J. Geophysical Research – Solid Earth

Supporting Information for

Southeast Papuan crustal tectonics: imaging extension and buoyancy of an active rift

Abers, G.A.[1]; Eilon, Z.[2,3]; Gaherty, J.B.[2]; Jin, G.[3,4]; YH Kim[5]; Obrebski, M.[2,6]; Dieck, C.[2,7]

[1]*Department of Earth and Atmospheric Sciences, Cornell University, Ithaca NY*
[2]*Lamont-Doherty Earth Observatory of Columbia University, Palisades NY*
[3]*Department of Earth and Environmental Sciences, Columbia University, New York NY*
[4]*now at ConocoPhillips, Houston TX*
[5] *School of Earth and Environmental Sciences, Seoul National University, South Korea*
[6] *now at Graduate School of Engineering, ESIGELEC, Saint-Etienne du Rouvray, France*
[7]*now at Gemological Institute of America, New York NY*

Contents of this file

This Table of Contents. Figures are fully described in captions and main text.

Additional Supporting Information (Files uploaded separately)

Figure S1. Map of seismic network, with station codes and labeled. Station types indicated by symbol as described in legend.

Figure S2a. Map and cross sections of microseismicity recorded by CDPAPUA and WoodSeis, showing all original locations before removing poor quality hypocenters and before relative relocation. Symbols and layout same as Figure 2.

Figure S2b. Estimation of magnitude of detection. Black dots show single-station M_L magnitude estimates plotted against source-station distance (black dots). Green squares show magnitude that is exceeded by 95% of single-station magnitude estimates within a given distance bin. Distance bins are 0.1 log units. Red curve shows regression to the minimum magnitude data as described in text; regression constants are shown in figure title, where Mmin is minimum magnitude of

completeness and R is distance in km. This detection limit curve is used to make detection contours on Figure 3A.

Figure S2c. Gutenberg-Richter plot for the CDPapua catalog, for all earthquakes within 150 km of the array center (9.5°S, 150.3°E). Cyan circles show cumulative number of earthquakes with magnitude exceeding M_L. Black line shows maximum-likelihood regression, equation as labeled, for data with $2.0 \leq M_L \leq 5.5$.

Figure S2d. Comparison of local (M_L) magnitudes estimated in this paper to ISC catalog body-wave magnitudes (mb) for the 14 earthquakes located in both catalogs. The two correlate well (correlation coefficient = 0.90). The mean M_L is 0.19 higher than the mean mb for these data, indicating a slight bias.

Figure S3. Velocity inversion results for all stations, showing PDF's for velocity, interface depth, and number of layers. For each set of panels, station name is labeled top center corresponding to location on Figure S1. Layout is same as on Figure 4 C)-F). Six pages.

