SUPPLEMENTARY TEXT

Here, we discuss the result of the application of this technique applied to different event sub-sets (figures S1 to S8), in order to distinguish the real features from possible interference effects and artefacts related to lateral variations. Our examples include two symmetric sources at equal epicentral distance from the array and as possible minimum distance from the great circle through the array (Figure S1); few sources inline with the deployment (Figures S2 and S3); sources from one side of the linear deployment (from N only (Figure S4) and from S(W) only (Figure S5)); sources only from large events (M >= 6.5) (Figure S6); sources of events located within +-40 degrees from the great circle through the array (Figure S7); and finally all possible events (Figure S8). These examples clearly document how sensitive the technique is to the choice of the events used for imaging. Few phases, even if the record of the seismogram is of high quality and the incoming energy is high due to the large magnitude, are not sufficient for contributing to a constructive reflection after correlation, and rather show consistent sub-horizontal negative and/or positive phases (Figure S1, S2, S3, S4, S5, S6) this helps us discerning the possible artefacts of the technique, due to the propagation of the wave and independent from the structure. Figure S7 and S8 instead show how a more homogeneous distribution of the sources (in terms of a wide range of ray-parameters) helps cancelling the effect described before, and helps enhancing the real features below the array. Moreover the difference between the image in Figure S7 (events occurred +-40 degrees from the great circle through the array) and in Figure S8 (all possible events, i.e. 64 phases) shows that the distribution in backazimuth can be neglected when the core phases are used.

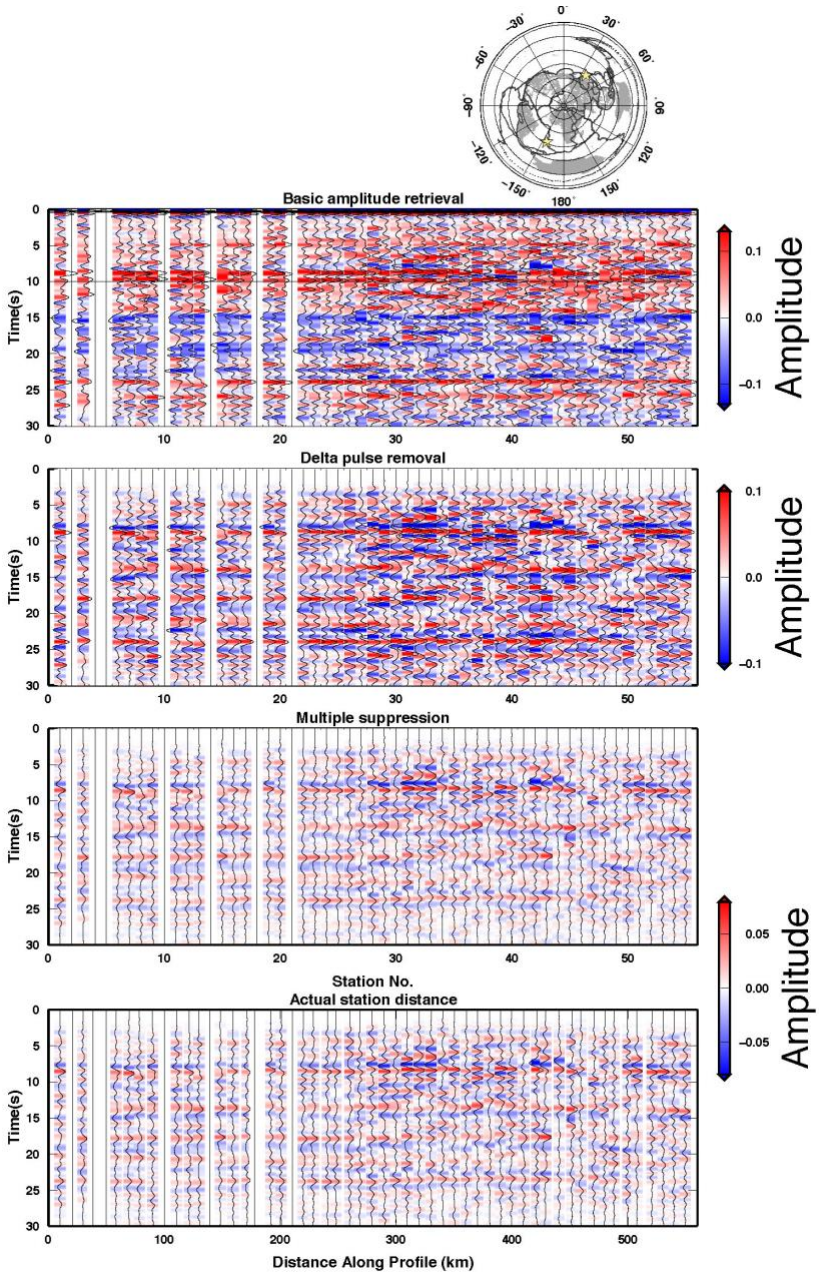

Figure S1

Same as Figure 2, but this image has been obtained including two symmetric sources at equal epicentral distance (81º and 88º) and as much as possible in-line with the deployment (20º off from the N-S direction, Figure S1). This configuration of events (ray-paths) do not contribute to a constructive reflection after correlation, or this contribution is overwhelmed by source-side reverberations (SSRs); we therefore must add more ray-paths for the construction of the interferometric image.

