

Supplementary Material

Exploring the use of adjoint noise tomography to refine a shear-wave velocity model beneath the Iranian Plateau

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This file includes 12 Figures and 1 table.

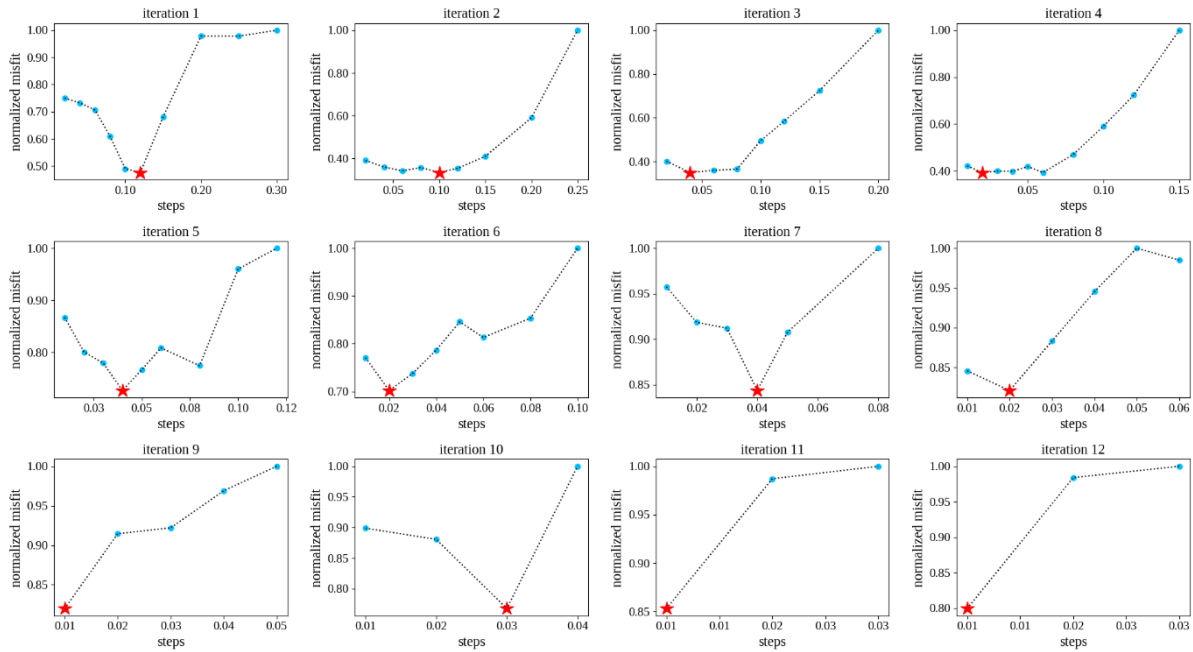


Figure S1. Results of the line search at each iteration, illustrating the change in misfit function values concerning the step length for the total misfit.

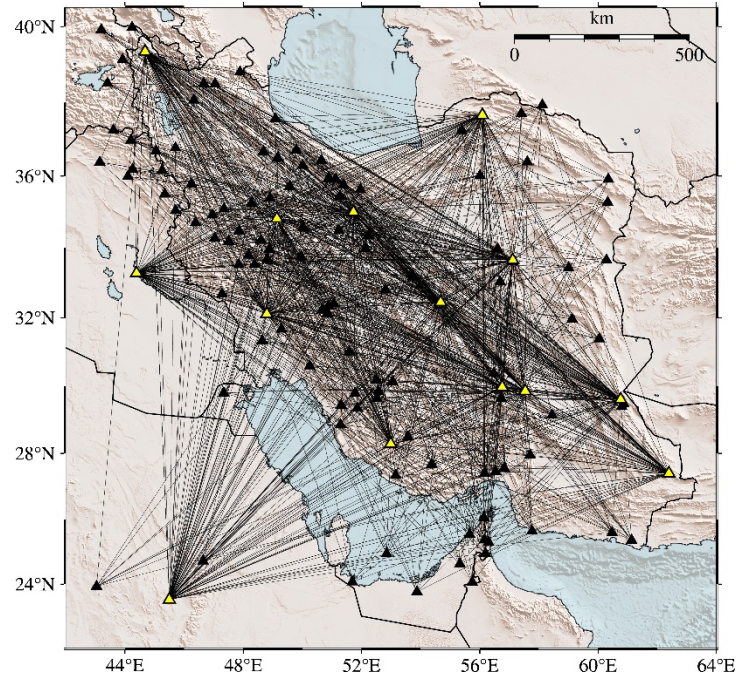


Figure S2. Location map of 14 source stations (marked with yellow triangles) and the corresponding source-receiver raypaths. These data are utilized for the selection of the optimal step length at each iteration.

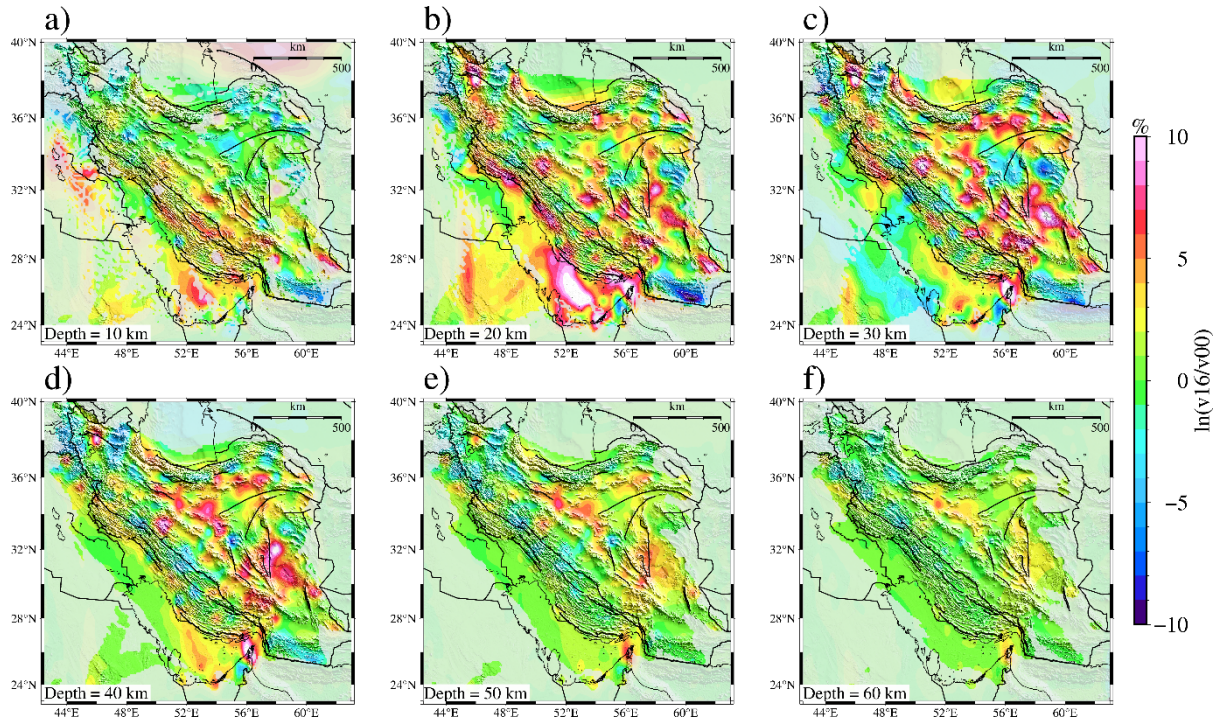


Figure S3. Difference in shear-wave velocity models (M00 and M12) shown in depth slices at 10, 20, 30, 40, 50 and 60 km. These maps are masked with respect to the misfit kernel values (see also Fig. S4 and S5).

