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GEOLOGY SUPPEMENTAL MATERIAL

Metastable olivine within oceanic lithosphere in the uppermost lower mantle beneath the eastern United States

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Data Availability

All the SKS and SKKS ("XKS") shear wave splitting measurements are from Liu et al. (2014), and Yang et al. (2016, 2017), which were measured based on the transverse energy minimization method (Silver and Chan, 1991). Only the well-defined measurements (Quality A or B) were utilized in the study. To ensure the reliability of the individual splitting measurements, every measurement used in the study was manually checked, during which the time window for measuring the shear wave splitting parameters are slightly adjusted if necessary to only include the XKS energy.

Estimation of the depth of the "residual" anisotropy layer

Due to the steep incidence angle of the XKS phases used in shear wave splitting analyses, the resulting splitting measurements have low vertical resolution. To estimate the depth of the "residual" anisotropy that accounts for the difference between the discrepant SKS and SKKS splitting measurements, we applied a slightly modified version of the approach based on the spatial coherency of the splitting parameters (Liu and Gao, 2011). The optimal depth maximizes the spatial consistency of the splitting measurements.

The procedure searches for the optimal anisotropy depth by computing a consistency factor. For each candidate depth, which ranges from 500 to 2800 km with an interval of 50 km, the consistency factor at this depth, $F_{\delta t}$, is calculated using

$$F_{\delta t} = \sqrt{\frac{\sum_{i=1}^{N}(\delta t_i - \overline{\delta t_i})^2}{N(N-1)}},$$

where

$$\delta t_i = \frac{1}{M_i}\sum_{j=1}^{M_i} \delta t_{ij},$$

and N is the number of the discrepant SKS/SKKS measurements in the area outlined by the dashed yellow line in Figure 1, M_i is the number of measurements for the circular bin i centered at the midpoint of the *i-th* discrepant pair of the SKS-SKKS splitting measurement. The diameter of the bins is estimated by $85+0.2D_a$ km (Liu and Gao, 2011), where D_a is the candidate anisotropy depth. The estimation for the diameter is computed with a period of 8 s, which is the dominant period for most SKS/SKKS waves (Favier and Chevrot, 2003). δt_i is the average splitting time over all the measurements in block i, and $\overline{\delta t_i}$ represents the average of all δt_i measurements in the bin. To normalize the resulting consistency factor, all the values are divided by 0.2, which represents the possible maximum consistency factor and is slightly smaller than the δt average of the "residual" anisotropy. The optimal anisotropy depth corresponds to the largest consistency factor.

A bootstrap resampling method (Efron and Tibshirani, 1986; Liu and Gao, 2006) was applied to compute the mean and standard deviation of the optimal anisotropy depth with 50 iterations. For each bootstrap step, 63%, which is calculated by 1-1/e, of the discrepant SKS/SKKS measurements are chosen. Approximately 60% of the chosen ones are then duplicated so that the sum of the new set of the discrepant pairs remains the same as the total number of the original set. The new set of discrepant pairs is then utilized to obtain a consistency factor for each candidate depth. For each iteration, there is an optimal depth value ($D_{\delta t}$) that corresponds to the largest consistency factor. The resultant optimal anisotropy depth ($\overline{D_{\delta t}}$) is obtained by averaging the optimal depths for all the bootstrap steps, and the standard deviation (σ) is estimated using

$$\sigma = \sqrt{\frac{1}{K}\sum_{j=1}^{K}(D_{\delta t}^{j} - \overline{D_{\delta t}})^2},$$

where K is the number of bootstrap steps, $D_{\delta t}^{j}$ is the resulting optimal depth from *j-th* bootstrap step.

Estimate of net buoyancy of the subducted slab

The density of the mantle is determined by the composition, the in-situ pressure and temperature. For a given pressure P, the lithospheric mantle density can be expressed as a function of the bulk modulus K_T that is calculated as (Bai et al., 2014; Tan et al., 2018)

$$K_T = 127.97 - 0.0232(T - 300)$$

where T is the in-situ temperature. The density change ($\Delta\rho_P$) for a specific pressure is estimated by

$$\Delta\rho_P = \rho_0[P - P_0]/K_T$$

where P_0 represents the standard atmospheric pressure in gigapascal and ρ_0 is the mantle density at normal pressure and temperature conditions, which is set as 3300 kg/m^3.

The thermal effect of bridgmanite on density can be estimated using equations of state for *(Mg, Fe)SiO$_3$* perovskite, which is obtained at lower mantle temperature and pressure conditions (Fiquet et al., 2000). At a given temperature T, the density change ($\Delta\rho_T$) can be expressed as (Bina, 2003)

$$\Delta\rho_T = \rho_r[(d\rho/dT)(T - T_r)]$$

where ρ_r and T_r are the reference density and temperature, respectively. $d\rho/dT$ denotes the temperature dependence of density, and is estimated as about -0.18%/100 K (Fiquet et al., 2000; Bina, 2003).

The net buoyancy of the subducted slab can be estimated by considering the combined effect of metastable olivine at uppermost lower mantle pressures and the ambient transformed bridgmanite with negative temperature anomalies.

Arguments against a D" origin of the observed differential anisotropy based on the width of the anomalous zone

At 845 km depth, the distance between the ray-piercing points of the discrepant SKS/SKKS phases ranges from ~120 to ~170 km, depending on the epicentral distance between the event and the station. This distance is comparable to the radius of the first Fresnel zone for a SKS/SKKS wave (e.g., ~130 km for a dominant period of 8 s; Favier and Chevrot, 2003) and explains why the discrepant splitting times can be observed in a zone above the edge of the anisotropy layer. For a raypath arriving from the direction normal to the strike of a sharp western edge of the anomalous zone, the width of the zone where the discrepant splitting times are observed is approximately the same as the distance between the SKS and SKKS ray piercing points at this depth (Figure DR6). The actual width could be greater than the distance between the piercing points if the boundary is a gradual rather than a sharp one. The observed width of the anomalous zone is about ~200 km (Figure 1), which is comparable to the actual distance between the ray piercing points at the depth of 845 km. In contrast, if we assume that the anomaly is located in the D" layer (~2700 km), the distance between the ray-piercing points of the SKS and SKKS phases is greater than 600 km, which would produce a zone of discrepant SKS/SKKS splitting times that is several times wider than what is observed.

References for Data Repository

Bai, Y., Williams, S.E., Müller, R.D., Liu, Z. and Hosseinpour, M., 2014, Mapping crustal thickness using marine gravity data: Methods and uncertainties: Geophysics, v. 79, 1MA-Z52, https://doi.org/10.1190/geo2013-0270.1.

Bina, C.R., 2003, Seismological Constraints upon Mantle Composition, *in* Carlson, R.W., ed., The Mantle and Core, Volume 2 Treatise on Geochemistry: Oxford, Elsevier-Pergamon, p. 39-56.

Crotwell, H.P., Owens, T.J. and Ritsema, J., 1999, The TauP toolkit: flexible seismic travel-time and ray-path utilities: Seismological Research Letters, v. 70, p. 154-160, https://doi.org/10.1785/gssrl.70.2.154.

Efron, B. and Tibshirani, R., 1986, Bootstrap methods for standard errors, confidence intervals, and other measures of statistical accuracy: Statistical Science, v. 1, p. 54-77.

Favier, N. and Chevrot, S., 2003, Sensitivity kernels for shear wave splitting in transverse isotropic media: Geophysical Journal International, v. 153, p. 213-228, https://doi.org/10.1046/j.1365-246X.2003.01894.x.

Fiquet, G., Dewaele, A., Andrault, D., Kunz, M. and Le Bihan, T., 2000, Thermoelastic properties and crystal structure of $MgSiO_3$ perovskite at lower mantle pressure and temperature conditions: Geophysical Research Letters, v. 27, p. 21-24, https://doi.org/10.1029/1999GL008397.

Kennett, B.L.N. and Engdahl, E.R., 1991, Traveltimes for global earthquake location and phase identification: Geophysical Journal International, v. 105, p. 429-465, https://doi.org/10.1111/j.1365-246X.1991.tb06724.x.

Liu, K.H. and Gao, S.S., 2011, Estimation of the depth of anisotropy using spatial coherency of shear-wave splitting parameters: Bulletin of the Seismological Society of America, v. 101, p. 2153-2161, http://dx.doi.org/10.1785/0120100258.

Liu, K.H. and Gao, S.S., 2006, Mantle transition zone discontinuities beneath the Baikal rift and adjacent areas: Journal of Geophysical Research, v. 111, B11301, https://doi.org/10.1029/2005JB004099.

Liu, K.H., Elsheikh, A., Lemnifi, A., Purevsuren, U., Ray, M., Refayee, H., Yang, B.B., Yu, Y. and Gao, S.S., 2014, A uniform database of teleseismic shear wave splitting measurements for the western and central United States: Geochemistry, Geophysics, Geosystems, v. 15, p. 2075-2085, https://doi.org/10.1002/2014GC005267.

Tan, P., Sippel, J., Breivik, A.J., Meeßen, C. and Scheck-Wenderoth, M., 2018, Lithospheric control on asthenospheric flow from the Iceland plume: 3-D density

modeling of the Jan Mayen-East Greenland Region, NE Atlantic: Journal of Geophysical Research, v. 123, p. 9223-9248, https://doi.org/10.1029/2018JB015634.

Silver, P.G. and Chan, W.W., 1991, Shear wave splitting and subcontinental mantle deformation: Journal of Geophysical Research, v. 96, p. 16429-16454, https://doi.org/10.1029/91JB00899.

Yang, B.B., Liu, K.H., Dahm, H.H. and Gao, S.S., 2016, A uniform database of teleseismic shear- wave splitting measurements for the western and central United States: December 2014 update: Seismological Research Letters, v. 87, p. 295-300, https://doi.org/10.1785/0220150213.

Yang, B.B., Liu, Y., Dahm, H., Liu, K.H. and Gao, S.S., 2017, Seismic azimuthal anisotropy beneath the eastern United States and its geodynamic implications: Geophysical Research Letters, v. 44, p. 2670-2678, https://doi.org/10.1002/2016GL071227.

