

**Rayleigh wave group velocities in North-West Iran: SOLA Backus-Gilbert vs. Fast Marching tomographic methods**

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Contents of this file: Table S1 to S3 and Figures S1 to S3.

This supporting file includes three tables provide information of the stations, events, instruments and information of noise correlation and some Figures related to ray path coverage maps at different periods, the model, difference of averaging and target kernel with different trade-off parameters and model uncertainties and model resolution in different trade-off parameters,

**Table S1.** The information of stations used in this study. *Italic* and **bold** stations are used for both events and noise studies.

<b>Name</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Networks</b>	<b>Instrument</b>
AHWZ	31.33	48.644	IRSC	CMG3T
KLNJ	31.008	51.592	IRSC	Tril40
BMDN	33.672	48.825	IRSC	Tril40
DHL1	32.681	47.281	IRSC	Tril40
BDRS	33.954	48.881	IRSC	Tril40
<i>THE</i>	33.752	51.389	IRSC	Tril40
FIR	35.642	52.754	IRSC	Tril120
<i>SFB</i>	34.352	52.241	IRSC	Tril240
KFM	33.524	47.847	IRSC	Tril40
DOB	33.787	48.178	IRSC	CMG3ESP
JHBN	32.231	50.666	IRSC	Tril40
QCNT	36.29	50.009	IRSC	CMG3ESP
<i>TVRZ</i>	38.504	46.668	IRSC	Tril40
<i>HSRG</i>	35.242	48.279	IRSC	Tril120
QSDN	36.504	49.174	IRSC	CMG3ESP
QALM	36.432	50.646	IRSC	CMG3ESP
<i>QABG</i>	39.708	49.582	IRSC	CMG3ESP
<i>LIN</i>	34.919	46.963	IRSC	Tril120
KOM	34.176	47.514	IRSC	Tril40
KCHF	34.275	47.04	IRSC	Tril40
<i>DHR</i>	36.7	46.387	IRSC	Tril120
BZA	34.47	47.861	IRSC	Tril120
HAGD	34.822	49.14	IRSC	Tril40
HSAM	34.212	48.602	IRSC	Tril40
<i>TAHR</i>	38.49	47.051	IRSC	Tril40
<i>TABZ</i>	38.057	46.327	IRSC	Tril40
<i>MAHB</i>	36.767	45.705	IRSC	Tril120
BRJ	31.908	51.263	IRSC	Tril40
LHJ2	37.166	50.062	IRSC	Tril40
GAS1	38.386	48.84	IRSC	Tril40
HGHA	35.488	48.857	IRSC	Tril40
CSN1	37.563	49.095	IRSC	Tril40
ASAO	34.548	50.025	IIEES	CMG-3TD
<i>CHTH</i>	35.908	51.126	IIEES	CMG-3TD
DAMV	35.63	51.971	IIEES	CMG-3TD
<i>GHVR</i>	34.48	51.245	IIEES	CMG-3TD
<i>GRMI</i>	38.81	47.894	IIEES	CMG-3TD
KHMZ	33.739	49.959	IIEES	CMG-3TD
<i>MAKU</i>	39.355	44.683	IIEES	CMG-3TD
<i>NASN</i>	32.799	52.808	IIEES	CMG-3TD
<i>SHGR</i>	32.108	48.801	IIEES	CMG-3TD
<i>SNGE</i>	35.093	47.347	IIEES	CMG-3TD
<i>THKV</i>	35.916	50.879	IIEES	CMG-3TD
<i>ZNJK</i>	36.67	48.685	IIEES	CMG-3TD
HSB	35.438	51.276	IIEES	CMG-3TD
SNQR	34.858	47.628	IIEES	CMG-3TD
MZPU	36.44	51.569	IIEES	CMG-3TD
FIR	35.641	52.754	IIEES	CMG-3TD
VRN	34.995	51.727	IIEES	CMG-3TD
ILBA	33.56	46.21	IIEES	CMG-3TD
GIDE	36.91	49.9	IIEES	CMG-3TD
MRD	38.713	45.702	IIEES	CMG-3TD
KRSH	33.969	52.135	IIEES	CMG-3TD
HKZM	35.377	48.904	IIEES	CMG-3TD
TEHA	35.746	51.387	IIEES	CMG-3TD

**Table S2.** Stacking time (the duration of simultaneously recorded signals) for each station pair. We did not consider pairs below than 3 months in our tomography process.