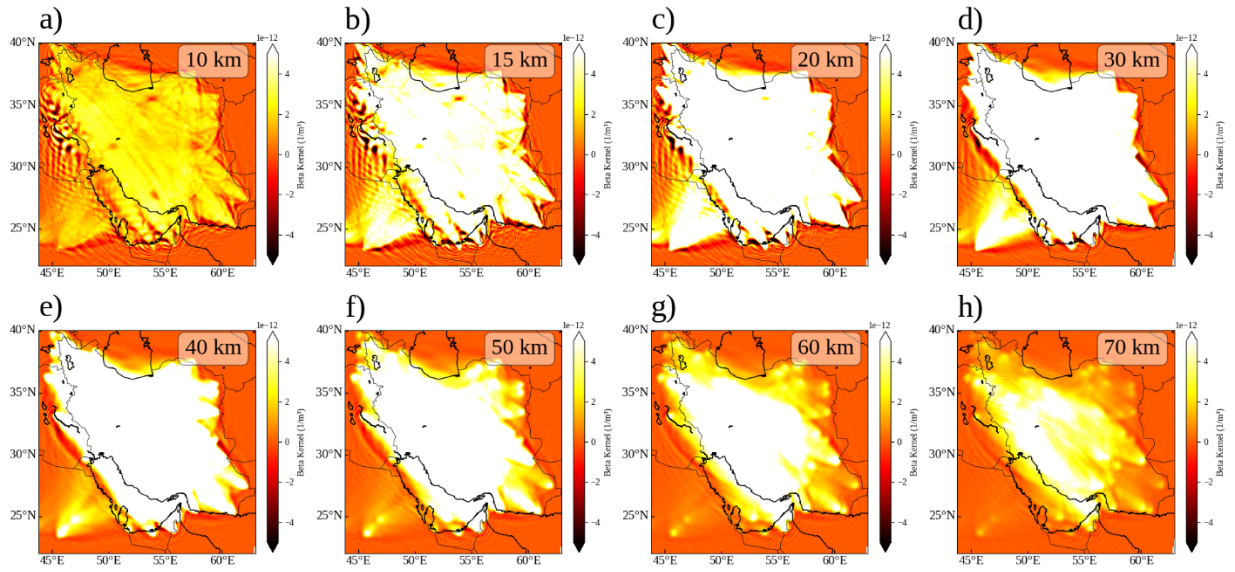


Figure S4. Volumetric sensitivity (misfit) kernels for shear wave velocity tomographic models shown at depths of 10, 15, 20, 30, 40, 50, 60 and 70 km.

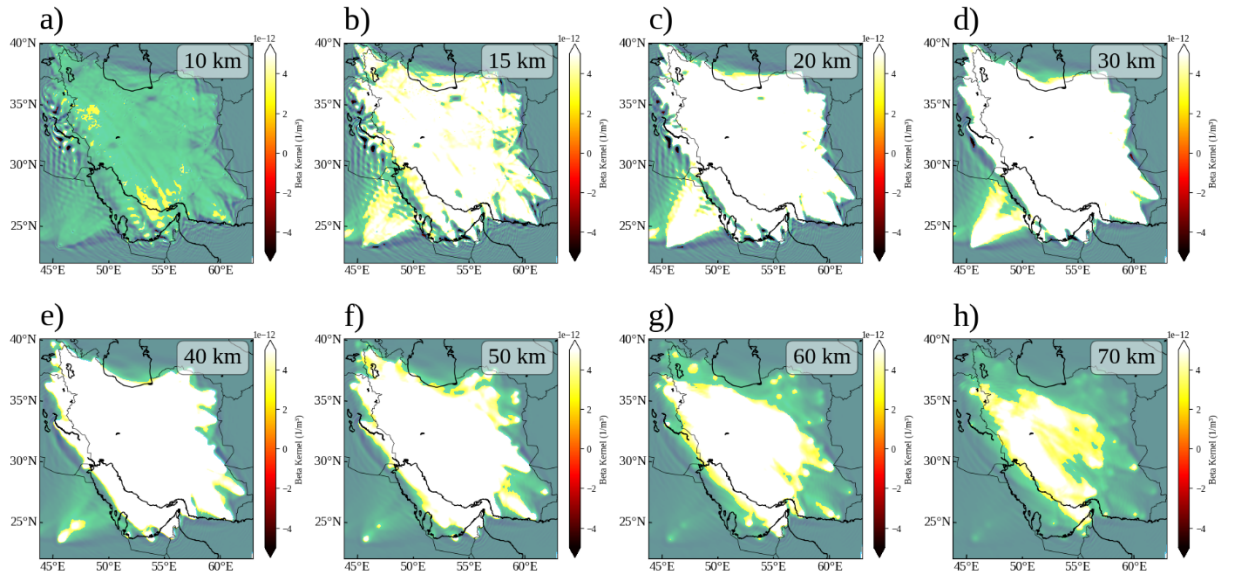


Figure S5. Same volumetric sensitivity kernels in Fig. S4 masked by a subjective threshold value of $K = 1.5 \times 10^{-13} \text{ m}^{-3}$.

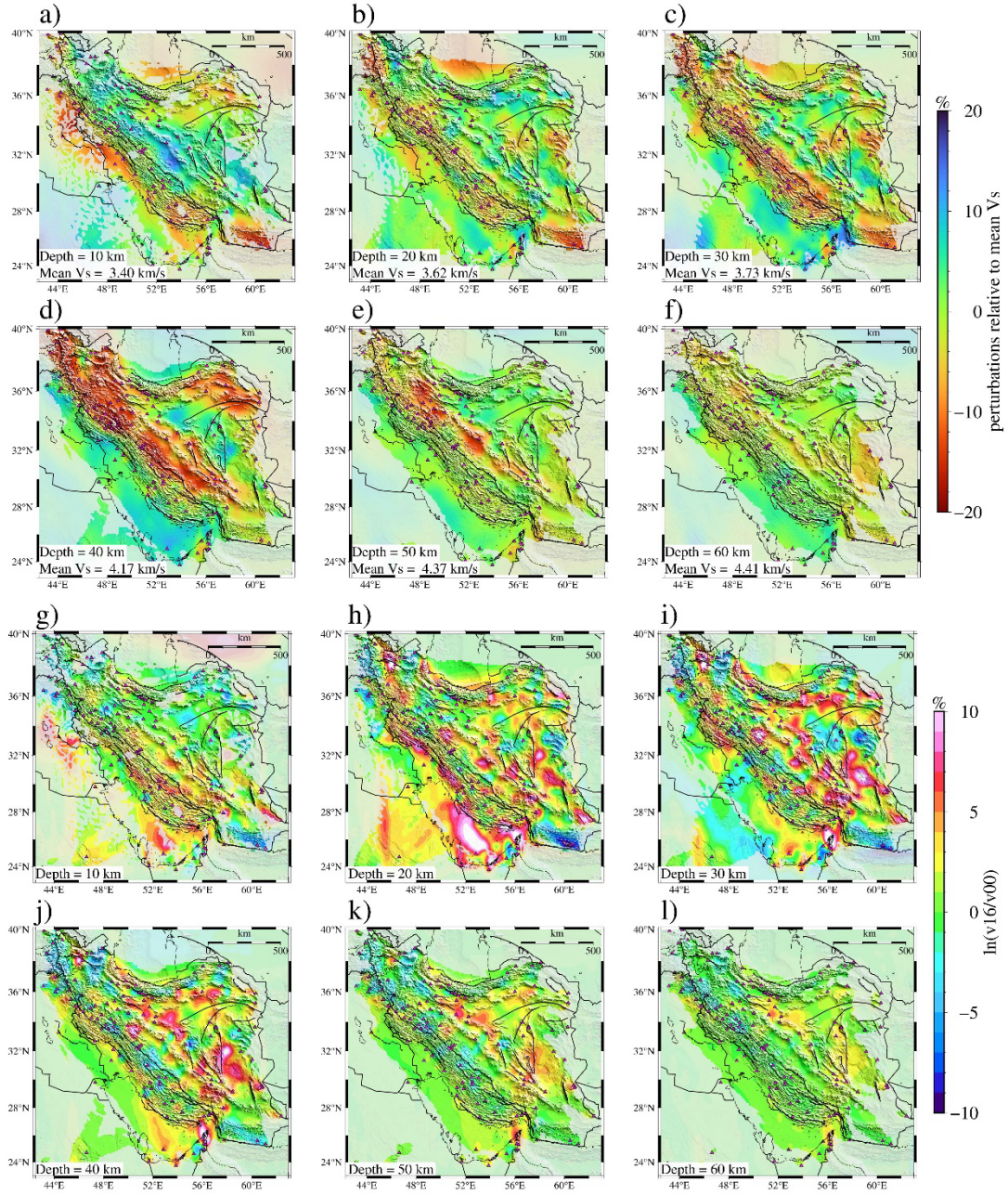


Figure S6. Comparison of shear wave velocity (V_s) depth slices at 10, 20, 30, 40, 50 and 60 km for the final model (M12, panels a-f) and the differences between the final and initial model (panels g-l), with stations locations on top. The relative velocity perturbation, expressed as a deviation from the mean velocity of each slice (values provided in the lower left corner of each map, a-f), is presented to highlight changes in the shape and amplitude of anomalies. These depth slices (a-l) are masked based on the misfit kernel values (also refer to Fig. S4 and S5).

