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Discussions
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Interactive comment on "Mapping turbulent diffusivity associated with oceanic internal lee waves offshore Costa Rica" *by* W. F. J. Fortin et al.

Anonymous Referee #1

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Fortin et al estimate turbulent diffusivity in the Caribbean Sea, offshore eastern Costa Rica, using seismic data. Diffusivity values are estimated by analyzing the slope spectra of the seismic reflectors through two different methods. The first method calculates displacement spectra from tracked seismic reflections; and the second method estimates seismic amplitude spectra taken along a depth slice of a seismic image and obtains diffusivity values from scaling factors derived with the first method. The results of this work are diffusivity maps in the wester Caribbean that show hight turbulent diffusivity values near rough seafloor topography as well as in the mid-water column where observed lee wave propagation terminates and levels of diffusivity that are fifty times greater than typical open-ocean diffusivities.

Major comments The seismic data set analyzed in this work is unique and the quality

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of the imaging, in terms of signal to noise ratio, is very good and suitable for energy cascading studies. Previous studies have mapped turbulent diffusivity using tracked reflections, assuming that the undulations of the reflectors correspond to the vertical isopycnal displacements. Therefore, energy propagated through the ocean is analyzed from the slope spectra at different subranges or scales, i.e. internal waves, turbulence, etc. I agree with the results obtained by Fortin et al using this method (Figure 9 of the paper). However, I am very skeptical about the results obtained from the second method. I would like to ask authors for further explanations in order to clarify the validity of this method. - Vertical displacement of isopycnals (figure 1) is the energetic magnitude used to calculated the y-axis of Fourier transform v.s wavenumber. Which is the energetic magnitude in the second method? I would say that it is the reflectivity (figure 2), however the reflectivity is related to the vertical gradient of T and S and vertical gradients are not related directly to the energy propagation. In my opinion, diffusivity values obtained from the second method are not nonsense numbers, just because they are scaled by the values obtained from the first method, but they are not consistent by their selves. - Figure 5 concerns to me, why this method does not detect internal waves? Why this spectrum does not show the three main different subranges: internal waves, turbulent and noise? - Authors state that the “data transform” method allows to estimate diffusivity even in regions where seismic reflections are difficult to track. I would say that if in these regions undulations can not be tracked by seismic data, then this method should not be valid in these regions.

Minor comments - Which are the vertical and lateral resolution of your system? Could you add the errors when estimating the parameters of the lee waves (section 2.3)? - Could authors give more information about the XCTD data used to calculated N? Where and when it was acquired? - Why Figure 7 and 8 are not showing the same seismic data section?

Interactive comment on Ocean Sci. Discuss., 12, 1433, 2015.