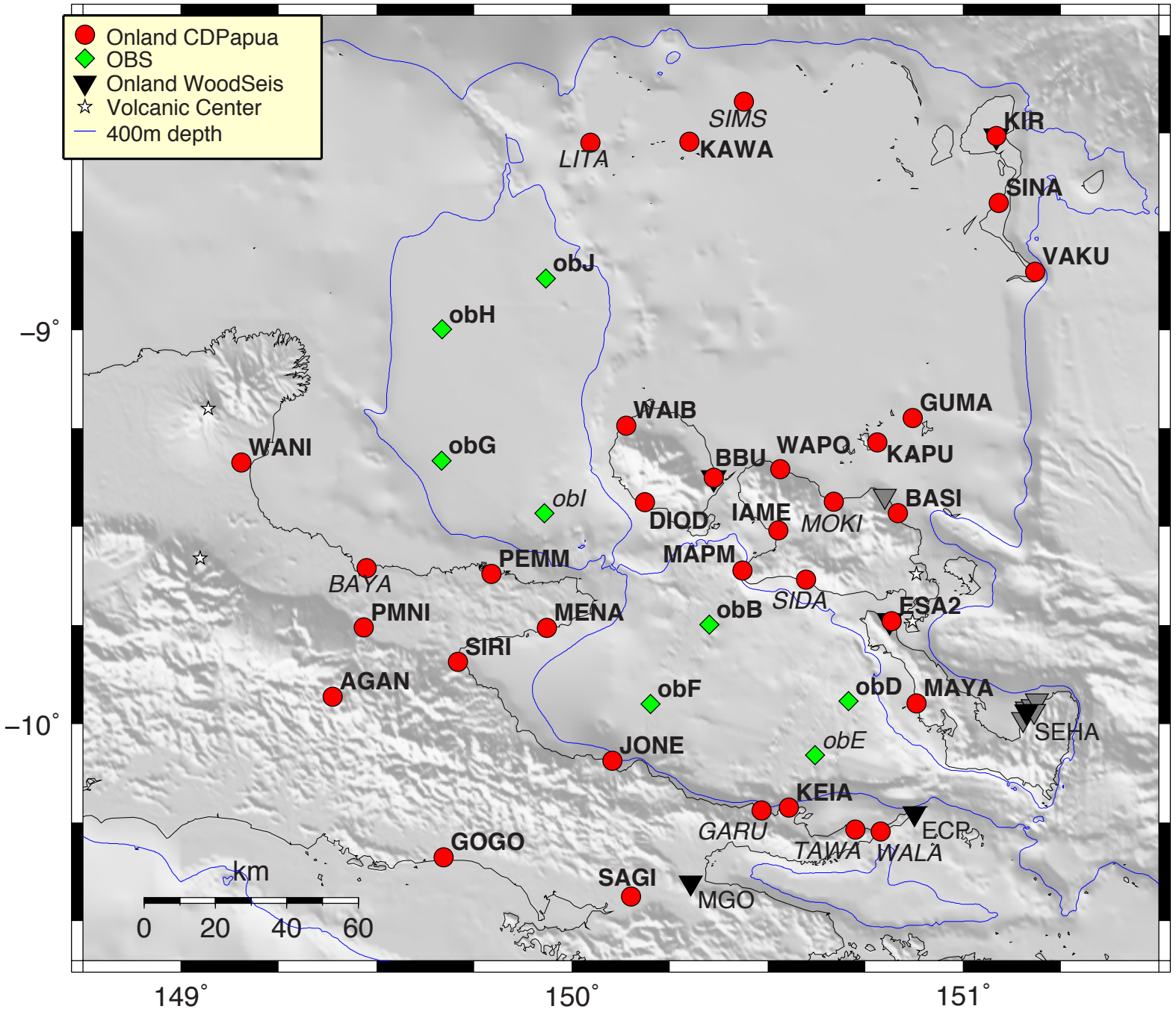

Onland CDPapua
OBS
Onland WoodSeis
Volcanic Center
400m depth
SIMS
KAWA
LITA
KIR
SINA
VAKU
obJ
obH
WAIB
GUMA
WANI
obG
WAPO
KAPU
BBU
obI
DIOD
IAME
MOKI
BASI
MAPM
PEMM
BAYA
SIDA
ESA2
PMNI
MENA
obB
SIRI
AGAN
obF
obD
MAYA
SEHA
JONE
obE
KEIA
GARU
ECR
TAWA
WALA
GOGO
SAGI
MGO
km
0
20
40
60
−9°
−10°
149°
150°
151°

Figure S1.

