.18	123.63						X			X		
30/04/2010	6.5	60.47	-177.88	X	X		X		X	X		X	X	
02/05/2010	5.4	57.36	162.20	X									X	
03/05/2010	6.1	29.64	140.97	X	X		X			X		X	X	
03/05/2010	5.5	52.61	-163.69	X			X			X		X	X	
09/05/2010	7.2	3.75	96.02	X	X				X	X		X	X	
16/05/2010	5.8	18.40	-67.07				X							
17/05/2010	5.3	46.29	152.02						X					
23/05/2010	5.0	35.96	4.14							X				
24/05/2010	6.5	-8.09	-71.56	X	X		X		X	X		X	X	
25/05/2010	6.3	35.34	-35.92	X	X		X		X	X				
26/05/2010	6.5	25.77	129.94	X	X		X		X	X		X	X	
31/05/2010	6.5	11.13	93.47										X	
01/06/2010	6.0	9.33	-84.21				X			X				
05/06/2010	5.5	43.43	146.77		X		X							
12/06/2010	7.5	7.88	91.94		X				X	X		X	X	
13/06/2010	5.9	37.37	141.63	X	X		X					X		
18/06/2010	6.2	44.45	148.69	X			X			X		X	X	
30/06/2010	6.3	16.40	-97.78	X			X		X	X		X	X	
04/07/2010	6.3	39.70	142.37	X	X		X			X		X	X	
18/07/2010	6.6	52.88	-169.85		X		X	X	X	X	X	X	X	X
23/07/2010	7.6	6.49	123.47		X		X	X			X	X		X
23/07/2010	7.3	6.72	123.41	X			X	X	X		X	X	X	X
25/07/2010	5.6	49.70	154.64				X					X	X	
28/07/2010	5.6	52.67	-169.41											
30/07/2010	6.3	52.50	159.84	X	X		X	X	X	X	X	X	X	X
04/08/2010	6.4	51.42	-178.65	X	X		X	X	X	X	X	X	X	X
12/08/2010	7.1	-1.27	-77.31		X		X				X	X	X	X
13/08/2010	6.9	12.48	141.48	X	X		X	X	X		X	X	X	X

14/08/2010	6.6	12.27	141.43	X			X				X	X	X	
27/08/2010	5.7	35.49	54.47							X				
03/09/2010	6.5	51.45	-175.87	X			X	X	X	X		X	X	X
08/09/2010	5.5	44.59	149.72						X					
17/09/2010	6.3	36.44	70.77		X		X					X		X
04/10/2010	6.3	24.27	125.15		X							X		
08/10/2010	6.4	51.37	-175.36	X			X	X			X		X	X
21/10/2010	6.7	24.69	-109.16				X					X	X	X
30/11/2010	6.8	28.36	139.15	X										
06/12/2010	5.7	40.90	142.97					X						
20/12/2010	6.7	28.41	59.18							X				
21/12/2010	7.4	26.90	143.70											
09/03/2011	7.5	38.44	142.84					X				X		X
09/03/2011	6.5	38.30	142.81											X
11/03/2011	9.0	38.30	142.37		X		X	X		X		X		X
12/03/2011	6.5	37.59	142.65							X		X		
13/03/2011	6.1	35.73	141.64		X			X		X		X		X
13/03/2011	5.8	37.35	142.40							X				
19/03/2011	5.9	39.70	142.90									X		
21/03/2011	5.8	36.50	70.93							X				
22/03/2011	6.5	37.24	144.00	X	X			X				X		X
22/03/2011	6.4	39.85	143.44		X									
22/03/2011	5.7	35.21	141.00									X		
25/03/2011	6.2	38.77	141.88	X				X						
27/03/2011	6.2	38.42	142.01	X				X		X		X		X
29/03/2011	6.1	37.40	142.01	X								X		X
30/03/2011	5.8	36.14	142.90		X							X		
07/04/2011	7.1	38.28	141.59	X	X			X				X		
07/04/2011	6.6	17.21	-94.34									X		
11/04/2011	6.6	37.00	140.40	X	X			X		X		X		X
11/04/2011	5.8	37.79	140.81					X		X				X
12/04/2011	5.9	37.11	140.37	X				X						
14/04/2011	5.8	35.56	141.88	X										
21/04/2011	5.8	40.31	143.63					X		X				X
23/04/2011	6.0	39.10	142.87	X				X		X		X		X
04/05/2011	5.5	37.04	143.25											X
05/05/2011	6.1	38.17	144.03	X	X			X		X		X		X
05/05/2011	5.8	55.02	-160.69	X	X			X		X		X		X
05/05/2011	5.7	55.09	-160.54	X				X		X		X		X
05/05/2011	5.7	16.78	-98.62									X		X
07/05/2011	5.7	40.24	142.24	X				X		X				X
13/05/2011	6.1	37.40	141.34	X								X		
14/05/2011	6.0	36.41	70.75		X			X		X		X		X
19/05/2011	5.9	39.15	29.10							X				X
23/05/2011	5.7	37.66	141.66							X				
24/05/2011	5.8	39.72	143.24											X
03/06/2011	6.2	37.29	143.91	X	X			X		X		X		X
14/06/2011	5.8	37.73	143.52											X
15/06/2011	5.7	27.78	57.77									X		