Figures and Tables

Table S1. SKS and SKKS shear wave splitting anisotropy measurements from same event-station pairs inside the anomalous zone (the arc shaped area outlined by the yellow dashed line in Fig. 1). The fields of the table include:

Sta: Station name

Ev: Event name

St_lat: Station latitude (°)

St_lon: Station longitude (°)

Phi_{sks}: Fast orientation of SKS (measured clockwise from the north) (°)

Phi_SD_{sks}: Standard deviation of the fast orientation of SKS

Dt_{sks}: Splitting time of SKS (s)

Dt_SD_{sks}: Standard deviation of the splitting time of SKS

Phi_{skks}: Fast orientation of SKKS (measured clockwise from the north) (°)

Phi_SD_{skks}: Standard deviation of the fast orientation of SKKS

Dt_{skks}: Splitting time of SKKS (s)

Dt_SD_{skks}: Standard deviation of the splitting time of SKKS

Ev_lat: Event latitude (°)

Ev_lon: Event longitude (°)

Ev_dep: Event depth (km)

Epi: Epicentral distance (°)

BAZ: Back azimuth (°)

Sta	Ev	St_lat	St_lon	Phi_{sks}	Phi_SD_{sks}	Dt_{sks}	Dt_SD_{sks}	Phi_{skks}	Phi_SD_{skks}	Dt_{skks}	Dt_SD_{skks}	Ev_lat	Ev_lon	Ev_dep	Epi	BAZ
237Axx_TA	EQ113480504	32.00	-95.81	35.00	4.00	1.55	0.20	42.00	15.50	1.15	0.38	-7.5610	146.8040	140.90	117.1552	278.3644
240Axx_TA	EQ122391505	32.04	-93.76	67.00	7.00	1.20	0.20	73.00	13.00	0.80	0.25	2.1900	126.8370	91.10	128.6348	303.6482
244Axx_TA	EQ113480504	32.04	-90.69	81.00	4.50	1.35	0.30	71.00	19.50	0.65	0.25	-7.5610	146.8040	140.90	121.4320	281.5106
344Axx_TA	EQ113480504	31.45	-90.73	55.00	4.50	1.25	0.13	62.00	14.50	0.65	0.22	-7.5610	146.8040	140.90	121.5140	281.1325
345Axx_TA	EQ113480504	31.31	-90.03	66.00	5.50	1.55	0.20	69.00	19.50	1.05	0.40	-7.5610	146.8040	140.90	122.1285	281.4831
441Bxx_N4	EQ141800556	30.75	-93.19	66.00	3.50	1.90	0.22	69.00	4.50	1.80	0.20	24.4010	142.5910	43.20	103.4377	309.1848
445Axx_TA	EQ113480504	30.73	-90.34	66.00	17.00	1.45	0.43	75.00	13.50	0.90	0.30	-7.5610	146.8040	140.90	121.9798	280.9366
446Axx_TA	EQ113480504	30.79	-89.36	67.00	7.50	1.30	0.28	77.00	10.00	1.15	0.33	-7.5610	146.8040	140.90	122.7955	281.5770
537Axx_TA	EQ110182023	30.08	-96.32	68.00	1.50	2.10	0.10	60.00	7.50	2.00	0.35	28.7770	63.9510	68.00	118.5165	19.7098
635Axx_TA	EQ110182023	29.39	-97.77	67.00	4.00	2.20	0.22	68.00	1.50	2.00	0.07	28.7770	63.9510	68.00	119.5787	18.4571
636Axx_TA	EQ113120259	29.48	-97.06	66.00	2.00	1.85	0.25	81.00	13.50	1.35	0.35	27.3240	125.6210	224.90	110.2871	319.9831
738Axx_TA	EQ110182023	28.84	-95.65	61.00	7.00	1.50	0.30	69.00	7.50	1.55	0.25	28.7770	63.9510	68.00	119.4754	20.5776
834Axx_TA	EQ110182023	28.13	-98.55	55.00	2.00	1.95	0.13	61.00	4.00	1.75	0.20	28.7770	63.9510	68.00	120.9852	17.9327
C34Axx_TA	EQ113480504	47.65	-94.91	44.00	2.50	1.05	0.10	61.00	14.00	0.55	0.17	-7.5600	146.8000	140.00	114.4556	286.4534
C35Axx_TA	EQ110182023	47.70	-93.98	68.00	6.00	0.70	0.07	68.00	7.00	1.10	0.17	28.7800	63.9500	68.00	101.3227	19.6567
C37Axx_TA	EQ110182023	47.73	-92.19	73.00	2.50	1.25	0.10	66.00	10.50	1.15	0.25	28.7800	63.9500	68.00	100.8727	21.1971
D33Axx_TA	EQ110182023	47.14	-95.84	41.00	1.00	1.35	0.08	49.00	5.50	1.30	0.23	28.7800	63.9500	68.00	102.2613	18.0796
D33Axx_TA	EQ112100742	47.14	-95.84	42.00	7.00	0.95	0.20	28.00	15.50	0.45	0.22	-23.7800	179.7600	523.00	103.4131	249.6012
D33Axx_TA	EQ113480504	47.14	-95.84	31.00	4.00	1.45	0.30	34.00	13.00	1.05	0.35	-7.5600	146.8000	140.00	113.9884	285.4721
D34Axx_TA	EQ113480504	47.09	-95.20	35.00	4.00	1.45	0.30	50.00	12.50	0.65	0.15	-7.5600	146.8000	140.00	114.4227	285.9712
D35Axx_TA	EQ112100742	47.08	-94.05	16.00	10.00	0.85	0.15	34.00	12.50	0.45	0.10	-23.7800	179.7600	523.00	104.5431	250.7914
D37Axx_TA	EQ112100742	47.16	-92.43	4.00	8.50	0.95	0.25	38.00	16.00	0.50	0.23	-23.7800	179.7600	523.00	105.6169	251.9000
E34Axx_TA	EQ112481755	46.51	-95.17	34.00	9.50	0.75	0.18	52.00	8.50	0.95	0.20	2.9600	97.8900	91.00	129.4061	343.0180
E38Axx_TA	EQ113480504	46.61	-91.55	69.00	9.00	0.85	0.12	45.00	9.00	0.70	0.18	-7.5600	146.8000	140.00	116.9568	288.7655
F40Axx_TA	EQ120331334	45.92	-90.12	58.00	5.50	1.35	0.22	36.00	16.00	0.80	0.28	-17.8300	167.1300	23.00	111.3871	266.1873
FFILxx_NM	EQ151160709	38.38	-88.39	54.00	6.00	0.80	0.10	68.00	6.50	0.90	0.17	27.7880	86.0350	24.80	113.9709	5.4050
FVMxxx_NM	EQ122010736	37.98	-90.43	83.00	4.50	1.25	0.20	78.00	12.00	1.00	0.28	37.2480	71.3750	98.40	103.2802	14.8338

G39Axx_TA	EQ132400254	45.29	-91.17	-37.00	15.50	0.60	0.20	-53.00	17.50	0.45	0.20	-27.7950	179.6720	488.60	108.6247	249.1902
G40Axx_TA	EQ122391505	45.27	-90.20	70.00	14.00	0.90	0.28	67.00	9.00	0.85	0.18	2.2000	126.8300	91.00	122.4337	314.5191
H42Axx_TA	EQ113480504	44.51	-88.53	62.00	10.50	1.15	0.30	43.00	15.50	0.95	0.33	-7.5610	146.8040	140.90	119.6558	290.2264
H43Axx_TA	EQ113480504	44.47	-87.77	57.00	5.50	1.15	0.18	54.00	16.00	0.70	0.30	-7.5610	146.8040	140.90	120.1792	290.8454
H46Axx_TA	EQ131881835	44.54	-85.20	57.00	10.00	1.10	0.32	50.00	8.50	0.75	0.18	-3.9230	153.9200	386.20	114.4363	289.8628
I45Axx_TA	EQ131881835	44.04	-86.23	60.00	9.00	1.05	0.23	48.00	15.00	0.80	0.33	-3.9230	153.9200	386.20	113.9039	288.8243
J42Axx_TA	EQ113480504	43.32	-89.12	74.00	13.50	0.60	0.20	60.00	11.00	0.65	0.12	-7.5610	146.8040	140.90	119.6546	289.0990
L44Axx_TA	EQ131881835	42.18	-87.91	63.00	15.50	0.70	0.25	38.00	5.00	0.80	0.15	-3.9230	153.9200	386.20	113.3001	286.7424
MPHxxx_NM	EQ072711338	35.12	-89.93	57.00	1.50	1.25	0.10	57.00	13.50	1.15	0.45	22.0130	142.6680	260.00	104.3969	310.4412
MPHxxx_NM	EQ141800556	35.12	-89.93	58.00	3.00	1.45	0.25	62.00	11.00	0.95	0.35	24.4010	142.5910	43.20	102.6787	312.1322
OLILxx_NM	EQ131881835	38.73	-88.10	59.00	3.00	0.95	0.07	89.00	4.50	0.75	0.20	-3.9230	153.9200	386.30	114.1077	285.1467
OXFxxx_US	EQ072711338	34.51	-89.41	63.00	2.50	1.20	0.13	70.00	16.00	0.90	0.30	22.0130	142.6680	260.00	105.1176	310.6882
OXFxxx_US	EQ131881835	34.51	-89.41	64.00	1.50	1.15	0.05	51.00	13.50	0.55	0.15	-3.9230	153.9200	386.30	114.0874	282.4253
P43Axx_TA	EQ131881835	39.64	-89.52	60.00	3.50	0.75	0.08	35.00	4.50	0.70	0.12	-3.9230	153.9200	386.30	112.8082	284.5117
P44Axx_TA	EQ113480504	39.47	-88.62	59.00	4.50	1.10	0.10	52.00	9.50	0.95	0.18	-7.5610	146.8040	140.90	121.2157	287.3502
P45Axx_TA	EQ113480504	39.53	-87.74	87.00	2.00	1.50	0.18	62.00	15.00	0.75	0.22	-7.5610	146.8040	140.90	121.8461	288.0698
Q44Axx_TA	EQ122391505	38.90	-89.02	68.00	16.00	0.95	0.43	58.00	12.00	0.60	0.45	2.1900	126.8370	91.10	127.4611	312.4876
Q44Bxx_N4	EQ141800556	38.90	-89.02	60.00	9.00	0.80	0.25	60.00	7.50	0.85	0.30	24.4010	142.5910	43.20	100.6525	313.3524
Q45Axx_TA	EQ113480504	38.89	-88.16	67.00	3.50	1.00	0.07	83.00	13.00	0.85	0.32	-7.5610	146.8040	140.90	121.7298	287.3665
Q45Axx_TA	EQ131881835	38.89	-88.16	74.00	4.00	0.85	0.10	94.00	2.00	0.85	0.17	-3.9230	153.9200	386.30	114.0206	285.1726
Q46Axx_TA	EQ113480504	39.02	-87.36	52.00	11.50	0.85	0.18	42.00	10.50	0.95	0.28	-7.5610	146.8040	140.90	122.2845	288.0634
Q46Axx_TA	EQ131881835	39.02	-87.36	63.00	5.00	0.90	0.13	57.00	6.50	0.60	0.07	-3.9230	153.9200	386.30	114.5871	285.8053
R45Axx_TA	EQ131881835	38.29	-88.28	51.00	4.00	1.15	0.12	86.00	10.50	0.60	0.18	-3.9230	153.9200	386.30	114.0849	284.8289
R46Axx_TA	EQ113480504	38.21	-87.51	48.00	4.50	1.30	0.20	44.00	8.50	1.00	0.25	-7.5610	146.8040	140.90	122.4193	287.4595
R46Axx_TA	EQ131881835	38.21	-87.51	53.00	5.50	1.00	0.15	66.00	9.50	0.80	0.15	-3.9230	153.9200	386.30	114.6910	285.3402
SFINxx_TA	EQ101511951	40.38	-87.10	21.00	10.00	1.00	0.35	52.00	5.50	0.65	0.07	11.1320	93.4710	112.00	128.7478	359.2815
SFINxx_TA	EQ132400254	40.38	-87.10	7.00	9.00	0.80	0.20	171.00	5.00	1.00	0.30	-27.7950	179.6720	488.60	109.7216	249.9873
SIUCxx_NM	EQ001660215	37.71	-89.22	104.00	6.50	0.65	0.10	129.00	9.00	0.70	0.15	-25.5160	178.0460	604.60	107.1650	250.8444
SIUCxx_NM	EQ001992253	37.71	-89.22	62.00	10.50	0.55	0.10	70.00	11.50	1.20	0.27	36.2830	70.9240	141.40	104.1139	16.4384
SIUCxx_NM	EQ002280430	37.71	-89.22	100.00	6.00	0.65	0.08	110.00	10.00	0.55	0.10	-31.5110	179.7250	357.70	109.2244	244.7406
SIUCxx_NM	EQ011540241	37.71	-89.22	99.00	10.50	0.60	0.15	105.00	11.00	0.45	0.10	-29.6660	-178.6330	178.10	107.0297	245.5349
SIUCxx_NM	EQ021812129	37.71	-89.22	104.00	17.50	0.55	0.25	112.00	10.50	0.55	0.10	-22.2010	179.2500	620.40	104.3859	253.0198
SIUCxx_NM	EQ031462313	37.71	-89.22	81.00	16.50	0.65	0.30	87.00	13.50	0.55	0.20	6.7610	123.7070	565.80	126.1497	318.0448
SIUCxx_NM	EQ102042251	37.71	-89.22	68.00	10.00	1.45	0.55	62.00	4.00	1.15	0.25	6.4970	123.4800	578.00	126.4918	318.1078
USINxx_NM	EQ032060937	37.97	-87.67	65.00	9.50	1.20	0.28	55.00	12.00	1.05	0.28	-1.5280	149.6940	24.00	116.2510	290.1784
USINxx_NM	EQ131881835	37.97	-87.67	66.00	4.00	1.00	0.13	69.00	10.00	0.80	0.17	-3.9230	153.9200	386.30	114.6321	285.1206
VBMSxx_US	EQ110182023	32.22	-90.52	48.00	2.50	1.10	0.12	60.00	13.00	1.15	0.35	28.7770	63.9510	68.00	114.6655	24.6021
W45Bxx_N4	EQ141240915	35.16	-89.19	29.00	18.50	0.45	0.20	56.00	3.00	1.15	0.20	-24.6110	179.0860	527.00	105.0616	250.4183
X44Axx_TA	EQ122391505	34.50	-90.15	65.00	5.50	1.75	0.30	76.00	6.00	1.05	0.15	2.1900	126.8370	91.10	129.6299	308.6848
Y39Axx_TA	EQ102042251	33.94	-94.09	68.00	4.50	1.50	0.20	61.00	7.50	1.50	0.48	6.4900	123.4700	585.00	126.3317	311.2441
Y45Axx_TA	EQ113480504	33.87	-89.54	71.00	8.50	1.20	0.25	80.00	13.00	0.95	0.30	-7.5610	146.8040	140.90	121.9832	283.3631
Z40Axx_TA	EQ113480504	33.26	-93.40	47.00	5.00	1.30	0.15	56.00	16.00	0.55	0.28	-7.5610	146.8040	140.90	118.9556	280.4961
Z45Axx_TA	EQ113480504	33.37	-89.69	51.00	8.00	1.50	0.30	37.00	4.50	0.95	0.15	-7.5610	146.8040	140.90	121.9749	282.9594
Z46Axx_TA	EQ113480504	33.19	-88.94	74.00	15.00	0.80	0.30	42.00	21.00	0.80	0.47	-7.5610	146.8040	140.90	122.6275	283.3489