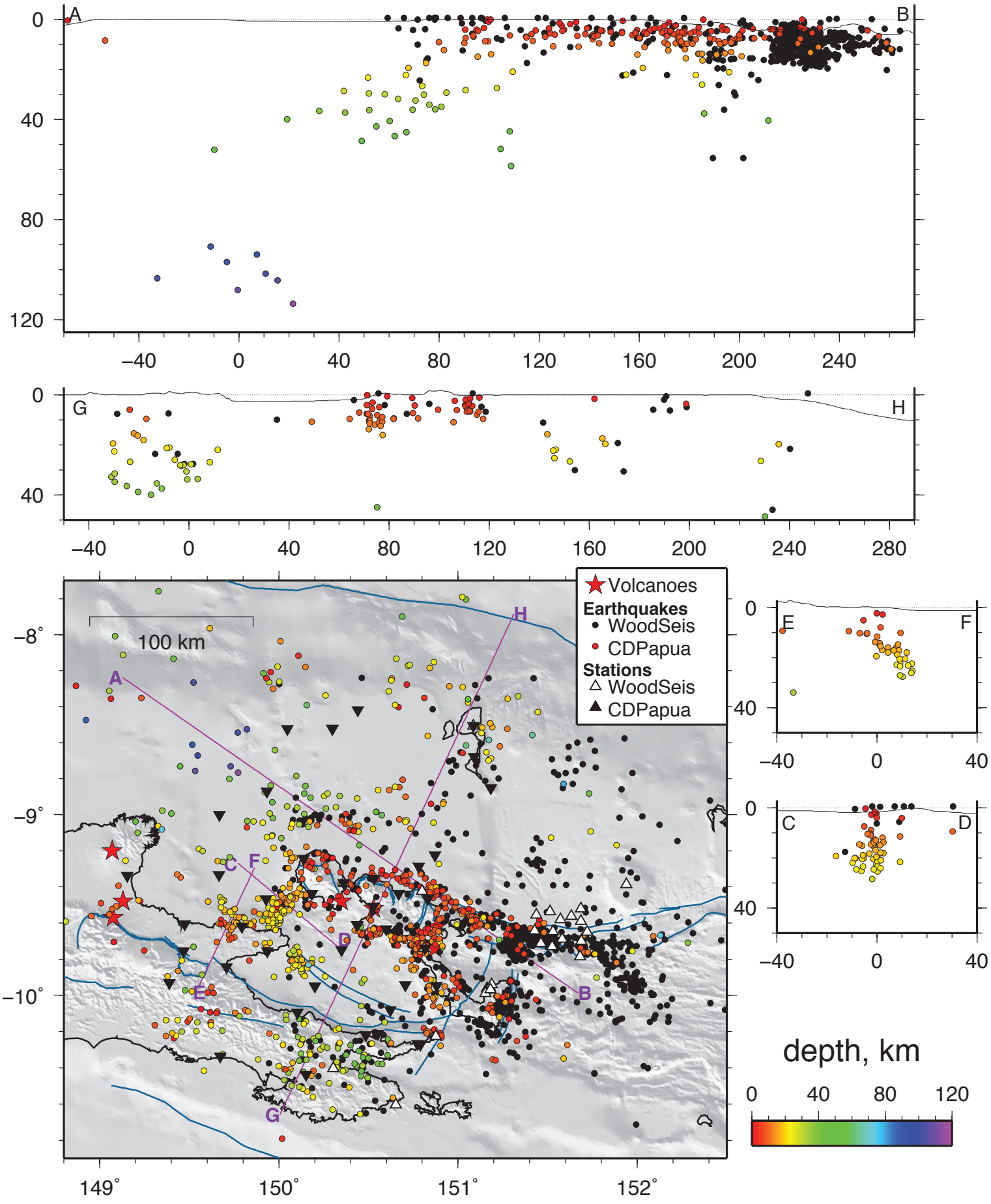

A
B
G
H
0
40
80
120
–40
0
40
80
120
160
200
240
280
Volcanoes
Earthquakes
WoodSeis
CDPapua
Stations
WoodSeis
CDPapua
100 km
–8˚
–9˚
–10˚
149˚
150˚
151˚
152˚
E
F
C
D
depth, km
0
40
80
120

Figure S2a

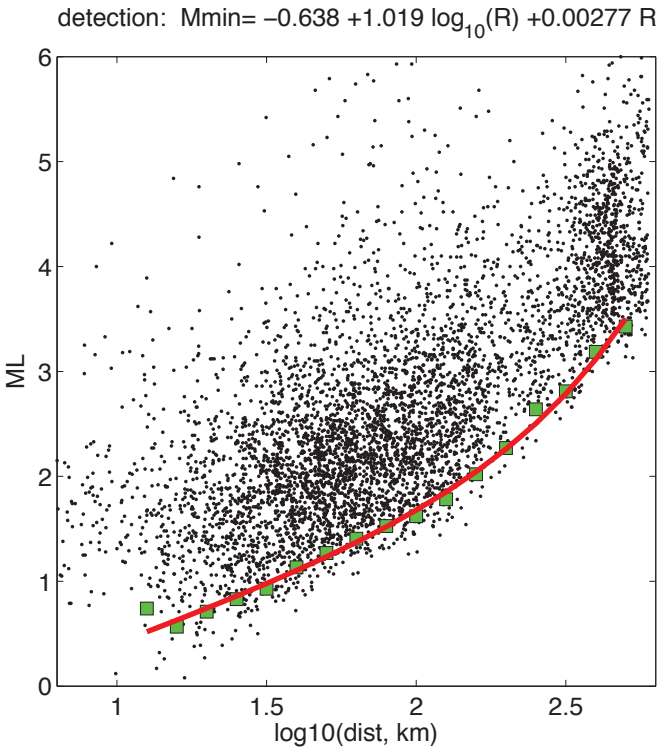


Figure S2b.

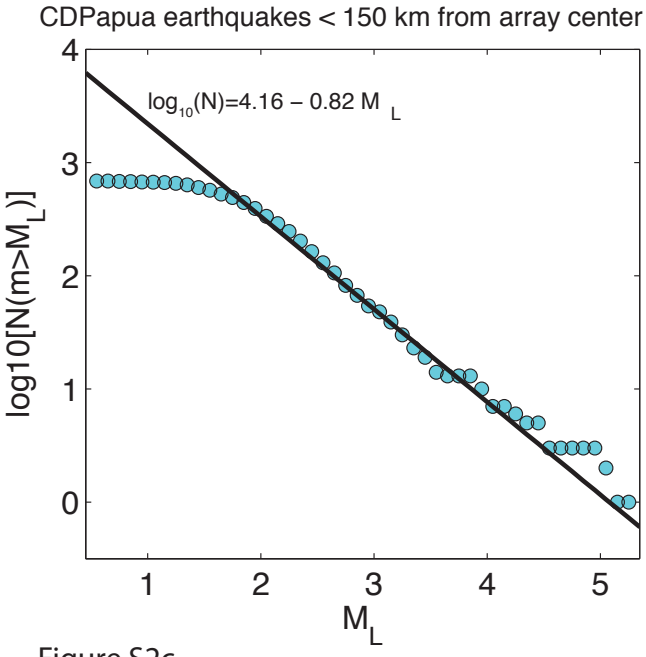


Figure S2c.