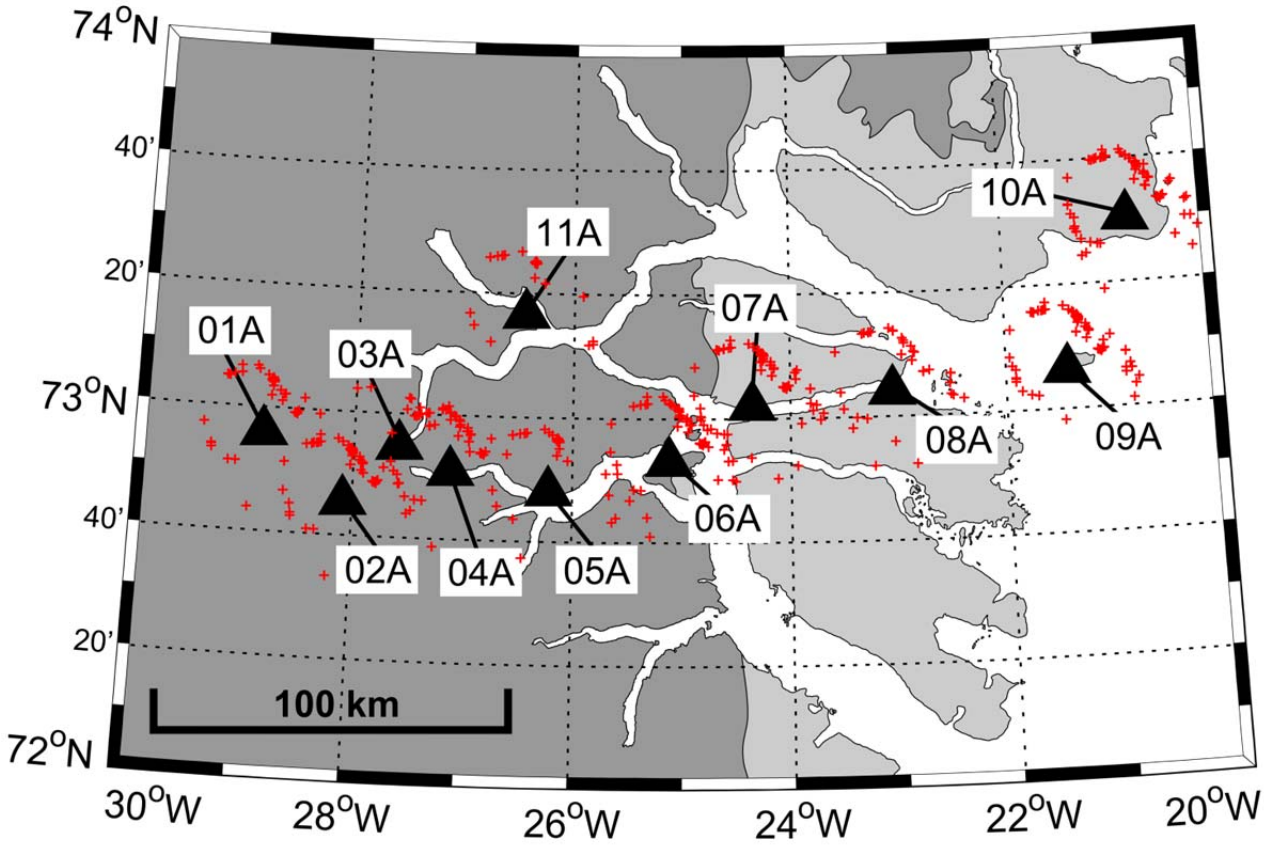

Figure DR1: Location map (as in figure 2B in the article). Dark grey: Caledonian rocks. Light grey: post-Devonian rocks. Triangles: station positions. Red crosses: Intersection points (piercing points) of ray paths at a depth of 40 km depth.