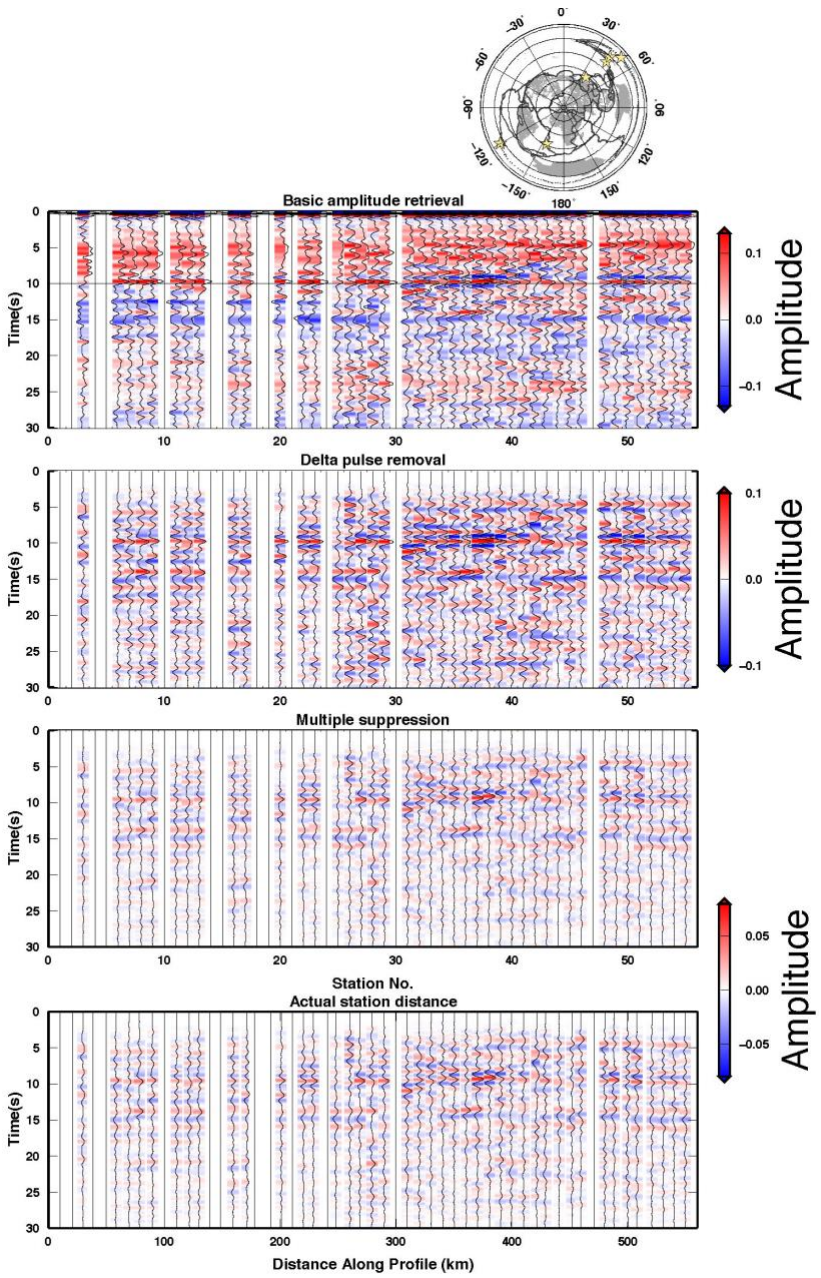

Figure S2

Same as Figure 2, including only 6 events nearest in line with the deployment (4 from the North and 2 from the South), Δ between 8 º and 165º M> 5.9. The arrival of a positive phase at 9 s along the whole profile (BAR gather), suggests that the signal we see is still dominated by SSRs and is not showing the receiver-side structures.

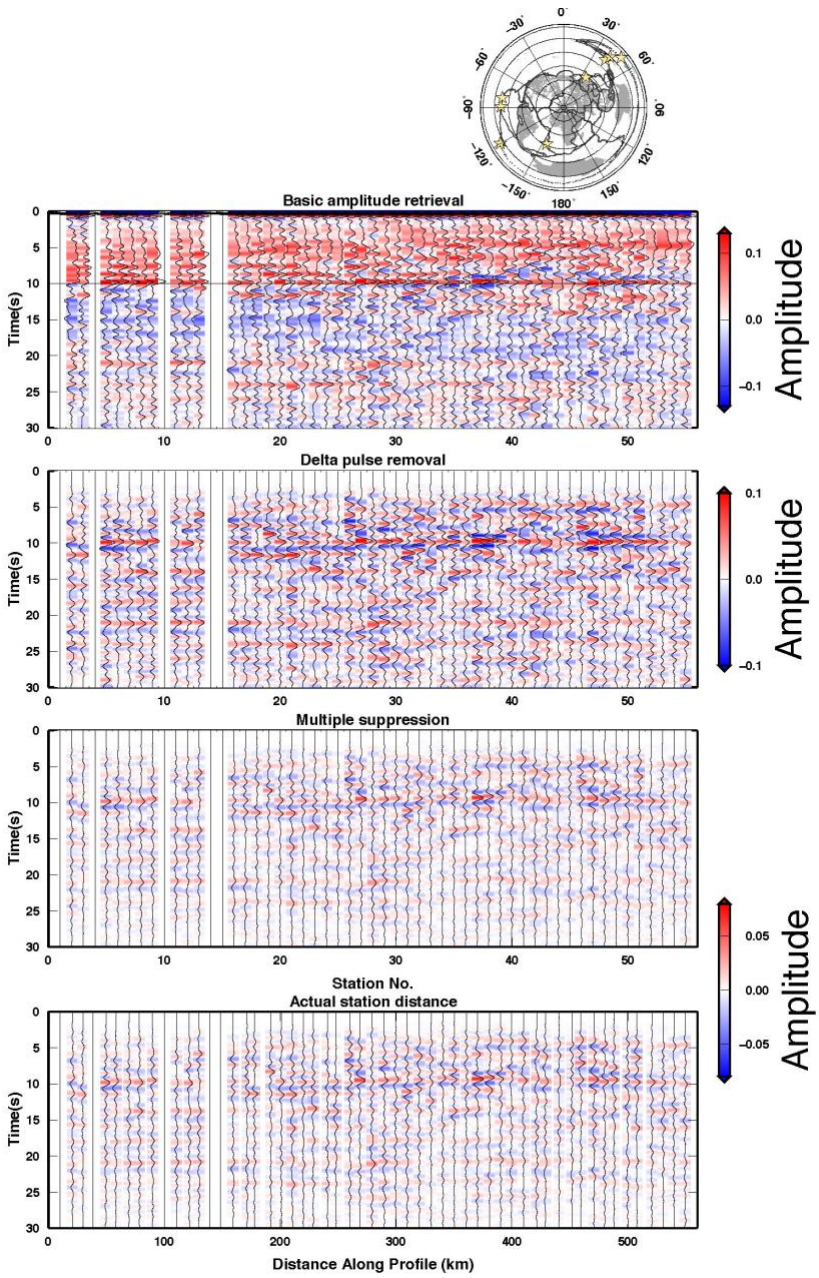

Figure S3

Same as Figure 2 including only few sources in line with the deployment but including 2 events from south offline with respect to the great circle of the array, in order to balance the number of events on either side of the array. Thanks to this balanced selection we start discerning between crust and mantle features in the BAR image (i.e. negative amplitudes in the crust and positive amplitudes in the mantle). Anyways, artefacts are still present (e.g. the phase at 9 s running along the whole profile).

