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Solid Earth
Discussions

Interactive comment on "Triplicated P-wave measurements for waveform tomography of the mantle transition zone" *by* S. C. Stähler et al.

Anonymous Referee #2

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Traditional travel-time tomography uses teleseismic arrivals whose ray paths are mainly vertical and has relatively poor vertical resolution, especially for structures deeper than 300 km. In this paper, the authors try to measure the finite-frequency travel-times of triplicated P waves and demonstrate that regional rays, which travel horizontally and have better vertical resolution, can be used for future investigation of transition-zone and upper-mantle structures.

This is an interesting paper. My main concerns are:

1) In teleseismic case, the inaccurate source location, depth, and origin time can be removed by a baseline shift to the travel-time residuals. In regional triplicated waves, the source parameters could cause a big problem.

2) In order to get source time function of each earthquake, the authors use teleseismic records and deconvolve with Green's functions. In this approach, the magnitude, source duration, and attenuation have large trade-offs. A 1D attenuation model of PREM may not be good enough. For shallow earthquakes, they may also trade-off with earthquake depths.

3) The authors use IASP91 as the starting model, which may not be a good model for western United States.

4) For a triplicated waveform, there are 3$\sim$5 arrivals depending on distance. I don't know whether the authors use only the first arrival or not. A common problem of triplication is the trade-off between the shallow and deep turning waves. This trade-off can be easily seen from Fig. 5.

5) If there are sharp structures (e.g. slabs) near the earthquake or the some stations, the triplication pattern will be more complicated.

My other comments are:

1) Lines 5 and 9, page3, the authors used km as unit for distance. Later, they use epicentral distance in degrees.

2) Line 9, page3, the authors state "The reason is that these regional waves generate much more complex seismograms than teleseismic ones, for the very reason that they have extensively interacted with the MTZ discontinuities." This is not true.

3) Line 15, page 7, the authors state that the depth phase "arriving 7 s after the first". In the caption of Fig. 1, they indicate the depth of the earthquake at 6 km. These two statements do not agree.

4) Line 24, page 8, PREM is not correctly cited.

5) Page 33, source time function should be all positive. However, their source time function has negative ruptures.

SED

4, C368–C370, 2012

6) Fig. 4 is not referenced and discussed in the paper. Even the cross-correlation coefficients are large; the waveform fits are not good in a waveform modeler's opinion. The reason may be that the station VALT is above a volcano, which is not a good case.

7) Line 26-27, page 23, this statement is not true.

Interactive comment on Solid Earth Discuss., 4, 783, 2012.