Supporting Information for "The Collaborative Seismic Earth Model: Generation 1"

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Introduction

The supplementary information provides an additional overview of the refinement regions and details of the structural model. This includes the 1-D background model and a comparison of the current CSEM to the initial model.

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A graphical summary of the refinement regions added so far is presented in Fig. S1. It includes the sequence in which refinements have been added. A global full-waveform update was number 9 in the sequence.

The spherically symmetric background model is a modified version of the Preliminary Refence Earth Model, PREM [*Dziewoński and Anderson*, 1981], and is shown in Figs. S2 and S3. To construct the spherically symmetric background of the CSEM, we replaced the 220 km discontinuity of PREM by a linear gradient. While not shown in the figures, we also used the attenuation model of PREM. The crustal part spherically symmetric background is overwritten by the crustal model of *Meier et al.* [2007] in the construction of the CSEM initial model shown in Figs. S5 to S16.

A visual summary of the updating scheme is shown in Fig. S4. It includes examples of both a regional and a global-scale update.

Figs. S5 to S12 show horizontal slices of the global SV velocity distribution at the reference frequency of 1 Hz and at depths of 15, 70, 120, 500, 1000, 1500, 2000, and 2500 km depth. For comparison, both the current CSEM and the initial model are shown. Since the CSEM is isotropic in the lower mantle, SH velocity is only shown at 15, 70, 120, and 500 km depth in Figs. S13 to S14.

References

Dziewoński, A. M., and D. L. Anderson (1981), Preliminary reference Earth model, *Phys. Earth Planet. Inter.*, *25*, 297–356.

Meier, U., A. Curtis, and J. Trampert (2007), Fully nonlinear inversion of fundamental mode surface waves for a global crustal model., *Geophys. Res. Lett.*, *34*,

doi:10.1029/2007GL030,989.

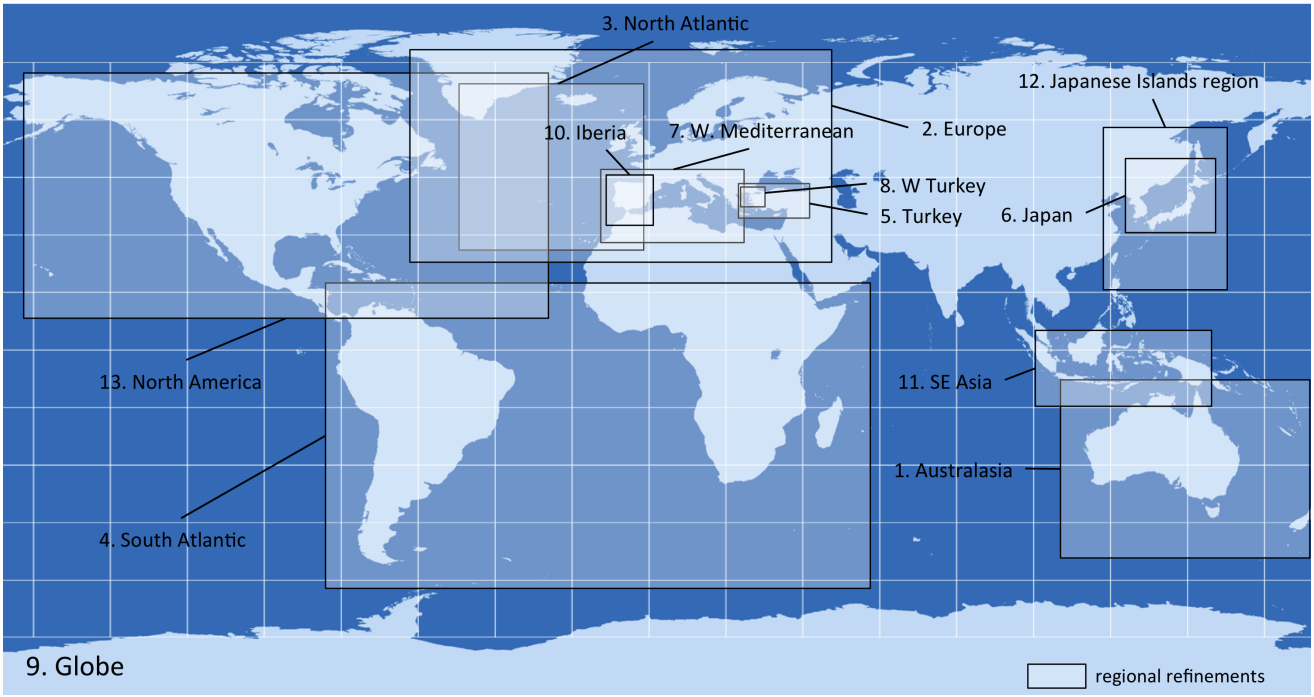

Figure S1. Summary of refinement regions in the first-generation CSEM. The updating sequence is indicated by numbers. A global full-waveform update was number 9 in the sequence.