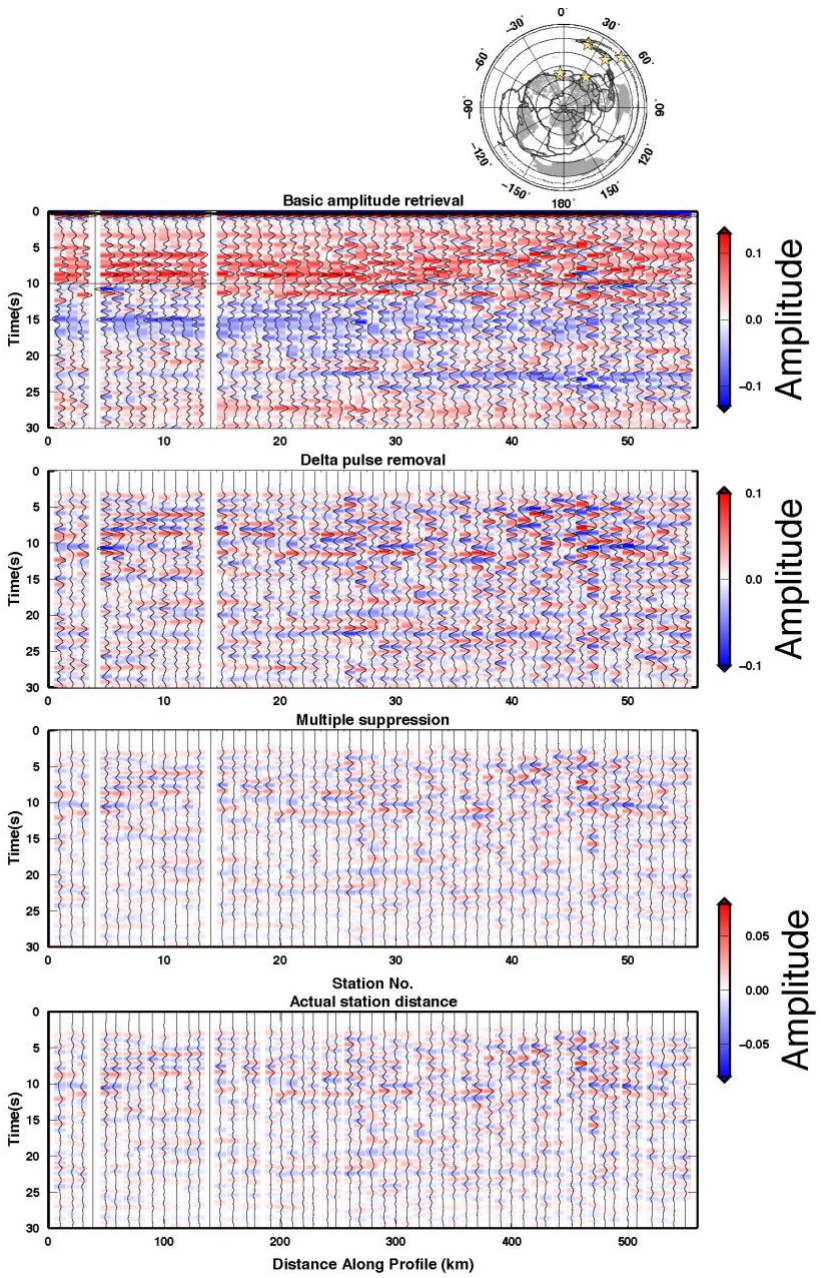

Figure S4

Same as Figure 2 including only sources from N (NE) only, Δ between 69º and 165º. Consistent sub-horizontal high energy reverberations at various times are observed in the northern part of the profile (stations 1 to 32) while for the southern part of the profile scattered energy is present between 5 and 15 seconds (marked by a black dashed box), in these arrival times we would expect to have some signal of the Moho.

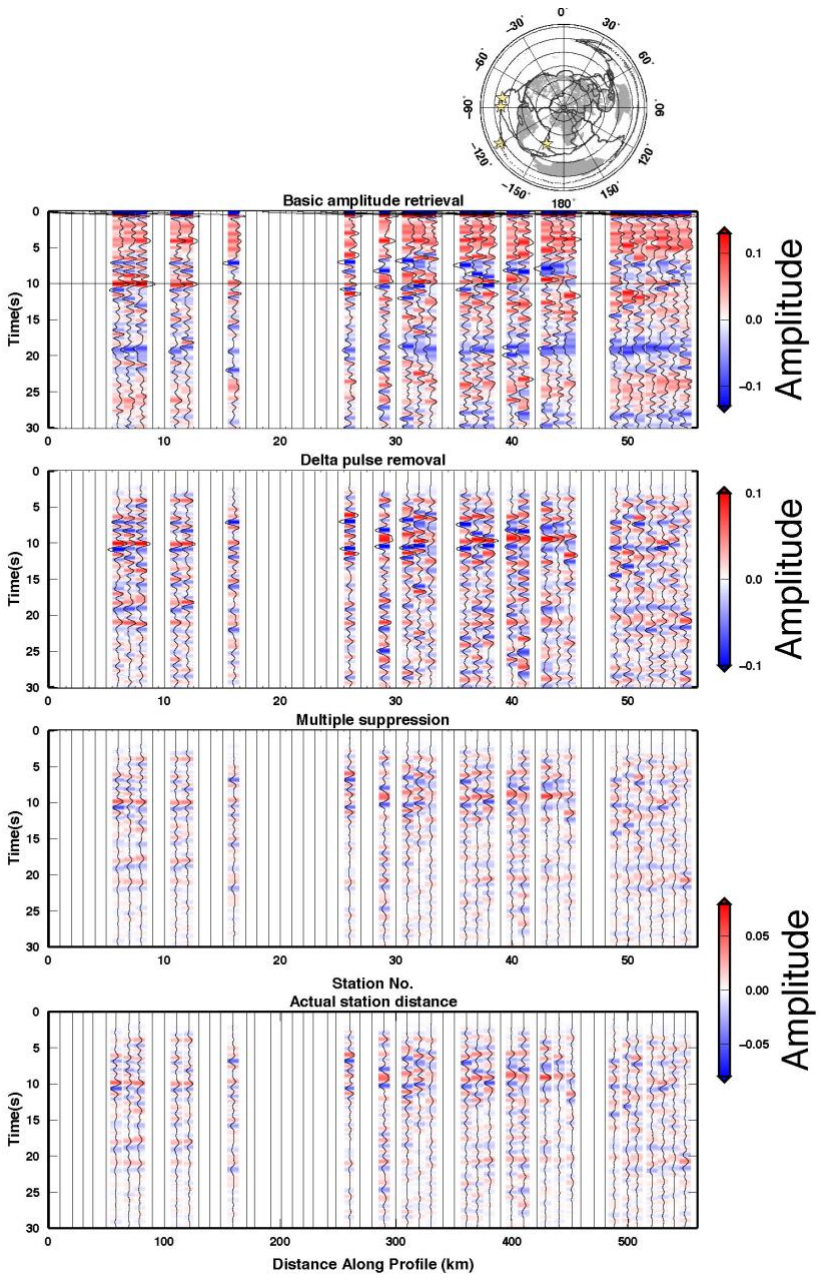

Figure S5

Same as Figure 2 including only sources from SW and W only, with Δ between 88º and 120º.