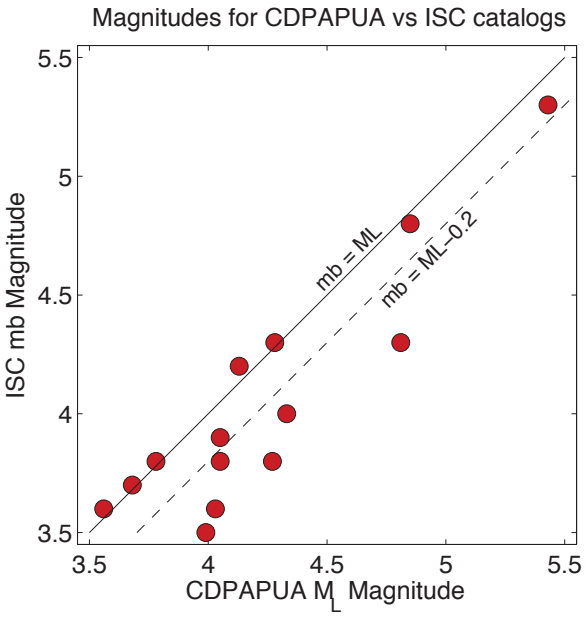


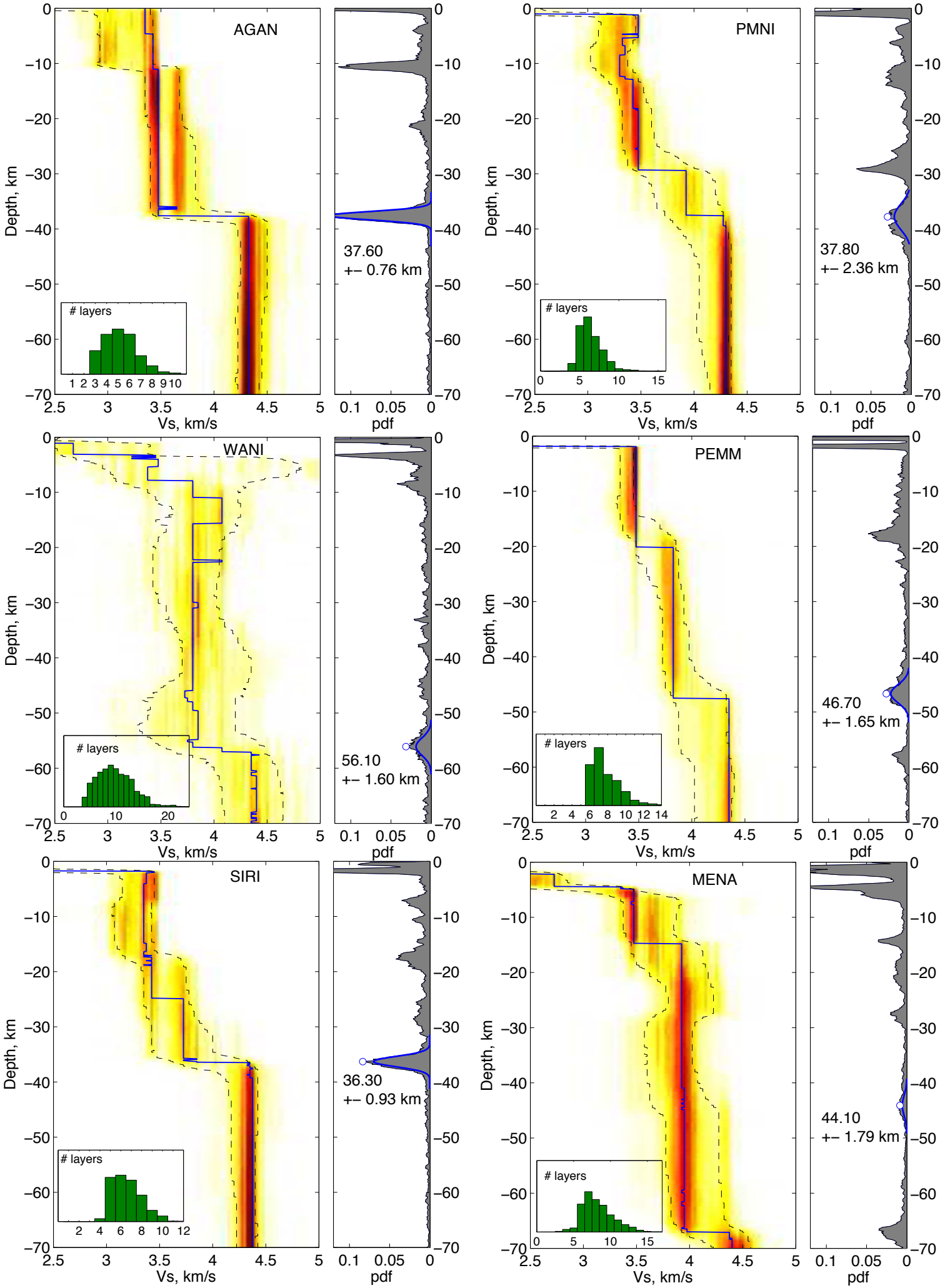
Figure S2d.