PAIRS	No. Month	PAIRS	No. Month	PAIRS	No. Month
CHTH-LIN	7	GRMI-TAHR	5	MAKU-QABG	5
CHTH-GRMI	20	GRMI-ZNJK	18	MAKU-SNGE	17
CHTH-HSRG	5	HSRG-LIN	5	MAKU-TABZ	3
CHTH-MAHB	7	HSRG-MAHB	5	MAKU-TAHR	6
CHTH-MAKU	25	HSRG-MAKU	4	MAKU-TVZR	3
CHTH-NASN	22	HSRG-MAHB	5	MAKU-ZNJK	24
DHR-GRMI	10	HSRG-MAKU	4	NASN-QABG	5
DHR-HSRG	5	HSRG-QABG	4	NASN-SHGR	18
DHR-LIN	10	HSRG-SNGE	3	NASN-SNGE	13
DHR-MAHB	10	HSRG-TAHR	3	QABG-SNGE	3
DHR-MAKU	12	HSRG-ZNJK	4	QABG-TAHR	5
DHR-QABG	7	LIN-MAHB	9	QABG-TVZR	3
DHR-SNGE	7	LIN-MAKU	7	QABG-ZNJK	5
DHR-TABZ	3	LIN-QABG	6	SFB-TEH	7
DHR-TAHR	8	LIN-SNGE	4	SNGE-TABZ	3
DHR-TVZR	4	LIN-TAHR	7	SNGE-TAHR	4
DHR-ZNJK	12	LIN-TVZR	3	SNGE-TVZR	3
GRMI-HSRG	4	LIN-ZNJK	6	SNGE-ZNJK	16
GRMI-LIN	7	MAHB-MAKU	7	TABZ-ZNJK	3
GRMI-MAHB	7	MAHB-QABG	6	TAHR-TVZR	3
GRMI-MAKU	20	MAHB-SNGE	4	TAHR-ZNJK	6
GRMI-QABG	5	MAHB-TAHR	7	THKV-GHVR	4
GRMI-SNGE	12	MAHB-TVZR	4	TVZR-ZNJK	3
GRMI-TABZ	3	MAHB-ZNJK	6		

