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# Visualizing active faults from 3-D GPR data

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Three-dimensional Ground Penetrating Radar (GPR) is an excellent tool for imaging the complex structure of active faults in the near surface. A densely sampled and correctly migrated GPR volume allows the interpreter to observe small scale ($\sim$0.3 m) structures in any direction with approximately equal resolution. The complexity of these structures can make interpretation difficult on a 2-D display. We have employed two independent techniques to calculate geometric attributes that improve the quality and efficiency of 3-D GPR data interpretation. The first technique is based on a semblance-coherency algorithm. Using this technique we evaluate the dip, azimuth and coherency (or continuity) of reflections. The second technique quantifies the volumetric texture of reflections. Textural attributes provide excellent discrimination between different reflection facies.

Geometric attributes were calculated from 4 data sets collected over different active faults in New Zealand. Our data sets sample a wide range of deformation styles: the transpressive Alpine Fault, the strike-slip Wellington Fault, reverse faults of the Ostler Fault Zone and normal faults within the Maleme Fault Zone. The processed data volumes exhibit contrasting structural characteristics resulting from both the different types of movement on the faults and the local geology deformed by the faults. From the suite of attribute volumes, we have successfully identified individual faults at each setting. In many cases, the location and orientation of these structures was not known from previous geological investigations. In addition, we have been able to classify reflection facies that will help us to reconstruct the recent tectonic and depositional history of each site.