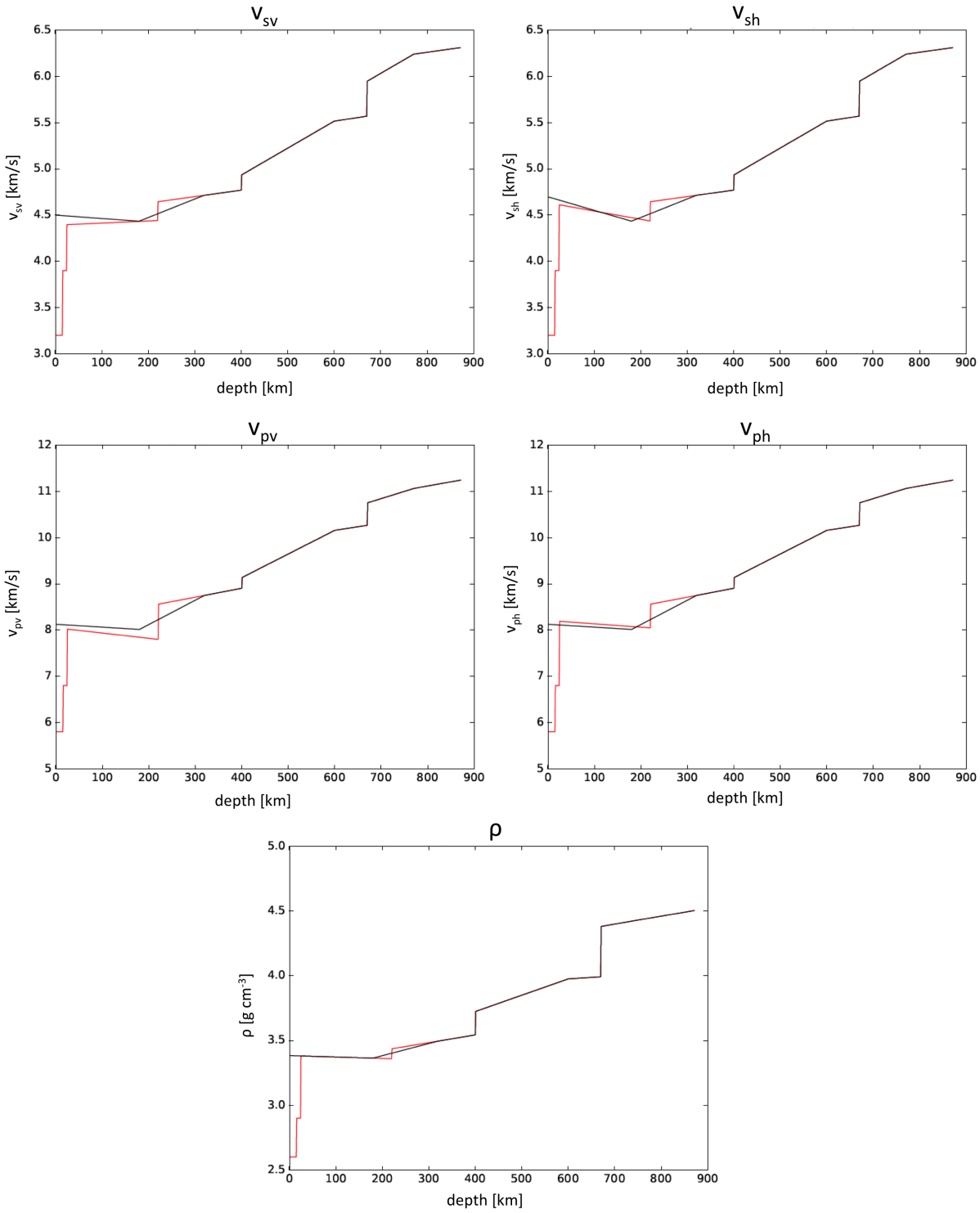

Figure S2. Radially symmetric background model of the CSEM (black) in the upper mantle, compared to the Preliminary Reference Earth Model, PREM (red), [*Dziewoński and Anderson*, 1981]. The reference frequency is 1 Hz. For the construction of the initial model, the upper part of the radially symmetric background is replaced by the crustal model of *Meier et al.* [2007].

