Auxiliary material for Paper 2007JB005263

Seismic array detection of subducted oceanic crust in the lower mantle

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Introduction

The auxiliary material contains comparisons of the present study with earlier results. These contain studies of detections
of scatterers in the Mariana region, as well as comparisons with tomographic images of the study regions. Our results agree
well with the tomographic pictures and seem to track areas of fast seismic velocities below the Mariana and Tonga/Fiji
subduction zones.

1. 2007jb005263-fs01.eps

Scatterer locations in the Mariana subduction zone region (squares). The depths of the scatterers are color-coded. Dotted lines show slab locations after the RUM model [Gudmundsson and Sambridge, 1998]. Green line shows plate boundaries. Other symbols mark locations of scatterers found by previous studies. Stars: Niu et al. [2003]; circles: Castle and Creager [1999]; diamonds: Kruger et al. [2001]; hexagons: Kaneshima and Helffrich [1999]; triangles: Kaneshima and Helffrich [2003]; inverted triangles: Weber and Wicks [1996]. The depths of the scatterers in these studies are also color-coded. The scatterers in the mid-mantle are located deeper and further north-east than in our study. The shallow reflections of Weber and Wicks [1996] are also in good agreement with our study.

2. 2007jb005263-fs02a.eps

Tomography cross sections for Tonga and S-wave tomography

model [Ritsema and van Heijst, 2000]. The insert shows the location of the cross-sections. Dots mark seismicity in this subduction zone from 1973 to 1995. Depth of seismicity and of scattering points found in this study are color coded on the same color scale. The green line denotes the surface plate boundary. In each cross section through the tomography model, the beginning of the profile shown in the top insert is marked by an orange circle and the end by a red triangle. Yellow circles represent the projection of the closest scatterer locations onto the profile shown at its correct depth location.

3. 2007jb005263-fs02b.eps

As a but for the tomography model of Karason and van der Hilst [2001]. Location of the cross-sections is as in a.

4. 2007jb005263-fs03a.eps

As Figure S2a but for the Mariana region. Profile 3 contains seismicity from 1973 to 1995 in a 3 degree corridor around the profile. The seismicity related to the subduction of the Pacific and the Philippine plate is clearly visible. All scatterers are projected onto profile 4 and clearly follow the higher seismic velocities in this region.

5. 2007jb005263-fs03b.eps

As a but for P-wave tomography. The deepest reflectors in this region are a continuation of the Wadati-Benioff zone of the Mariana subduction zone and perhaps witholder subducted material to the west.

6. 2007jb005263-ms01.gif

Animated GIF of scatterer locations in the mantle beneath the Pacific. The box stretches from 100 deg to 240 deg longitude and -30 deg to 80 deg latitude and stretches from the surface to the core mantle boundary. For orientation a map of the Pacific is shown at the surface. Slab contours of Gudmundsson and Sambridge [1998] are shown beneath the subduction zones of the region. Scatterer locations are marked as spheres with depths greater than 600 km shown in purple and shallower depth shown as blue. The same colorscale applies to the slab contours. Small yellow dots indicate earthquakes from the Engdahl et al. [1998] catalog. The figure was produced using Holodraw (http://www.holodraw.org) by Simkin et al. [2003].

7. 2007JB005263-ts01.txt

Table S1: Basic earthquake information.

1.1 Column "Origin Time", Earthquake origin time, day-month-year
1.2 Column "Origin Time", Earthquake origin time, hh:mm
1.3 Column "Lat", degrees, Source latitude
1.4 Column "Lon", degrees, Source longitude
1.5 Column "Z", kilometers, Source depth
1.6 Column "delta", degrees, epicentral source receiver distance
1.7 Column "baz", degrees, great circle path back azimuth