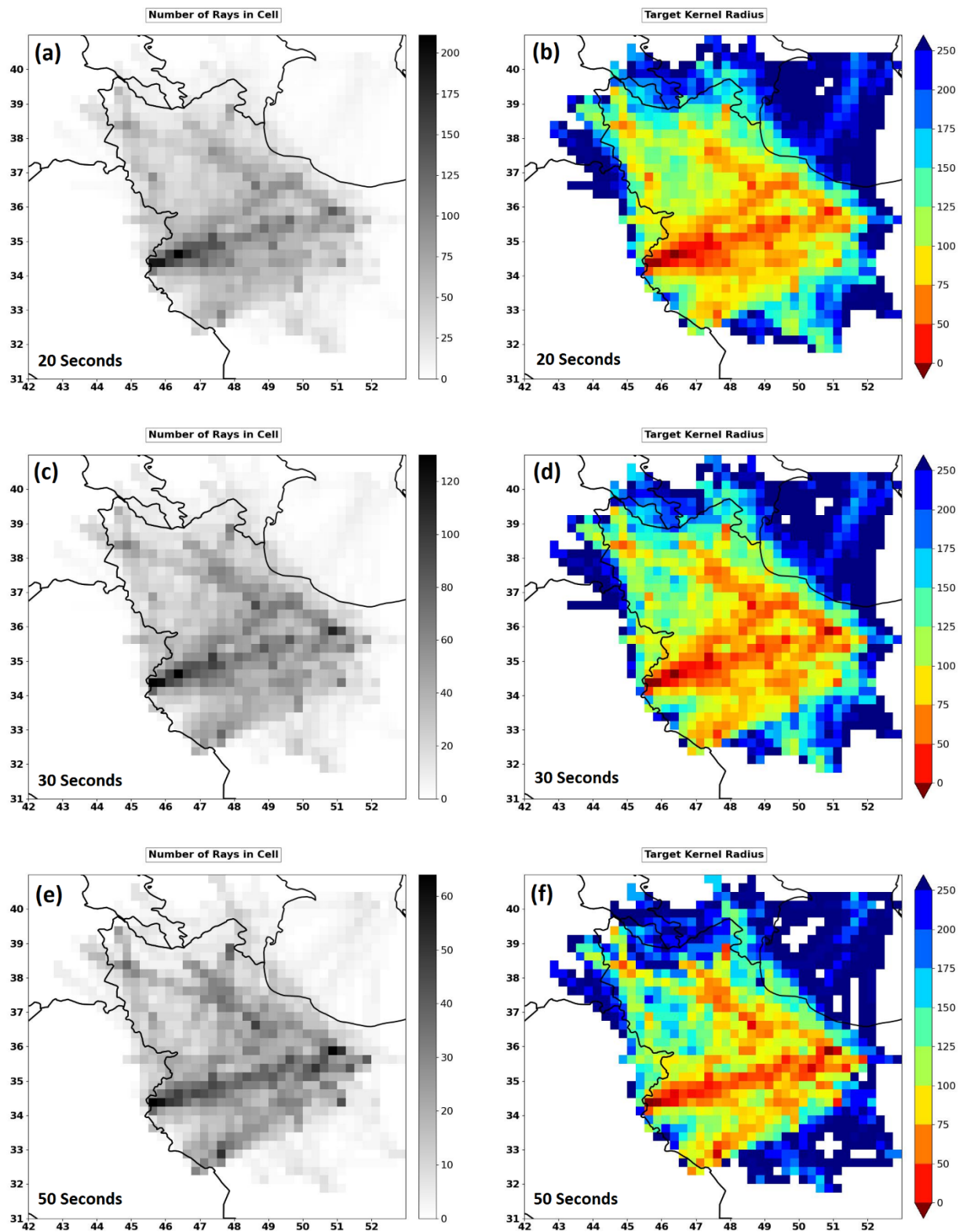
**Table S3.** Information of used events in NW study.

Number	start time	latitude	longitude
1	2012-04-18_18-43-02	32.7	47.21
2	2012-04-20_01-21-10	32.73	47.19
3	2012-04-20_03-05-41	32.48	46.81
4	2012-04-20_15-37-02	32.42	46.85
5	2012-04-20_16-17-50	32.34	46.9
6	2012-04-21_02-39-15	32.39	46.97
7	2012-04-21_05-25-09	32.4	46.95
8	2012-04-21_06-13-28	32.42	47.04
9	2012-08-11_15-43-20	38.48	46.72
10	2012-08-11_22-24-02	38.46	46.72
11	2012-08-14_14-02-25	38.46	46.76
12	2012-08-15_17-49-05	38.45	46.66
13	2012-11-16_03-58-25	38.56	46.59
14	2012-11-27_06-22-26	33.26	49.41
15	2012-12-23_06-38-57	38.5	44.92
16	2013-01-12_03-25-05	31.85	51.02
17	2013-01-26_15-10-49	38.49	46.83
18	2013-03-11_14-57-07	36.674	43.439
19	2013-04-24_03-08-25	33.6	50.44
20	2013-09-16_16-05-02	32.537	49.605
21	2013-09-27_10-02-46	37.33	44.944
22	2013-10-16_08-49-32	35.283	49.692
23	2013-11-05_04-03-39	34.851	45.055
24	2013-11-22_06-51-25	34.44	45.43
25	2013-11-22_18-30-58	34.289	45.555
26	2013-11-23_23-26-20	34.24	45.49

