

## ***Interactive comment on “Structure of the upper mantle in the north-western and central United States from USArray S-receiver functions” by R. Kind et al.***

### **Anonymous Referee #2**

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While much of the U.S. has been examined before using S receiver functions, it is important that multiple studies are performed using similar techniques on similar datasets to insure reproducibility of results and to identify points of contrast, which in turn offers a rough method of understanding uncertainty.

I am not a practitioner of the receiver function methodology, although I understand the basics and know the authors as having a track record of high-quality work. With that in mind, the analysis of the data looks reasonable, and I appreciate the careful attention paid to identifying the nature of the conversion identified as the MLD or LAB (like in Figure 3).

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However, there is no interpretation of the physical cause of the various impedance contrasts identified, and without this interpretation, the study lacks importance. Discontinuities are identified as the MLD or LAB by default (as the authors state in the introduction). However, the study would be more interesting if the some constraints were put on the impedance contrast, and thus physical characteristics, of the features producing the S-P conversions. One could also envision examining the layers in the context of the pressure and temperature at which they occur and then considering what causes are plausible.

Partially because there is no attempt to examine the cause of the imaged structures I also found the conclusion rather unsatisfying: complicated structures are interpreted as being caused by the collision of the Farallon and Laurentia plates. What exactly does this mean? Please give more specifics.

Also, I'm not sure I follow the reasoning that suggests the lack of a low velocity layer just above the 410 km discontinuity as being consistent with cratonic tectosphere. Under the transition zone water filter hypothesis, doesn't a low velocity layer indicate melt produced when hydrated mantle moves upward through the 410 discontinuity; hence, I would think the lack of a low velocity layer would just mean no vertical movement. But perhaps I am a little confused here.

All in all, this paper reads like a study that is not quite complete.

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Interactive comment on Solid Earth Discuss., 7, 1025, 2015.

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