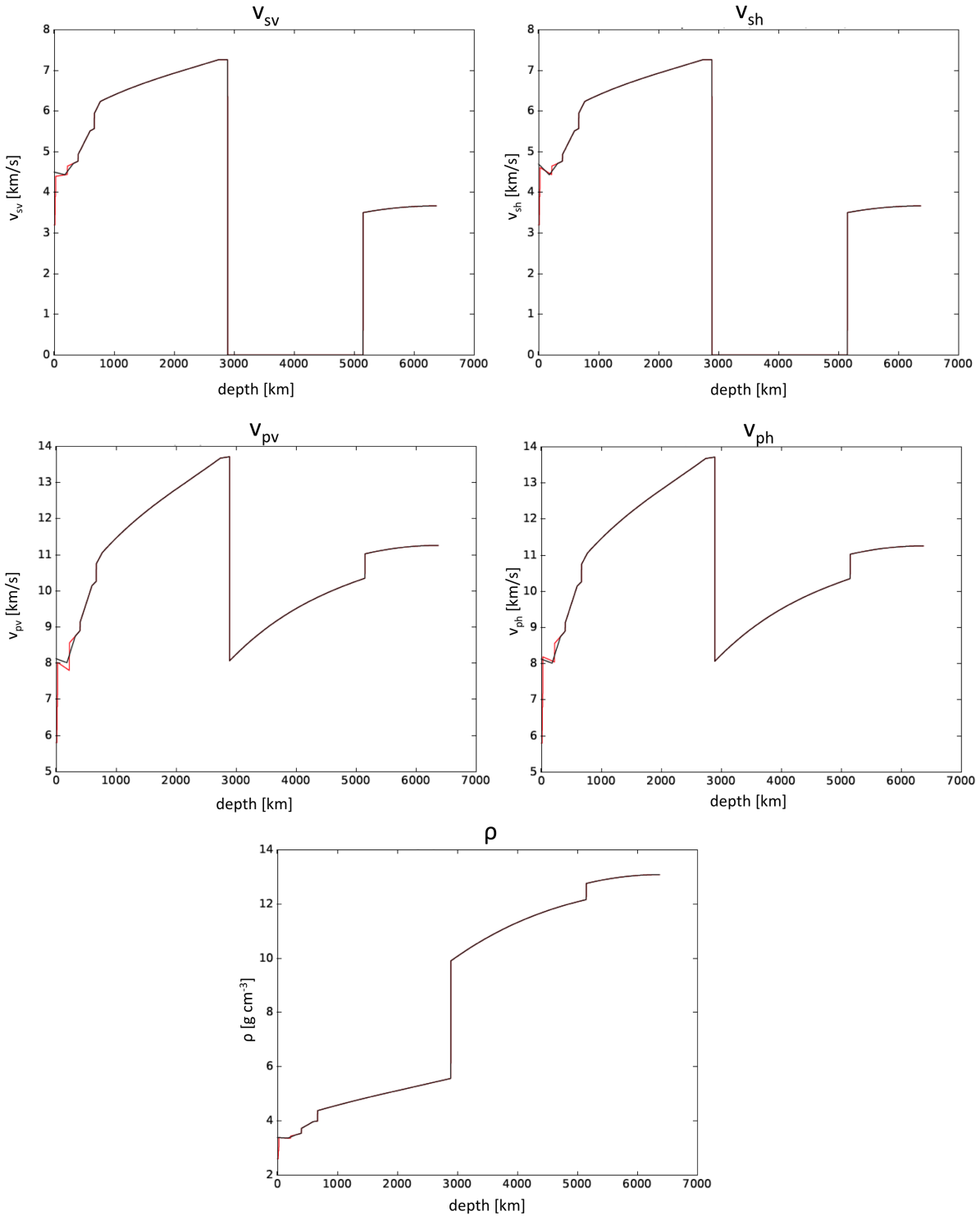

Figure S3. Radially symmetric background model of the CSEM (black), compared to the Preliminary Reference Earth Model, PREM (red), [*Dziewoński and Anderson*, 1981]. The reference frequency is 1 Hz. For the construction of the initial model, the upper part of the radially symmetric background is replaced by the crustal model of *Meier et al.* [2007].

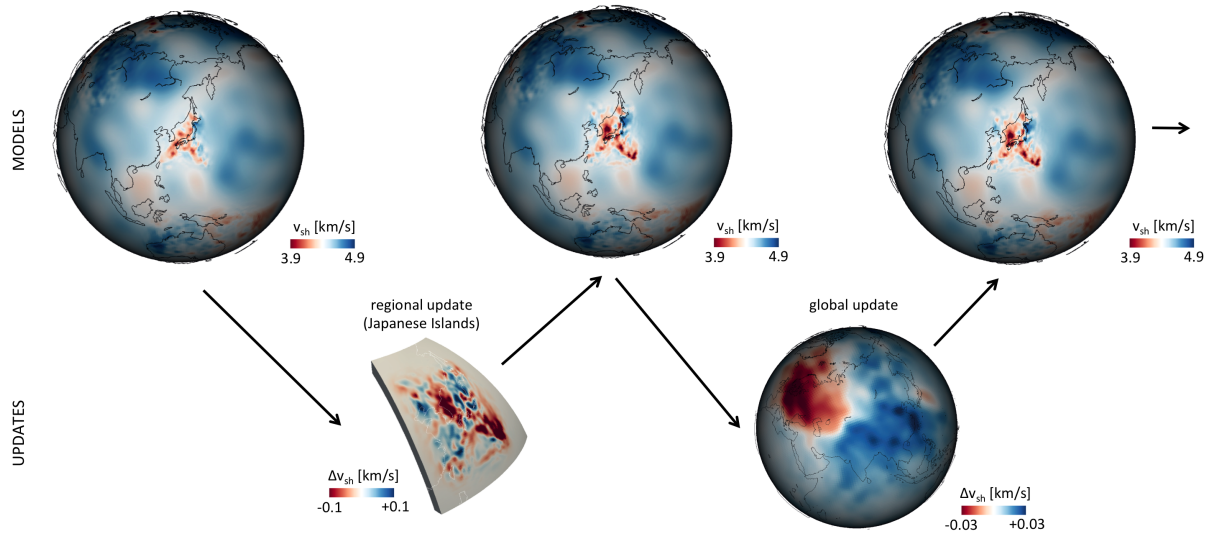

Figure S4. Illustration of the updating scheme. A regional update is shown for the Japanese Islands region at 100 km depth. This is followed by a global-scale update, based on the global dataset. Note that the velocity changes on the global scale, also shown at 100 km depth, are significantly smaller in amplitude but more extended than for the regional refinement.