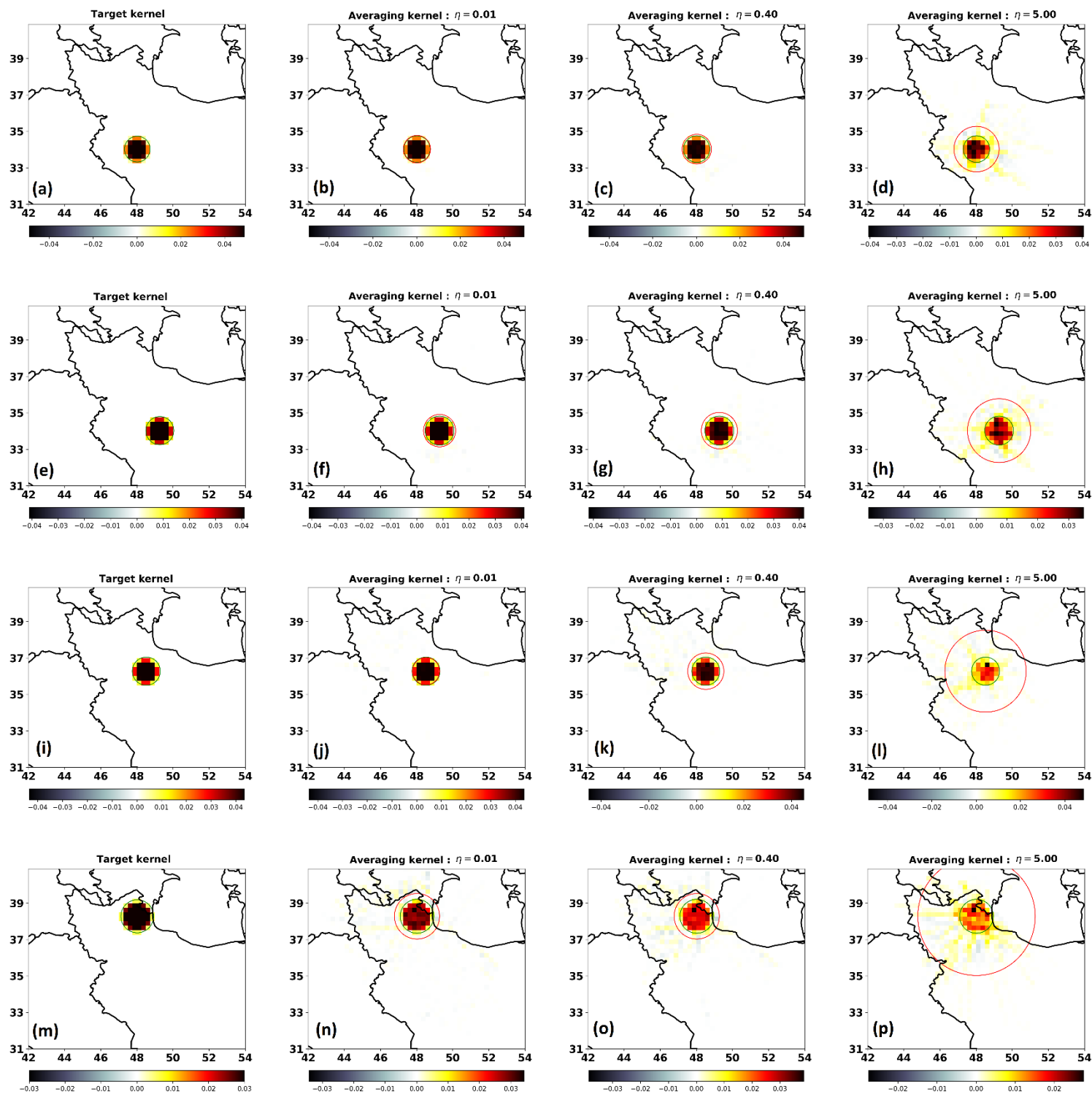
27	2014-01-14_13-54-57	40.238	52.848
28	2014-02-10_12-06-41	40.36	48.84
29	2014-02-20_04-18-36	32.661	49.913
30	2014-06-07_06-05-26	40.3	51.55
31	2014-08-18_02-32-06	32.711	47.638
32	2014-08-18_05-25-51	32.718	47.692
33	2014-08-18_11-01-37	32.733	47.532
34	2014-08-18_18-08-23	32.58	47.52
35	2014-08-18_21-44-29	32.706	47.547
36	2015-01-14_09-48-05	32.837	46.928
37	2015-01-21_13-58-04	38.287	42.866
38	2015-02-15_08-04-40	32.785	46.84
39	2015-03-02_06-08-41	35.752	48.942
40	2015-03-12_00-42-35	38.437	49.157
41	2015-03-22_22-45-23	40.129	52.099
42	2015-05-10_22-08-58	36.744	49.881
43	2015-08-25_17-36-34	35.563	52.579
44	2015-09-04_04-49-38	40.983	47.424
45	2015-09-25_06-10-24	32.849	46.532
46	2015-10-29_09-46-40	39.097	43.776
47	2016-01-12_02-38-37	39.108	48.163
48	2016-03-31_07-15-17	31.932	50.815
49	2016-08-01_04-46-34	40.003	47.981
50	2016-12-13_00-32-59	40.781	48.605
51	2017-02-06_13-46-35	40.253	50.497
52	2017-05-11_03-24-18	39.776	48.592
53	2017-11-15_19-48-02	40.176	47.194
54	2017-11-17_13-27-37	40.218	47.193
55	2018-01-06_15-22-08	34.459	45.736
56	2018-01-10_15-56-26	34.576	46.802
57	2018-01-19_22-17-56	33.709	45.699
58	2018-02-19_19-20-44	36.204	44.969
59	2018-04-01_08-35-26	34.434	45.786
60	2018-06-26_17-57-04	34.624	46.246
61	2018-07-22_10-07-25	34.625	46.293
62	2018-08-25_22-13-25	34.62	46.212
63	2018-09-01_05-31-10	34.344	45.545
64	2018-10-02_02-42-50	31.956	50.604
65	2018-10-17_03-16-55	34.462	45.51
66	2018-11-25_17-09-37	34.301	45.644
67	2018-11-25_23-00-46	34.138	45.601
68	2018-11-26_01-19-42	34.32	45.697
69	2019-01-06_14-15-08	34.062	45.602
70	2019-01-14_18-17-59	34.098	45.583
71	2019-03-12_12-06-06	34.22	45.58
72	2019-03-21_15-43-04	40.47	51.84
73	2019-04-01_10-07-23	33.69	45.62
74	2019-04-17_20-02-49	33.188	46.445
75	2019-05-11_10-28-59	34.82	45.71
76	2019-06-05_03-36-16	34.48	45.61
77	2019-11-07_22-47-05	37.712	47.521
78	2019-11-08_13-51-45	37.74	47.43
79	2019-11-10_02-13-47	37.52	47.47
80	2020-01-28_20-37-18	33.712	45.757
81	2020-01-29_18-07-29	37.21	45.04
82	2020-02-12_10-53-46	37.07	49.404