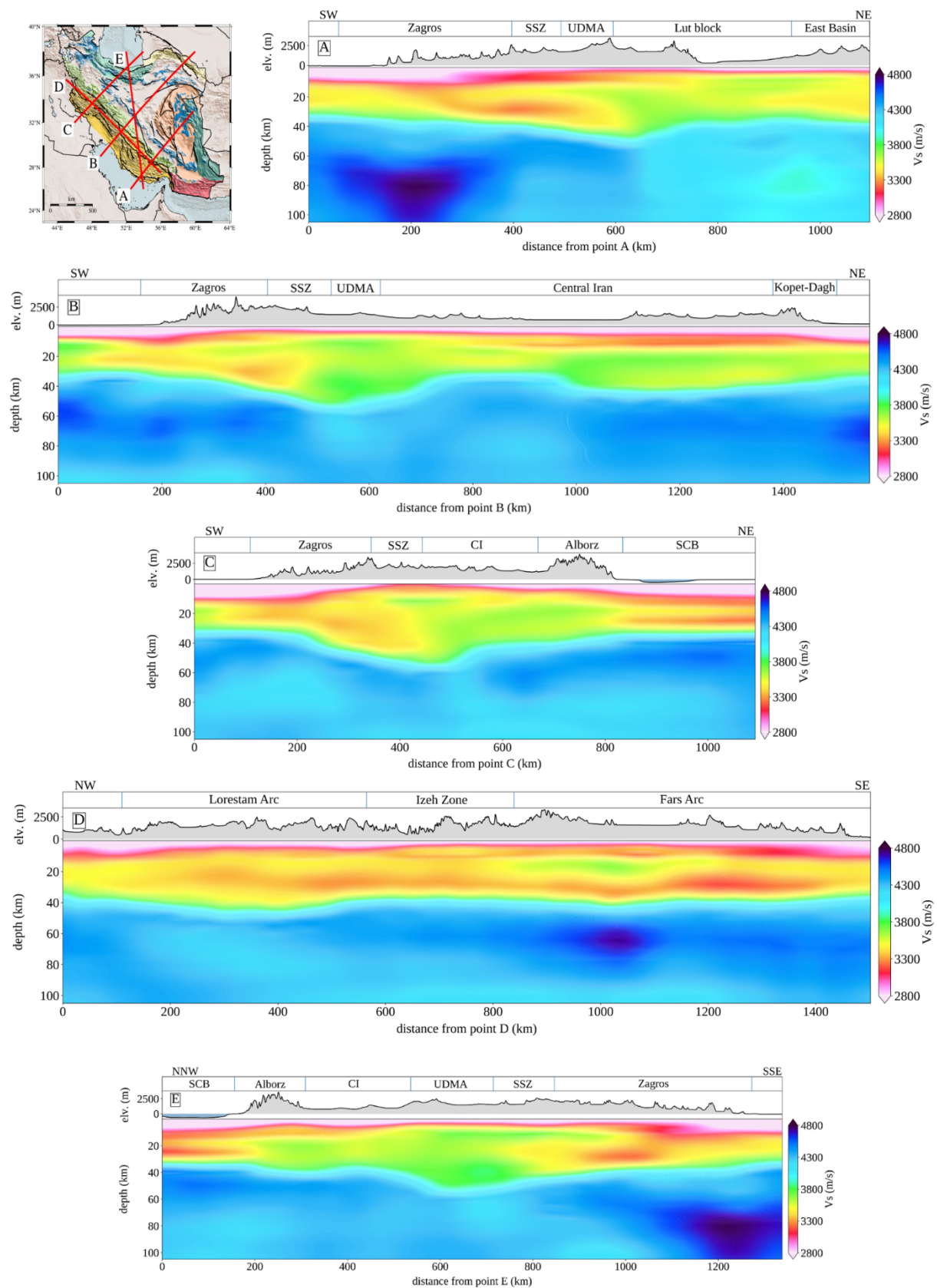


Figure S7. Vertical slices of the initial shear wave velocity model (M00) along profiles A-E across the Iranian Plateau. The positions of these profiles are indicated on the map in the top-left corner. Vertical exaggeration: 4.

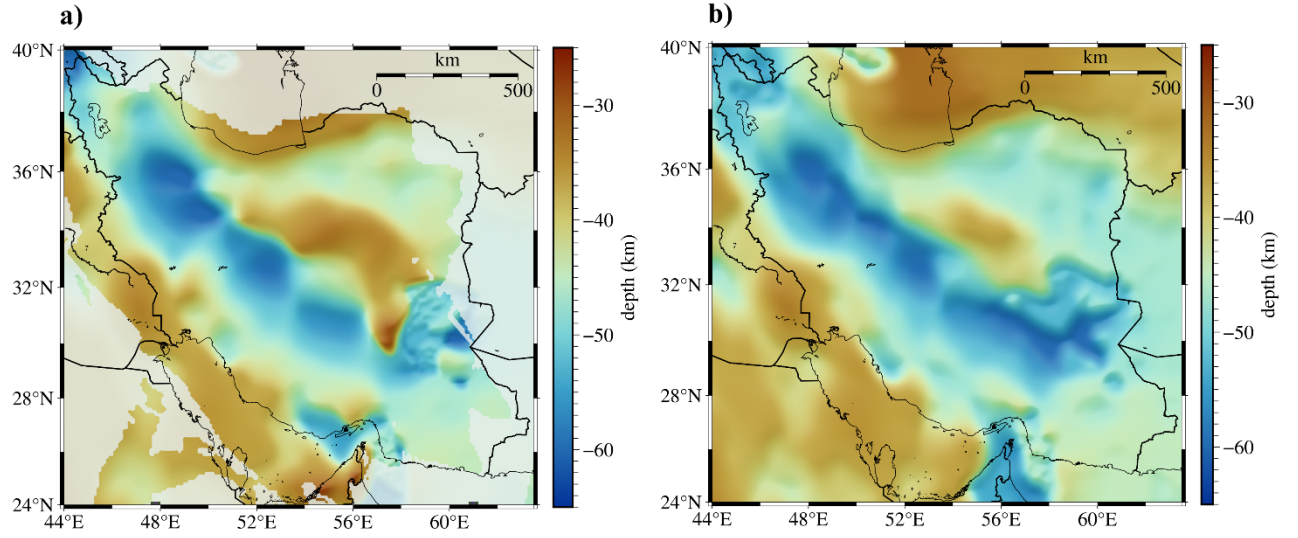


Figure S8. Moho depth maps for $V_s = 4.2$ iso-velocity surface – a) final model, b) initial model. Final model Moho map masked based on misfit kernel values (see also Fig. S4 and S5).