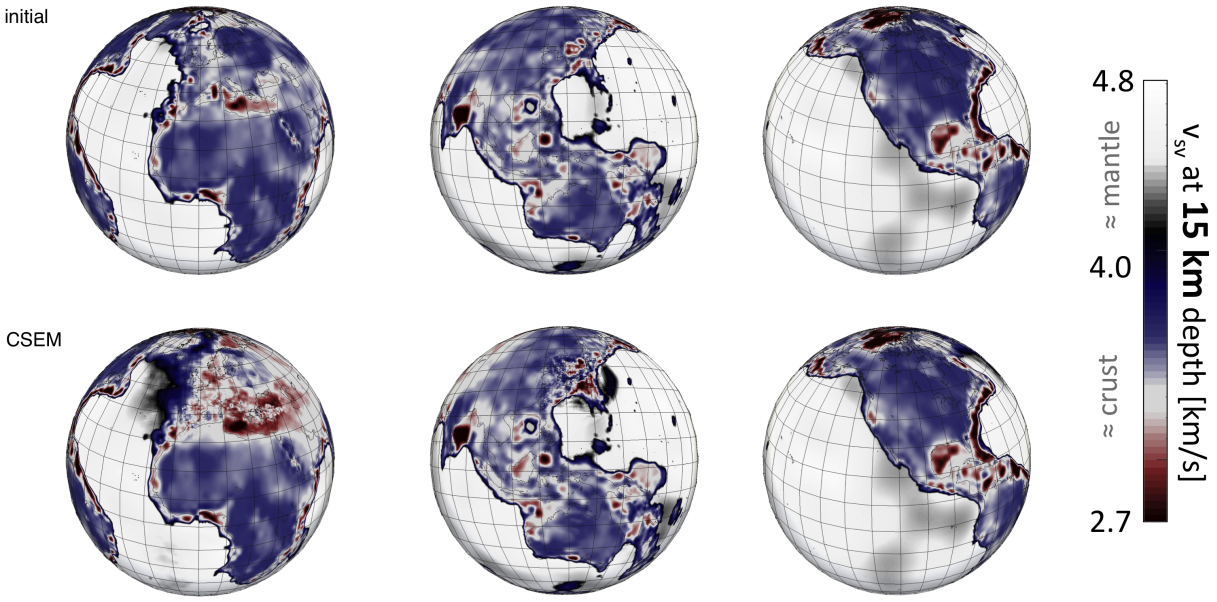

Figure S5. Absolute SV velocity at 15 km depth for the initial model (top) and the current CSEM (bottom). The reference frequency is 1 Hz.

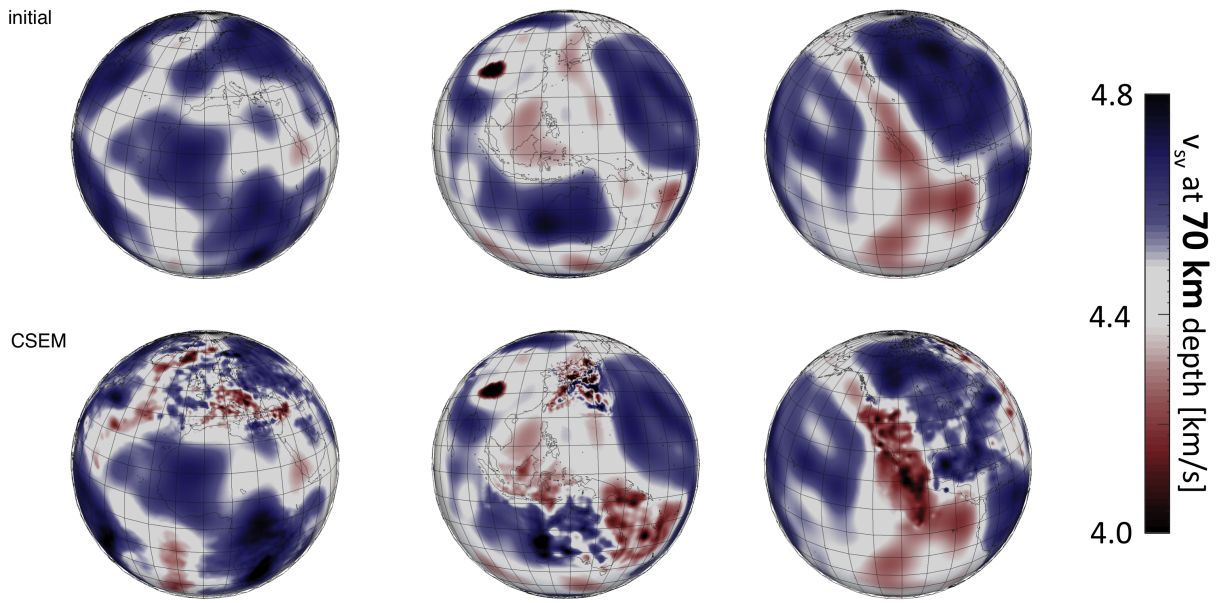

Figure S6. Absolute SV velocity at 70 km depth for the initial model (top) and the current CSEM (bottom). The reference frequency is 1 Hz.

