Alpine drilling fault project moves into new phase

October 20 2014

(L-R) Dr Giles Henry (University of Montpellier, France), Prof Doug Schmitt (University of Alberta, Canada), Dr Bernard Celerier (CNRS, France), and Loren Mathewson (MSc student from University of Otago) eagerly watch data being sent from instruments inside the Alpine Fault borehole. Credit: Virginia Toy

The multi-national Alpine Fault drilling project has moved to a new phase with a new drilling rig positioned over the borehole to take the probe to its target depth of 1.3km

In the initial part of the project, the New Zealand-led team drilled through 240m of gravel-laden sediments in the Whataroa Valley, north of Franz Josef Glacier, and hit schist bedrock a few days ago.

They have now installed different drilling equipment above the borehole specially designed to penetrate the hard schist bedrock. All going well, the drill bit should intersect the fault at about 1000m depth in mid-November.

In preparation for the deep drilling phase, the scientists have placed concentric steel casings of 38cm, 30cm and 24cm diameter respectively through the sediments and into the bedrock to a depth of 270m. This forms a stable platform from which to drill deeper.

Although it less than a quarter of the way to its target depth, the borehole is already the deepest probe into the Alpine Fault yet attempted.

The project is being jointly led by GNS Science, Victoria University of Wellington, and the University of Otago and is funded mainly by the International Continental Scientific Drilling Program, the Marsden Fund of the Royal Society of New Zealand, and the participating scientists' own organisations. It involves scientists from other New Zealand organisations and from more than a dozen other countries.

According to project co-leader Virginia Toy, of the University of Otago, the drilling has already yielded intriguing measurements of temperature and fluid.

"We have discovered that temperatures increase quite rapidly with depth, which tells us a lot about how fluids that once fell on the Southern Alps as rain circulate and warm up next to the Alpine Fault," Dr Toy said.

"These measurements are important scientific findings in their own right and also allow us to predict what we will encounter as we drill deeper."

Another project co-leader, John Townend of Victoria University of Wellington, said the project was important for New Zealand and for the international community.

"This work is important to New Zealand because it will provide the scientific data required to improve our understanding of the largest seismic hazard in the South Island," said Associate Professor Townend.

"It's also very important to the international scientific community in terms of understanding how large faults work mechanically, which is why so many scientists from around the world are working with us to extract maximum information from the borehole."

Dr Bernard Célerier, a senior researcher at the National Center for Scientific Research in France and member of the group making geophysical measurements in the borehole commented that "This is a great opportunity for us to work closely with New Zealand researchers and colleagues from other countries to understand fundamental scientific problems of great relevance to society."

His colleague Doug Schmitt of the University of Alberta in Canada is coordinating measurements of the rocks' hydraulic properties, which govern the flow of fluids, said the project provided an opportunity to study many different aspects of the Alpine Fault's internal structure using different methods. "This makes it a really important study," Prof Schmitt said.

The third project co-leader Rupert Sutherland, of GNS Science, emphasised the multidisciplinary nature of the research.

"Our goal is to make important geological, geophysical, and geochemical measurements at all depths in the borehole to provide the greatest insight into the fault zone's current state and what this implies for future earthquakes," Dr Sutherland said.

In parallel with the drilling operations, the science team has set up a sophisticated field laboratory for processing and analysing rock and fluid samples and digital data from the borehole.

The laboratory equipment includes a mass spectrometer and gas chromatograph used to provide continuous measurements of gas chemistry and a core scanner that produces high-resolution images of core samples.

There is even an on-site facility to make microscopic slides of the rocks gathered within only a few hours of them having been ground up by the drill bit hundreds of metres below the surface.

The 60-strong scientific team assembled in Whataroa includes many experienced researchers as well as university students and up-and-coming researchers.

"The training I'm getting in new methods and the cool scientists I am meeting have already made this a fantastic trip," said Katrina Sauer, a PhD student from California now working at the University of Otago.

Provided by University of Otago

Citation: Alpine drilling fault project moves into new phase (2014, October 20) retrieved 16 June 2024 from https://phys.org/news/2014-10-alpine-drilling-fault-phase.html