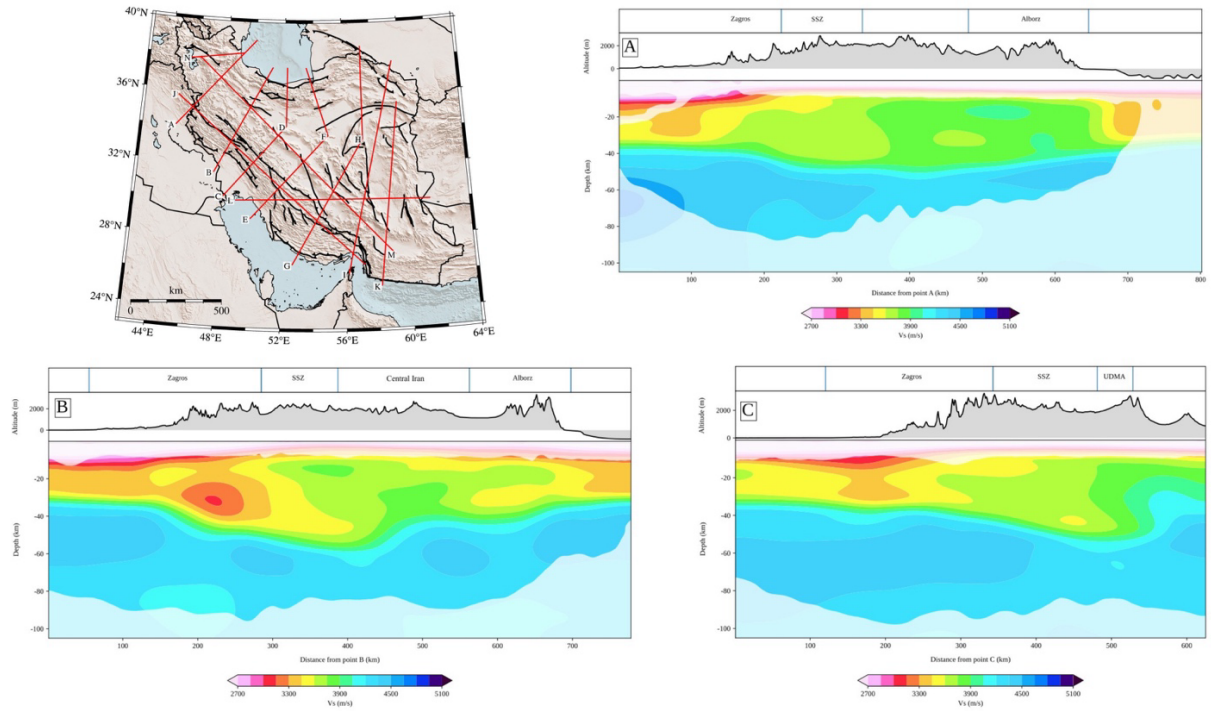


Figure S9. Vertical slices of the final shear wave velocity model (M12) along profiles A-N across the Iranian Plateau. The positions of these profiles are indicated on the map in the top-left corner. Vertical exaggeration: 4. Shear wave velocity values are masked according to the associated misfit kernel values (also refer to Figs. S4 and S5).

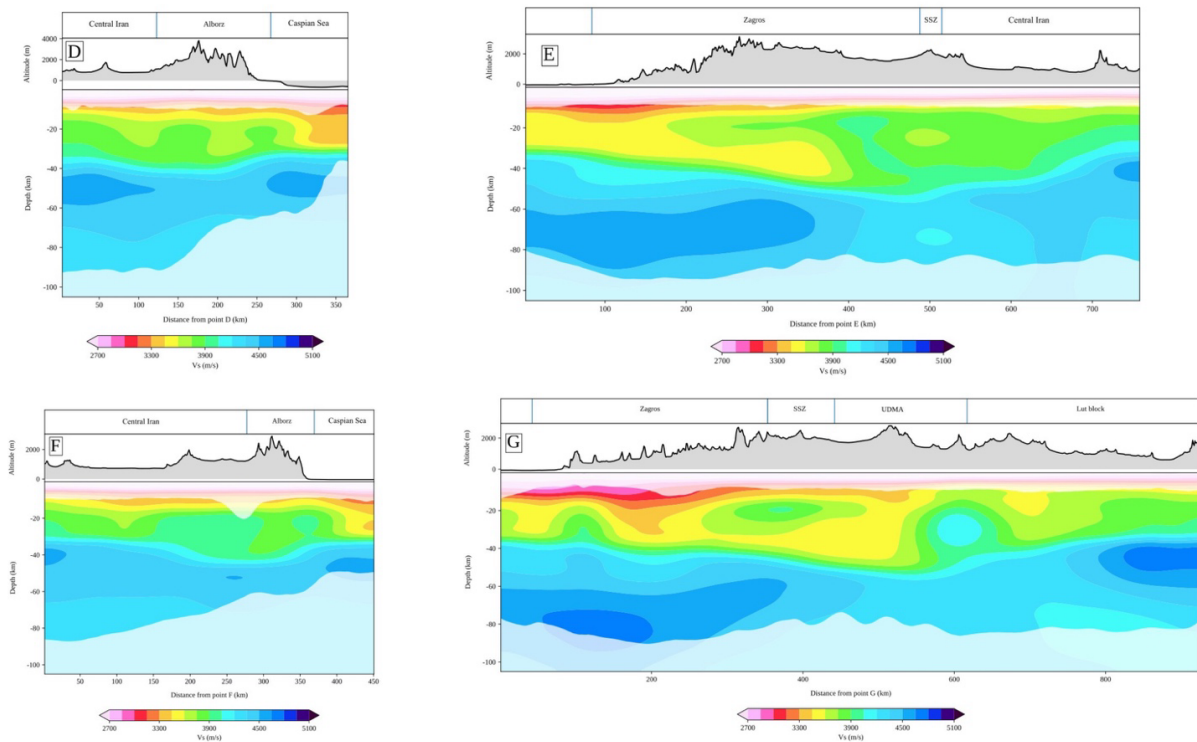


Figure S9. Continued.

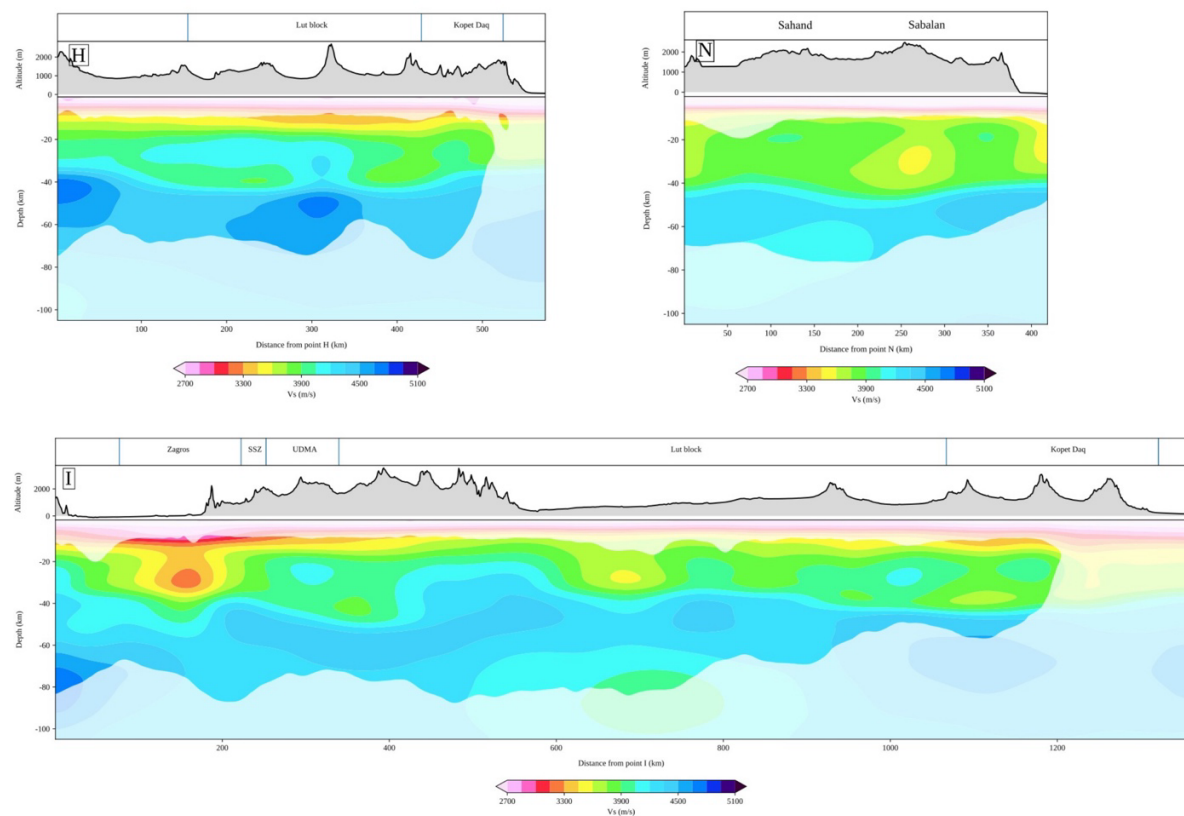


Figure S9. Continued.