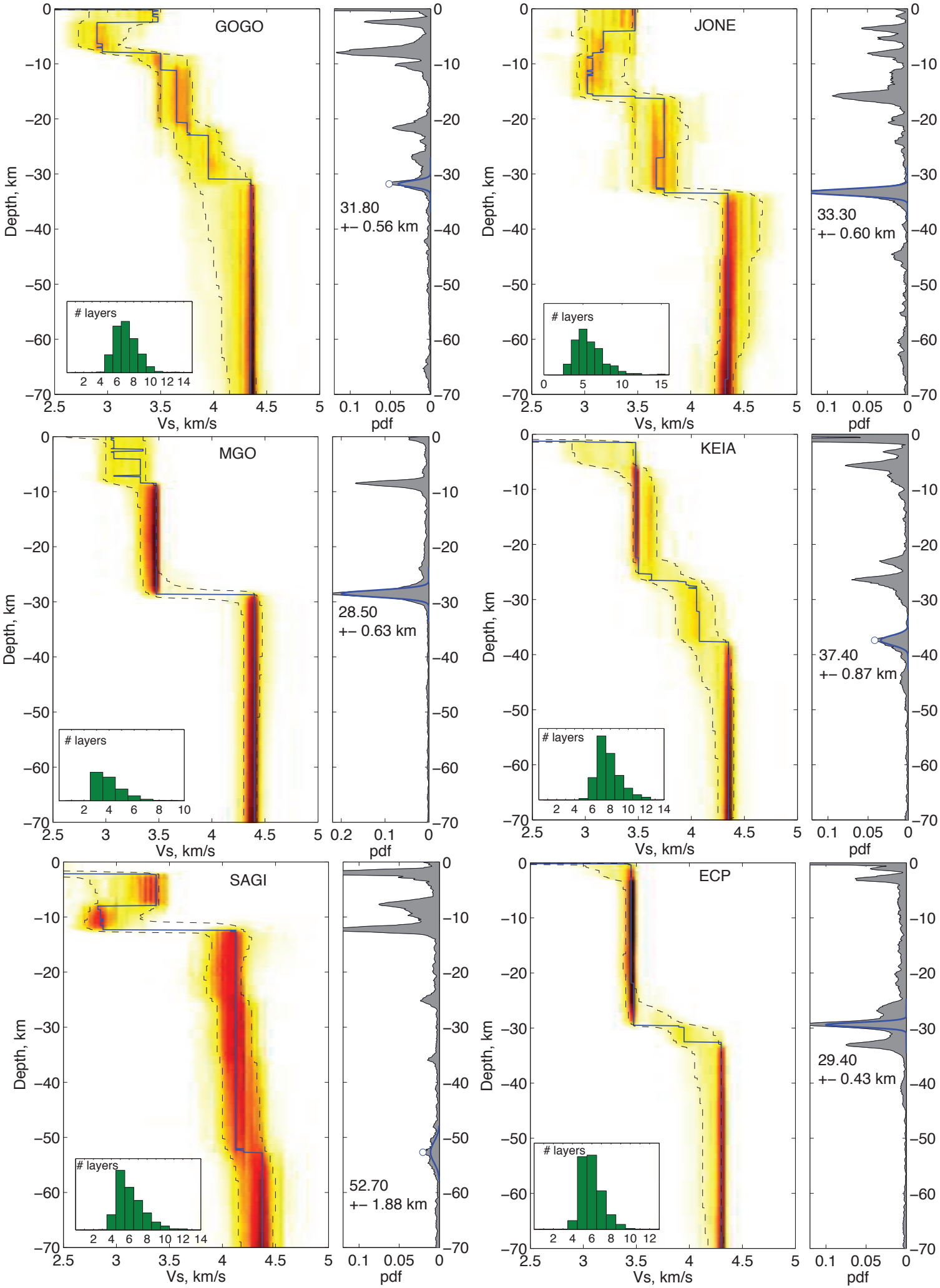
Supplementary Figure 3

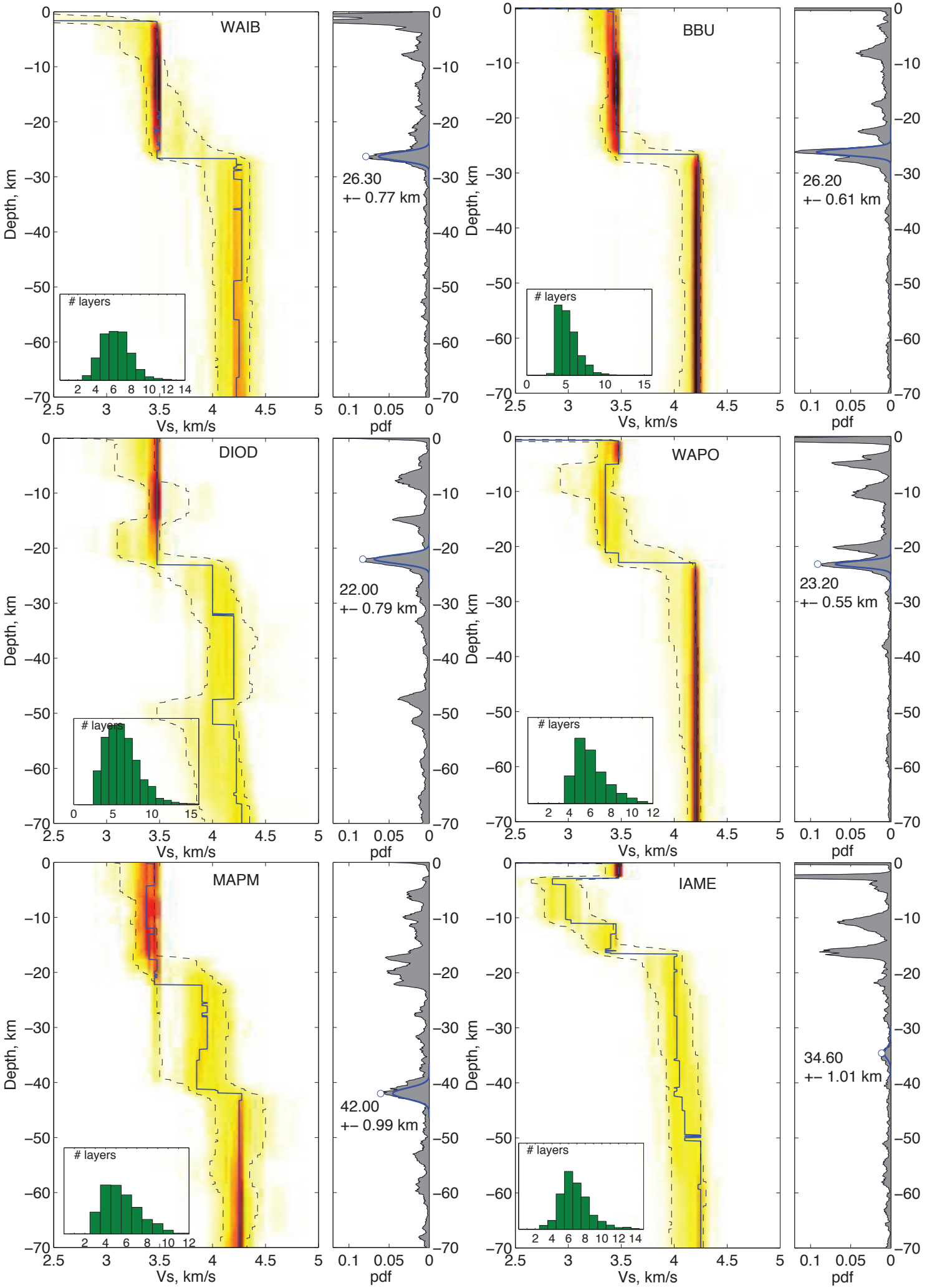
(next 6 pages)

