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Nonlinear Processes in Geophysics
Discussions
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Interactive comment on "Elastic envelope inversion using multicomponent seismic data without low frequency" *by* C. Huang et al.

Anonymous Referee #1

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Your numerical results appear to validate my claim that the envelope method does not conjure up all low wavenumber information about the model. It appears to perform better than the standard FWI because it is less prone to cycle skipping.

My hypothesis is that it is less prone to cycle skipping largely because it is equivalent to the multiscale method of early arrival waveform inversion, where only the early arrivals are inverted initially. At later iterations, the time window in the trace is gradually opened up to admit more arrivals. In this way, cycle skipping problems are mitigated.

A numerical test should be used to compare the multiscale method of early arrival FWI with the envelope FWI method. I think this is a more apples-to-apples comparison. Otherwise, the authors will likely claim that the envelope method conjures up low-wavenumber information in traces that do not contain such low-wavenumber infor-

mation according to the diffraction-slice theorem for linearized inversion.

The authors can do a real service to the community if they clearly identify the reason why the envelope method appears to be a somewhat better performer than standard FWI. The envelope FWI is a multiscale method (early arrivals are isolated and inversted, and then later arrivals are inverted with a better initial model) so it should be compared to a multiscale FWI method, not the standard FWI.

I believe the idea that envelope FWI conjures up low wavenumber info in traces that don't contain such information is nothing more than magic, so the magician must reveal clearly how it is done.

Interactive comment on Nonlin. Processes Geophys. Discuss., 1, 1757, 2014.