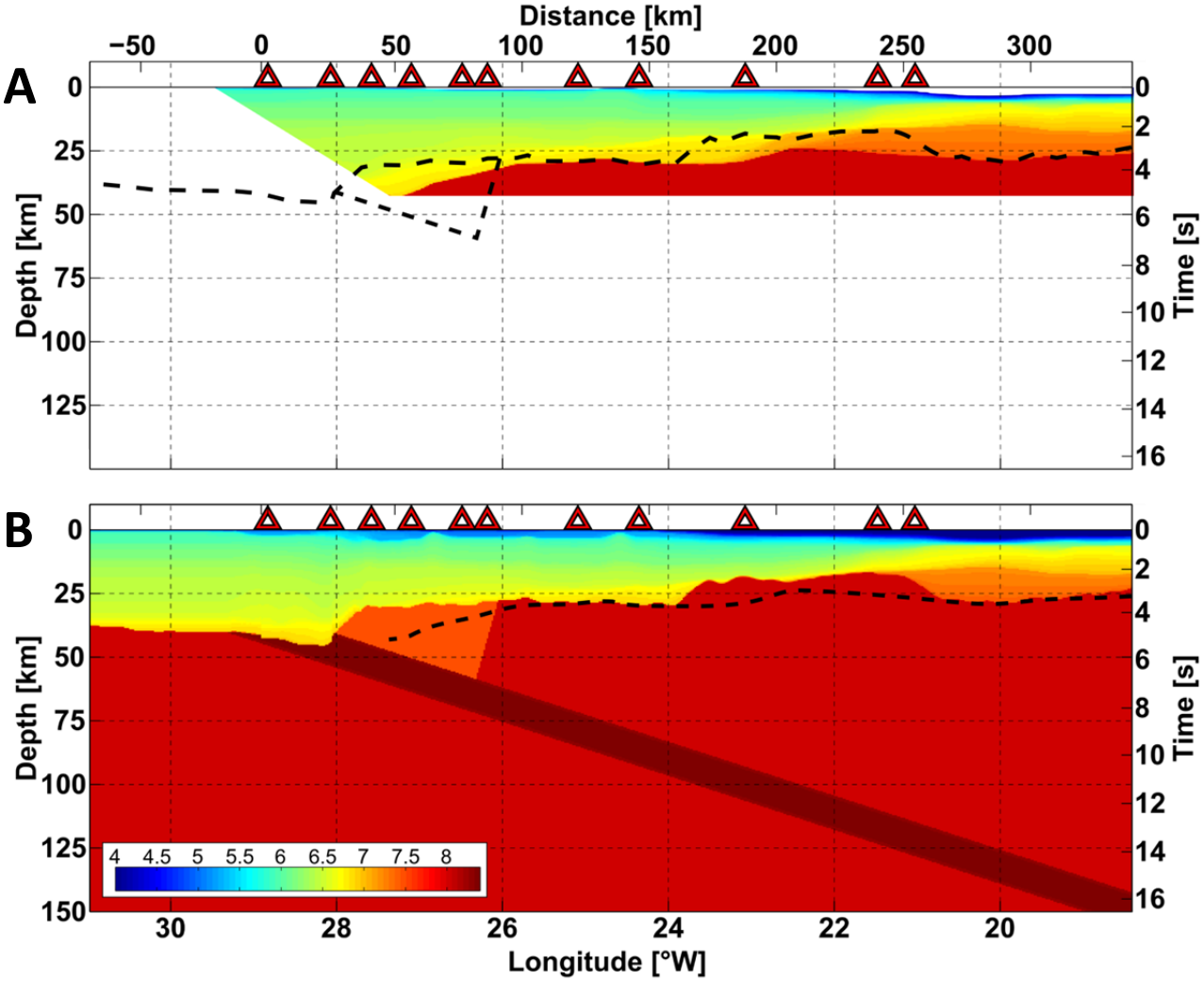

Figure DR2: West-east sections through P-wave velocity models. A: The original, interpolated velocity model from wide-angle data (Schlindwein and Jokat, 1999; Voss and Jokat, 2007). Superimposed are the Moho depth and the intermediate velocity layer from Fig. DR3 B as stippled lines. B: The modified model for the synthetic RF modeling with superimposed Moho depth from Fig. DR3A as stippled line.