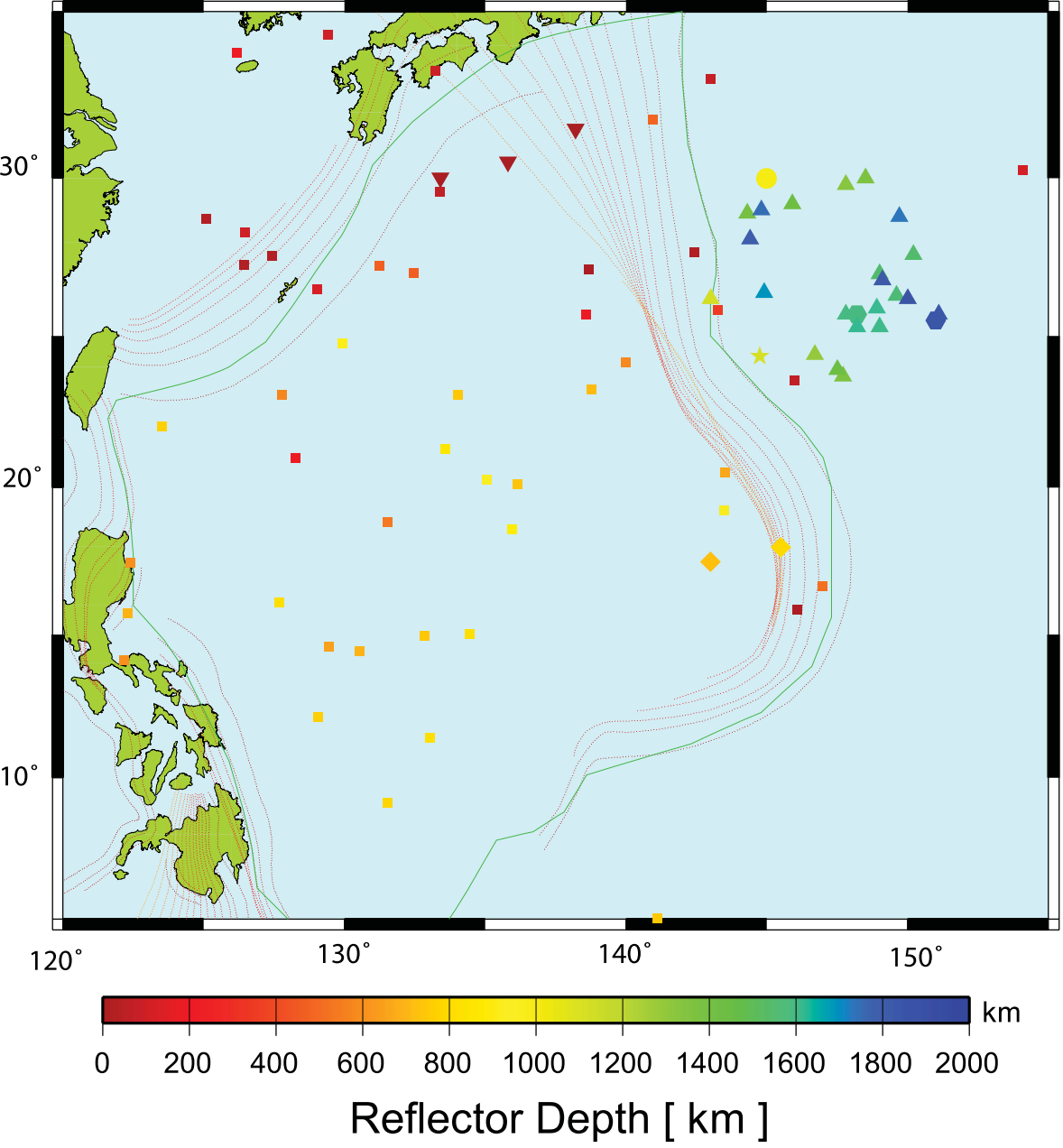
#	Origin time		Lat	Lon	Z	delta	baz
	day-month-year	hh:mm	(deg)	(deg)	(km)	(deg)	(deg)
1	31-JAN-1991	02:13	0.49	126.08	42.98	102.55	296.33
2	08-AUG-1991	02:09	1.09	122.60	12.16	103.43	299.84
3	16-APR-1992	08:00	1.25	122.63	37.75	103.28	299.87
4	10-JUN-1992	02:13	1.12	124.11	61.39	102.80	298.44
5	02-AUG-1992	05:50	-0.85	127.66	18.95	103.10	294.29
6	13-APR-1993	20:07	1.21	126.54	53.71	101.72	296.21
7	13-DEC-1993	11:43	-20.48	-173.67	29.51	94.71	233.52
8	21-JAN-1994	02:24	1.02	127.80	17.93	101.36	294.96
9	20-FEB-1994	01:53	2.03	126.51	33.45	100.98	296.58
10	21-JAN-1995	07:30	2.58	126.93	54.41	100.31	296.43
11	06-MAR-1995	18:43	2.68	118.18	25.25	103.72	304.66
12	12-JUL-1995	15:46	-23.26	170.87	11.00	103.38	245.45
13	10-JAN-1996	22:36	-6.13	133.56	38.00	105.25	286.46
14	17-FEB-1996	14:21	-0.57	135.84	19.00	99.29	286.90
15	02-APR-1996	18:50	3.07	126.29	41.00	100.14	297.22
16	04-APR-1996	11:11	3.10	126.22	33.00	100.14	297.30
17	18-APR-1996	06:12	12.82	124.98	33.00	91.82	302.38
18	07-MAY-1996	08:44	1.62	126.56	33.00	101.34	296.37
19	16-JUL-1996	10:07	1.02	120.15	33.00	104.48	302.12
20	23-JUL-1996	03:32	-26.75	-177.20	33.00	101.73	233.92
21	12-AUG-1996	17:00	-0.27	125.09	42.00	103.65	296.93