Table S2. Same as Table DR1 but for the SKS and SKKS pairs outside the anomalous zone.

Sta	Ev	St_lat	St_lon	Phi_{sks}	Phi_SD_{sks}	Dt_{sks}	Dt_SD_{sks}	Phi_{skks}	Phi_SD_{skks}	Dt_{skks}	Dt_SD_{skks}	Ev_lat	Ev_lon	Ev_dep	Epi	BAZ
150Axx_TA	EQ131340032	32.61	-86.02	72.00	5.50	1.25	0.18	69.00	4.50	1.20	0.18	18.7280	145.2870	602.30	109.1993	308.4404
152Axx_TA	EQ131340032	32.67	-84.72	70.00	7.00	0.80	0.17	63.00	12.00	0.70	0.17	18.7280	145.2870	602.30	110.0151	309.4003
233Axx_TA	EQ112001935	32.02	-98.90	53.00	4.00	1.00	0.10	61.00	8.00	1.25	0.28	40.0800	71.4100	20.00	107.7021	7.7912
234Axx_TA	EQ112001935	32.00	-98.14	35.00	12.50	0.65	0.22	50.00	7.00	1.10	0.17	40.0800	71.4100	20.00	107.6309	8.3966
335Axx_TA	EQ112001935	31.28	-97.43	38.00	10.00	1.30	0.37	41.00	10.00	1.60	0.33	40.0810	71.4100	20.00	108.2479	8.9961
336Axx_TA	EQ113480504	31.39	-96.84	40.00	4.50	1.10	0.15	43.00	4.00	1.20	0.12	-7.5610	146.8040	140.90	116.3692	277.4611
349Axx_TA	EQ131340032	31.35	-87.19	86.00	6.50	1.10	0.17	103.00	3.50	1.30	0.17	18.7280	145.2870	602.30	109.1851	307.2660
355Axx_TA	EQ131312046	31.34	-82.85	28.00	6.50	0.95	0.12	23.00	12.00	0.85	0.20	-17.9540	-175.0990	212.20	100.9841	255.6791
355Axx_TA	EQ131431719	31.34	-82.85	17.00	8.00	1.15	0.23	18.00	16.00	0.50	0.20	-23.0250	-177.1090	171.40	105.0600	252.0652
435Bxx_TA	EQ112001935	30.78	-97.58	41.00	7.50	1.65	0.35	59.00	2.50	1.80	0.13	40.0800	71.4100	20.00	108.7613	8.9027
435Bxx_TA	EQ113450954	30.78	-97.58	32.00	9.50	0.80	0.20	36.00	17.00	0.90	0.35	-56.0090	-28.1840	116.00	104.5488	147.1027
435Bxx_TA	EQ113480504	30.78	-97.58	25.00	19.50	0.80	0.35	33.00	7.00	1.15	0.20	-7.5610	146.8040	140.90	115.8144	276.7470
448Axx_TA	EQ120010527	30.93	-87.86	91.00	13.00	1.05	0.28	100.00	10.00	1.15	0.22	31.4560	138.0720	365.30	104.1916	320.7009
449Axx_TA	EQ131431719	30.76	-87.22	113.00	12.00	0.45	0.15	122.00	10.00	0.60	0.15	-23.0250	-177.1090	171.40	101.3256	249.9794
451Axx_N4	EQ151501123	30.62	-85.75	68.00	7.00	1.10	0.23	66.00	10.50	1.35	0.50	27.8410	140.4880	664.00	107.0111	318.0245
451Axx_N4	EQ151741218	30.62	-85.75	67.00	16.00	1.20	0.57	85.00	16.00	0.95	0.33	27.6690	139.7930	455.90	107.5408	318.3993
733Axx_TA	EQ102042251	28.72	-99.29	64.00	3.00	1.20	0.10	-85.00	6.00	0.70	0.10	6.4900	123.4700	585.00	125.9529	303.5506
733Axx_TA	EQ102100731	28.72	-99.29	61.00	5.00	1.20	0.17	-81.00	12.00	0.75	0.23	6.5300	123.2500	627.00	126.0869	303.7697
833Axx_TA	EQ102042251	28.32	-99.39	66.00	5.00	1.25	0.18	80.00	7.00	1.00	0.15	6.4900	123.4700	585.00	126.0988	303.2259
833Axx_TA	EQ122391505	28.32	-99.39	78.00	8.50	1.55	0.30	57.00	13.50	1.15	0.40	2.1900	126.8370	91.10	126.2682	296.4969
833Axx_TA	EQ131340032	28.32	-99.39	68.00	3.50	1.00	0.10	72.00	11.00	1.00	0.30	18.7280	145.2870	602.30	101.9326	298.8886
A29Axx_TA	EQ092771058	48.92	-99.23	66.00	9.50	0.60	0.17	70.00	3.50	1.55	0.15	6.7400	123.3800	620.00	113.2364	312.9673
A29Axx_TA	EQ102042251	48.92	-99.23	72.00	8.50	0.45	0.12	63.00	1.50	1.50	0.13	6.5000	123.4800	578.00	113.3963	312.7464
A29Axx_TA	EQ110182023	48.92	-99.23	42.00	3.00	1.15	0.13	53.00	8.00	0.95	0.17	28.7800	63.9500	68.00	101.2021	15.0077
A29Axx_TA	EQ111130416	48.92	-99.23	51.00	3.00	1.30	0.13	56.00	3.50	1.20	0.12	-10.3800	161.2000	79.00	104.0303	270.2870
A30Axx_TA	EQ102042251	48.94	-98.30	75.00	7.00	0.80	0.15	79.00	2.50	1.45	0.10	6.4970	123.4800	578.00	113.8324	313.6339
A30Axx_TA	EQ110182023	48.94	-98.30	69.00	10.50	0.70	0.12	69.00	12.00	0.65	0.15	28.7800	63.9500	68.00	101.0198	15.8219
A31Axx_TA	EQ110182023	48.93	-97.19	76.00	2.00	1.30	0.07	72.00	3.00	1.60	0.15	28.7800	63.9500	68.00	100.8239	16.7924
A32Axx_TA	EQ110182023	48.92	-96.49	68.00	2.00	1.50	0.07	70.00	3.00	1.60	0.12	28.7800	63.9500	68.00	100.6977	17.4030
A33Axx_TA	EQ110182023	48.94	-95.39	76.00	3.00	1.50	0.12	64.00	3.00	1.50	0.10	28.7800	63.9500	68.00	100.4559	18.3577
A33Axx_TA	EQ122071120	48.94	-95.39	65.00	5.00	1.70	0.22	72.00	13.00	1.25	0.43	-9.6900	159.7300	20.00	107.0172	274.8045
A33Axx_TA	EQ122391505	48.94	-95.39	67.00	3.00	1.40	0.13	77.00	6.50	1.80	0.35	2.2000	126.8300	91.00	117.3403	310.8931
AAMxxx_US	EQ050360334	42.30	-83.66	75.00	6.50	0.85	0.15	62.00	6.00	0.80	0.17	16.0110	145.8670	142.70	106.2182	310.3686
ABTXxx_TA	EQ113480504	32.62	-99.64	83.00	9.00	0.90	0.28	30.00	3.00	1.50	0.20	-7.5610	146.8040	140.90	113.8596	276.4199
ACSOxx_US	EQ021812129	40.23	-82.98	47.00	9.50	0.75	0.18	14.00	14.50	0.65	0.22	-22.2010	179.2500	620.40	109.7315	257.2951
ACSOxx_US	EQ022311101	40.23	-82.98	25.00	13.00	0.65	0.17	8.00	11.50	0.90	0.38	-21.6960	-179.5130	580.00	108.5093	256.9999
ACSOxx_US	EQ032060937	40.23	-82.98	49.00	5.50	1.60	0.38	47.00	6.00	1.55	0.35	-1.5280	149.6940	24.00	118.7568	294.9401
ACSOxx_US	EQ151160709	40.23	-82.98	42.00	10.00	1.00	0.25	61.00	9.50	1.05	0.22	27.7880	86.0350	24.80	111.5624	10.4586
AGMNxx_US	EQ110182023	48.30	-95.86	64.00	6.00	0.90	0.10	61.00	5.00	1.45	0.20	28.7800	63.9500	68.00	101.1618	17.9876
AGMNxx_US	EQ112100742	48.30	-95.86	41.00	5.00	0.95	0.12	23.00	19.00	0.45	0.43	-23.7840	179.7600	523.00	103.8055	249.8483
AGMNxx_US	EQ122071120	48.30	-95.86	40.00	10.50	1.15	0.28	37.00	14.00	0.70	0.23	-9.6940	159.7270	20.00	106.7618	274.2511
AGMNxx_US	EQ131881835	48.30	-95.86	44.00	7.00	1.05	0.22	42.00	8.50	0.70	0.15	-3.9230	153.9200	386.20	106.3102	282.7194
ALLYxx_LD	EQ062192218	41.65	-80.14	53.00	2.00	0.90	0.05	62.00	6.50	1.00	0.18	-15.7980	167.7890	150.00	116.7585	272.3581
ALLYxx_LD	EQ072892105	41.65	-80.14	53.00	6.00	1.05	0.22	25.00	19.50	0.50	0.30	-25.7750	179.5300	509.30	114.0480	256.2496
ALLYxx_LD	EQ140640956	41.65	-80.14	40.00	5.00	0.90	0.10	45.00	15.00	0.70	0.20	-14.7380	169.8230	638.00	114.5705	271.8915
ALLYxx_LD	EQ152932152	41.65	-80.14	47.00	7.50	0.90	0.15	50.00	6.00	0.90	0.10	-14.8600	167.3010	135.00	116.5352	273.4999
B29Axx_TA	EQ110182023	48.46	-99.35	54.00	1.50	1.25	0.05	50.00	6.50	1.20	0.22	28.7800	63.9500	68.00	101.6674	14.9263
B29Axx_TA	EQ111130416	48.46	-99.35	29.00	7.50	1.00	0.25	28.00	2.50	0.80	0.10	-10.3800	161.2000	79.00	103.9523	270.0824
B30Axx_TA	EQ110182023	48.45	-98.33	68.00	3.00	1.20	0.07	69.00	5.50	1.15	0.15	28.7800	63.9500	68.00	101.4971	15.8222
B32Axx_TA	EQ110182023	48.40	-96.54	64.00	2.50	1.35	0.08	62.00	2.00	1.60	0.10	28.7800	63.9500	68.00	101.2043	17.3896
B32Axx_TA	EQ112462255	48.40	-96.54	30.00	3.50	1.05	0.10	32.00	14.00	1.05	0.32	-20.6700	169.7200	185.00	107.5982	258.6057
B32Axx_TA	EQ113480504	48.40	-96.54	41.00	3.50	1.35	0.15	40.00	15.00	0.95	0.33	-7.5600	146.8000	140.00	113.1974	285.4311
B33Axx_TA	EQ110182023	48.27	-95.59	50.00	7.00	0.80	0.15	61.00	11.00	0.75	0.15	28.7800	63.9500	68.00	101.1343	18.2242
B34Axx_TA	EQ110182023	48.49	-94.65	71.00	4.50	1.25	0.15	72.00	4.00	1.40	0.15	28.7800	63.9500	68.00	100.7255	19.0259
B34Axx_TA	EQ113480504	48.49	-94.65	75.00	7.50	0.95	0.15	79.00	7.00	0.95	0.23	-7.5600	146.8000	140.00	114.3804	287.0345
B34Axx_TA	EQ121880228	48.49	-94.65	43.00	6.50	1.00	0.10	53.00	8.50	1.20	0.25	-14.6600	167.3400	160.00	106.1106	266.0243
B35Axx_TA	EQ110182023	48.36	-93.73	73.00	1.50	1.40	0.05	67.00	2.00	1.40	0.10	28.7800	63.9500	68.00	100.6444	19.8294
BELLxx_XB	EQ961610112	48.10	-78.94	113.00	12.50	0.95	0.30	90.00	9.50	1.05	0.20	17.4440	145.4580	149.00	103.6558	316.5839
BRALxx_US	EQ072711338	31.17	-87.05	82.00	4.50	1.45	0.15	93.00	5.50	1.45	0.22	22.0130	142.6680	260.00	108.8052	311.5963
BRALxx_US	EQ092211055	31.17	-87.05	91.00	5.00	1.10	0.12	93.00	10.00	1.00	0.20	33.1670	137.9440	292.00	103.1788	322.4778
C32Axx_TA	EQ120331334	47.83	-96.53	30.00	14.00	1.15	0.32	14.00	4.50	1.30	0.23	-17.8300	167.1300	23.00	107.2027	262.3397
C32Axx_TA	EQ121750434	47.83	-96.53	47.00	7.00	1.15	0.28	49.00	4.00	1.25	0.23	3.0090	97.8960	95.00	127.8173	341.6430
C38Axx_TA	EQ110182023	47.72	-91.27	66.00	13.00	0.65	0.15	51.00	14.50	1.05	0.40	28.7800	63.9500	68.00	100.6534	21.9862
CAROxx_XB	EQ961610112	47.92	-78.98	108.00	8.00	0.95	0.20	96.00	6.50	1.20	0.17	17.4440	145.4580	149.00	103.7681	316.5193
CCMxxx_IU	EQ052881551	38.06	-91.24	12.00	12.00	0.45	0.15	28.00	8.00	0.90	0.18	25.3100	123.3500	192.00	109.0962	327.0604
CCMxxx_IU	EQ932190000	38.06	-91.24	25.00	7.00	0.50	0.10	31.00	5.50	0.85	0.17	26.5800	125.6100	155.00	107.0038	325.8331
D30Axx_TA	EQ110182023	47.11	-98.76	55.00	3.50	0.85	0.08	63.00	10.50	0.85	0.22	28.7800	63.9500	68.00	102.8664	15.5226
D31Axx_TA	EQ110182023	47.05	-97.72	45.00	2.50	0.95	0.10	49.00	8.00	0.70	0.13	28.7800	63.9500	68.00	102.7284	16.4408
D31Axx_TA	EQ113480504	47.05	-97.72	36.00	2.00	1.10	0.12	38.00	7.50	0.95	0.20	-7.5600	146.8000	140.00	112.7688	283.9207
D31Axx_TA	EQ120331334	47.05	-97.72	27.00	7.00	0.85	0.12	37.00	13.00	0.75	0.18	-17.8300	167.1300	23.00	106.2919	261.2680
DESTxx_XB	EQ961610112	48.46	-78.99	98.00	17.00	0.55	0.20	80.00	13.50	0.90	0.25	17.4440	145.4580	149.00	103.3711	316.6004
DWDANx_SP	EQ021812129	34.74	-82.83	44.00	10.50	0.50	0.12	59.00	16.50	0.55	0.22	-22.2010	179.2500	620.40	108.5588	255.5255
DWPFxx_IU	EQ072711338	28.11	-81.43	76.00	3.00	1.15	0.10	75.00	4.00	1.45	0.18	22.0130	142.6680	260.00	114.4576	314.8123
DWPFxx_IU	EQ110182023	28.11	-81.43	91.00	2.50	1.15	0.10	83.00	8.00	1.10	0.20	28.7770	63.9510	68.00	114.4369	33.2162
E29Axx_TA	EQ111130416	46.57	-99.64	28.00	4.00	1.30	0.15	21.00	4.00	1.60	0.28	-10.3800	161.2000	79.00	103.7472	269.4031
E31Axx_TA	EQ113480504	46.56	-97.89	43.00	4.00	0.80	0.10	47.00	16.00	0.60	0.20	-7.5600	146.8000	140.00	112.7719	283.5857
E42Axx_TA	EQ131312046	46.43	-87.91	55.00	9.50	0.70	0.20	17.00	16.50	0.55	0.20	-17.9540	-175.0990	212.20	100.8936	255.5143
E43Axx_TA	EQ113480504	46.38	-87.00	46.00	8.50	1.35	0.32	40.00	3.00	1.80	0.30	-7.5610	146.8040	140.90	119.9771	292.5363
E44Axx_TA	EQ131881835	46.62	-85.92	51.00	5.50	0.90	0.15	45.00	10.00	0.80	0.23	-3.9230	153.9200	386.20	113.2495	290.1377
E45Axx_TA	EQ113480504	46.36	-85.18	61.00	6.50	0.90	0.12	49.00	11.00	1.05	0.30	-7.5610	146.8040	140.90	121.1422	294.1334
E45Axx_TA	EQ122391505	46.36	-85.18	71.00	3.50	1.25	0.17	90.00	17.00	0.55	0.28	2.1900	126.8370	91.10	124.0144	320.2716
E46Axx_TA	EQ131881835	46.37	-84.31	62.00	6.00	0.80	0.12	45.00	15.50	0.60	0.22	-3.9230	153.9200	386.20	114.3782	291.3725
ERPAxx_US	EQ062192218	42.12	-79.99	54.00	3.50	0.85	0.08	68.00	11.50	1.05	0.40	-15.7980	167.7890	150.00	116.8497	272.6974
ERPAxx_US	EQ140640956	42.12	-79.99	53.00	18.50	1.10	0.50	61.00	17.50	1.00	0.43	-14.7380	169.8230	638.00	114.6656	272.2082
EYMNxx_US	EQ021161606	47.95	-91.50	55.00	2.50	1.25	0.15	53.00	3.50	1.15	0.17	13.0900	144.6200	85.00	101.4515	304.3769
EYMNxx_US	EQ031462313	47.95	-91.50	67.00	3.50	0.70	0.12	62.00	1.00	1.60	0.12	6.7600	123.7100	565.00	117.3179	319.8720
EYMNxx_US	EQ032060937	47.95	-91.50	54.00	6.00	1.45	0.25	52.00	3.00	1.45	0.12	-1.5300	149.6900	24.00	110.0894	291.1468