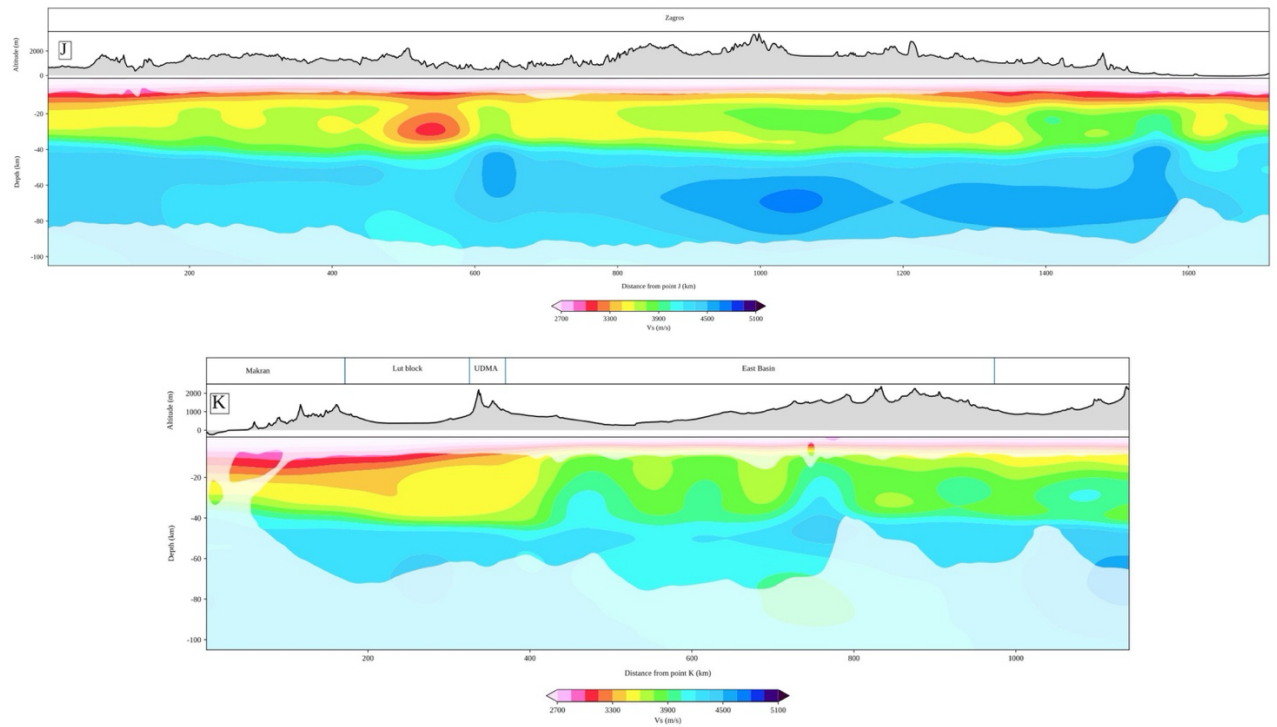


Figure S9. Continued.

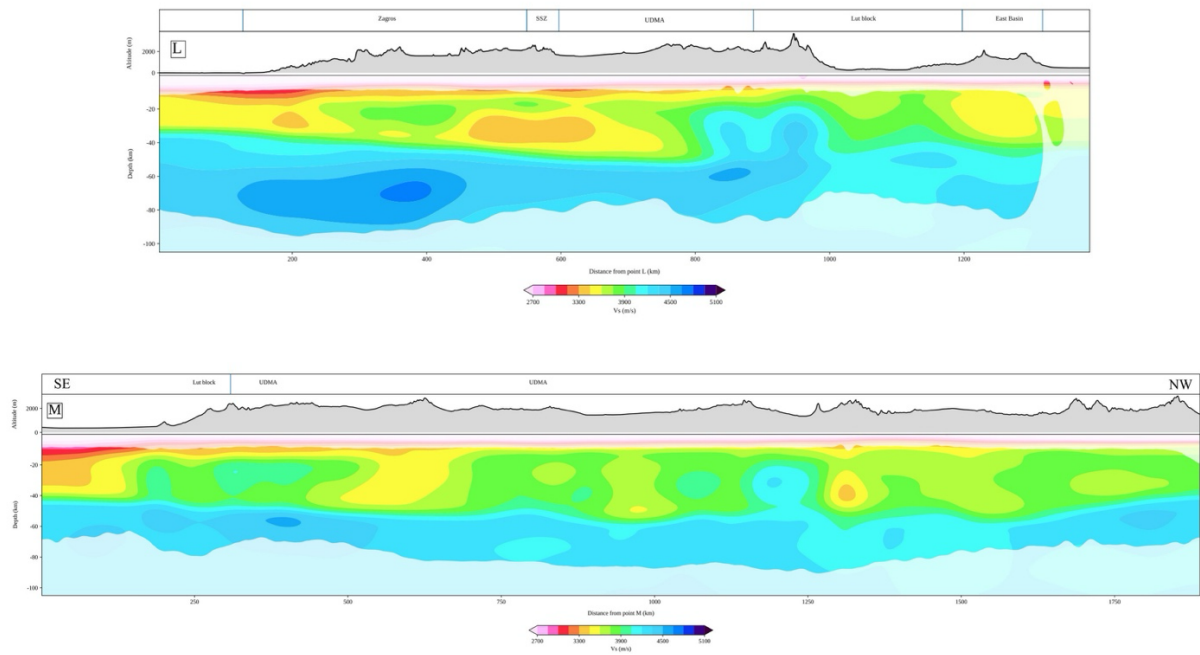


Figure S9. Continued.

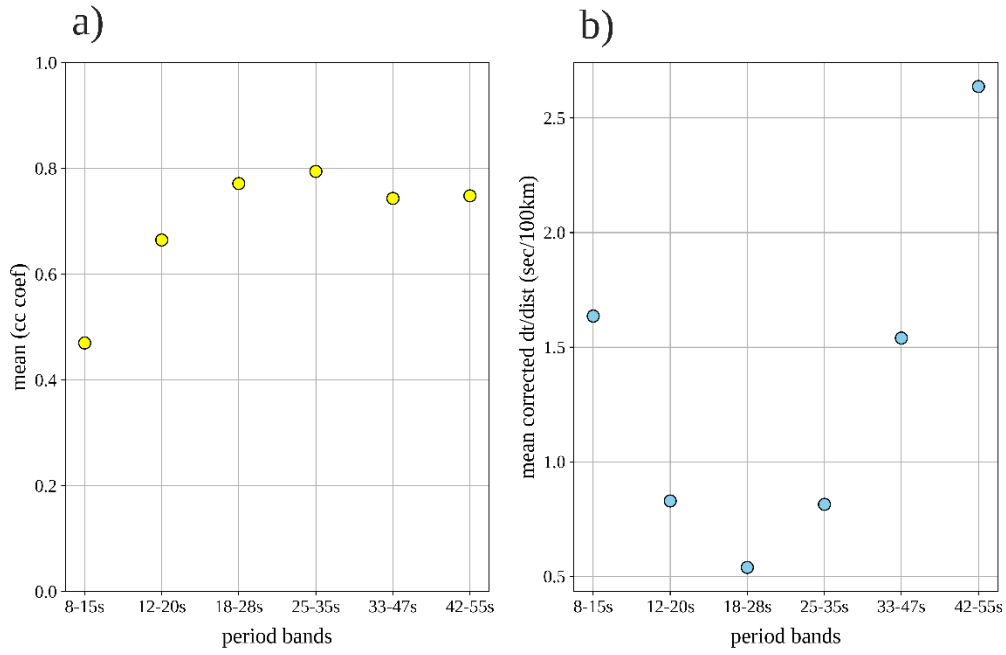


Figure S10. The mean cross correlation coefficient (a) and mean corrected delay times (b), calculated from comparison of the waveforms resulting from the final (M12) and initial (M00) models.