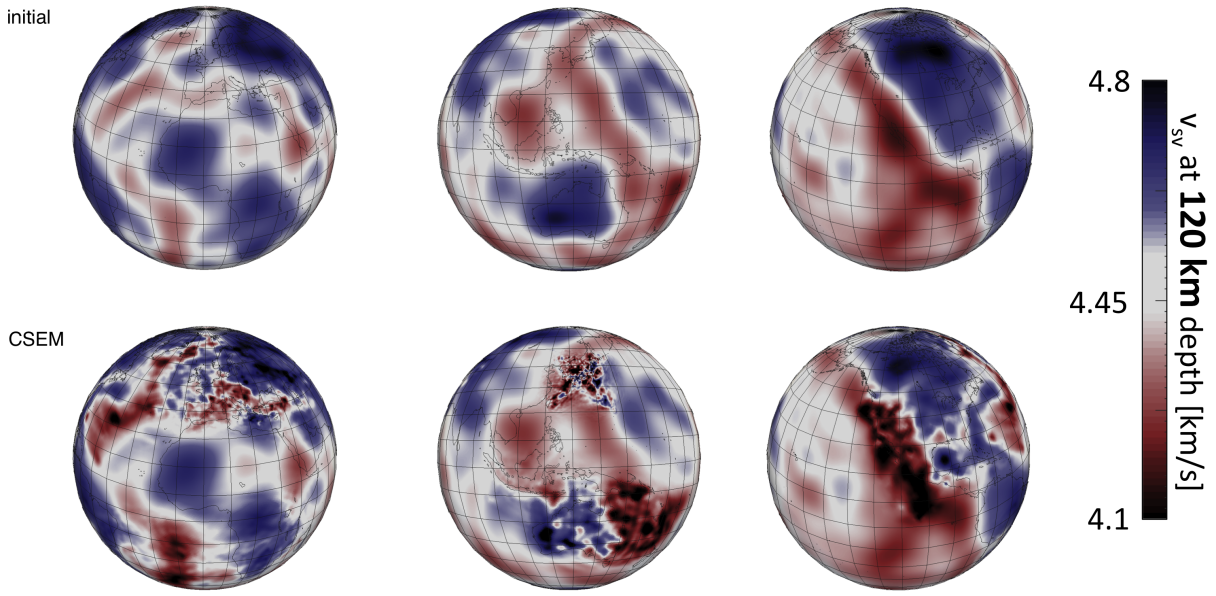

Figure S7. Absolute SV velocity at 120 km depth for the initial model (top) and the current CSEM (bottom). The reference frequency is 1 Hz.

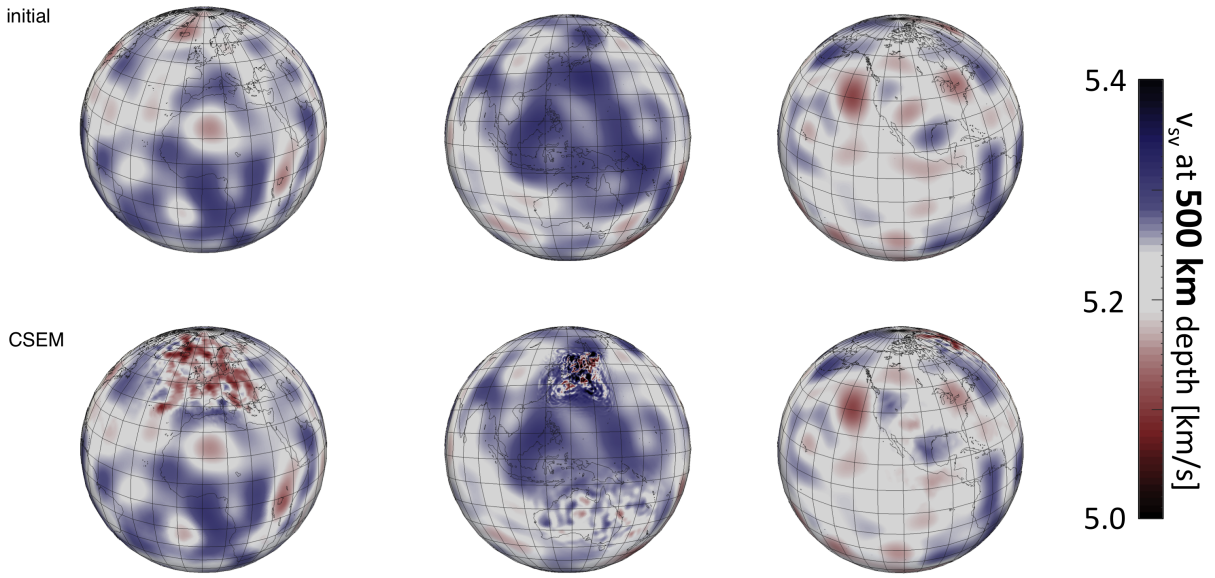

Figure S8. Absolute SV velocity at 500 km depth for the initial model (top) and the current CSEM (bottom). The reference frequency is 1 Hz.

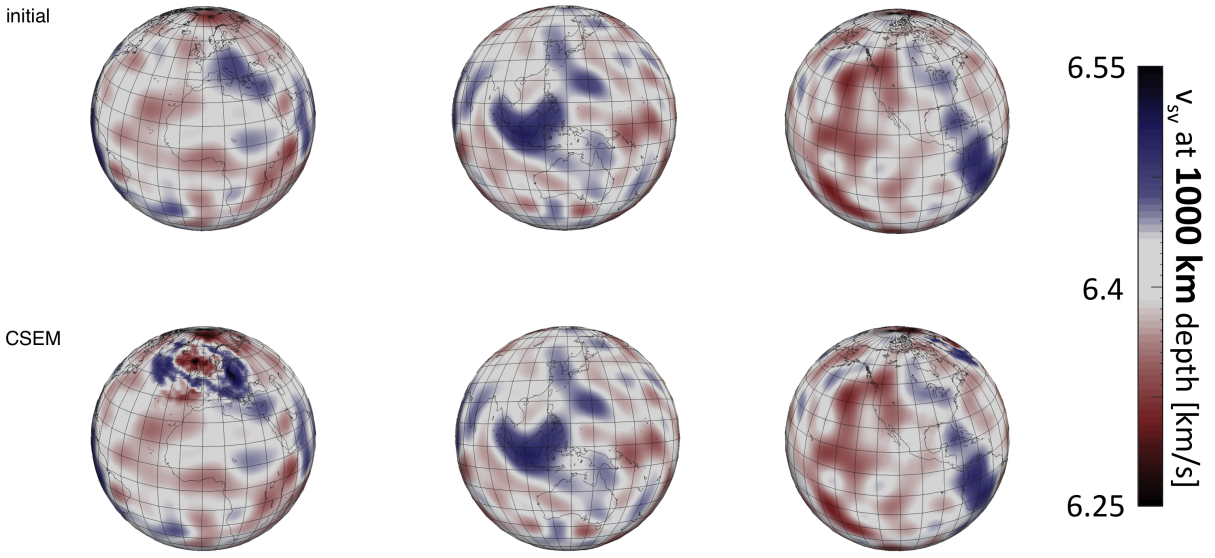

Figure S9. Absolute SV velocity at 1000 km depth for the initial model (top) and the current CSEM (bottom). The reference frequency is 1 Hz.