Few data and restricted backazimuthal coverage do not allow to make observations.

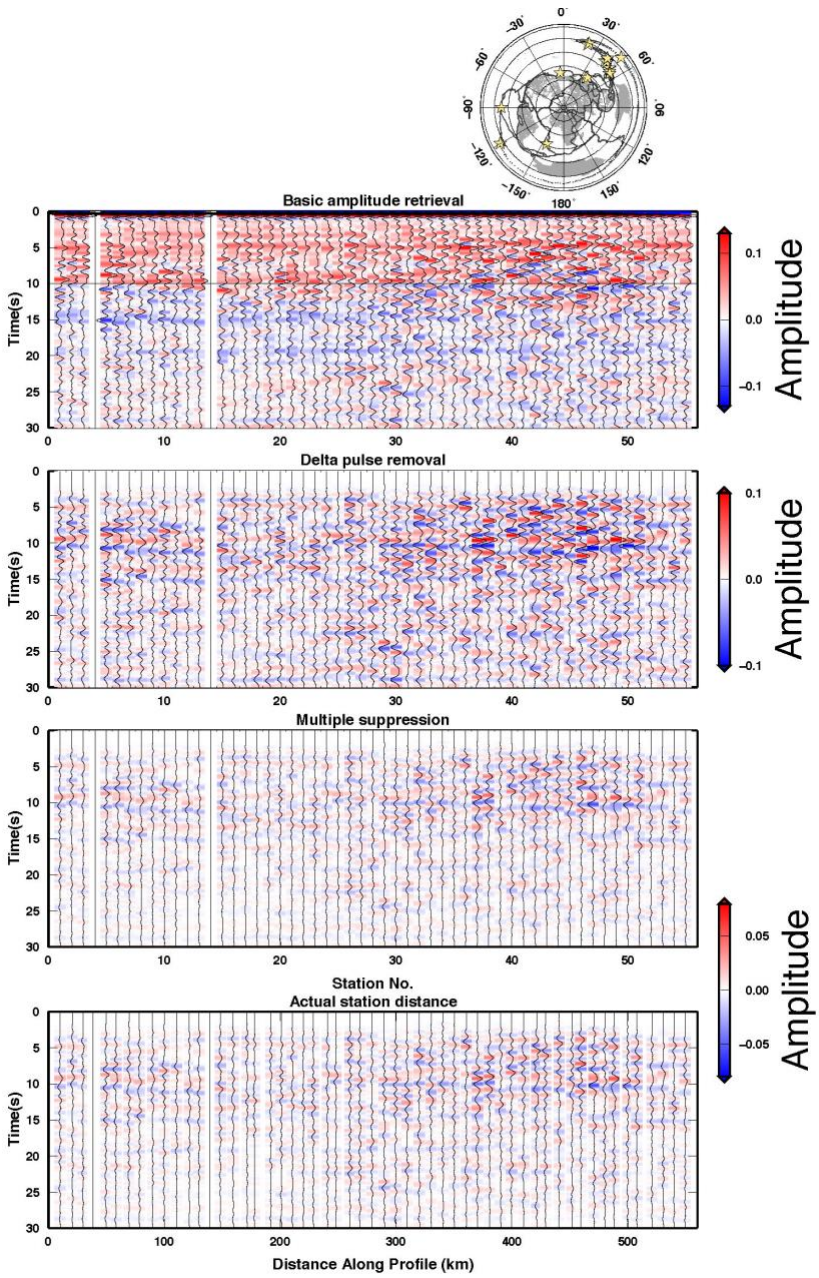

Figure S6

Same as Figure 2 including all events with M>= 6.5, for a total of 22 events of which 3 only are from Southern backazimuths. The number of subhorizontal reflections is diminished but still there is no clear distinction between which phase could correspond to the Moho.