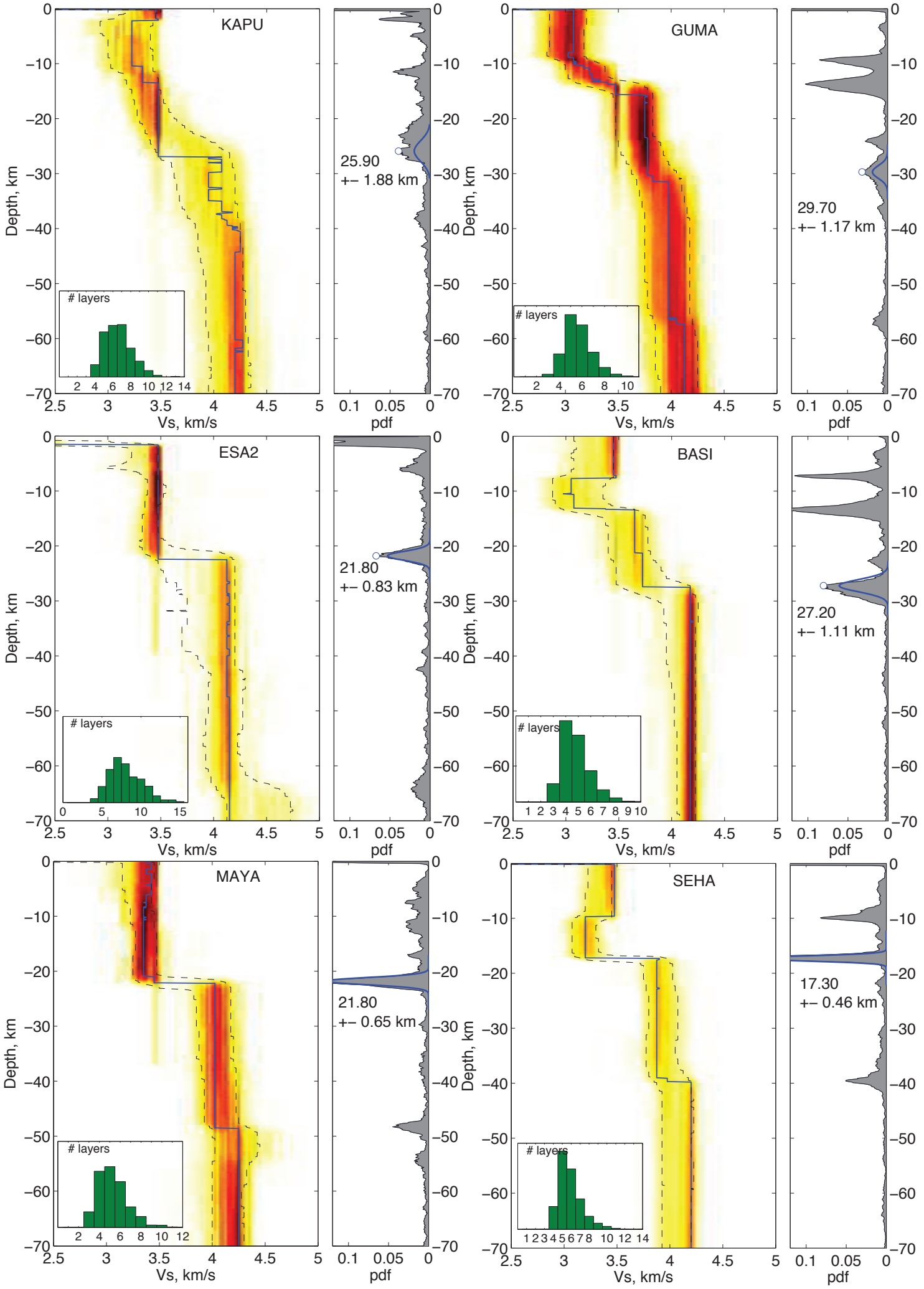
Velocity inversion results for all stations, showing PDF's for velocity, interface depth, and number of layers. For each set of panels, station name is labeled top center corresponding to location on Figure S1. Layout is same as on Figure 4 C)-F), with 4-6 station per page.

