High Resolution Imaging of the South Hikurangi Subduction Zone, New Zealand, Using 2D Full-Waveform Inversion

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Large quantities of fluids are predicted to be expelled from compacting sediments on subduction margins. Fluid expulsion is thought to be focussed, but its exact locations are usually constrained on very small scales and rarely can be resolved using velocity images obtained from traditional velocity analysis and ray-based tomography because of their resolution and accuracy limitation. However, with recent advancement in computing power, the full waveform inversion (FWI) is a powerful alternative to those traditional approaches as it uses phase and amplitude information contained in seismic data to yield a high-resolution velocity model of the subsurface.

Here, we applied elastic FWI along an 85 Km long 2D multichannel seismic profile on the southern Hikurangi margin, New Zealand. Our processing sequence includes: (1) downward continuation, (2) 2D traveltime tomography, and (3) full waveform inversion of wide-angle seismic data. We will present the final high-resolution velocity model and our interpretation of the fluid flow regimes associated with both the deforming overriding plate and the subducting plate.