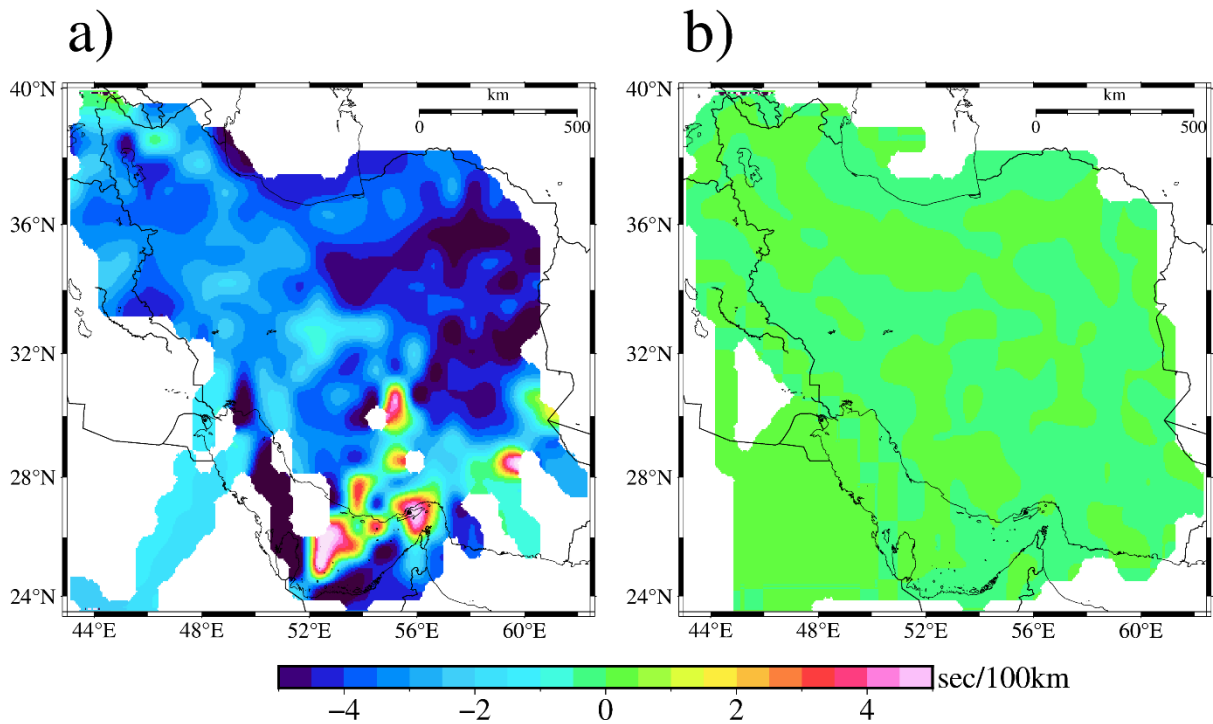


Figure S11. Spatial distribution of the corrected misfit values for a) initial and b) final model at grid points with 0.5° interval for all grids with minimum 3 value points.

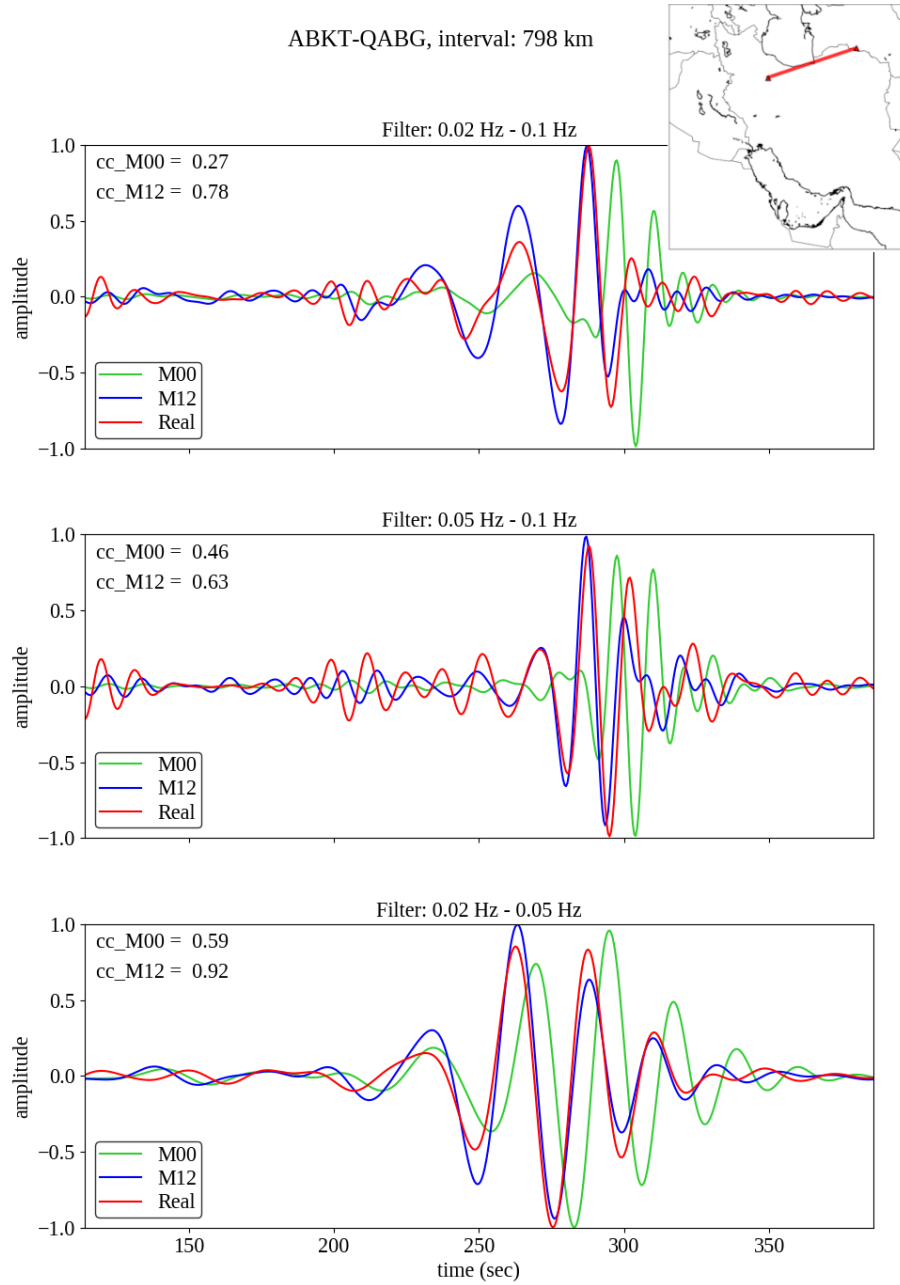


Figure S12. Examples of waveform fitting for source-receiver pairs with different intervals and azimuths are shown. In this graph the real waveform (EGF) with the waveforms resulting from the final model (M12, blue) and the initial model (M00, green) are compared. This comparison is done from top to bottom for period bands 10-50, 10-20, and 20-50 seconds, respectively. The value of the cross-correlation coefficient between the real and synthetic waveforms for both the initial and final model is denoted in the top left corner.