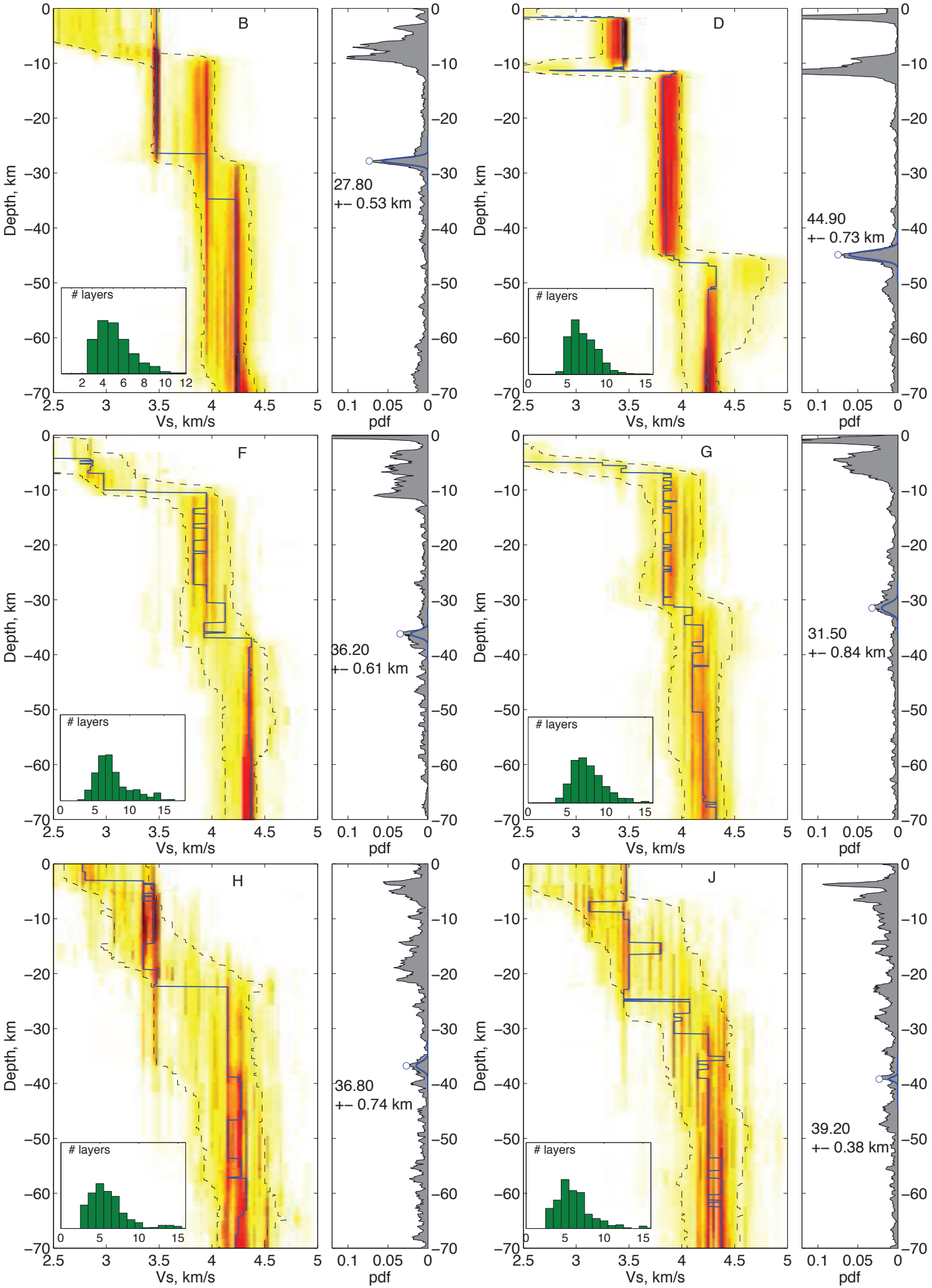
For each station, left panel shows pdf for V_S based on histogram of the number of accepted models at each depth; darker colors indicate higher probability. Dashed lines bound the central 80% of acceptable models, solid line shows maximum-likelihood velocity. Right panel shows pdf for interface depth; peaks show most likely depths for interfaces. The Moho is picked from the peak as described in the text, here assigned a depth of 37.60 ± 0.76 km (one-sigma uncertainty in local maximum probability only). Inset to left panel shows pdf for number of layers in the best-fitting model, a meta-parameter determined in the inversion.