83	2020-02-23_05-53-00	38.44	44.53
84	2020-02-23_16-00-33	38.44	44.53
85	2020-03-13_07-02-05	32.83	47.34
86	2020-04-03_05-44-23	38.89	43.52
87	2020-04-12_02-23-13	38.464	44.468
88	2020-04-29_17-01-34	35.583	44.973
89	2020-05-07_20-18-21	35.776	52.046
90	2020-06-03_08-16-54	33.58	46.07
91	2020-06-25_10-03-28	38.58	43.97
92	2020-08-09_09-16-19	34.21	45.53
93	2020-10-24_11-34-17	35.72	48.97
94	2020-11-09_23-18-25	35.61	45.02
95	2020-12-14_21-58-45	38.908	43.504
96	2021-02-05_15-36-10	40.509	45.216
97	2021-02-11_22-10-34	34.61	45.2
98	2021-02-13_11-29-24	39.931	44.613
99	2021-12-14_21-23-03	32.37	49.714
100	2021-12-15_08-21-10	32.368	49.718
101	2022-01-10_18-29-48	35.586	44.921
102	2022-01-16_03-25-07	39.164	46.501
103	2022-01-20_01-37-17	34.235	51.743

**Figure S1.** Path density and SOLA Backus Gilbert target kernel radii in km at 20s, 30s and 50 seconds. The cells without rays are masked.



**Figure S2.** Examples of SOLA target kernels  $T^{(k)}$  [a, e, i, m] and corresponding averaging kernels  $A^{(k)}$  at 10 seconds period for three different  $\eta$  values (0.01, 0.4 and 5). Green circles indicate the edge of the target kernel circles and red circles contain 68 percent of the averaging kernel amplitude.



**Figure S3.** SOLA inversion results at 10s period for three values of trade-off parameters  $\eta$  (0.01, 0.4 and 5). Each row corresponds to a value of trade-off parameter. The first column shows models (a, d and g), the second column shows model uncertainties, and the third column shows resolution length calculated by the Principal Component Analysis method.

