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Report

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Validation of Western North America Models based on finite-frequency and ray theory imaging methods

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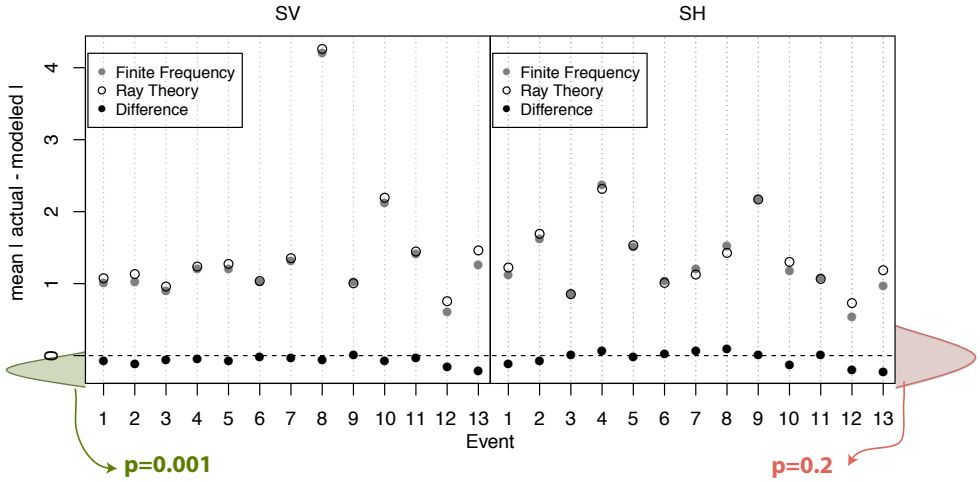
We validate seismic models developed for western North America with a focus on effect of imaging methods on data fit. We use the DNA09 models for which our collaborators provide models built with both the body-wave FF approach and the RT approach, when the data selection, processing and reference models are the same.
For 14 seismic events, we compute synthetic seismograms through both the FF and RT DNA09 models using the Spectral Element Method. On average, the delay times of S-waves produced by the FF model are 0.07 s closer to the actual delay times for SV and 0.03 s closer for SH. A simple paired t-test (*Box et al.*, 1978) can be used to assess the significance of this measured difference. The difference is significant for the SV arrival times (p=0.001) and not for the SH arrival times (p=0.2). Further analysis is published in (Maceira et al., 2015).



For each station measurement, the misfit between observed and modeled delay times – with respect to iasp91 - is summarized by the mean of the absolute deviations. The differences resulting from each pair of models for the13 events are given by the black dots. The difference is statistically significant, favoring smaller absolute SV residuals for the FF model (schematically represented by the narrower green distribution shifted away from zero). There is no significant difference in mean absolute residuals for the SH delay times (wider and more zero-centered red distribution).

CIG Code(s): SPECFEM3D

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References

Box, G. E., W.G. Hunter, and J.S. Hunter (1978), Statistics for experimenters: an introduction to design, data analysis, and model building, Wiley Series in Probability and Statistics.

Maceira, M., C. Larmat, R. W. Porritt, D. M. Higdon, C. A. Rowe, and R. M. Allen (2015), On the validation of seismic imaging methods: Finite frequency or ray theory? *Geophys. Res. Lett.*, doi:10.1002/2014GL062571