References

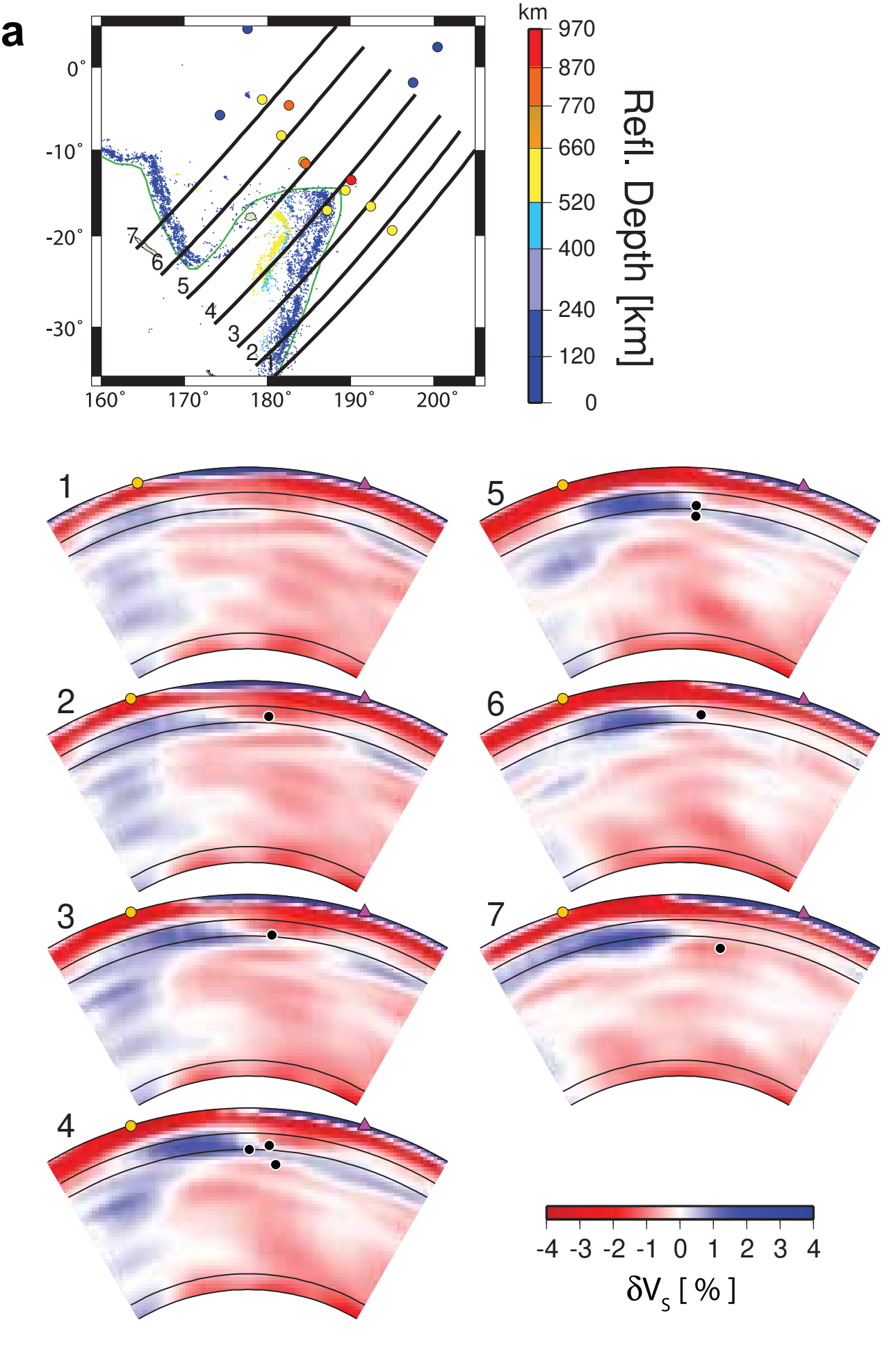
Engdahl E.R., R. van der Hilst, and R. Buland (1998), Global teleseismic earthquake relocation with improved travel times and procedures for depth determination, Bull. Seism. Soc. Am., 88, 722-743.

