



Seismic site characterization for the Deep-Fault-Drilling-Project Alpine Fault

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The Alpine Fault in New Zealand (South Island) is one of the largest active plate-bounding continental fault zones on earth with earthquakes of magnitude 7.9 occurring every 200-400 years. Due to the surface exposure and the shallow depth of mechanical and chemical transitions it is a globally significant natural laboratory. Within the ICDP Deep-Fault-Drilling-Project Alpine Fault (DFDP-AF; <https://wiki.gns.cri.nz/DFDP>) a drill hole shall give insight into the geological structure of the fault zone and its evolution to understand the related deformation and earthquake processes.

With the help of advanced seismic imaging techniques the shallow structure of the Alpine Fault is imaged to find the most suitable drill site location. A new seismic reflection profile has been acquired in 2011 by the WhataDUSIE project team consisting of partners from the University of Otago (New Zealand), TU Bergakademie Freiberg (Germany) and the University of Alberta (Canada). The reflection profile, located in the Whataroa river valley, has a total length of about 5 km. Up to 643 geophones with spacings between 4-8 m recorded the approximately 100 shot points along the profile line. Single shot gathers as well as preliminary imaging results will be presented. The high-quality data show various indicators of the Alpine Fault such as strong reflections and distorted first-arrival wavefields which are clearly visible already in single shot gathers. With the help of high resolution seismic images we can study the shallow structures of the subsurface thus gaining information about the location and dip of reflectors. Further detailed processing and intensive interpretative work will enable a seismic site characterization providing important information for the selection of the borehole location. Additionally the high resolution seismic images themselves allow a better understanding of the tectonic and geodynamic settings.