**Solid Earth
Discussions**

Interactive comment on "Tomography of the 2011 Iwaki earthquake (M 7.0) and Fukushima nuclear power plant area" *by* P. Tong et al.

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This is an interesting and timely manuscript which has the merit to apply seismic tomography methods to a problem of societal relevance: the security of nuclear power plants.

The main point seems to be that the comparison of Vp and Vs tomography results suggests the presence of fluid in the region of the Iwaki earthquake. It is indeed a good idea to combine Vp and Vs results to get information on Earth structure other than elastic parameters. Some of the difficulties involved by this endeavour are, however, not discussed. In particular, how was regularization selected for the Vp and Vs inversion? in principle, if the results are to be compared, the regularization scheme in the two cases should be the "same", but the problem is that the Vp and Vs inverse

problems presumably have different properties (coverage, signal-to-noise ratio of the P and S data...) so that the same numerical values of the regularization parameters would not result in an equivalent level of regularization. I believe that clarifying this point would make the paper more convincing.

A related issue is that of the metric used to compare different models: what exactly is the "structural similarity index", or SSIM? please give at least a reference of a publication where this quantity is clearly defined. Is SSIM, like correlation, just sensitive to the pattern of heterogeneity, or does it also compare amplitude?

Note that a general issue with tomography is that, while the geographic pattern of structural heterogeneity is reasonably easy to constrain, it is much harder to determine robustly its amplitude. As the authors' inferences rely on the ratio of Vp to Vs, rather than just on the distribution of lateral variations in either quantity, amplitude is here very important. How stable are values of amplitude with respect to variations in the regularization scheme? How does amplitude of the solution models respond, in synthetic tests, to the level of random noise added to the synthetics?

I am sure that it will not be difficult for the authors to address the points I mentioned, and believe a very minor revision will be sufficient to make this nice manuscript fully acceptable.

Lapo Boschi, Zurich, 31.12.2011

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