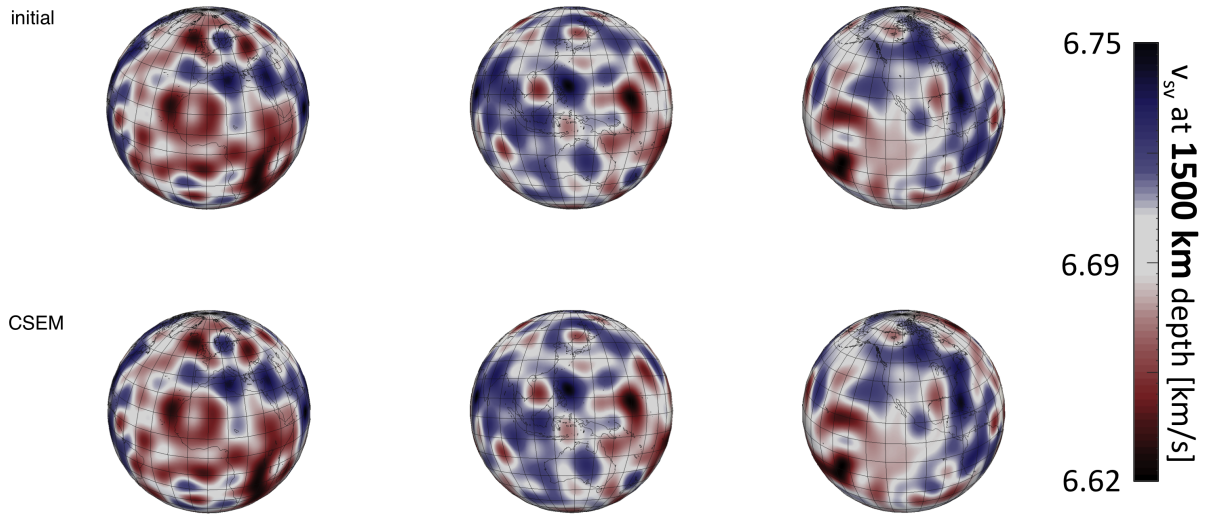

Figure S10. Absolute SV velocity at 1500 km depth for the initial model (top) and the current CSEM (bottom). The reference frequency is 1 Hz.

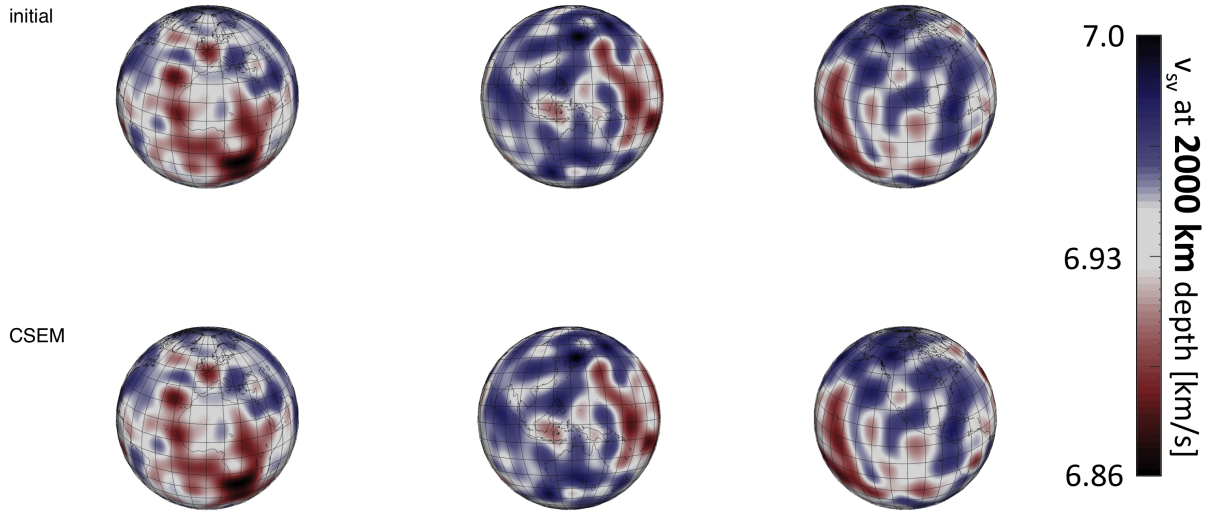

Figure S11. Absolute SV velocity at 2000 km depth for the initial model (top) and the current CSEM (bottom). The reference frequency is 1 Hz.

