

Appendix A

The PREM model

For many years the most widely used 1-D model of Earth's seismic velocities has been the Preliminary Reference Earth Model (PREM) of Dziewonski and Anderson (1981). This model was designed to fit a variety of different data sets, including free oscillation center frequency measurements, surface wave dispersion observations, travel time data for a number of body-wave phases, and basic astronomical data (Earth's radius, mass, and moment of inertia). In addition to profiling the P and S velocities, PREM specifies density and attenuation as functions of depth. Although these parameters are known less precisely than the seismic velocities, including them is important because it makes the model complete and suitable for use as a reference to compute synthetic seismograms without requiring additional assumptions. In order to simultaneously fit Love and Rayleigh wave observations, PREM is transversely isotropic between 80 and 220 km depth in the upper mantle. This is a spherically symmetric form of anisotropy in which SH and SV waves travel at different speeds. For simplicity, the table here lists only values from an isotropic version of PREM. The true PREM model is also specified in terms of polynomials between node points; linear interpolation between the 100 km spacing of values in this table will produce only approximate results. All current Earth models have values that are reasonably close to PREM; the largest differences are in the upper mantle, where, for example, a discontinuity at 220 km is not found in most models.

Table A.1: Preliminary reference Earth model (isotropic version)

Depth (km)	Radius (km)	V_p (km/s)	V_s (km/s)	ρ (g/cc)	Q_μ	Q_κ	P (GPa)
0.0	6371.0	1.45	0.00	1.02	0.0	57823.0	0.0
3.0	6368.0	1.45	0.00	1.02	0.0	57823.0	0.0
3.0	6368.0	5.80	3.20	2.60	600.0	57823.0	0.0
15.0	6356.0	5.80	3.20	2.60	600.0	57823.0	0.3
15.0	6356.0	6.80	3.90	2.90	600.0	57823.0	0.3
24.4	6346.6	6.80	3.90	2.90	600.0	57823.0	0.6
24.4	6346.6	8.11	4.49	3.38	600.0	57823.0	0.6
71.0	6300.0	8.08	4.47	3.38	600.0	57823.0	2.2
80.0	6291.0	8.08	4.47	3.37	600.0	57823.0	2.5
80.0	6291.0	8.08	4.47	3.37	80.0	57823.0	2.5
171.0	6200.0	8.02	4.44	3.36	80.0	57823.0	5.5
220.0	6151.0	7.99	4.42	3.36	80.0	57823.0	7.1
220.0	6151.0	8.56	4.64	3.44	143.0	57823.0	7.1
271.0	6100.0	8.66	4.68	3.47	143.0	57823.0	8.9
371.0	6000.0	8.85	4.75	3.53	143.0	57823.0	12.3
400.0	5971.0	8.91	4.77	3.54	143.0	57823.0	13.4
400.0	5971.0	9.13	4.93	3.72	143.0	57823.0	13.4
471.0	5900.0	9.50	5.14	3.81	143.0	57823.0	16.0
571.0	5800.0	10.01	5.43	3.94	143.0	57823.0	19.9
600.0	5771.0	10.16	5.52	3.98	143.0	57823.0	21.0
600.0	5771.0	10.16	5.52	3.98	143.0	57823.0	21.0
670.0	5701.0	10.27	5.57	3.99	143.0	57823.0	23.8
670.0	5701.0	10.75	5.95	4.38	312.0	57823.0	23.8
771.0	5600.0	11.07	6.24	4.44	312.0	57823.0	28.3
871.0	5500.0	11.24	6.31	4.50	312.0	57823.0	32.8
971.0	5400.0	11.42	6.38	4.56	312.0	57823.0	37.3
1071.0	5300.0	11.58	6.44	4.62	312.0	57823.0	41.9
1171.0	5200.0	11.73	6.50	4.68	312.0	57823.0	46.5
1271.0	5100.0	11.88	6.56	4.73	312.0	57823.0	51.2
1371.0	5000.0	12.02	6.62	4.79	312.0	57823.0	55.9
1471.0	4900.0	12.16	6.67	4.84	312.0	57823.0	60.7
1571.0	4800.0	12.29	6.73	4.90	312.0	57823.0	65.5
1671.0	4700.0	12.42	6.78	4.95	312.0	57823.0	70.4
1771.0	4600.0	12.54	6.83	5.00	312.0	57823.0	75.4
1871.0	4500.0	12.67	6.87	5.05	312.0	57823.0	80.4
1971.0	4400.0	12.78	6.92	5.11	312.0	57823.0	85.5
2071.0	4300.0	12.90	6.97	5.16	312.0	57823.0	90.6
2171.0	4200.0	13.02	7.01	5.21	312.0	57823.0	95.8
2271.0	4100.0	13.13	7.06	5.26	312.0	57823.0	101.1
2371.0	4000.0	13.25	7.10	5.31	312.0	57823.0	106.4
2471.0	3900.0	13.36	7.14	5.36	312.0	57823.0	111.9
2571.0	3800.0	13.48	7.19	5.41	312.0	57823.0	117.4
2671.0	3700.0	13.60	7.23	5.46	312.0	57823.0	123.0
2741.0	3630.0	13.68	7.27	5.49	312.0	57823.0	127.0
2771.0	3600.0	13.69	7.27	5.51	312.0	57823.0	128.8
2871.0	3500.0	13.71	7.26	5.56	312.0	57823.0	134.6
2891.0	3480.0	13.72	7.26	5.57	312.0	57823.0	135.8
2891.0	3480.0	8.06	0.00	9.90	0.0	57823.0	135.8
2971.0	3400.0	8.20	0.00	10.03	0.0	57823.0	144.2
3071.0	3300.0	8.36	0.00	10.18	0.0	57823.0	154.8
3171.0	3200.0	8.51	0.00	10.33	0.0	57823.0	165.2