EYMNxx_US	EQ050391448	47.95	-91.50	44.00	8.50	1.55	0.28	29.00	3.50	1.85	0.25	-14.2500	167.2600	206.00	107.9472	268.5232
EYMNxx_US	EQ102160715	47.95	-91.50	55.00	4.00	1.75	0.20	50.00	3.50	1.50	0.18	-5.4900	146.8200	220.00	114.9490	290.8796
EYMNxx_US	EQ122391505	47.95	-91.50	60.00	2.50	1.20	0.15	63.00	2.00	1.65	0.15	2.1900	126.8370	91.10	119.9220	314.3431
EYMNxx_US	EQ131881835	47.95	-91.50	58.00	7.00	1.55	0.27	51.00	4.50	1.25	0.18	-3.9230	153.9200	386.20	109.2263	286.0810
F29Axx_TA	EQ102042251	45.83	-99.83	52.00	3.00	1.00	0.23	61.00	1.50	1.30	0.12	6.5000	123.4800	578.00	115.1599	311.1457
F31Axx_TA	EQ113480504	45.86	-98.25	31.00	2.00	0.90	0.10	47.00	13.50	0.55	0.15	-7.5600	146.8000	140.00	112.6898	283.0171
F33Axx_TA	EQ110182023	45.84	-96.29	40.00	1.00	1.10	0.08	43.00	3.50	1.15	0.15	28.7800	63.9500	68.00	103.5943	17.7782
F34Axx_TA	EQ110182023	45.80	-95.26	73.00	2.00	0.90	0.05	72.00	6.50	1.05	0.17	28.7800	63.9500	68.00	103.4069	18.6817
F44Axx_TA	EQ113480504	45.97	-86.42	51.00	3.00	1.15	0.13	45.00	6.50	1.25	0.30	-7.5610	146.8040	140.90	120.5071	292.8234
F45Axx_TA	EQ113480504	45.68	-85.52	51.00	5.00	1.10	0.17	53.00	9.00	1.15	0.28	-7.5610	146.8040	140.90	121.1998	293.4552
F46Axx_TA	EQ113480504	45.77	-84.76	50.00	13.00	0.85	0.28	43.00	2.50	1.25	0.18	-7.5610	146.8040	140.90	121.6505	294.1793
FA20xx_XR	EQ021161606	42.97	-95.98	67.00	6.00	0.80	0.12	64.00	5.00	0.95	0.12	13.0900	144.6200	85.00	101.4338	299.9968
G29Axx_TA	EQ102042251	45.19	-99.92	60.00	1.50	1.00	0.10	71.00	5.50	1.00	0.15	6.5000	123.4800	578.00	115.5319	310.8332
G30Axx_TA	EQ092971440	45.13	-99.14	58.00	6.00	1.25	0.25	61.00	3.00	1.15	0.13	-6.1300	130.3800	130.00	122.1322	296.7280
G30Axx_TA	EQ102042251	45.13	-99.14	62.00	1.00	1.20	0.07	63.00	2.00	1.40	0.10	6.5000	123.4800	578.00	115.9868	311.5380
G31Axx_TA	EQ113480504	45.23	-98.21	52.00	3.50	1.05	0.10	49.00	5.00	0.80	0.12	-7.5600	146.8000	140.00	112.8579	282.7903
G33Axx_TA	EQ112100742	45.19	-96.44	49.00	5.50	1.00	0.20	44.00	7.00	0.70	0.15	-23.7800	179.7600	523.00	102.3304	248.7869
G47Axx_TA	EQ131881835	45.17	-83.86	57.00	2.50	1.00	0.08	48.00	2.00	1.05	0.10	-3.9230	153.9200	386.20	115.1077	291.2313
H31Axx_TA	EQ112100742	44.48	-98.48	8.00	9.00	0.60	0.13	28.00	7.50	0.40	0.05	-23.7800	179.7600	523.00	100.7188	247.3296
H32Axx_TA	EQ113480504	44.50	-97.44	48.00	7.50	0.90	0.17	39.00	2.50	1.00	0.10	-7.5600	146.8000	140.00	113.5549	283.0792
I51Axx_TA	EQ131881835	43.80	-81.02	83.00	8.00	0.85	0.20	64.00	12.00	0.65	0.15	-3.9230	153.9200	386.20	117.5063	292.9656
J30Axx_TA	EQ110182023	43.32	-99.49	78.00	7.50	0.65	0.15	72.00	16.50	0.60	0.20	28.7800	63.9500	68.00	106.6580	15.1389
J32Axx_TA	EQ112100742	43.37	-97.85	-48.00	4.00	1.15	0.15	-47.00	5.00	1.05	0.17	-23.7800	179.7600	523.00	100.7134	247.5382
J37Axx_TA	EQ122391505	43.31	-93.55	70.00	13.50	0.90	0.30	58.00	7.00	0.95	0.22	2.2000	126.8300	91.00	121.9772	310.2538
K32Axx_TA	EQ102042251	42.66	-97.97	-60.00	6.00	0.90	0.25	-74.00	1.00	0.95	0.05	6.5000	123.4800	578.00	118.2591	311.6886
K33Axx_TA	EQ102042251	42.61	-97.00	-75.00	11.50	0.65	0.20	83.00	3.00	0.80	0.08	6.5000	123.4800	578.00	118.8235	312.5842
K33Axx_TA	EQ102100731	42.61	-97.00	-89.00	9.00	0.60	0.12	88.00	2.50	1.00	0.07	6.5500	123.2200	618.00	118.9228	312.8624
K49Axx_TA	EQ131881835	42.78	-83.46	78.00	6.50	0.90	0.15	58.00	3.00	0.90	0.08	-3.9230	153.9200	386.20	116.2285	290.4844
KGNOxx_CN	EQ122391505	44.23	-76.49	88.00	8.50	1.10	0.20	84.00	15.00	0.80	0.25	2.1900	126.8370	91.10	129.2910	329.2515
KSU1xx_US	EQ101511951	39.10	-96.61	34.00	13.50	0.55	0.17	19.00	3.50	0.90	0.10	11.1320	93.4710	112.00	129.1523	347.2011
L32Axx_TA	EQ102042251	42.00	-98.01	-74.00	16.00	0.55	0.20	77.00	4.50	0.60	0.05	6.5000	123.4800	578.00	118.6743	311.3834
L32Axx_TA	EQ102100731	42.00	-98.01	89.00	8.50	0.45	0.07	85.00	11.50	0.50	0.12	6.5500	123.2200	618.00	118.7783	311.6589
L34Axx_TA	EQ102042251	41.97	-96.38	60.00	7.50	0.95	0.30	71.00	2.00	0.85	0.05	6.5000	123.4800	578.00	119.5954	312.9119
L53Axx_TA	EQ151160709	41.95	-80.26	59.00	10.50	1.25	0.28	62.00	4.00	1.30	0.15	27.7880	86.0350	24.80	109.4641	12.8635
LRALxx_US	EQ110182023	33.03	-87.00	72.00	10.00	0.95	0.17	49.00	6.50	1.60	0.35	28.7770	63.9510	68.00	112.6352	27.5048
LRALxx_US	EQ113480504	33.03	-87.00	65.00	3.00	1.30	0.12	66.00	9.00	0.95	0.20	-7.5610	146.8040	140.90	124.2462	284.5608
LRALxx_US	EQ131340032	33.03	-87.00	71.00	4.00	1.45	0.18	61.00	4.50	1.45	0.23	18.7280	145.2870	602.30	108.2917	307.8506
M33Axx_TA	EQ102042251	41.57	-97.19	75.00	10.50	0.75	0.15	-87.00	2.50	0.90	0.07	6.4900	123.4700	585.00	119.4318	311.9790
M33Axx_TA	EQ102100731	41.57	-97.19	85.00	7.50	0.75	0.12	-85.00	5.50	0.95	0.15	6.5300	123.2500	627.00	119.5214	312.2126
M33Axx_TA	EQ110182023	41.57	-97.19	83.00	0.50	1.30	0.05	87.00	2.00	1.30	0.10	28.7800	63.9500	68.00	107.8609	17.3456
M34Axx_TA	EQ102042251	41.50	-96.58	72.00	5.00	0.95	0.12	79.00	2.50	0.95	0.08	6.5000	123.4800	578.00	119.8040	312.5245
M34Axx_TA	EQ102050535	41.50	-96.58	70.00	4.50	1.00	0.13	80.00	3.50	0.85	0.10	6.2200	123.5200	553.00	120.0127	312.3074
M35Axx_TA	EQ102042208	41.47	-95.69	61.00	4.50	1.05	0.22	69.00	1.00	0.95	0.05	6.7200	123.4100	607.00	120.1694	313.5690
M35Axx_TA	EQ102042251	41.47	-95.69	64.00	2.50	1.10	0.12	66.00	1.00	1.00	0.08	6.4900	123.4700	585.00	120.3277	313.3661
M35Axx_TA	EQ102100731	41.47	-95.69	68.00	7.00	1.05	0.25	69.00	2.50	0.90	0.10	6.5300	123.2500	627.00	120.4144	313.6032
