

Seismic re-processing routine for EW9601-P1 multi-channel seismic data

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Multichannel Seismic Reflection Data Processing

Expedition EW9601 collected marine multi-channel seismic data along the South Island of New Zealand with the R/V *Maurice Ewing*. Details of the original data acquisition can be found on the [Marine Geoscience Data System portal](#). Seismic data from the EW9601-P1 profile were reprocessed using the Echos and Geodepth software packages from Emerson/Paradigm Geophysical. Only shots from the portion of the profile along the Puysegur margin were used (shots 51995-58068). First, the SEG-D traces were input and resampled to 4 ms. Noise reduction consisted of trace editing to remove noisy channels, low-frequency (0-6 Hz) wave suppression, and Butterworth bandpass filtering (7-85 Hz). Interpolation was applied first to shot gathers to fill in missing channels, and then in the receiver domain to recover signal from missing and low-energy shots recorded during marine mammal shutdowns and ramp-ups, respectively. Marine geometry consisted of 50 m shot spacing, 25 m receiver group spacing, and resulting 12.5 m CMP spacing. Semblance-based velocity analysis was performed approximately every 250 CMPs (~3 km). Multiple suppression was performed by parabolic radon transforms in the CMP domain followed by a dip filter to remove undercorrected multiple arrivals and out-of-plane energy. Velocity models for Kirchhoff pre-stack depth migration algorithms were derived from the RMS stacking velocities. Kirchhoff pre-stack depth migrations were performed using an Eikonal travel-time fitting algorithm with a migration aperture of 2000 CMPs. Outside muting removed stretched reflections at far offsets and inside muting removed residual multiple energy. The depth-migrated gathers were bandpass filtered, mixed with 3 adjacent traces, and then stacked. The final resulting PSDM section has significantly improved imaging from legacy sections.