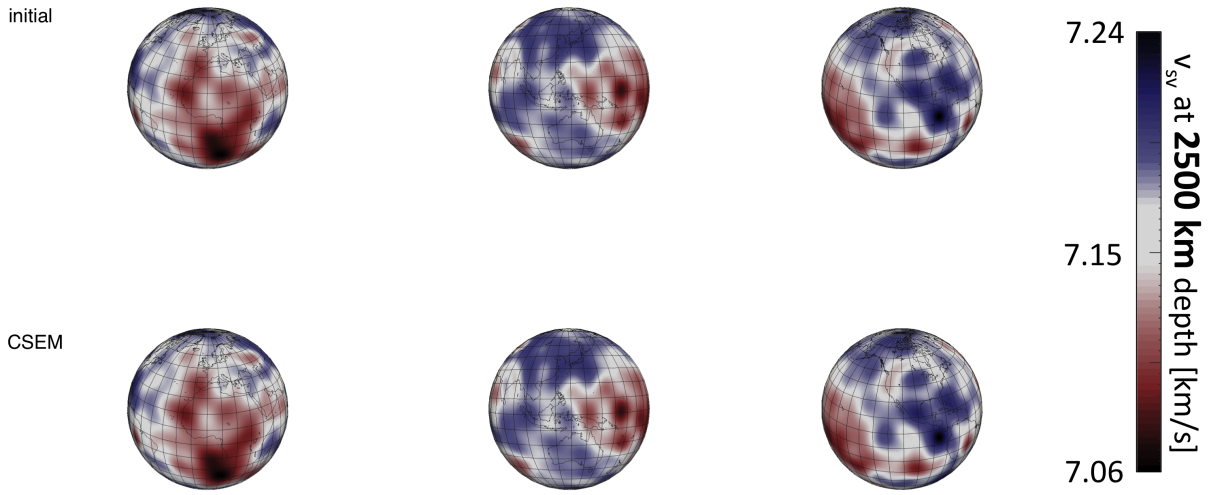

Figure S12. Absolute SV velocity at 2500 km depth for the initial model (top) and the current CSEM (bottom). The reference frequency is 1 Hz.

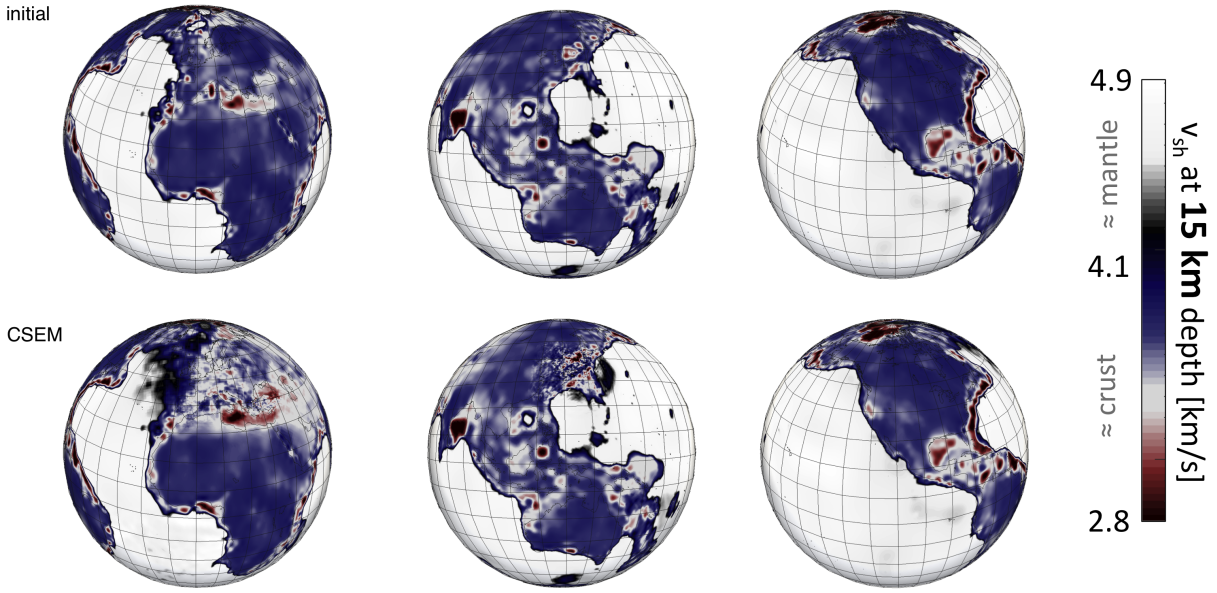

Figure S13. Absolute SH velocity at 15 km depth for the initial model (top) and the current CSEM (bottom). The reference frequency is 1 Hz.

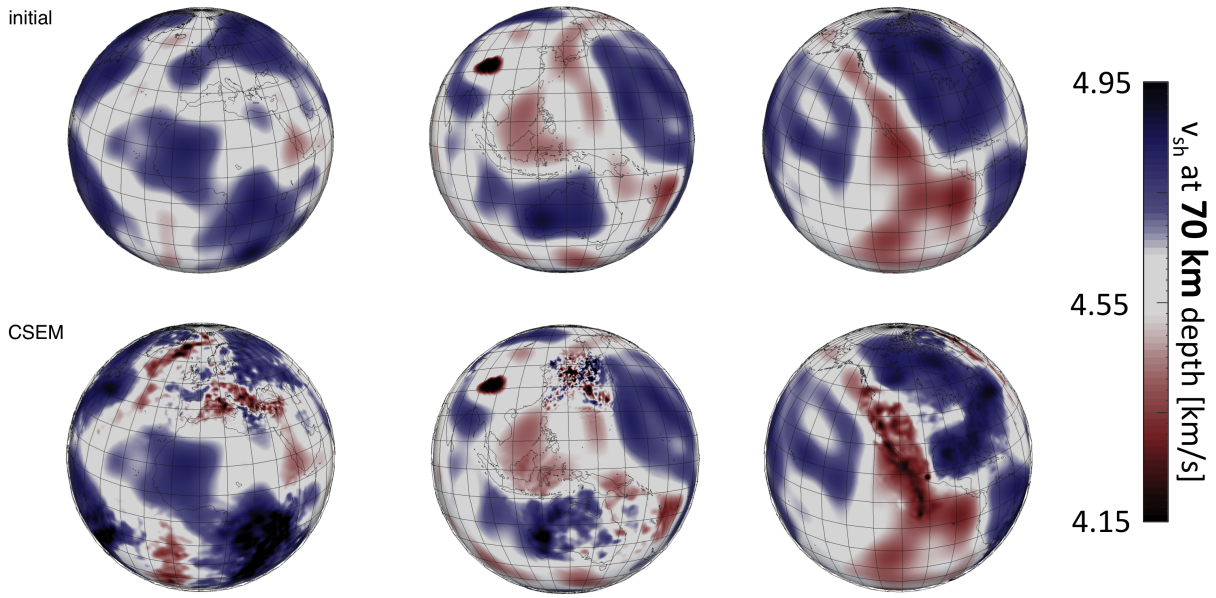

Figure S14. Absolute SH velocity at 70 km depth for the initial model (top) and the current CSEM (bottom). The reference frequency is 1 Hz.