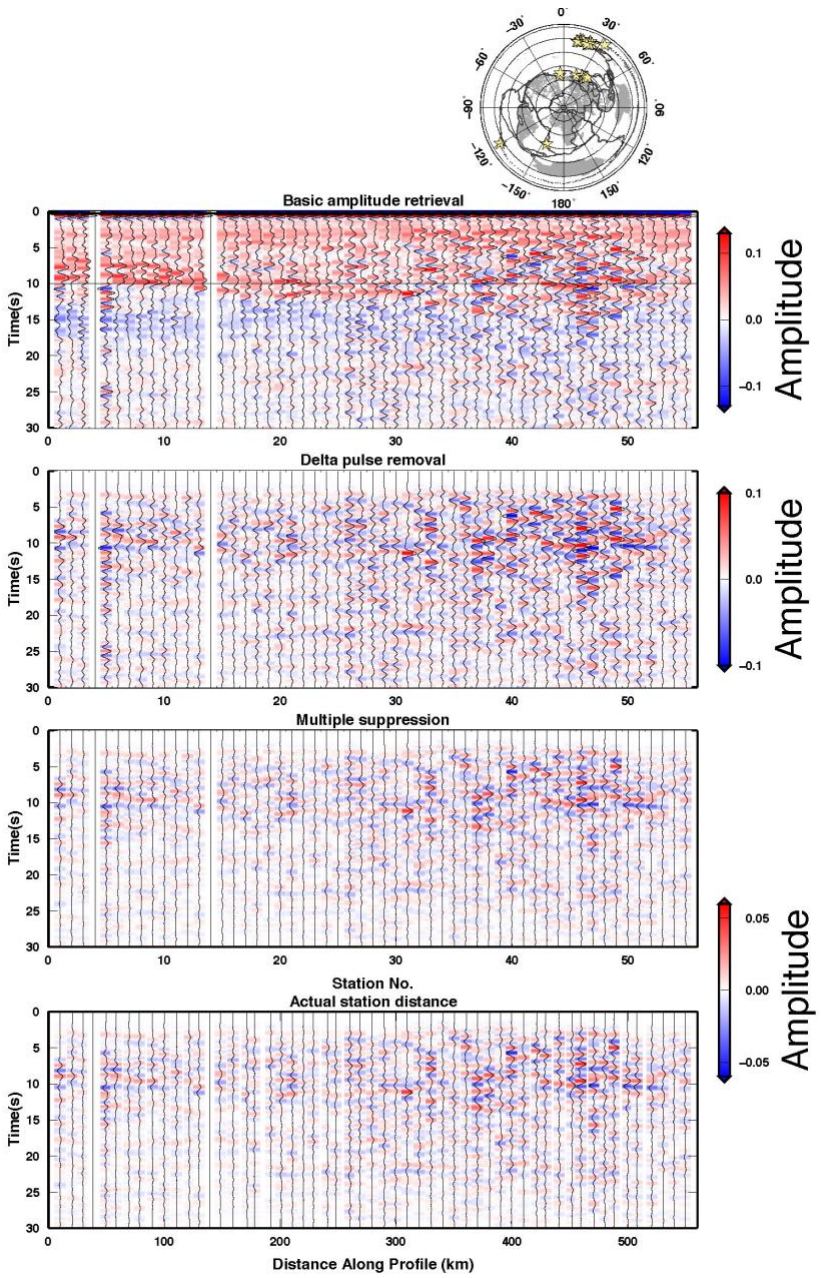

Figure S7

Same as Figure 2 including only sources of events located within +-40 degrees from the great circle through the array. As in the previous figure the number of sub-horizontal reflections is strongly reduced, apparently a sufficient amount of phases is reached to stack out most of the SSRs. Separation between crustal and mantle features is already visible in BAR image for the northern part of the profile, we have marked it with a dashed line.

After Delta Pulse removal, nearly all sub-horizontal reflections are gone and Moho generated amplitudes are visible at stations 1 to 9 (black dashed box), but between 9 to 30 are not univocally interpretable. In the DPR image, multiple phases are well visible at 21-22 s TWT (highlighted by a blue dotted box), these are also not being suppressed by the multiple suppression step, possibly due to imbalance in sources from either side and to many events all at same distances from one side. In the “Multiple suppression” gather, we highlight the blue-red-blue triplet identified as the signature of the positive impedance contrast at the Moho, it is very clear between stations 1 and 9.

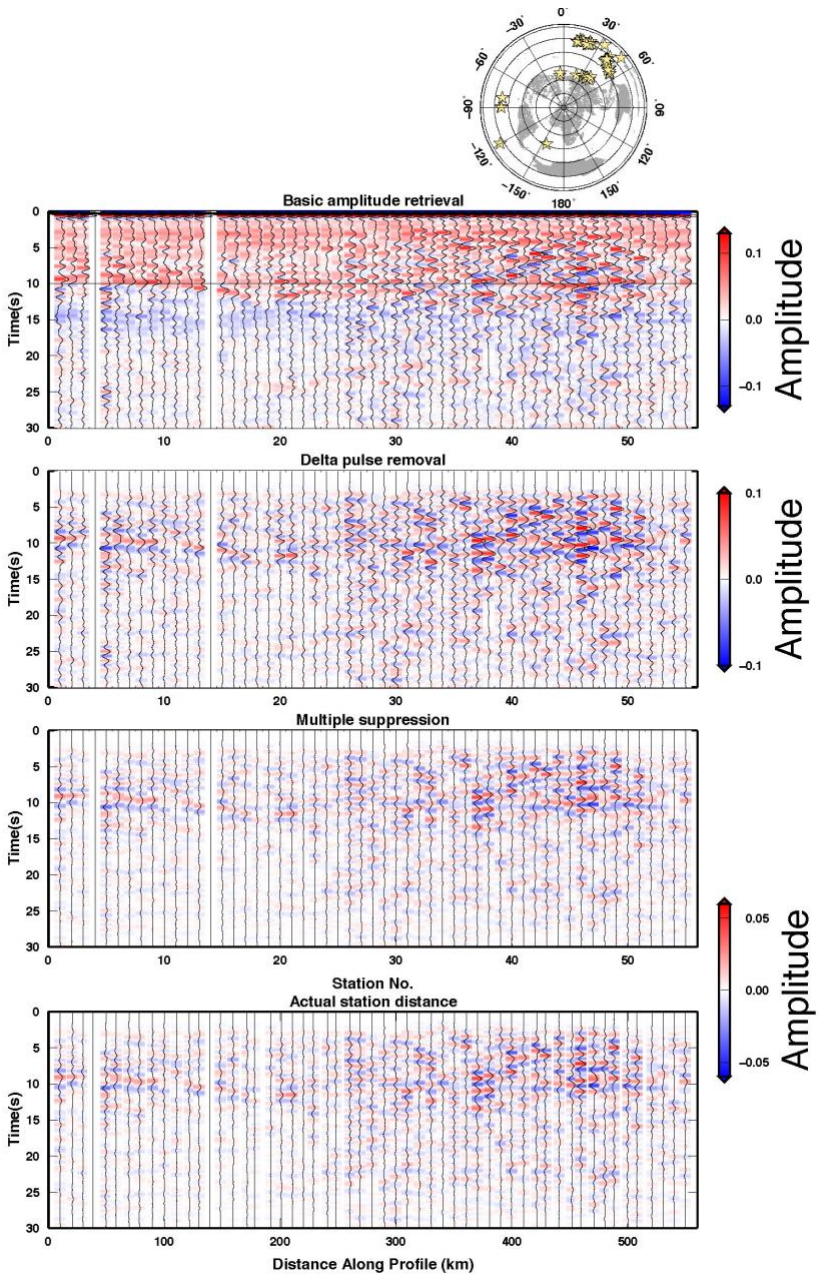

Figure S8

Same as Figure 2 including all 64 events with high SNR depicted for this study. The boundary between crustal and mantle features is already well visible in BAR image for the northern part of the profile.

After Delta Pulse removal, nearly all sub-horizontal reflections are gone and Moho generated amplitudes are well visible (from station 1 to 21, marked in figure by a dashed box). In this

DPR image the amplitude of multiple phases is reduced with respect to the previous image (Figure S7) due to the high number of events from either side of the profile having various incidence angles. In the “Multiple suppression” gather, we highlight the blue-red-blue triplet identified as the signature of the positive impedance contrast at the Moho, it is very clear between stations 1 and 21, and can be followed southward to station 26.