Gudmundsson O. and M. Sambridge (1998), A regionalized upper mantle (RUM) seismic model. J. Geophys. Res., 103, 7121-7136.

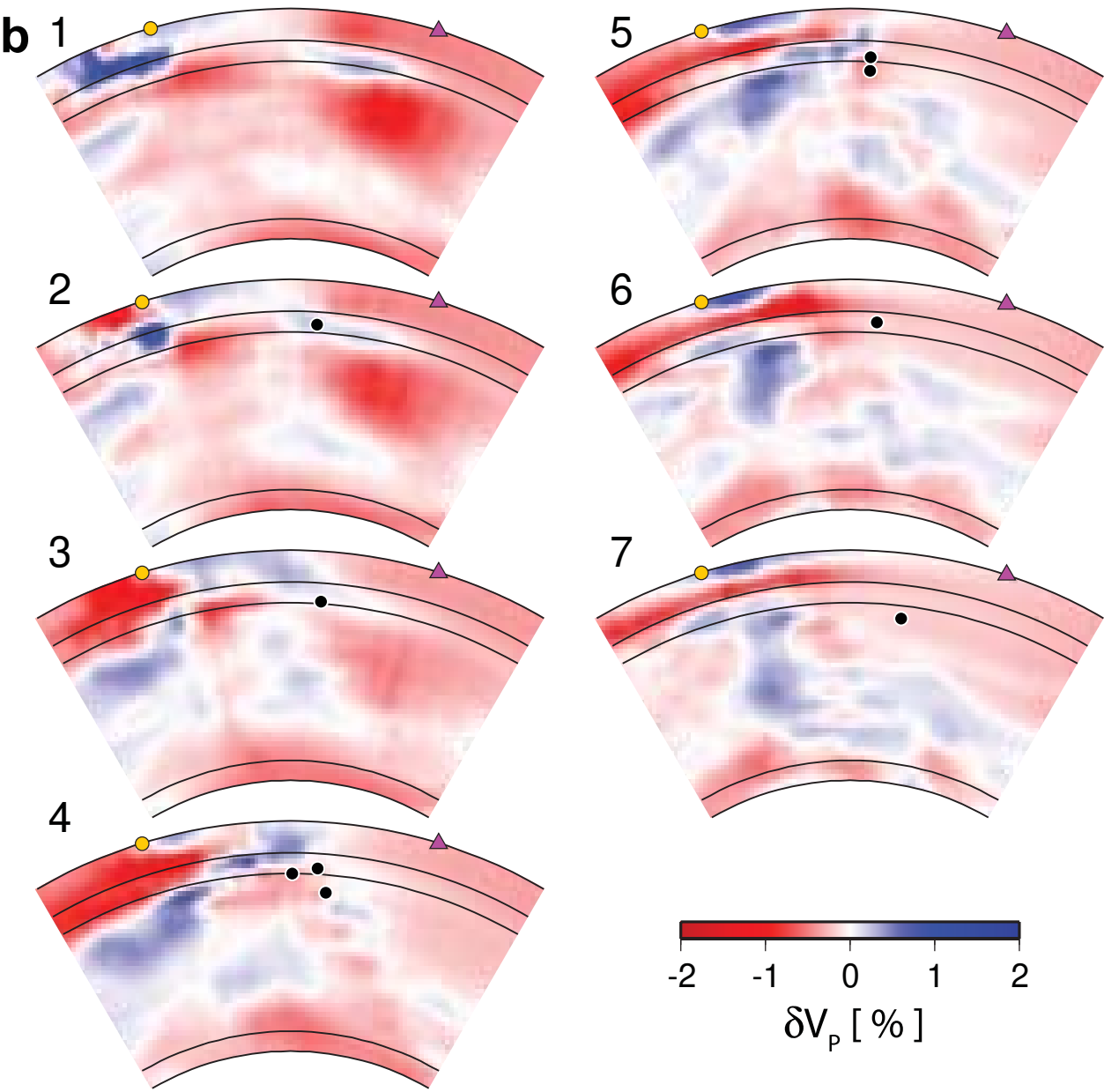
Simkin, M V, E.J. Garnero and M. Fouch (2003), New 3D Tools Provide Insights for Earth Interior Research, Visualization, and Education, Eos Trans. AGU, 84(46), Fall Meet. Suppl., Abstract ED31E-05.