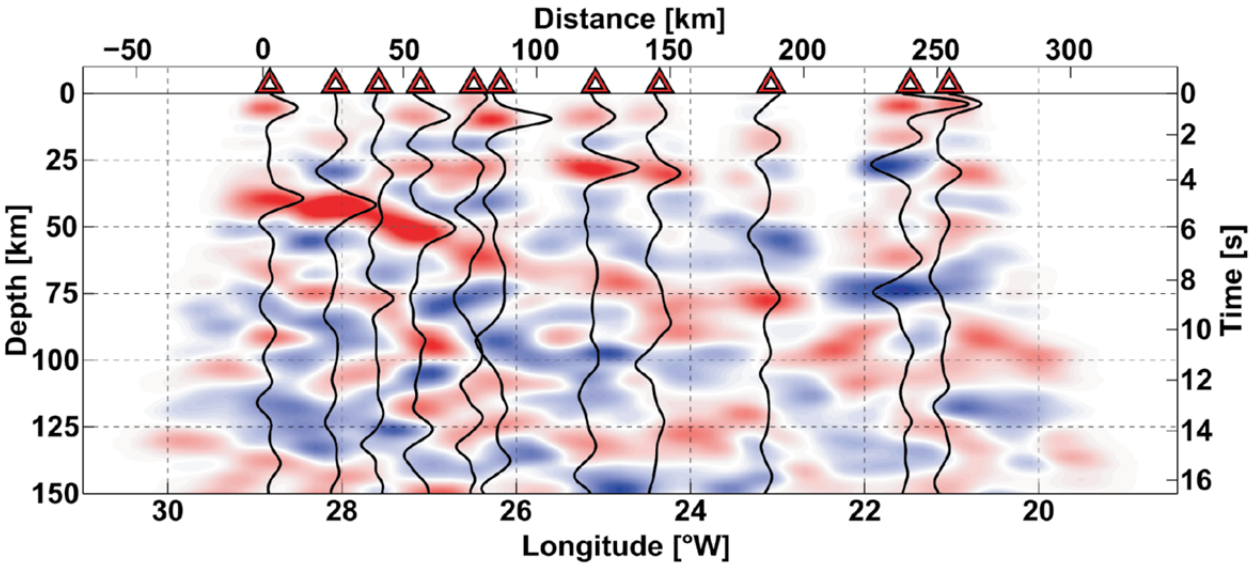

Figure DR3: Receiver function migration image as seen in the Figure 3A of the article, using the recorded teleseismic waveforms. The depth converted and normal-moveout-corrected RF stacks are superimposed underneath every station as black lines.