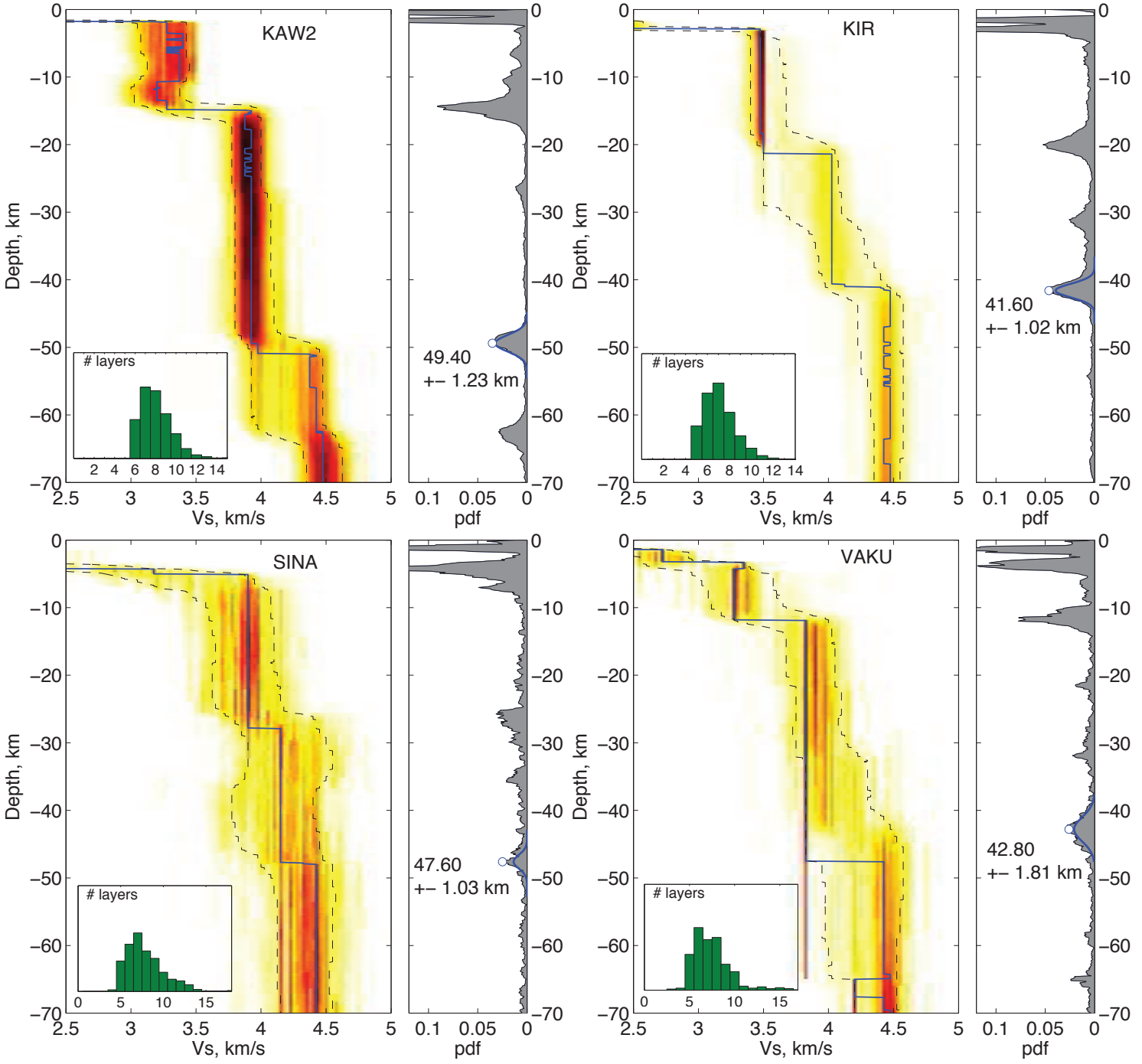

AGAN
37.60
+– 0.76 km
layers
PMNI
37.80
+– 2.36 km
layers
WANI
56.10
+– 1.60 km
layers
PEMM
46.70
+– 1.65 km
layers
SIRI
36.30
+– 0.93 km
layers
MENA
44.10
+– 1.79 km
layers
Depth, km
Vs, km/s
pdf


GOGO
31.80
+– 0.56 km
layers
JONE
33.30
+– 0.60 km
layers
MGO
28.50
+– 0.63 km
layers
KEIA
37.40
+– 0.87 km
layers
SAGI
52.70
+– 1.88 km
layers
ECP
29.40
+– 0.43 km
layers
Depth, km
Vs, km/s
pdf


WAIB
26.30
+– 0.77 km
BBU
26.20
+– 0.61 km
DIOD
22.00
+– 0.79 km
WAPO
23.20
+– 0.55 km
MAPM
42.00
+– 0.99 km
IAME
34.60
+– 1.01 km
layers
Depth, km
Vs, km/s
pdf


KAPU
25.90
+– 1.88 km
layers
GUMA
29.70
+– 1.17 km
layers
ESA2
21.80
+– 0.83 km
layers
BASI
27.20
+– 1.11 km
layers
MAYA
21.80
+– 0.65 km
layers
SEHA
17.30
+– 0.46 km
layers
Depth, km
Vs, km/s
pdf


B
27.80
+– 0.53 km
D
44.90
+– 0.73 km
F
36.20
+– 0.61 km
G
31.50
+– 0.84 km
H
36.80
+– 0.74 km
J
39.20
+– 0.38 km
layers
Depth, km
Vs, km/s
pdf


KAW2
KIR
SINA
VAKU
Depth, km
Vs, km/s
pdf
layers
49.40
+– 1.23 km
41.60
+– 1.02 km
47.60
+– 1.03 km
42.80
+– 1.81 km