Table A.1: Continued							
Depth (km)	Radius (km)	V_p (km/s)	V_s (km/s)	ρ (g/cc)	Q_μ	Q_κ	P (GPa)
3271.0	3100.0	8.66	0.00	10.47	0.0	57823.0	175.5
3371.0	3000.0	8.80	0.00	10.60	0.0	57823.0	185.7
3471.0	2900.0	8.93	0.00	10.73	0.0	57823.0	195.8
3571.0	2800.0	9.05	0.00	10.85	0.0	57823.0	205.7
3671.0	2700.0	9.17	0.00	10.97	0.0	57823.0	215.4
3771.0	2600.0	9.28	0.00	11.08	0.0	57823.0	224.9
3871.0	2500.0	9.38	0.00	11.19	0.0	57823.0	234.2
3971.0	2400.0	9.48	0.00	11.29	0.0	57823.0	243.3
4071.0	2300.0	9.58	0.00	11.39	0.0	57823.0	252.2
4171.0	2200.0	9.67	0.00	11.48	0.0	57823.0	260.8
4271.0	2100.0	9.75	0.00	11.57	0.0	57823.0	269.1
4371.0	2000.0	9.84	0.00	11.65	0.0	57823.0	277.1
4471.0	1900.0	9.91	0.00	11.73	0.0	57823.0	284.9
4571.0	1800.0	9.99	0.00	11.81	0.0	57823.0	292.3
4671.0	1700.0	10.06	0.00	11.88	0.0	57823.0	299.5
4771.0	1600.0	10.12	0.00	11.95	0.0	57823.0	306.2
4871.0	1500.0	10.19	0.00	12.01	0.0	57823.0	312.7
4971.0	1400.0	10.25	0.00	12.07	0.0	57823.0	318.9
5071.0	1300.0	10.31	0.00	12.12	0.0	57823.0	324.7
5149.5	1221.5	10.36	0.00	12.17	0.0	57823.0	329.0
5149.5	1221.5	11.03	3.50	12.76	84.6	1327.7	329.0
5171.0	1200.0	11.04	3.51	12.77	84.6	1327.7	330.2
5271.0	1100.0	11.07	3.54	12.82	84.6	1327.7	335.5
5371.0	1000.0	11.11	3.56	12.87	84.6	1327.7	340.4
5471.0	900.0	11.14	3.58	12.91	84.6	1327.7	344.8
5571.0	800.0	11.16	3.60	12.95	84.6	1327.7	348.8
5671.0	700.0	11.19	3.61	12.98	84.6	1327.7	352.3
5771.0	600.0	11.21	3.63	13.01	84.6	1327.7	355.4
5871.0	500.0	11.22	3.64	13.03	84.6	1327.7	358.0
5971.0	400.0	11.24	3.65	13.05	84.6	1327.7	360.2
6071.0	300.0	11.25	3.66	13.07	84.6	1327.7	361.8
6171.0	200.0	11.26	3.66	13.08	84.6	1327.7	363.0
6271.0	100.0	11.26	3.67	13.09	84.6	1327.7	363.7
6371.0	0.0	11.26	3.67	13.09	84.6	1327.7	364.0