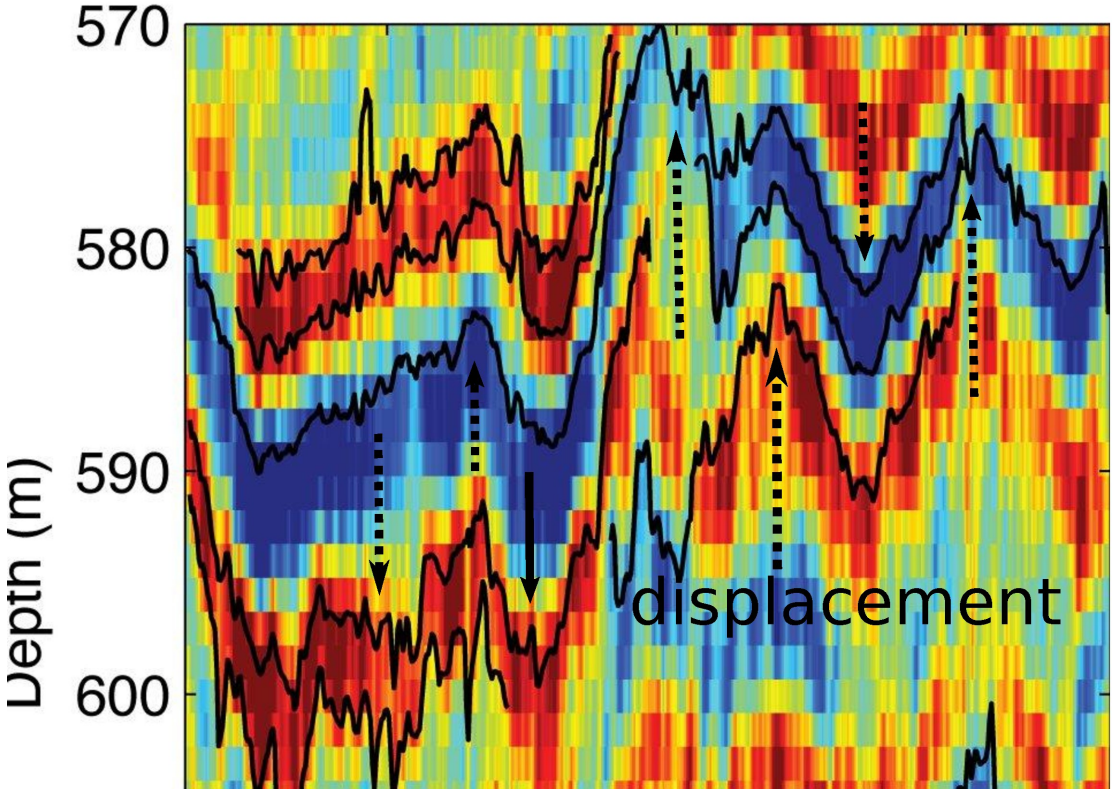

Fig. 1.

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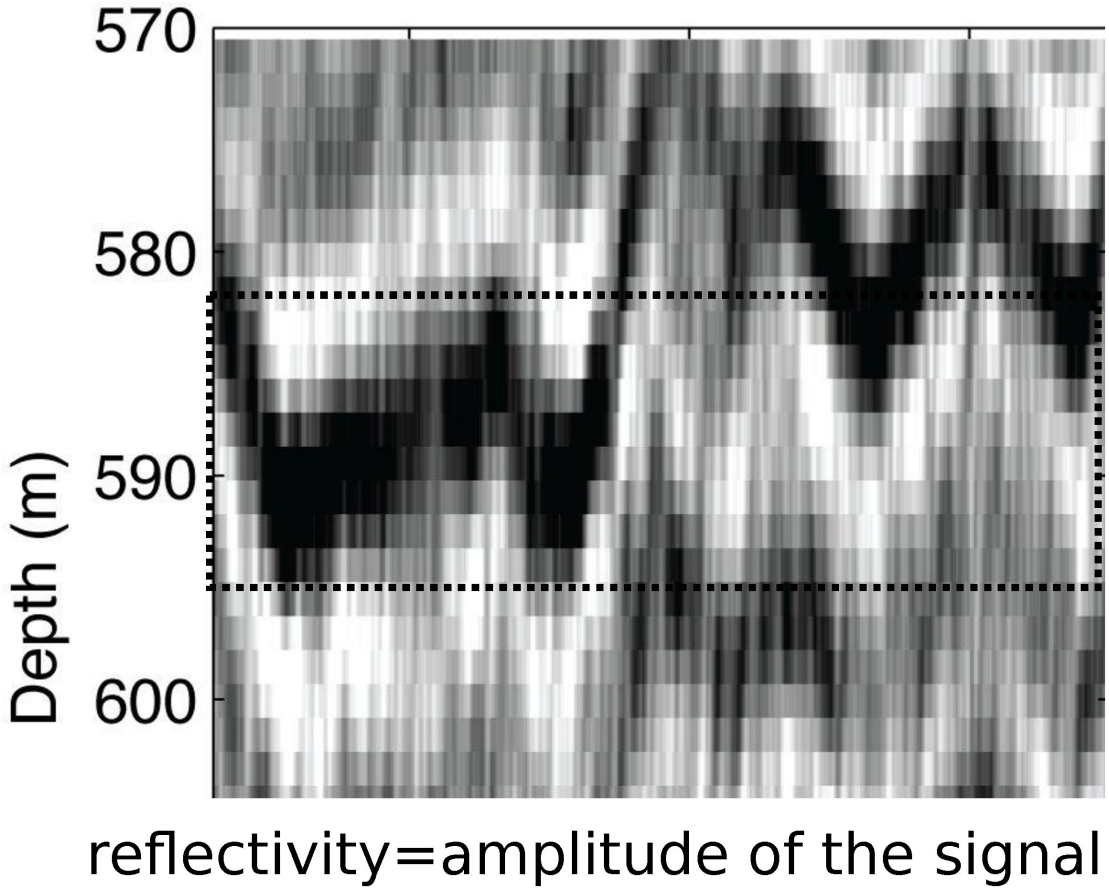

Fig. 2.

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