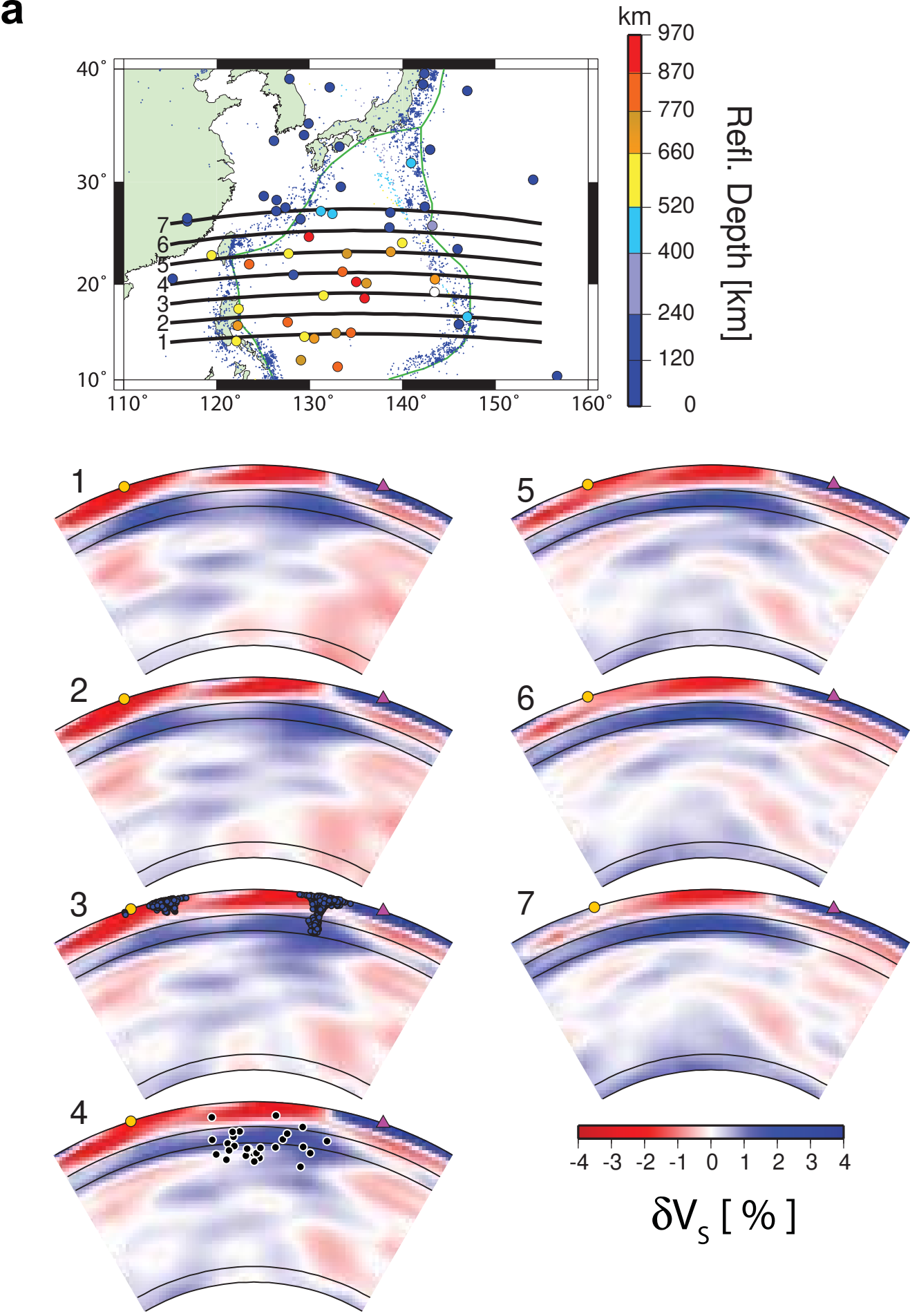
Suppl. Figure 1: Rost, Garnero and Williams (2008)



