**Data Services Products: EMC-AKFWANT-Vs2019**

3-D shear-wave isotropic model for Alaska from full-wave ambient noise tomography

Summary

AACSE-FWANT-Vs2025 (Sassard et al., 2025) is a 3-D shear-wave isotropic model for the Alaska Peninsula from full-wave ambient noise tomography with resolvable depth for the top 130 km.

Description

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| **Name** | AACSE-FWANT-Vs2025 |
| **Title** | 3-D shear-wave isotropic model for the Alaska Peninsula from full-wave ambient noise tomography |
| **Type** | 3-D Tomography Earth Model |
| **Sub Type** | Shear-wave velocity (km/s) |
| **Year** | 2025 |
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| **Short Description** | AACSE-FWANT-Vs2025 is a 3-D shear-wave isotropic model for the Alaska Peninsula from full-wave ambient noise tomography with resolvable depth for the top 130 km. The Vs model with good resolution (> 70% recovery) is from the depth of 20 km to the depth of 100 km for 110-km wide anomalies. The tomography was based on an empirical Green’s function data set extracted from cross-correlation between station pairs. The tomography method involves 3-D wave propagation simulation. The travel-time different between the synthetics and the observed empirical Green’s functions are inverted for finite-frequency sensitivity kernels to get velocity perturbations. The velocity model is updated iteratively for a total of 6 iterations. |
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| **Previous Model** | None |  |
| **Reference Model** | The reference velocity model consists of two parts: a global shear-velocity model for the top 400 km (Shapiro and Ritzwoller, 2002) and the IASP91 1-D Earth model from 400 km down to 1000 km (Kennett and Engdahl, 1991). |  |
| **Model Download** |  |  |
| netCDF binary file for the above isotropic shear velocity model: AACSE-FWANT-Vs2025.nc. |  |
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| **Depth Coverage** | From 0 km to 130 km (resolvable below 15 km depth). |  |
| **Areal Coverage** | Alaska Peninsula (United States) (latitude: 53° to 60°, longitude: -164° to -149°) |  |
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| **Data Set Description** | The data set includes the shear velocity model on an inversion grid of longitude and latitude with spacing of 0.05° in both directions. No smoothing or interpolation applied. Vertical grid spacing increases with depth. |  |
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| **Model Resolution** | As tested and validated by previous applications of full-wave tomographic imaging (e.g., Gao, 2018; Zhang and Shen, 2008), Rayleigh waves are most sensitive to *P*-wave velocity at shallow depths (< 15 km) and to *S*-wave velocity at greater depths. Although *P*-wave velocity model is also provided for all depth, interpretation of *P* velocities deeper than 15 km and shallower than 5 km is discouraged. The model provided here (Figure 1) is from the inversion result of the 6th iteration without smoothing or interpolation. **When interpreting the velocity model, it is recommended that the user smooth the model based on the best resolution at the corresponding depth, as shown in Sassard et al. (2025) and Figure 2 on this page**. The checkerboard tests show that shear-wave velocity perturbations can be well resolved with horizontal scales of 66 km, 110 km, 154 km, and 198 km at the depths of 51 km, 98 km, 123 km, and 150 km, respectively. |  |

A close-up of a map

AI-generated content may be incorrect.

Figure 1. Shear-wave velocities at the depths of (a) 63 km and (b) 98 km, from full-wave ambient noise tomography model: AACSE-FWANT-Vs2025 (simplified after Sassard et al., 2025).



Figure 2. 3D checkerboard resolution tests for the velocity model. The velocity perturbation varies within ±10% in the input models (after Extended Data Fig. 4 in Sassard et al., 2025).

References

This model:

* Sassard, V., Yang, X., Liu, L., & Elliott, J. (2025). Slab tearing along a subducted oceanic plate joint beneath the Alaska Peninsula. *Nature Geoscience*, doi: 10.1038/s41561-025-01749-6

Other cited work:

* Gao, H. (2018). Three-dimensional variations of the slab geometry correlate with earthquake distributions at the Cascadia subduction system. *Nature Communications*, *9*(1), 1–8. https://doi.org/10.1038/s41467-018-03655-5
* Kennett, B. L. N., Engdahl, E. R. Traveltimes for global earthquake location and phase identification. Geophys. J. Int., 105: 429-465 (1991)
* Shapiro, N. M., and M. H. Ritzwoller (2002), Monte-Carlo inversion for a global shear-velocity model of the crust and upper mantle, *Geophys. J. Int.*, *151*(1), 88-105, doi:10.1046/j.1365-246X.2002.01742.x
* Zhang, Z., & Shen, Y. (2008). Cross-dependence of finite-frequency compressional waveforms to shear seismic wave speeds. *Geophysical Journal International*, *174*(3), 941–948. <https://doi.org/10.1111/j.1365-246X.2008.03840.x>