M47Axx_TA	EQ131881835	41.36	-85.62	48.00	6.00	1.05	0.20	35.00	1.50	1.35	0.10	-3.9230	153.9200	386.20	115.1798	288.1416
M47Axx_TA	EQ141240915	41.36	-85.62	38.00	19.50	0.60	0.32	11.00	18.00	0.70	0.33	-24.6110	179.0860	527.00	109.6240	254.1995
M52Axx_N4	EQ152932152	41.54	-81.36	65.00	3.00	1.00	0.10	58.00	8.50	0.95	0.23	-14.8600	167.3010	135.00	115.6273	272.6154
M53Axx_TA	EQ141031236	41.44	-80.68	37.00	10.50	1.20	0.35	37.00	6.50	1.60	0.28	-11.4780	162.0040	38.40	117.9415	279.6406
M53Axx_TA	EQ152932152	41.44	-80.68	42.00	2.50	1.10	0.08	38.00	9.00	1.10	0.22	-14.8600	167.3010	135.00	116.1425	273.0280
M54Axx_TA	EQ152932152	41.51	-79.66	42.00	9.00	0.50	0.10	37.00	7.00	0.80	0.12	-14.8600	167.3010	135.00	116.9035	273.7585
MADWxx_XB	EQ961971651	45.53	-78.00	73.00	11.50	0.70	0.23	80.00	12.50	0.80	0.30	18.7260	145.6280	176.50	104.7872	317.4450
MVLxxx_LD	EQ031462313	40.00	-76.35	110.00	6.50	0.75	0.10	111.00	10.50	0.70	0.15	6.7610	123.7070	565.80	129.9223	333.6331
N32Axx_TA	EQ092971440	40.76	-98.30	77.00	7.50	0.80	0.15	60.00	10.50	0.60	0.12	-6.1300	130.3800	130.00	124.5904	294.8852
N32Axx_TA	EQ102042251	40.76	-98.30	77.00	6.50	0.80	0.12	71.00	4.00	0.90	0.10	6.5000	123.4800	578.00	119.3222	310.5947
N33Axx_TA	EQ102042251	40.74	-97.45	55.00	4.50	1.10	0.28	65.00	2.00	1.05	0.08	6.4900	123.4700	585.00	119.8366	311.3820
N33Axx_TA	EQ110182023	40.74	-97.45	62.00	2.00	1.15	0.08	76.00	5.50	1.45	0.25	28.7800	63.9500	68.00	108.7110	17.1945
N34Axx_TA	EQ102042251	40.84	-96.50	77.00	16.50	0.65	0.25	69.00	4.00	1.05	0.15	6.4900	123.4700	585.00	120.3072	312.3220
N34Axx_TA	EQ110182023	40.84	-96.50	81.00	1.50	1.45	0.08	86.00	3.00	1.65	0.23	28.7800	63.9500	68.00	108.3975	18.0334
N35Axx_TA	EQ102042208	40.86	-95.64	82.00	8.50	0.75	0.15	77.00	3.50	1.00	0.10	6.7200	123.4100	607.00	120.6161	313.3576
N35Axx_TA	EQ102042251	40.86	-95.64	75.00	10.50	0.70	0.15	73.00	4.00	1.00	0.12	6.4900	123.4700	585.00	120.7729	313.1522
N35Axx_TA	EQ102100731	40.86	-95.64	77.00	12.50	0.85	0.25	78.00	7.50	0.90	0.15	6.5300	123.2500	627.00	120.8613	313.3895
N35Axx_TA	EQ113120259	40.86	-95.64	81.00	21.00	0.50	0.30	81.00	9.00	1.15	0.28	27.3200	125.6200	224.00	102.1085	323.1234
N36Axx_TA	EQ111641431	40.82	-94.96	78.00	11.00	0.85	0.20	71.00	5.00	1.10	0.15	2.5200	126.4600	61.00	122.6923	308.2464
N36Axx_TA	EQ122391505	40.82	-94.96	56.00	3.50	1.35	0.20	66.00	3.50	1.25	0.15	2.2000	126.8300	91.00	122.7254	307.6683
N40Axx_TA	EQ131061044	40.88	-91.58	73.00	10.00	0.85	0.17	67.00	17.00	0.60	0.38	28.1070	62.0530	82.00	107.1331	24.2390
N48Axx_TA	EQ131881835	40.86	-85.03	75.00	19.50	0.75	0.33	45.00	2.00	1.10	0.07	-3.9230	153.9200	386.20	115.7597	288.3686
N49Axx_N4	EQ152360941	40.92	-84.18	109.00	16.00	0.45	0.22	84.00	15.00	1.00	0.45	-30.8750	-178.3190	220.80	112.3465	248.0008
N49Axx_TA	EQ132400254	40.92	-84.18	134.00	17.50	0.50	0.23	109.00	15.00	0.40	0.17	-27.7950	179.6720	488.60	111.9973	251.7995
N50Axx_TA	EQ131881835	40.77	-83.15	50.00	4.50	0.90	0.15	56.00	10.00	1.20	0.28	-3.9230	153.9200	386.20	117.1376	289.7825
N51Axx_TA	EQ131881835	40.92	-82.37	60.00	6.00	0.90	0.12	58.00	5.50	1.15	0.17	-3.9230	153.9200	386.20	117.6417	290.4690
N54Axx_TA	EQ152932152	40.96	-79.99	38.00	8.00	0.80	0.15	49.00	18.00	0.60	0.45	-14.8600	167.3010	135.00	116.6887	273.2571
NHSCxx_US	EQ072711338	33.11	-80.18	58.00	2.50	1.45	0.30	61.00	7.00	1.35	0.40	22.0130	142.6680	260.00	111.6176	317.2488
O31Axx_TA	EQ102042251	40.15	-99.33	54.00	5.50	0.90	0.22	-71.00	10.50	1.00	0.30	6.4900	123.4700	585.00	119.1255	309.3877
O32Axx_TA	EQ102042251	40.26	-98.28	64.00	10.50	0.65	0.20	-84.00	6.00	0.60	0.08	6.4900	123.4700	585.00	119.6720	310.4010
O33Axx_TA	EQ110182023	40.08	-97.58	62.00	6.00	0.90	0.10	70.00	8.00	1.25	0.28	28.7800	63.9500	68.00	109.3702	17.1450
O33Axx_TA	EQ113480504	40.08	-97.58	52.00	3.00	0.85	0.05	48.00	14.00	0.60	0.15	-7.5600	146.8000	140.00	114.3772	281.0545
O37Axx_TA	EQ110182023	40.17	-94.15	74.00	4.00	0.75	0.07	66.00	13.00	0.75	0.23	28.7800	63.9500	68.00	108.4431	20.1909
O39Axx_TA	EQ110182023	40.25	-92.54	-89.00	3.50	0.90	0.12	79.00	19.00	0.95	0.43	28.7800	63.9500	68.00	107.9288	21.5953
O49Axx_TA	EQ131881835	40.19	-84.34	70.00	14.00	0.60	0.15	49.00	5.00	1.05	0.13	-3.9230	153.9200	386.20	116.4707	288.5858
O52Axx_N4	EQ152932152	40.12	-81.84	36.00	3.00	1.05	0.10	49.00	14.00	1.15	0.32	-14.8600	167.3010	135.00	115.3157	271.6210
P31Axx_TA	EQ102042251	39.52	-99.38	74.00	9.00	0.60	0.12	-76.00	6.00	0.75	0.15	6.5000	123.4800	578.00	119.4797	309.0663
P32Axx_TA	EQ102042251	39.62	-98.60	61.00	9.00	0.85	0.22	85.00	9.00	0.55	0.08	6.4900	123.4700	585.00	119.8957	309.8258
P34Axx_TA	EQ102042251	39.55	-96.83	57.00	5.00	1.30	0.37	57.00	2.00	1.35	0.17	6.4900	123.4700	585.00	120.9793	311.4415
P34Axx_TA	EQ102151208	39.55	-96.83	69.00	4.00	0.95	0.12	56.00	6.50	0.95	0.22	1.2400	126.2100	41.00	123.4579	305.1267
P47Axx_TA	EQ113480504	39.49	-86.27	48.00	4.00	1.10	0.15	37.00	3.50	1.65	0.33	-7.5610	146.8040	140.90	122.9364	289.2079
P47Axx_TA	EQ131312046	39.49	-86.27	12.00	5.50	0.65	0.12	11.00	18.50	0.65	0.27	-17.9540	-175.0990	212.20	100.3121	255.3150
P48Axx_N4	EQ152932152	39.46	-85.43	64.00	4.50	1.15	0.17	68.00	5.50	1.15	0.22	-14.8600	167.3010	135.00	112.5536	269.0326
P48Axx_TA	EQ131881835	39.46	-85.43	70.00	4.00	1.10	0.12	57.00	2.50	1.10	0.10	-3.9230	153.9200	386.30	115.8977	287.4219
P49Axx_TA	EQ131881835	39.53	-84.72	67.00	4.50	1.05	0.13	61.00	3.50	1.00	0.08	-3.9230	153.9200	386.30	116.3998	287.9864

