1. Abstract

The Seismic Array on the Hikurangi Experiment (SAHKE) I consisted of 50 2 Hz seismometers deployed in a two-dimensional array and ten broadband seismometers deployed in a line above the Hikurangi Subduction Zone throughout the Wellington/Wairarapa region of New Zealand. Continuous signals were recorded between November 2009 and March 2010 on the short period sensors and up to 18 months on the broadband sensor. These stations densified the GeoNet network of two broadband and 13 1 Hz seismometers. Airgun shots and earthquakes were extracted for analysis. Here we summarize the preliminary analysis of earthquakes and seismic noise. Receiver function images of the plate boundary reveal similar structures to the results of active source analysis, suggesting that at long wavelength the S velocity and P velocity change at the same boundaries. A low velocity layer at the top of the plate and the Moho within the subducting slab are well imaged. Deeper features may also be present.

2. Shear wave splitting

Teleseismic splitting 100 km piercing points

3. Receiver Functions

 Receiver functions calculated using the Method of Park and Levin (2000). Top right: Back-azimuthal stacks of stations labelled in Fig. 1 with blue as positive arrivals and red as negative: Bottom: Common midpoint stack using the method of Doser and Shearer (1998), with red as positive and blue as negative.

4. Noise Cross-Correlations

We calculate cross-correlations of the noise on all the vertical components of the short period array and the Geonet stations. The processing flow that follows used by Bensen et al. (2007). Top figure shows schematic paths from some of the stations to S039. Bottom figure shows the cross-correlation functions between each station pair as a function of distance between the pairs. Note that even though station S039 has only a 2 Hz seismometer, noise at periods of 5 seconds propagates to 80 km.

5. Conclusions

- Receiver function images of the plate boundary reveal similar structures to the results of active source analysis, suggesting that at long wavelength the S velocity and P velocity change at the same boundaries. A low velocity layer at the top of the plate is well imaged.
- S-wave splitting on local and teleseismic phases yield similar fast azimuths, suggesting a strong coupling between NE-SW aligned mantle flow and shearing beneath the major faults in the central region of the transect.
- Cross-correlating seismic noise yields coherent energy out to 80 km with wave speeds between 5.2 and 1.3 km/s. Periods of 5 s can be recorded even on 2 Hz seismometers.