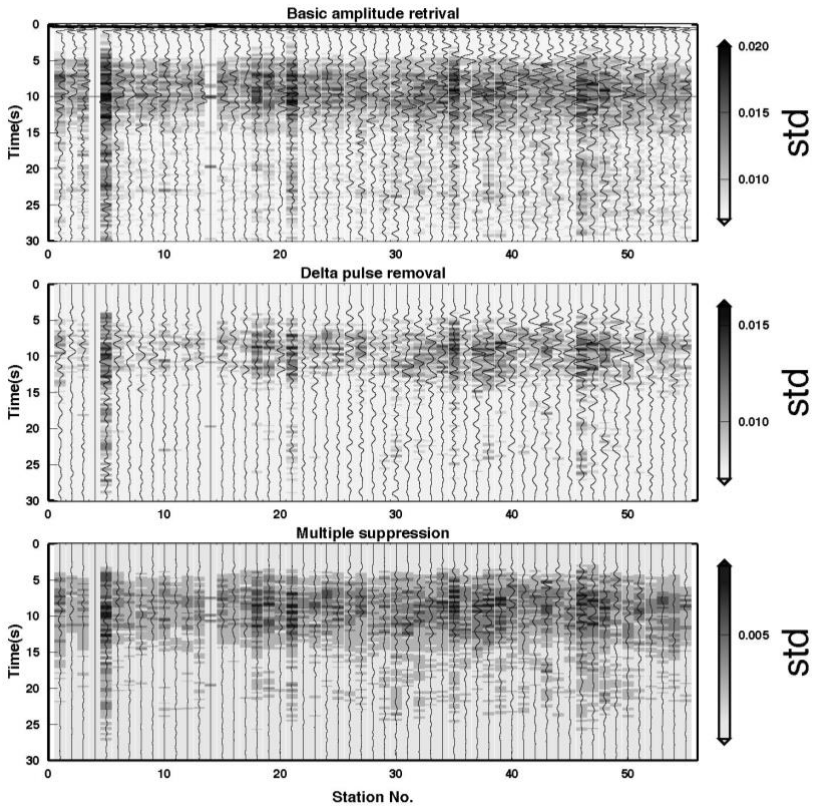

Figure S9

Standard deviation calculated over 100 samples generated by bootstrapping events ensembles by the pool of 64 events in Table S1. The wiggle on top is the mean wiggles over the 100 bootstrapped wiggles.

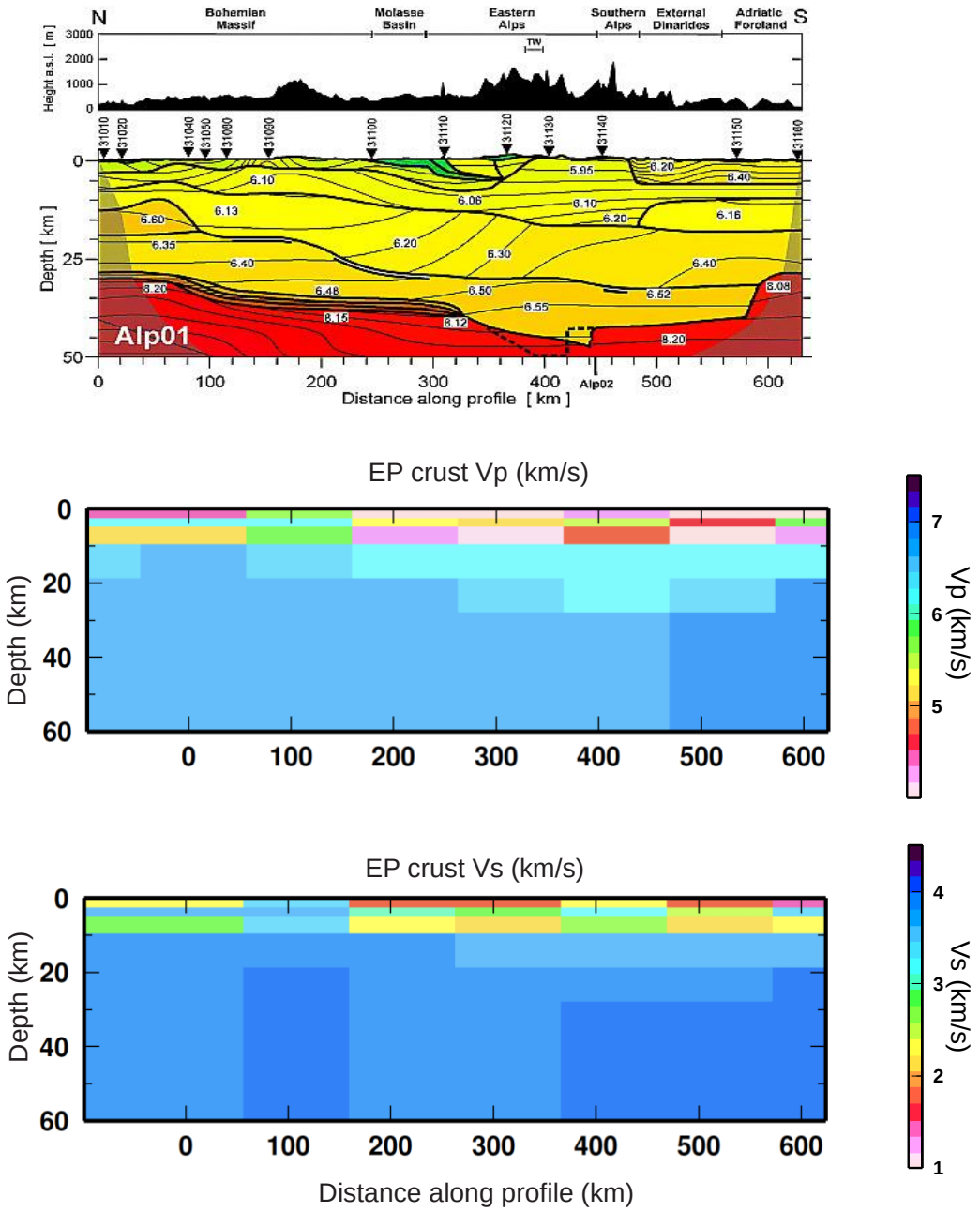

Figure S10

Upper panel: Figure 13 from Brückl et al., 2007, showing the Alp01, *P* wave velocity model; the grey shows the portions of the model which had no ray coverage.

Middle and lower panels: Vp and Vs models from the model EP crust (Molinari et al., 2011).

TABLE T1

Table of the 64 seismic events used in this study. Marked with asterisk are the 27 selected for creating the images in Figure 2, 4(b,c) and 5.