PLALxx_NM	EQ000881100	34.98	-88.08	58.00	11.00	0.90	0.32	59.00	6.50	1.15	0.35	22.3380	143.7300	126.50	104.7373	311.1979
POP10x_XB	EQ961610112	46.29	-78.29	112.00	9.00	0.70	0.15	104.00	10.50	1.00	0.25	17.4440	145.4580	149.00	105.2778	316.8222
POP1xx_XB	EQ961882136	47.81	-79.18	120.00	6.50	0.80	0.20	97.00	11.00	1.05	0.25	21.9680	142.8300	241.10	100.9634	320.7432
POP4xx_XB	EQ961610112	47.26	-79.12	111.00	17.00	0.55	0.25	104.00	8.50	1.05	0.22	17.4440	145.4580	149.00	104.1810	316.2859
POP5xx_XB	EQ961610112	47.12	-78.91	104.00	8.50	0.65	0.10	87.00	13.50	0.80	0.25	17.4440	145.4580	149.00	104.3812	316.4412
POP6xx_XB	EQ961610112	46.95	-78.82	106.00	9.50	0.60	0.10	79.00	10.50	0.90	0.22	17.4440	145.4580	149.00	104.5469	316.4882
POP7xx_XB	EQ961610112	46.81	-78.60	104.00	14.50	0.75	0.30	89.00	13.00	0.85	0.28	17.4440	145.4580	149.00	104.7523	316.6517
POP8xx_XB	EQ961610112	46.62	-78.58	110.00	4.50	0.95	0.15	87.00	12.00	1.00	0.25	17.4440	145.4580	149.00	104.9000	316.6343
PSDBxx_PE	EQ113480504	41.13	-78.75	45.00	3.00	1.45	0.23	71.00	11.00	0.90	0.18	-7.5610	146.8040	140.90	127.5949	296.7115
Q32Axx_TA	EQ102042251	38.99	-98.56	57.00	3.00	0.90	0.17	57.00	3.50	1.05	0.17	6.4900	123.4700	585.00	120.3215	309.5819
Q39Axx_TA	EQ112100742	39.05	-92.98	-66.00	13.00	0.60	0.18	-54.00	11.00	0.65	0.20	-23.7800	179.7600	523.00	102.5612	249.6337
Q47Axx_TA	EQ131312046	38.94	-86.43	11.00	11.50	0.90	0.20	12.00	14.50	0.85	0.30	-17.9540	-175.0990	212.20	100.0518	255.1246
Q48Axx_TA	EQ131061044	38.93	-85.73	48.00	12.50	0.95	0.38	103.00	13.00	0.90	0.32	28.1070	62.0530	82.00	106.8359	29.4750
R32Axx_TA	EQ110182023	38.42	-98.71	50.00	15.00	0.65	0.20	57.00	11.00	0.70	0.13	28.7800	63.9500	68.00	111.2103	16.2985
R47Axx_TA	EQ113480504	38.30	-86.53	49.00	7.50	1.30	0.25	60.00	12.50	0.90	0.20	-7.5610	146.8040	140.90	123.1261	288.2712
R49Axx_N4	EQ152932152	38.29	-85.17	49.00	4.00	0.90	0.10	53.00	11.50	1.00	0.23	-14.8600	167.3010	135.00	112.7334	268.7062
R49Axx_TA	EQ131312046	38.29	-85.17	32.00	10.00	0.70	0.15	20.00	14.50	0.45	0.15	-17.9540	-175.0990	212.20	100.8439	255.7461
R50Axx_TA	EQ131312046	38.28	-84.33	11.00	20.00	0.75	0.45	178.00	6.50	1.10	0.33	-17.9540	-175.0990	212.20	101.4829	256.2309
S40Axx_TA	EQ122391505	37.60	-92.50	-71.00	9.50	0.95	0.28	70.00	12.00	1.15	0.30	2.1900	126.8370	91.10	126.2141	308.2708
S47Axx_TA	EQ131881835	37.59	-86.88	80.00	13.00	0.60	0.22	90.00	5.50	0.95	0.22	-3.9230	153.9200	386.30	115.3361	285.5091
S51Axx_N4	EQ151160709	37.64	-83.59	40.00	2.50	1.25	0.10	47.00	6.50	1.30	0.22	27.7880	86.0350	24.80	114.1920	10.0737
SADOxx_CN	EQ102042251	44.77	-79.14	92.00	9.00	1.30	0.30	88.00	12.50	1.55	0.68	6.4970	123.4800	578.00	125.0610	332.1665
SADOxx_CN	EQ122391505	44.77	-79.14	105.00	8.50	1.00	0.15	111.00	17.50	0.85	0.32	2.1900	126.8370	91.10	127.8237	326.3504
SPMNxx_TA	EQ110182023	45.22	-92.80	54.00	1.50	1.15	0.08	60.00	7.50	1.20	0.20	28.7800	63.9500	68.00	103.3675	20.8651
SUSDxx_TA	EQ112100742	44.44	-98.96	28.00	4.00	0.55	0.05	11.00	8.00	0.75	0.15	-23.7800	179.7600	523.00	100.3865	247.0126
T49Axx_TA	EQ131881835	37.10	-85.53	58.00	4.00	0.95	0.10	55.00	14.50	0.55	0.12	-3.9230	153.9200	386.30	116.5047	286.2390
TIGAxx_TA	EQ110182023	31.44	-83.59	74.00	5.50	0.85	0.10	69.00	7.00	1.25	0.20	28.7770	63.9510	68.00	112.6147	30.6895
TIGAxx_TA	EQ142021454	31.44	-83.59	36.00	11.50	0.60	0.10	40.00	17.50	0.40	0.17	-19.8020	-178.4000	615.40	104.0213	255.2595
TKLxxx_IM	EQ110182023	35.66	-83.77	53.00	5.50	0.95	0.20	60.00	7.50	1.10	0.20	28.7770	63.9510	68.00	109.0526	29.7347
TZTNxx_US	EQ112001935	36.54	-83.55	64.00	5.00	1.05	0.12	73.00	19.00	1.10	0.55	40.0810	71.4100	20.00	100.3494	19.2757
U49Axx_N4	EQ151160709	36.51	-85.78	54.00	4.00	0.90	0.07	59.00	11.00	0.90	0.18	27.7880	86.0350	24.80	115.5815	8.0388
U52Axx_TA	EQ131340032	36.39	-83.37	55.00	4.00	1.55	0.33	58.00	4.00	1.00	0.17	18.7280	145.2870	602.30	108.4583	311.4012
V35Axx_TA	EQ102042251	35.76	-96.84	64.00	5.50	1.00	0.18	85.00	10.00	0.45	0.10	6.4900	123.4700	585.00	123.4328	309.6201
V36Axx_TA	EQ102042251	35.79	-95.94	74.00	5.50	0.90	0.15	60.00	10.50	0.50	0.12	6.4900	123.4700	585.00	123.9738	310.4733
V37Axx_TA	EQ102042251	35.88	-95.14	85.00	11.50	0.85	0.20	79.00	7.00	0.75	0.10	6.4900	123.4700	585.00	124.4066	311.2747
V41Axx_TA	EQ122391505	35.79	-92.16	86.00	15.00	0.85	0.25	61.00	10.50	1.00	0.30	2.1900	126.8370	91.10	127.5396	307.5297
VLDQxx_CN	EQ122391505	48.19	-77.76	97.00	10.00	1.30	0.27	101.00	7.50	0.90	0.13	2.1900	126.8370	91.10	125.4352	329.3035
W35Axx_TA	EQ102042251	35.15	-96.87	89.00	13.00	0.45	0.15	85.00	6.50	0.65	0.10	6.4900	123.4700	585.00	123.8006	309.2800
W37Axx_TA	EQ102042251	35.14	-95.43	79.00	5.00	0.95	0.10	82.00	10.00	0.85	0.17	6.4900	123.4700	585.00	124.7117	310.6161
W39Axx_TA	EQ122391505	35.20	-93.78	66.00	4.00	1.60	0.17	54.00	4.00	1.80	0.32	2.1900	126.8370	91.10	126.8288	305.6368
W41Bxx_TA	EQ141800556	35.17	-92.25	77.00	16.50	0.85	0.38	71.00	5.00	1.15	0.18	24.4010	142.5910	43.20	101.2182	310.5448
W51Axx_TA	EQ131881835	35.16	-84.76	53.00	7.50	0.90	0.17	86.00	12.50	0.70	0.20	-3.9230	153.9200	386.30	117.6386	285.8279
WCIxxx_IU	EQ113480504	38.23	-86.29	40.00	11.00	1.20	0.38	39.00	6.50	1.45	0.33	-7.5610	146.8040	140.90	123.3274	288.4147
WCNYxx_LD	EQ113480504	43.98	-75.65	85.00	19.50	0.80	0.40	74.00	16.50	0.85	0.32	-7.5610	146.8040	140.90	128.2083	301.6074
WVNYxx_LD	EQ151160709	42.41	-78.60	61.00	18.00	0.45	0.30	84.00	4.50	1.40	0.25	27.7880	86.0350	24.80	108.7270	14.3518
X37Axx_TA	EQ102042251	34.59	-95.37	73.00	7.50	0.95	0.18	78.00	13.00	0.90	0.25	6.4900	123.4700	585.00	125.1056	310.3814
X51Axx_N4	EQ142021454	34.57	-84.86	30.00	19.00	0.70	0.62	59.00	6.50	1.15	0.30	-19.8020	-178.4000	615.40	103.7797	255.3851
X51Axx_N4	EQ151160709	34.57	-84.86	51.00	8.50	1.25	0.22	70.00	5.00	1.55	0.23	27.7880	86.0350	24.80	117.3840	9.0845
X51Axx_TA	EQ131312046	34.57	-84.86	12.00	11.50	1.05	0.23	29.00	8.00	0.75	0.12	-17.9540	-175.0990	212.20	100.1561	255.2515
X53Axx_TA	EQ132400254	34.50	-83.30	20.00	7.00	0.60	0.10	4.00	14.50	0.55	0.20	-27.7950	179.6720	488.60	110.5521	249.8871
X57Axx_TA	EQ141240915	34.46	-80.09	21.00	2.00	1.00	0.07	7.00	11.00	0.60	0.15	-24.6110	179.0860	527.00	111.9938	254.6193
X58Axx_N4	EQ151631107	34.55	-79.34	22.00	7.50	1.15	0.20	9.00	8.50	1.50	0.38	-15.6850	-173.0560	41.00	101.7244	259.0185
Y47Axx_TA	EQ113480504	33.90	-87.85	48.00	5.00	0.95	0.12	36.00	11.00	0.90	0.32	-7.5610	146.8040	140.90	123.3405	284.5369
Y48Axx_TA	EQ131881835	33.91	-87.17	66.00	9.00	0.85	0.17	84.00	13.00	0.90	0.38	-3.9230	153.9200	386.30	116.0309	283.6019
Z48Axx_TA	EQ113480504	33.38	-87.56	47.00	3.50	1.15	0.15	39.00	6.50	1.00	0.17	-7.5610	146.8040	140.90	123.7043	284.4041
Z49Axx_TA	EQ131881835	33.19	-86.53	67.00	4.50	0.75	0.10	67.00	11.00	0.45	0.12	-3.9230	153.9200	386.30	116.7196	283.6703