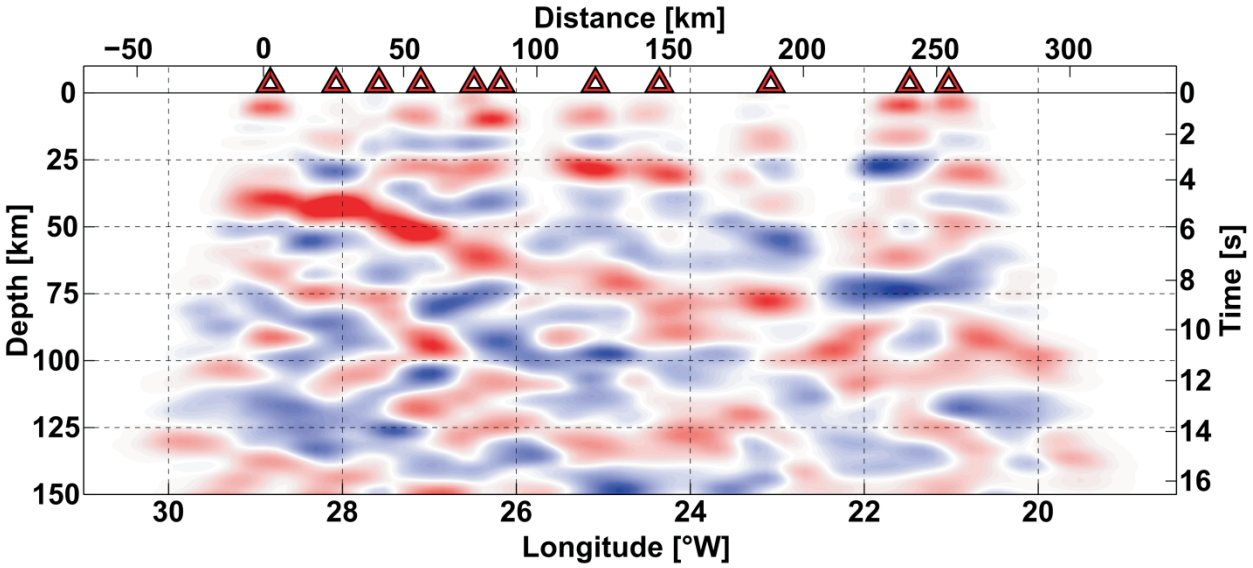

Figure DR4: Receiver function migration image as seen in the Figure 3A of the article, using the recorded teleseismic waveforms (letters indicating Moho, “M” and sub-Moho convertors, “S” are not shown here). Red represents positive conversions, blue represent negative conversions.

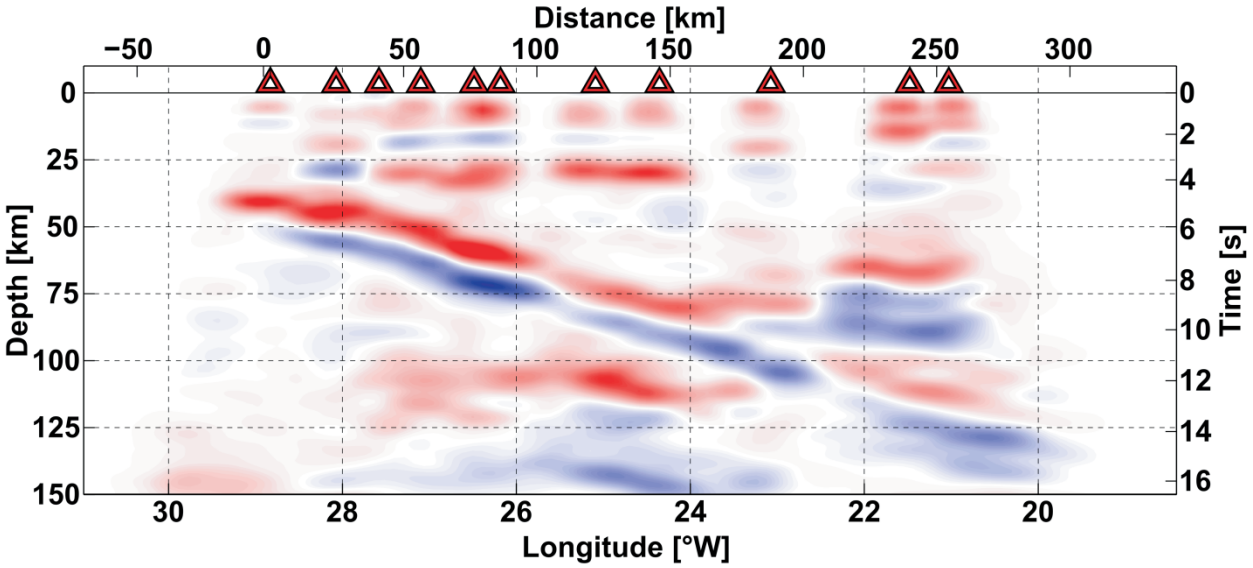

Figure DR5: Receiver function migration image of the synthetic receiver functions, processed from the original computed synthetic waveforms. The synthetic waveforms are not processed further, before the receiver function analysis.