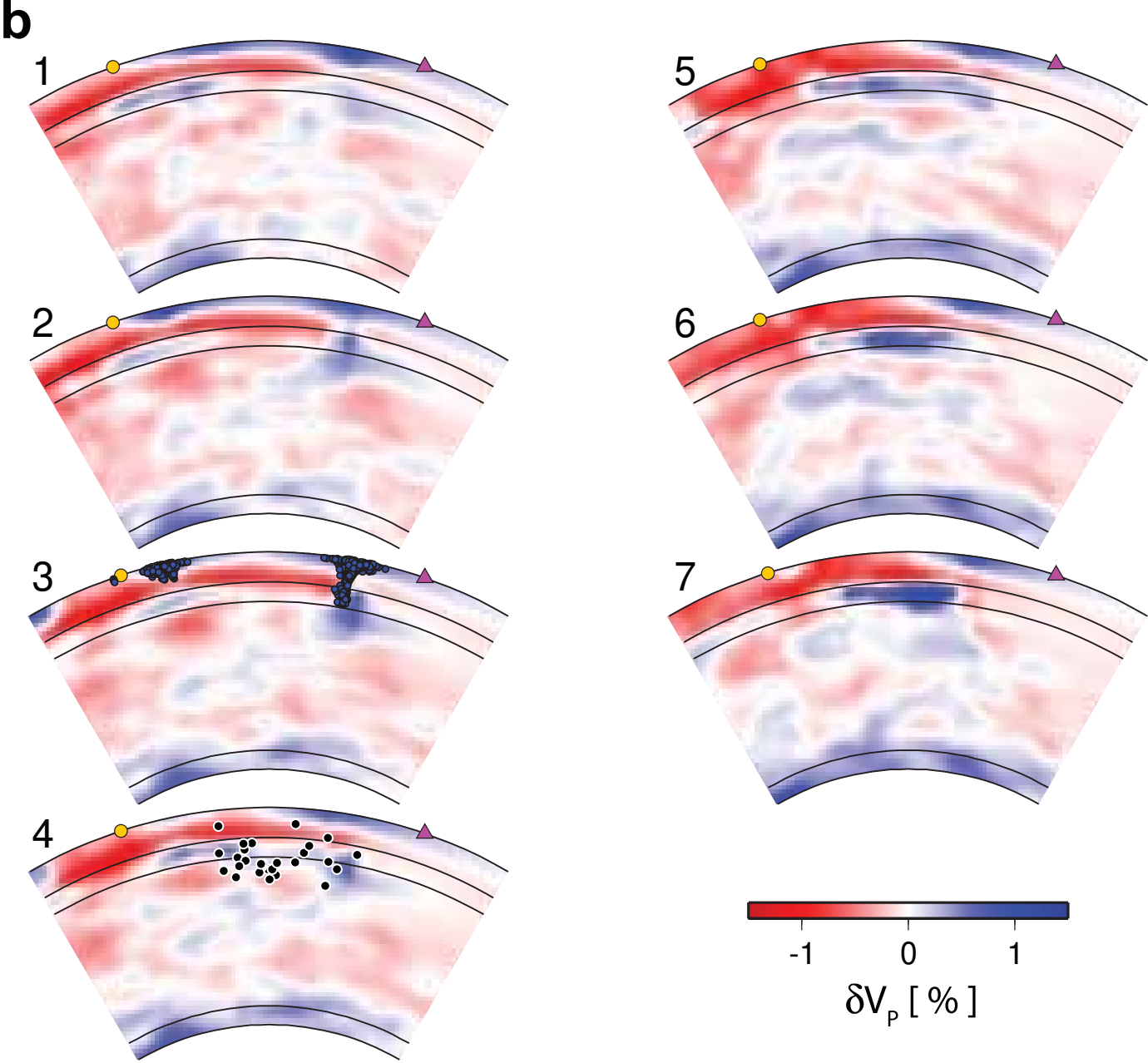
Suppl. Figure 2**a**: Rost, Garnero and Williams (2008)



Suppl. Figure 2b: Rost, Garnero and Williams (2008)



Suppl. Figure 3a: Rost, Garnero and Williams (2008)



Suppl. Figure 3b: Rost, Garnero and Williams (2008)