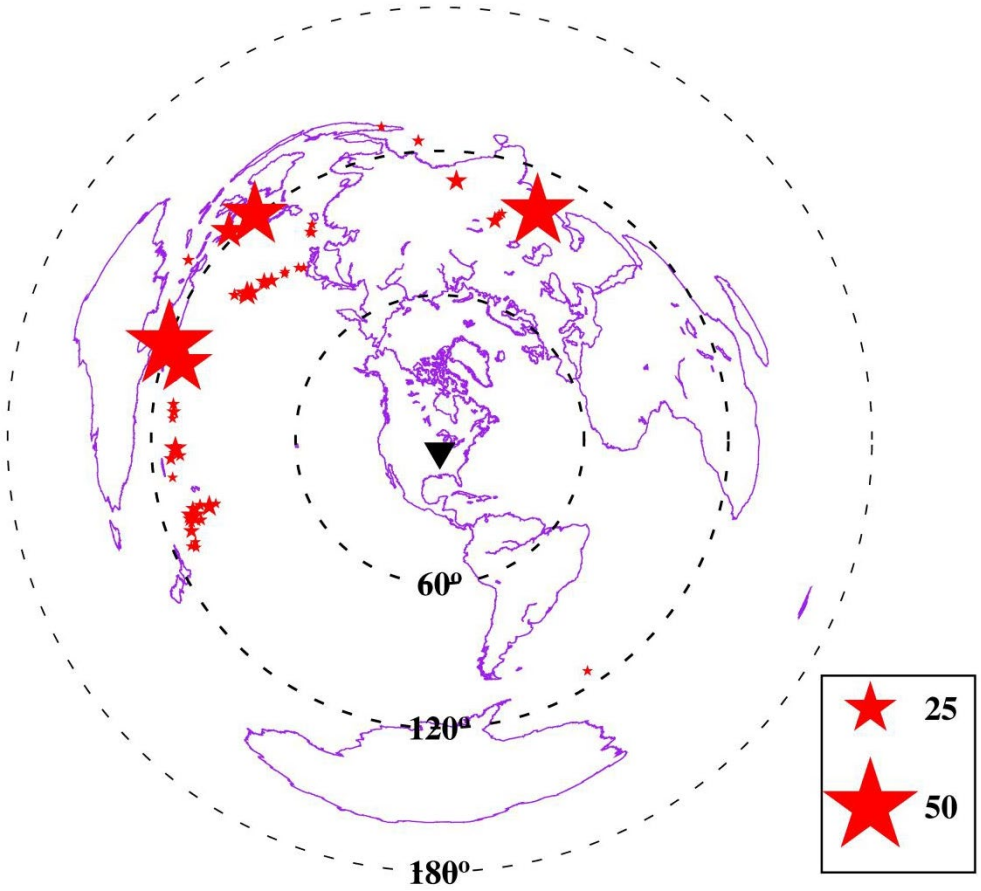

Figure S1: An azimuthal equidistant projection map centered at the study area, showing the distribution of earthquakes used in this study. The numbers (in degree) represent the distance from the center of the study area (black triangle). Red stars show the earthquakes that resulted in at least one pair of SKS/SKKS shear wave splitting measurements, with the size being proportional to the number of pairs from the events.

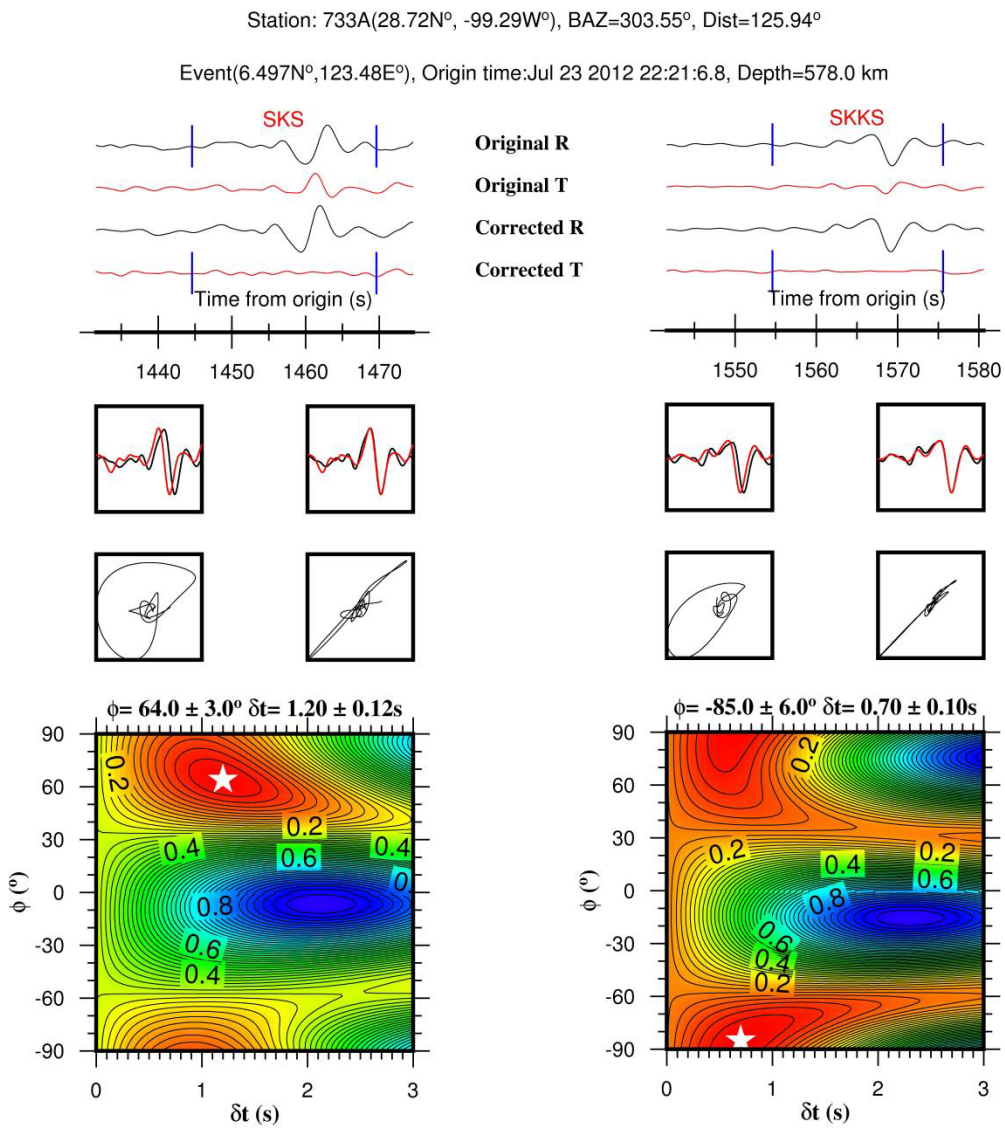

Figure S2: Examples of SKS (left column) and SKKS (right) shear wave splitting measurements from the same event-station pair. The plots from the top to the bottom represent the original and corrected radial and transverse components, fast and slow shear waveforms before and after advancing the slow component by the optimal splitting time, and particle motion patterns before and after correcting the original radial and transverse components, respectively. The optimal pair of splitting parameters corresponds to the pair that can best remove the energy on the corrected transverse component, as indicated by the stars on the bottom misfit map.

