

Description of the Model:

Shen, W., M.H. Ritzwoller, and V. Schulte-Pelkum, A 3-D model of the crust and uppermost mantle beneath the central and western US by joint inversion of receiver functions and surface wave dispersion, *J. Geophys. Res.*, submitted.

Properties:

Location: US west of 100°W longitude

Grid: 0.25°x0.25°

Stations: TA

Ambient noise: 2005 - 2010 (828 stations)

Earthquakes: 1550 earthquakes, $M_s > 5.0$, 2005-2010

Receiver functions: 828 stations, 30-90 deg distance, $m_b > 5.0$, ~130 earthquakes/station

Tomography: (Rayleigh waves alone)

Ambient noise: ray theory (eikonal tomography, Lin et al., 2009), 8-40 s

Earthquakes: finite frequency (Helmholtz tomography, Lin and Ritzwoller, 2011), 25-80 s

Parameterization:

Isotropic V_{sv} : sediment layer (linear velocity increase with depth), 4 B-spline crust, 5 B-spline mantle

Inversion: Bayesian Monte Carlo model space sampling.

Forward code: Herrmann

Moho: variable

Format of model file: WCUS_Shen_2012

The model was originally constructed beneath each of the 828 TA stations, but then it was interpolated onto a 0.25°x0.25° grid by simple-kriging. The resulting model appears in directory **WCUS_Shen_2012** separately as a set of 1-D models for each grid point. For example, there is file 236_40.mod.1, for (lat, lon) = (40, 236). The first few kms look as follows:

```
236 40 24.2691 1.06721687317
0.0 1.16519 0.363969
0.121821 1.16519 0.363969
0.121821 2.56136 0.428722
0.365463 2.56136 0.428722
0.365463 2.58903 0.23161
0.609105 2.58903 0.23161
0.609105 2.67966 0.178154
0.852747 2.67966 0.178154
0.852747 2.77078 0.136742
1.096389 2.77078 0.136742
1.096389 2.78715 0.0946852
1.34003 2.78715 0.0946852
1.34003 2.8009 0.0906884
1.58367 2.8009 0.0906884
1.58367 2.81492 0.0874548
```

```
1.827315 2.81492 0.0874548
1.827315 2.82855 0.0838197
2.07096 2.82855 0.0838197
2.07096 2.8405 0.0799558
2.3146 2.8405 0.0799558
2.3146 2.85211 0.0763388
2.55824 2.85211 0.0763388
2.55824 2.86607 0.0736183
2.80188 2.86607 0.0736183
2.80188 2.88045 0.0710949
3.045525 2.88045 0.0710949
3.045525 2.89403 0.0690074
3.28917 2.89403 0.0690074
3.28917 2.90669 0.067453
3.53281 2.90669 0.067453
3.53281 2.91947 0.0658721
3.77645 2.91947 0.0658721
3.77645 2.93025 0.0645037
4.02009 2.93025 0.0645037
.
.
.
```

The first line is formatted: lon lat Crustal_thickness (km) Error_crustal_thickness (km). At this point, crustal thickness is about 24.3 km and the error is estimated to be about 1.1 km. Then each line thereafter is: depth (km), V_{sv} (km/s), Error_ V_{sv} (km/s). At layer boundaries (base of the sediments, base of the crust) there is a repeated knot so the model can take a discrete jump. At this point that occurs at depths of 1.096 km and 24.26 km. The model extends to a depth of 200 km.

The model was created by a Monte Carlo method so at each depth there is an averaging that produced the values in the file.