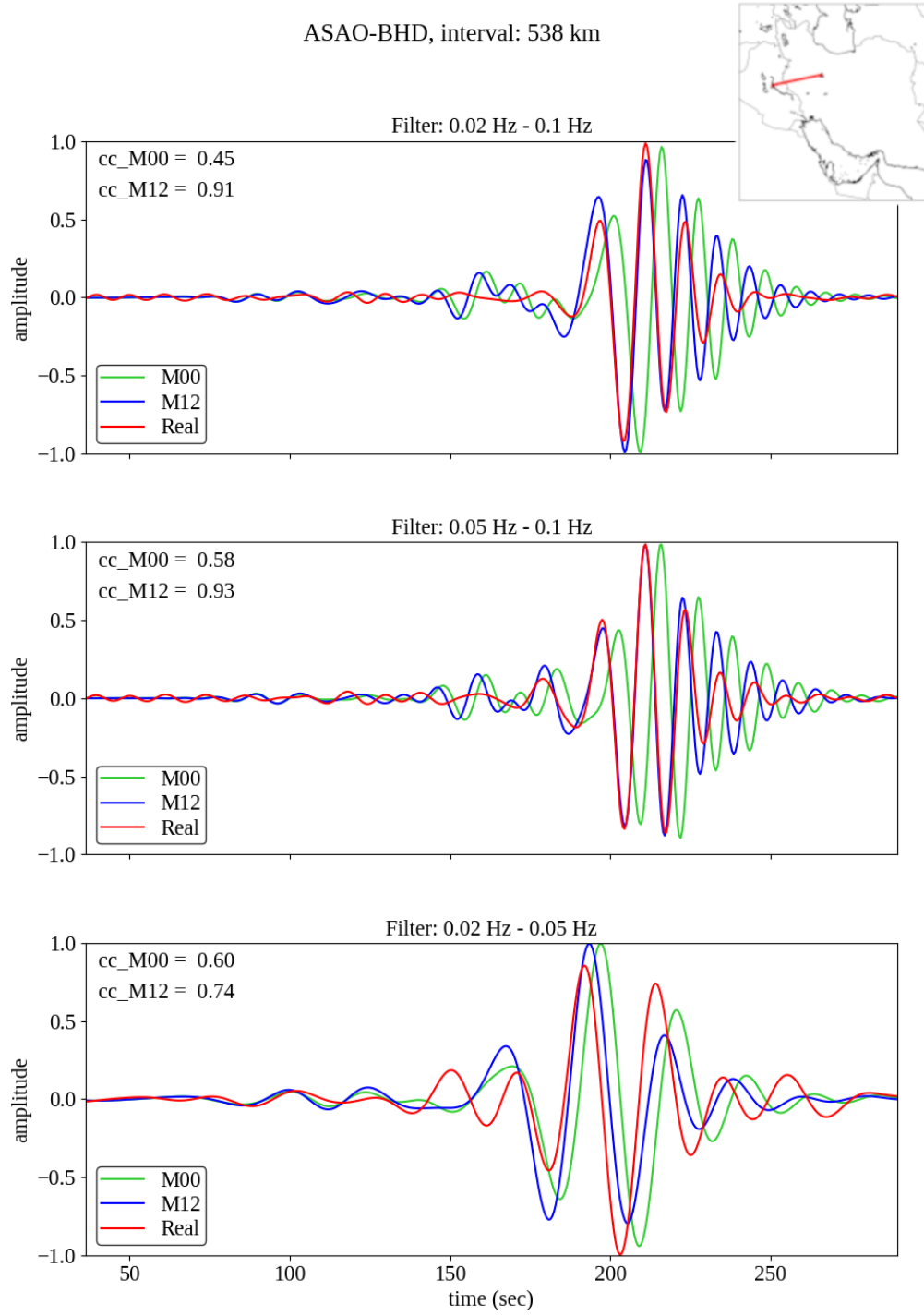


Fig S12. Continued.

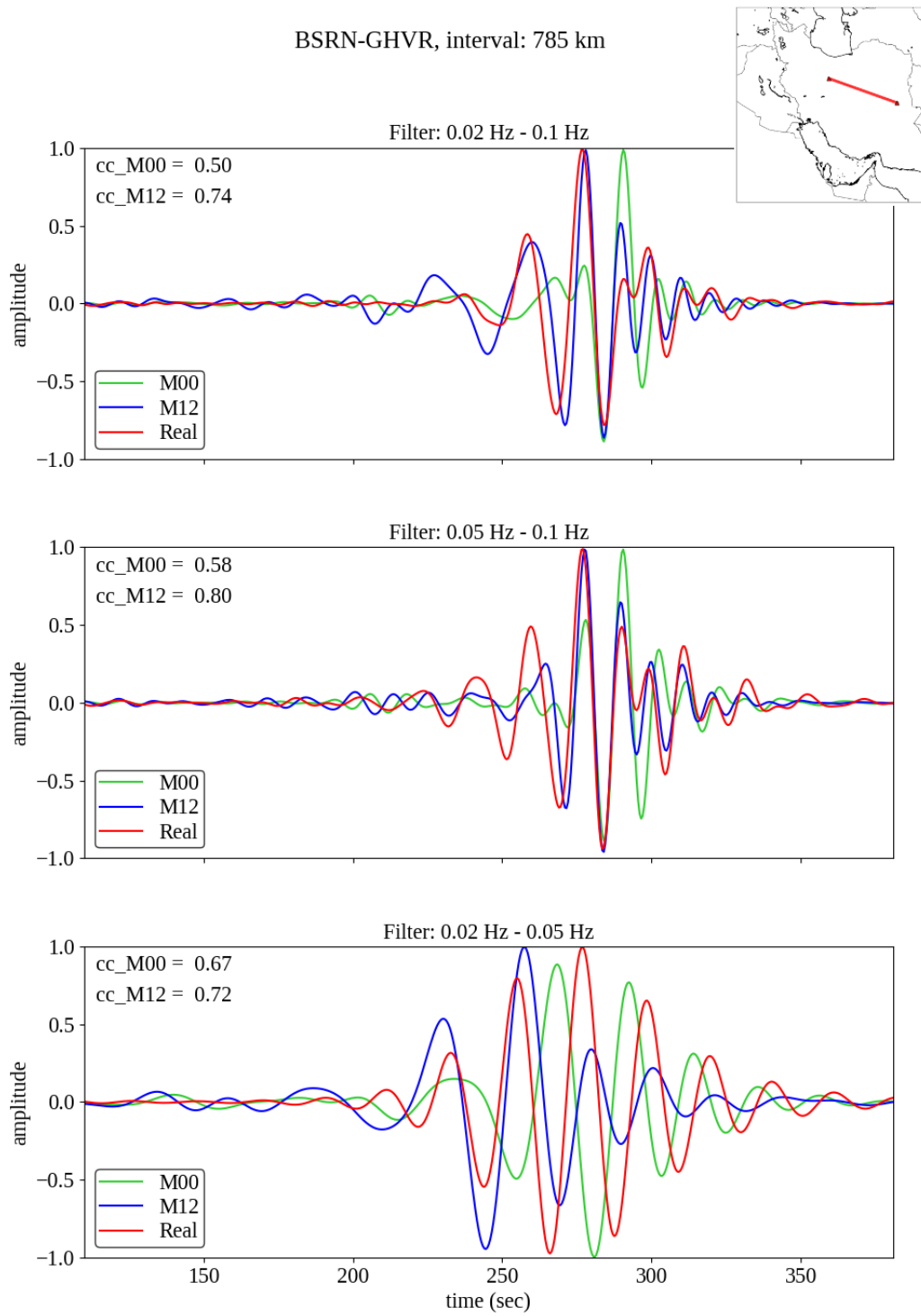


Figure S12. Continued.