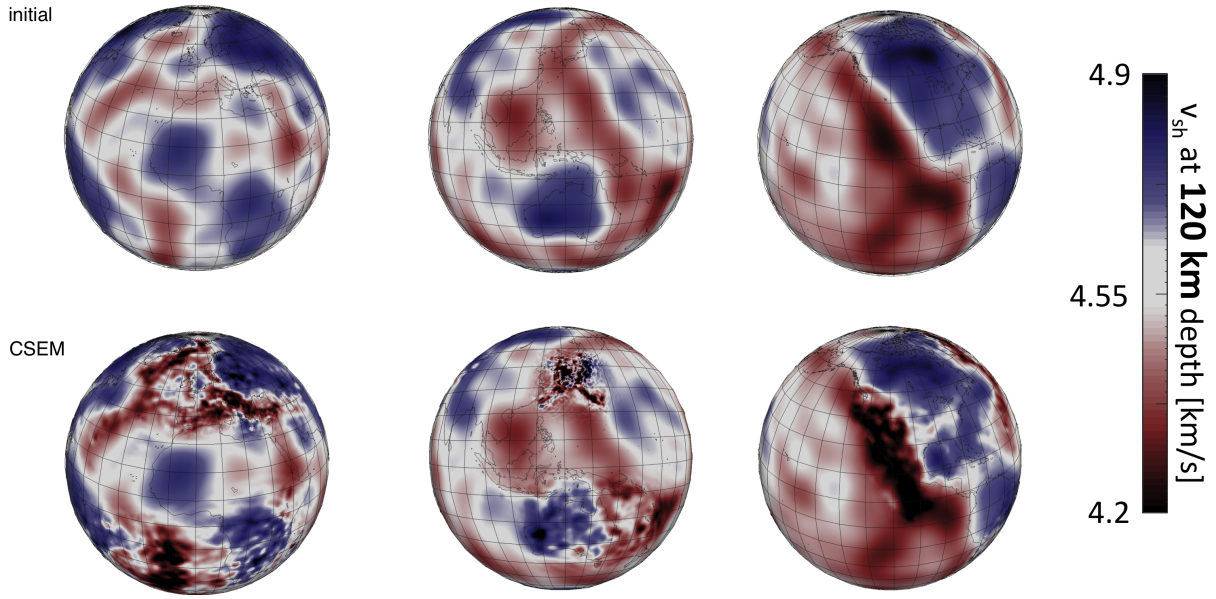

Figure S15. Absolute SH velocity at 120 km depth for the initial model (top) and the current CSEM (bottom). The reference frequency is 1 Hz.

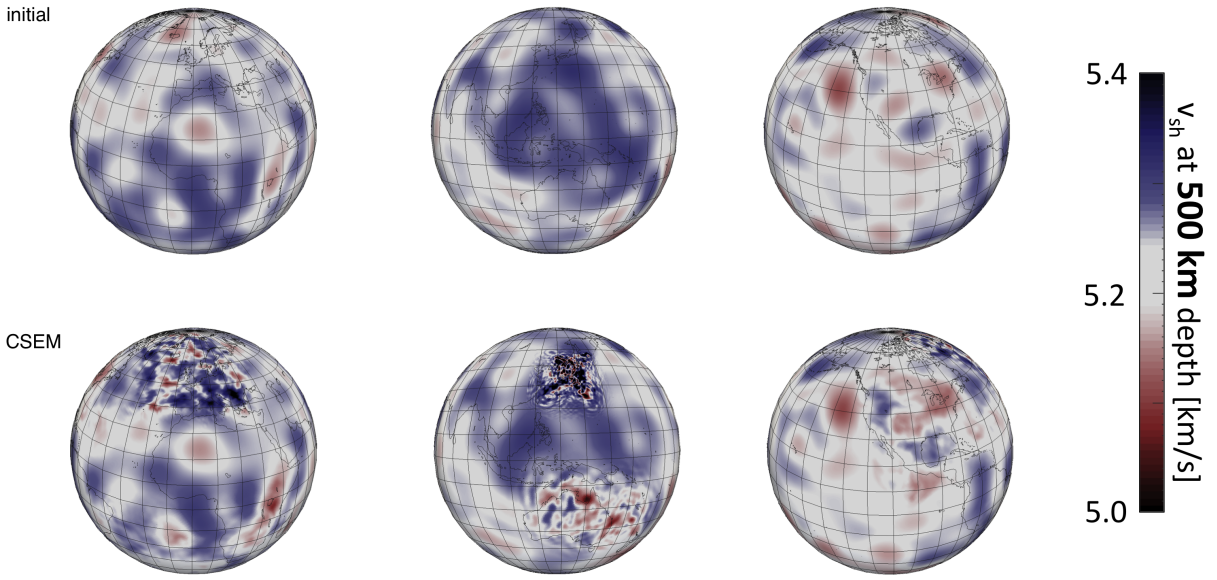

Figure S16. Absolute SH velocity at 500 km depth for the initial model (top) and the current CSEM (bottom). The reference frequency is 1 Hz.