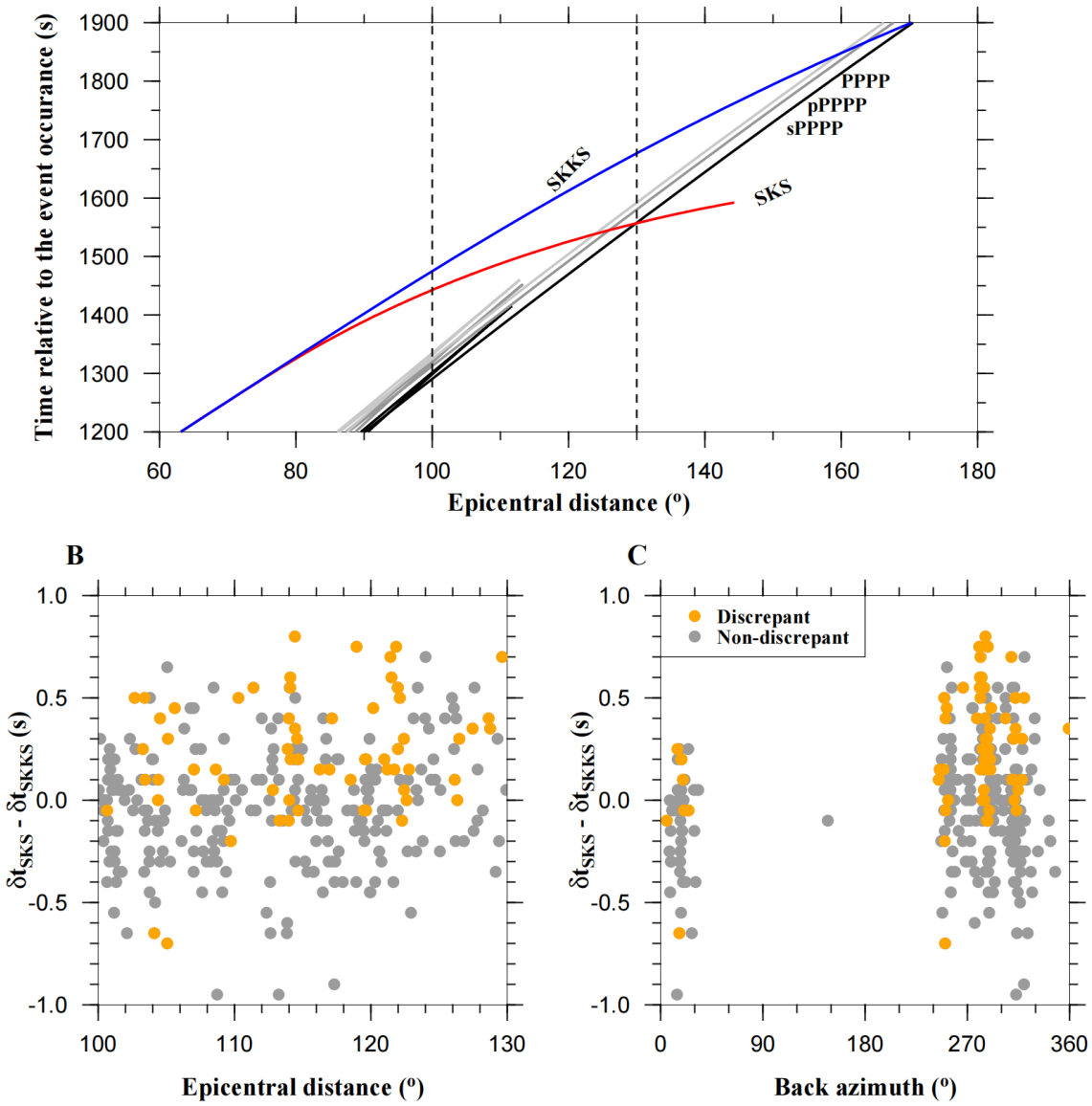

Figure S3: Distributions in epicentral distance and back azimuth of the discrepant and non-discrepant SKS/SKKS splitting time measurements. (A) Predicted arrival times of SKS (red), SKKS (blue), PPPP (black), pPPPP (dark gray), and sPPPP (light gray) for an event with a focal depth of 100 km calculated using Taup (Crotwell et al., 1999) for the IASP91 Earth model (Kennett and Engdahl, 1991). Dashed lines represent the upper and lower limits for the events used in the study. (B) Distribution in epicentral distance with the discrepant and non-discrepant measurements shown in orange and gray, respectively. (C) Same as (B) but for the back azimuthal distribution.

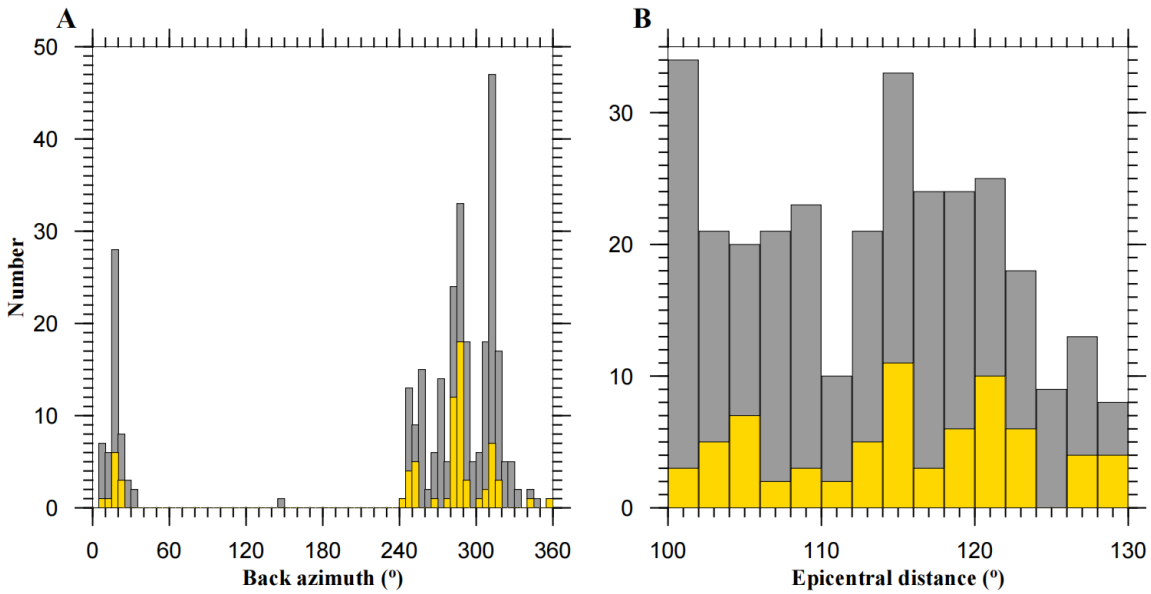

Figure S4: Histograms showing the distribution of (A) back-azimuths and (B) epicentral distances for the discrepant (yellow) and non-discrepant (gray) event-station pairs.

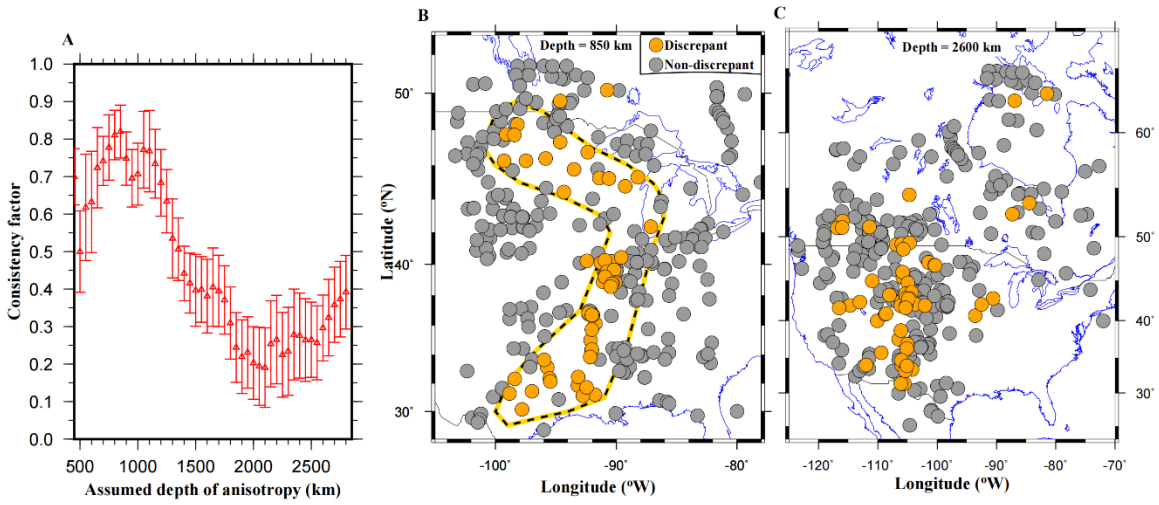

Figure S5: Illustration of the estimation for the anisotropy depth. (A) The consistency factor (red triangles) plotted against the assumed depths of anisotropy. The length of the vertical bars indicates the standard deviations. The optimal anisotropy depth corresponds to the depth of the largest value of the consistency factor. (B) The orange and gray dots represent the midpoint of the ray-piercing points of the discrepant and non-discrepant SKS and SKKS phases at 850 km, respectively. (C) Same as (B) but for ray-piercing point depth at 2600 km.

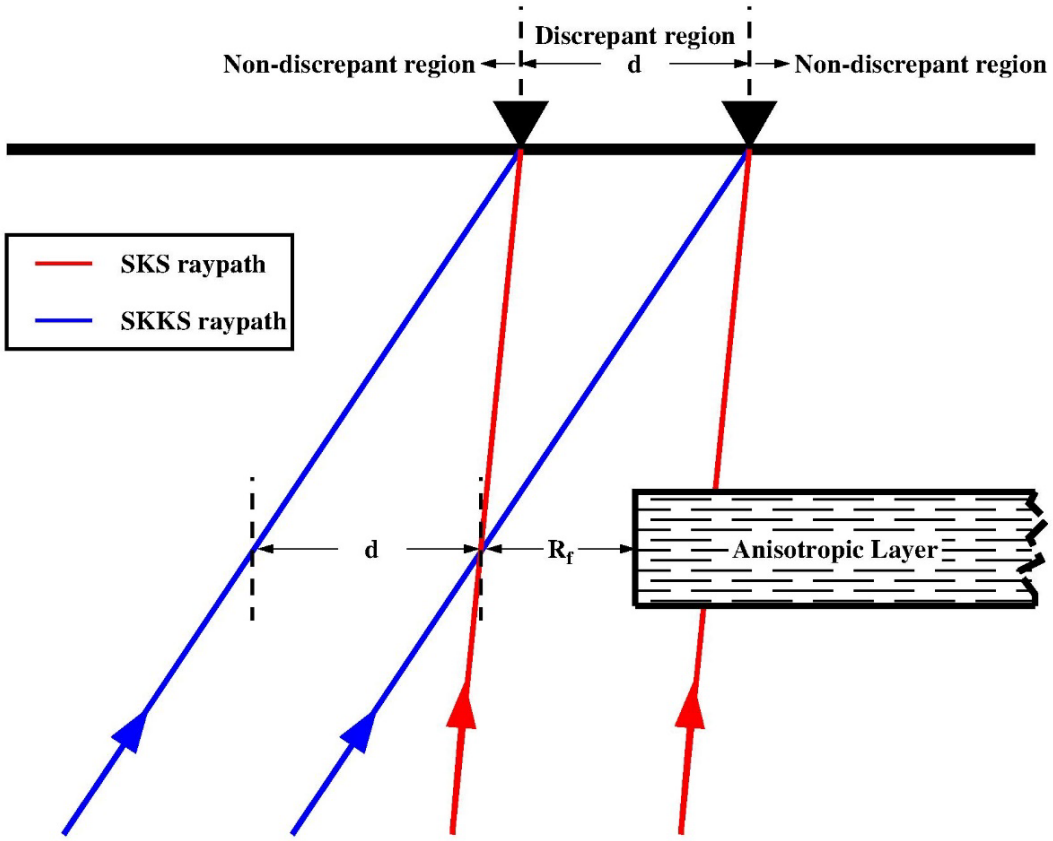

Figure S6: A schematic diagram showing that the width of the discrepant region at surface approximately equals to the distance between the ray-piercing points at a given depth. *d*: the distance between the ray-piercing point locations of a pair of SKS/SKKS phases at a certain depth. R_f: the radius of the Fresnel zone of a SKS/SKKS phase at this depth. The two reversed triangles at the surface indicate the left and right range of the zone in which discrepant SKS/SKKS pairs are observed. Neither SKS nor SKKS recorded at stations located to the left of the left-most station samples the anisotropic layer, and thus the two phases have comparable splitting times. In contrast, both SKS and SKKS recorded by stations located to the right of the right-most station sample the anisotropic layer, leading to slightly greater but also non-discrepant splitting times. For stations between these two stations, only the SKS phase samples the anisotropic layer, leading to greater SKS splitting times.