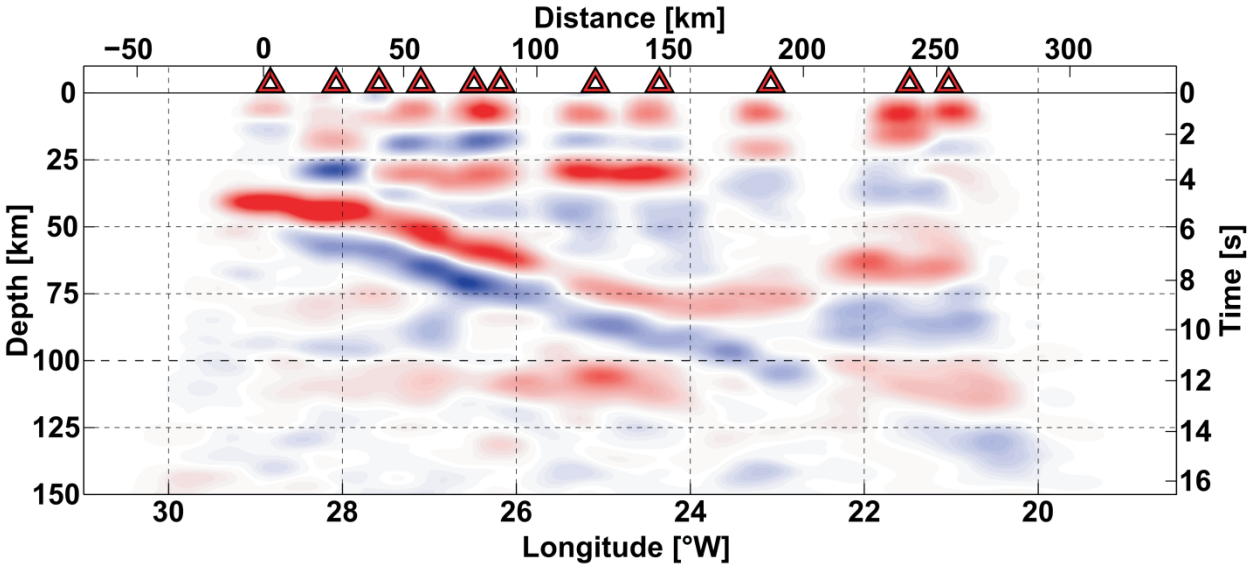

Figure DR6: Receiver function migration image of the computed synthetic receiver functions, using the synthetic waveforms, after convolution with the observed P-waveform in order to simulate the realistic wavelets for each event and station. The convolution with the real P-wavelets adds some incoherency to the image, as compared to the 'pure' synthetic image in Fig. DR5.

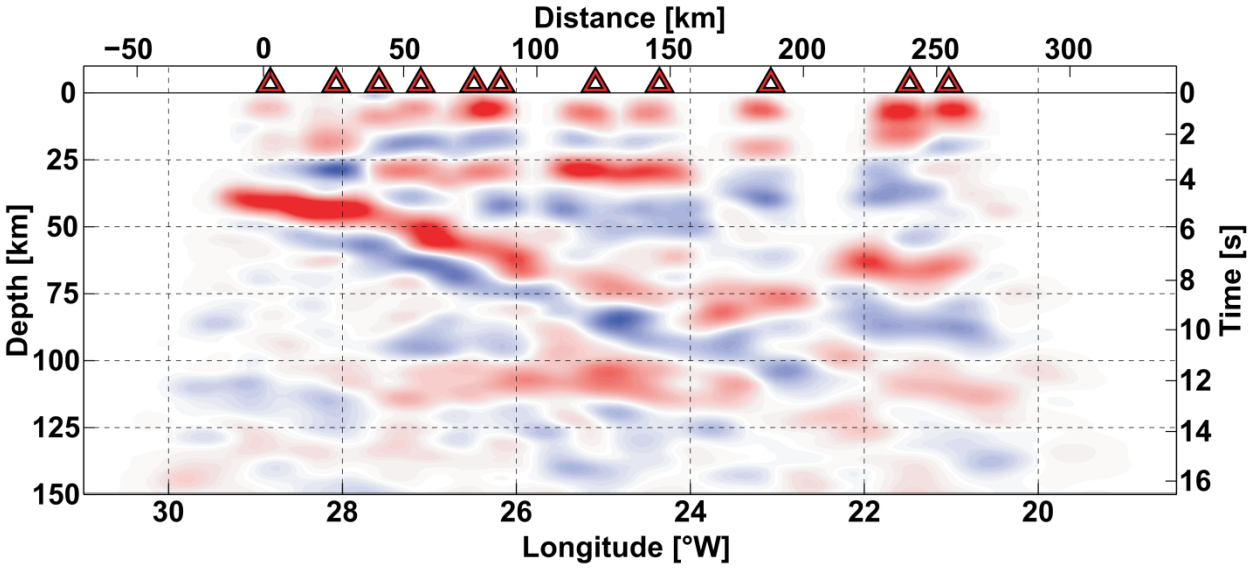

Figure DR7: Receiver function migration image of the computed synthetic receiver functions, using the convolved synthetic waveforms (as in Figure DR6) with additional noise. After the convolution with the observed P-waveform (Figure DR6) the waveforms from -100 to -5 seconds before the P-arrivals of each recorded component is added to the corresponding synthetic component. Thereby realistic ambient noise is simulated. The texture, style and complexity of the migrated receiver functions with additional noise are very similar to the observed section (Figure DR4).