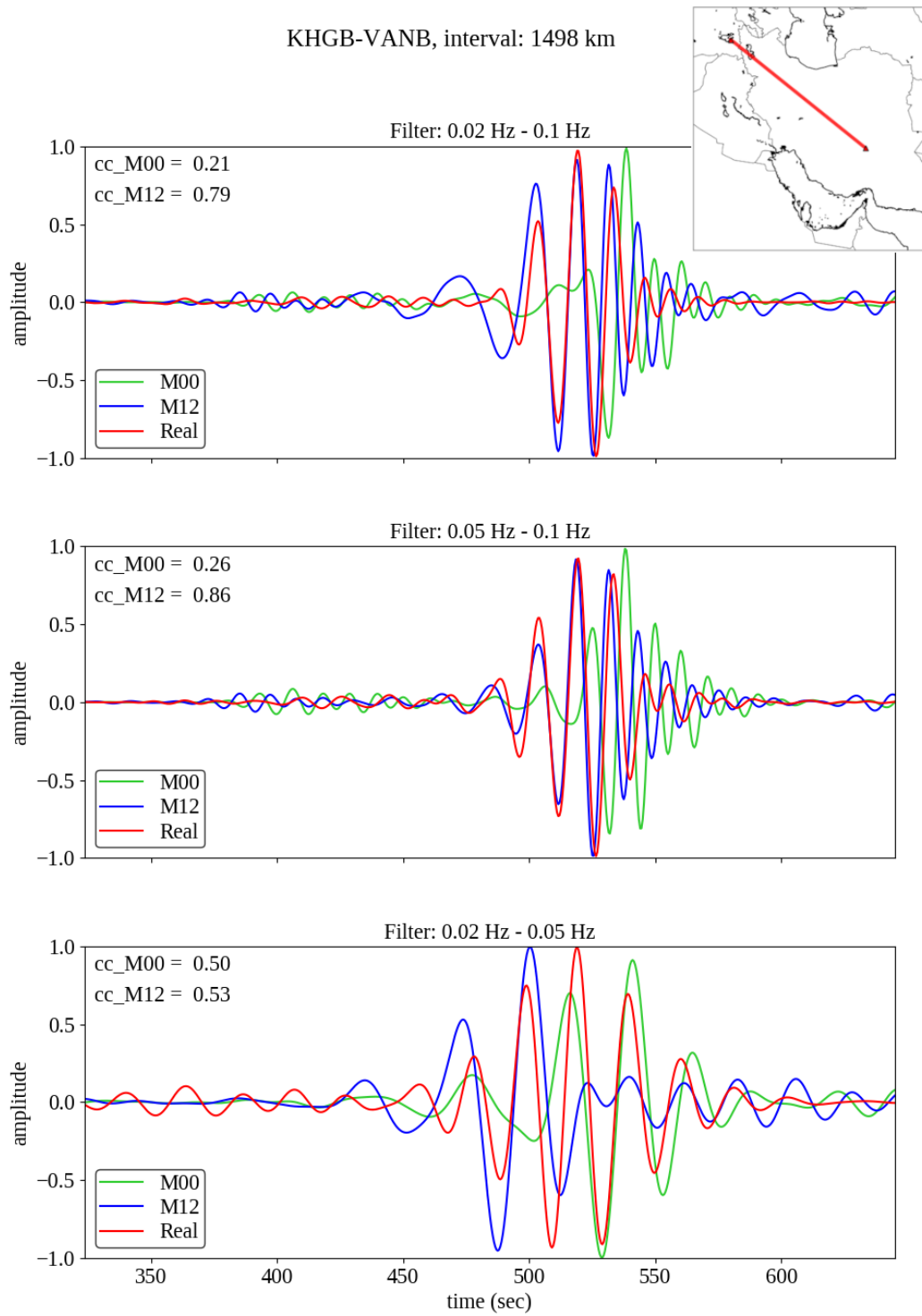


Figure S12. Continued.

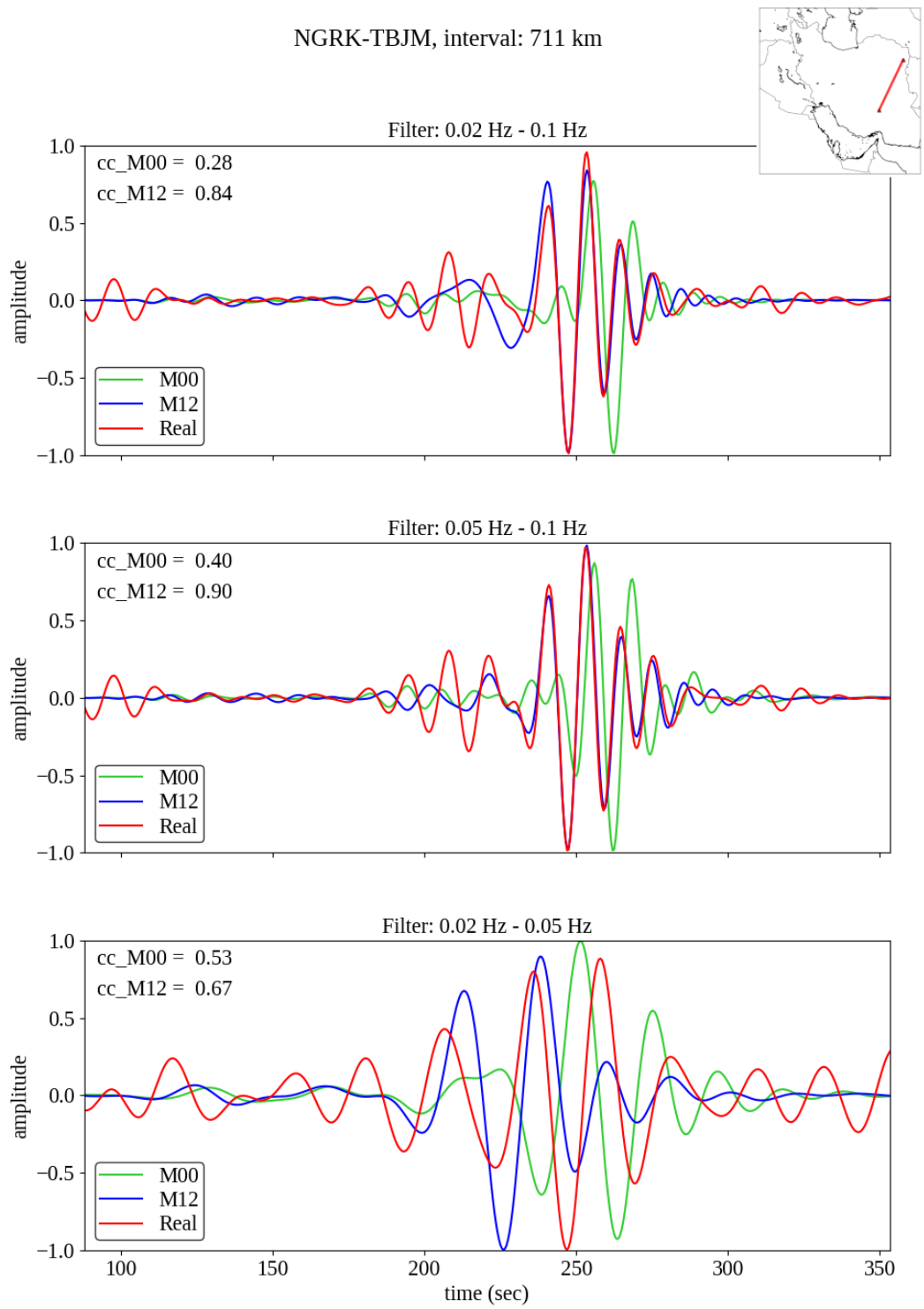


Figure S12. Continued.

Iteration Number	1	2	3	4	5	6	7	8	9	10	11	12
Δt (s)	[− 4.5, 4.5]											
$\Delta \ln A$	[− 1.0, 1.0]											
CC_{min}	0.59	0.65			0.7			0.75			0.8	
α	0.12	0.1	0.04	0.02	0.04	0.02	0.04	0.02	0.01	0.03	0.01	0.01

Table S1. Inversion parameter values across iterations: Δt (time shift), $\Delta \ln A$ (amplitude difference), and CC_{min} (cross-correlation coefficient) are criteria for window selection. The α denotes the optimal step length selected at each iteration.