Event ID (date+time)	Date (YY.MM.DD)	Time (HHMMSS)	Lat	Long	Depth (km)	M	Baz	Dist
1508150747	15.08.15	074706	-10.91	163.8	10	6.5	43.5	135.2
1508121849	15.08.12	184924	-9.34	157.88	10	6.5	49.4	130.9
1508100412	15.08.10	041213	-9.28	158.01	10	6.6	49.2	131
1507262242	15.07.26	224217	-18.16	-174.07	30	6	14.1	149.3
*1507180227	15.07.18	022733	-10.38	165.2	10	6.9	41.4	135.3
*1507100412	15.07.10	041241	-9.35	158.39	10	6.8	48.9	131.2
1506300339	15.06.30	033928	-5.38	151.57	35	6	53.5	124.3
*1506251845	15.06.25	184556	-32.22	-178.08	10	6	32.6	161.7
1506212128	15.06.21	212816	-20.47	-178.34	563	6	22.9	150.6
*1505202248	15.05.20	224853	-10.88	164.14	10	6.8	43.1	135.3
*1505200030	15.05.20	003050	-19.3	-175.47	173	6	17.1	150.1
*1505191525	15.05.19	152521	-54.36	-132.19	10	6.7	241.1	157.9
*1505070710	15.05.07	071022	-7.23	154.56	20	7.1	51.6	127.4
*1505050144	15.05.05	014405	-5.46	151.98	40	7.4	53.2	124.6
1505010806	15.05.01	080606	-5.16	151.85	60	6.8	53.1	124.3
1504301045	15.04.30	104506	-5.39	151.73	54	6.7	53.4	124.4
1504281639	15.04.28	163937	-20.92	-178.68	566	6.2	23.8	151
1504222257	15.04.22	225717	-12.01	166.49	80	6.3	40.9	137.4

*1504171552	15.04.17	155253	-16.11	-178.39	10	6.5	20.8	146.4
*1504070046	15.04.07	004618	-15.3	-173.31	10	6.3	11.9	146.6
1502191318	15.02.19	131832	-16.4	168.19	2	6.5	41.7	142
*1501280243	15.01.28	024319	-21.01	-178.27	485	6.2	23.1	151.2
*1501230347	15.01.23	034726	-17.02	168.57	216	6.7	41.6	142.7
*1411162233	14.11.16	223320	-37.69	179.79	20	6.7	48.2	165.5
*1411011857	14.11.01	185722	-19.8	-177.8	431	7.1	21.6	150.1
1411011059	14.11.01	105958	-31.83	-111.17	30	6	270.8	135.6
*1410280315	14.10.28	031538	-15.27	-174.63	2	6.1	14.1	146.3
*1410090214	14.10.09	021432	-32.08	-110.83	10	7.1	270.2	135.6
*1409060653	14.09.06	065313	-26.6	-114.6	10	6.1	279.1	134.5
*1409040533	14.09.04	053345	-21.4	-173.28	4	6	13.7	152.6
1508100743	15.08.10	074338	-19.65	-174.79	60	5.7	15.9	150.6
1508031401	15.08.03	140150	-16.46	-174.35	162	5.7	14	147.5
1507171849	15.07.17	184951	-18.12	-178.2	522	5.8	21.4	148.4
1507072003	15.07.07	200312	-23.21	-176.99	125	5.8	22	153.6
1507061224	15.07.06	122400	-20.8	-174.52	2	5.7	15.9	151.8
1507011935	15.07.01	193521	-10.94	162.54	10	5.9	45.1	134.6
1506230859	15.06.23	085953	-19.67	-175.14	117	5.7	16.6	150.6
1506160616	15.06.16	061659	-20.43	-178.9	645	5.9	23.9	150.4
1505032232	15.05.03	223241	-5.52	151.77	30	5.8	53.4	124.5
1504140813	15.04.14	081354	-15.18	-173.35	2	5.6	11.9	146.4
1504020410	15.04.02	041011	-17.87	-178.61	560	5.9	22	148

1503301802	15.03.30	180209	-15.57	-172.8	2	5.7	11	146.9
1503201542	15.03.20	154252	-4.76	154.84	23	5.6	49.8	125.5
1411101004	14.11.10	100422	-22.81	171.54	10	5.9	42.1	149.2
1409170611	14.09.17	061149	-16.03	168.01	181	5.6	41.6	141.6
1409032034	14.09.03	203400	-26.49	-114.77	10	5.9	279.4	134.5
1409031134	14.09.03	113438	-15.03	-173.4	2	5.7	11.9	146.3
1409030743	14.09.03	074330	-14.99	-173.44	2	5.8	12	146.2
1408272311	14.08.27	231135	-15.04	167.44	124	5.9	41.7	140.5
1408271631	14.08.27	163113	-15.59	-177.81	10	5.6	19.6	146
*1409251751	14.09.25	175117	61.97	-151.79	102	6.2	352.6	69.1
*1410021257	14.10.02	125706	52.38	158.05	153	5.7	21.5	74.9
*1505290700	15.05.29	070008	56.74	-156.73	60	6.8	354.4	74.7
*1506171251	15.06.17	125132	-35.39	-17.63	10	6.9	204.9	88.1
*1507070510	15.07.07	051026	44.00	147.98	30	6.3	31.4	79.5
1407201832	14.07.20	183247	44.66	148.80	60	6.2	30.6	79.2
1506080601	15.06.08	060109	41.54	142.05	50	6.0	36.5	79.4
1505122112	15.05.12	211259	38.95	141.99	40	6.8	37.9	81.6
1502211013	15.02.21	101353	39.88	143.52	2	6.0	36.4	81.4
*1502162306	15.02.16	230627	39.87	142.94	15	6.8	36.8	81.2
*1407111921	14.07.11	192159	37.06	142.54	10	6.5	38.6	83.4
*1411221308	14.11.22	130817	36.00	137.00	2	6.2	203.5	82.3
*1505301849	15.05.30	184906	30.77	143.04	2	6.2	41.5	89.0

TABLE S2:

Moho depth along profile. Columns in the tables correspond to: Longitude, Latitude, Distance along profile, estimated Moho depth. Asterisks show the fairly resolved Moho.

LON LAT DIST(km) DEPTH(km)
13.35 50.608 000 29
13.35 50.599 001 29
13.35 50.590 002 29
13.35 50.581 003 29
13.35 50.572 004 29
13.35 50.563 005 29
13.35 50.554 006 29
13.35 50.545 007 29
13.35 50.536 008 29
13.35 50.527 009 29
13.35 50.518 010 29
13.35 50.509 011 29
13.35 50.500 012 29
13.35 50.491 013 29
13.35 50.482 014 29
13.35 50.473 015 29
13.35 50.464 016 29
13.35 50.455 017 29
13.35 50.446 018 29
13.35 50.437 019 29
13.35 50.428 020 29
13.35 50.419 021 29
13.35 50.410 022 29
13.35 50.401 023 29
13.35 50.392 024 29
13.35 50.383 025 29
13.35 50.374 026 29
13.35 50.365 027 30
13.35 50.356 028 30
13.35 50.347 029 30
13.35 50.338 030 30
13.35 50.329 031 30
13.35 50.320 032 30
13.35 50.311 033 30
13.35 50.302 034 30
13.35 50.293 035 30
13.35 50.284 036 30
13.35 50.275 037 30
13.35 50.266 038 30
13.35 50.257 039 30

