

## Authors Reply

### **Anonymous Referee #1**

**1. This is not the first tomographic work in northern Cascadia. The authors should mention the previous tomographic studies for this region made by other researchers.**

We will include the following references that relate to discussion of lower crust and upper mantle in the revised version.

#### Cascadia

Zhao, D., K. Wang, G.C. Rogers, and S.M. Peacock, 2001. Tomographic image of low P velocity anomalies above slab in northern Cascadia subduction zone Earth Planets Space, 53, 285–293.

#### SW Japan

Zhao et al., 2011. Low velocity in forearc mantle wedge SW Japan 40-60 km depth, especially Shikoku.

Xia et al., 2008. Low velocity in mantle wedge of Kyushu SW Japan indicating serpentinization of 20-30%.

**2. A figure showing the distribution of seismic stations and earthquakes used should be provided.**

Will be added as inset to Figure 1.

**3. Just the checkerboard resolution test (Fig. 3) is not convincing and sufficient. The authors should conduct some synthetic tests to confirm the main features appearing in the obtained tomographic images.**

We are using the velocity distribution to present our case. We are not interpreting structural features from the velocity model and do not find it necessary to do additional synthetic tests.

**4. In almost all the tomographic studies published until now, low-velocity anomalies are shown in red color, whereas high-velocity anomalies are shown in blue color. I hope the authors can follow this conventional way to show their tomographic results (Figs. 4a and 4b).**

Previous results from tomographic inversions for P-wave velocity studies conducted by the authors are published in JGR, GRL and Nature using the current color scheme. It

would be detrimental to change the color scheme at this point of time as it would not allow one to compare results from this study with previous studies.

**5. The Southwest Japan subduction zone is similar to Cascadia that a young and warm oceanic plate (the Philippine Sea plate) is subducting, and several tomographic studies have suggested fore-arc mantle serpentinization there (e.g., Xia et al., *Tectonophysics* 449, 85-96, 2008; Zhao et al., *J. Asian Earth Sci.* 42, 1381-1393, 2011). I suggest the authors to give a brief discussion on the comparison of Cascadia with SW Japan.**

We will include a comparison of the above mentioned papers.