13.35 50.248 040 30
13.35 50.239 041 30
13.35 50.230 042 30
13.35 50.221 043 30
13.35 50.212 044 30
13.35 50.203 045 30
13.35 50.194 046 30
13.35 50.185 047 30
13.35 50.176 048 30
13.35 50.167 049 31
13.35 50.158 050 31
13.35 50.149 051 31
13.35 50.140 052 31
13.35 50.131 053 31
13.35 50.122 054 31
13.35 50.113 055 31
13.35 50.104 056 31
13.35 50.095 057 31
13.35 50.086 058 31
13.35 50.077 059 31
13.35 50.068 060 31
13.35 50.059 061 31
13.35 50.050 062 31
13.35 50.041 063 31
13.35 50.032 064 31
13.35 50.023 065 31
13.35 50.014 066 31
13.35 50.005 067 31
13.35 49.996 068 31
13.35 49.987 069 31
13.35 49.978 070 31
13.35 49.969 071 31
13.35 49.960 072 31
13.35 49.951 073 31
13.35 49.942 074 31
13.35 49.933 075 31
13.35 49.924 076 31
13.35 49.915 077 31
13.35 49.906 078 31
13.35 49.897 079 31
13.35 49.888 080 31
13.35 49.879 081 31
13.35 49.870 082 31
13.35 49.861 083 31
13.35 49.852 084 31
13.35 49.843 085 31
13.35 49.834 086 31

13.35 49.825 087 31
13.35 49.816 088 31
13.35 49.807 089 31
13.35 49.798 090 31
13.35 49.789 091 31
13.35 49.780 092 31
13.35 49.771 093 32
13.35 49.762 094 32
13.35 49.753 095 32
13.35 49.744 096 32
13.35 49.735 097 32
13.35 49.726 098 32
13.35 49.717 099 32
13.35 49.708 100 32
13.35 49.699 101 32
13.35 49.690 102 32
13.35 49.681 103 32
13.35 49.672 104 32
13.35 49.663 105 32
13.35 49.654 106 33
13.35 49.645 107 33
13.35 49.636 108 33
13.35 49.627 109 33
13.35 49.618 110 33
13.35 49.609 111 33
13.35 49.600 112 33
13.35 49.591 113 33
13.35 49.582 114 33
13.35 49.573 115 33
13.35 49.564 116 34
13.35 49.555 117 34
13.35 49.546 118 34
13.35 49.537 119 34
13.35 49.528 120 34
13.35 49.519 121 34
13.35 49.510 122 34
13.35 49.501 123 34
13.35 49.492 124 34
13.35 49.483 125 35
13.35 49.474 126 35
13.35 49.465 127 35
13.35 49.456 128 35
13.35 49.447 129 35
13.35 49.438 130 35
13.35 49.429 131 35
13.35 49.420 132 35
13.35 49.411 133 35

13.35 49.402 134 35
13.35 49.393 135 36
13.35 49.384 136 36
13.35 49.375 137 36
13.35 49.366 138 36
13.35 49.357 139 36
13.35 49.348 140 36
13.35 49.339 141 36
13.35 49.330 142 36
13.35 49.321 143 36
13.35 49.312 144 36
13.35 49.303 145 36
13.35 49.294 146 36
13.35 49.285 147 36
13.35 49.277 148 36
13.35 49.268 149 36
13.35 49.259 150 36
13.35 49.250 151 36
13.35 49.241 152 37
13.35 49.232 153 37
13.35 49.223 154 37
13.35 49.214 155 37
13.35 49.205 156 37
13.35 49.196 157 37
13.35 49.187 158 37
13.35 49.178 159 37
13.35 49.169 160 37
13.35 49.160 161 37
13.35 49.151 162 37
13.35 49.142 163 37
13.35 49.133 164 37
13.35 49.124 165 37
13.35 49.115 166 37
13.35 49.106 167 37
13.35 49.097 168 37
13.35 49.088 169 37
13.35 49.079 170 37
13.35 49.070 171 37
13.35 49.061 172 37
13.35 49.052 173 37
13.35 49.043 174 38
13.35 49.034 175 38
13.35 49.025 176 38
13.35 49.016 177 38
13.35 49.007 178 38
13.35 48.998 179 38
13.35 48.989 180 38

13.35 48.980 181 38
13.35 48.971 182 38
13.35 48.962 183 38
13.35 48.953 184 38
13.35 48.944 185 38
13.35 48.935 186 38
13.35 48.926 187 38
13.35 48.917 188 38
13.35 48.908 189 38
13.35 48.899 190 38
13.35 48.890 191 38
13.35 48.881 192 38
13.35 48.872 193 38
13.35 48.863 194 38
13.35 48.854 195 38
13.35 48.845 196 38
13.35 48.836 197 38
13.35 48.827 198 38
13.35 48.818 199 38
13.35 48.809 200 38
13.35 48.800 201 38
13.35 48.791 202 38
13.35 48.782 203 38
13.35 48.773 204 38
13.35 48.764 205 38
13.35 48.755 206 38
13.35 48.746 207 38
13.35 48.737 208 38
13.35 48.728 209 38
13.35 48.719 210 38
13.35 48.710 211 38
13.35 48.701 212 38
13.35 48.692 213 38
13.35 48.683 214 38
13.35 48.674 215 38
13.35 48.665 216 38
13.35 48.656 217 38
13.35 48.647 218 38
13.35 48.638 219 38
13.35 48.629 220 38
13.35 48.620 221 38
13.35 48.611 222 38
13.35 48.602 223 38
13.35 48.593 224 38
13.35 48.584 225 38
13.35 48.575 226 38
13.35 48.566 227 38

13.35 48.557 228 38
13.35 48.548 229 38
13.35 48.539 230 38
13.35 48.530 231 38
13.35 48.521 232 38
13.35 48.512 233 38
13.35 48.503 234 38
13.35 48.494 235 38
13.35 48.485 236 38
13.35 48.476 237 38
13.35 48.467 238 38
13.35 48.458 239 38
13.35 48.449 240 38
13.35 48.440 241 38
13.35 48.431 242 38
13.35 48.422 243 38
13.35 48.413 244 38
13.35 48.404 245 38
13.35 48.395 246 38
13.35 48.386 247 38
13.35 48.377 248 38
13.35 48.368 249 38
13.35 48.359 250 38
13.35 48.350 251 38
13.35 48.341 252 38
13.35 48.332 253 38
13.35 48.323 254 38
13.35 48.314 255 38
13.35 48.305 256 38
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