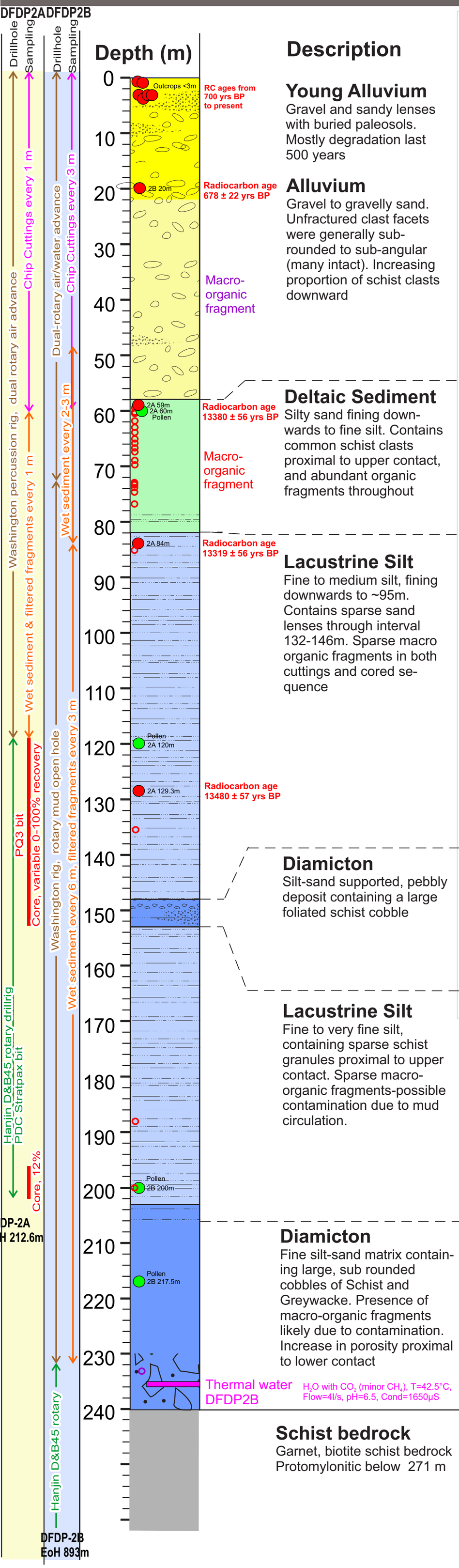
Quaternary geology of the DFDP-2 drill holes, Alpine Fault, New Zealand

Adam Thomas

Supervised by Cliff Atkins[1], Simon Cox[2] & Jamie Howarth[2]

1. Victoria University of Wellington, NZ, 2. GNS Science, NZ.



Description

Young Alluvium
Gravel and sandy lenses with buried paleosols. Mostly degradation last 500 years

Alluvium
Gravel to gravelly sand. Unfractured clast facets were generally sub-rounded to sub-angular (many intact). Increasing proportion of schist clasts downward

Deltaic Sediment
Silty sand fining down-wards to fine silt. Contains common schist clasts proximal to upper contact, and abundant organic fragments throughout

Lacustrine Silt
Fine to medium silt, fining downwards to ~95m. Contains sparse sand lenses through interval 132-146m. Sparse macro organic fragments in both cuttings and cored se-quence

Diamicton
Silt-sand supported, pebbly deposit containing a large foliated schist cobble

Lacustrine Silt
Fine to very fine silt, containing sparse schist granules proximal to upper contact. Sparse macro-organic fragments-possible contamination due to mud circulation.

Diamicton
Fine silt-sand matrix contain-ing large, sub rounded cobbles of Schist and Greywacke. Presence of macro-organic fragments likely due to contamination. Increase in porosity proximal to lower contact

Schist bedrock
Garnet, biotite schist bedrock Protomylonitic below 271 m

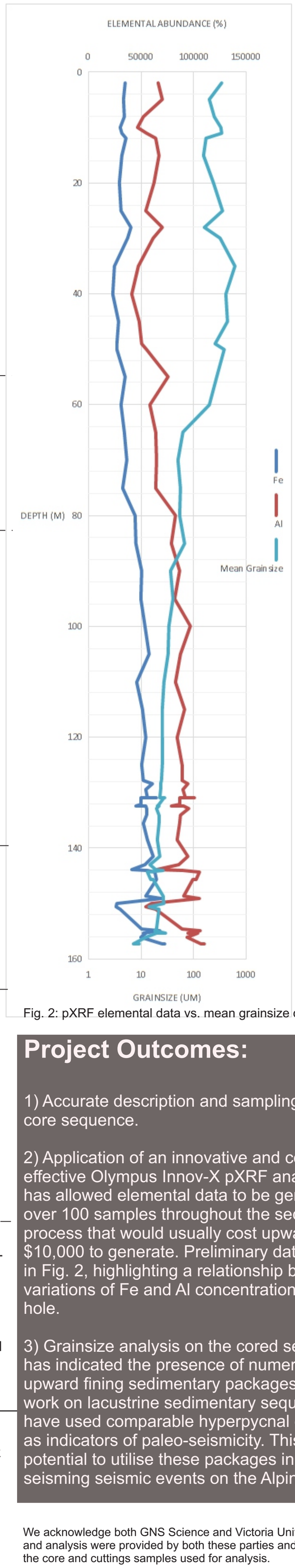


Fig. 2: pXRF elemental data vs. mean grainsize down hole

Project Goals:

The Deep Fault Drilling Project 2 (DFDP 2) drilled two holes in the Whataroa Valley (Fig.1) late 2014, uncovering an unprecedented Quartenary sedimentary record of post glacial deglaciation.

This project aimed to analyse the uncovered sequence, using detailed description, grainsize and pXRF analysis, being the first of its kind being carried out on a New Zealand glacio-lacustrine sequence.

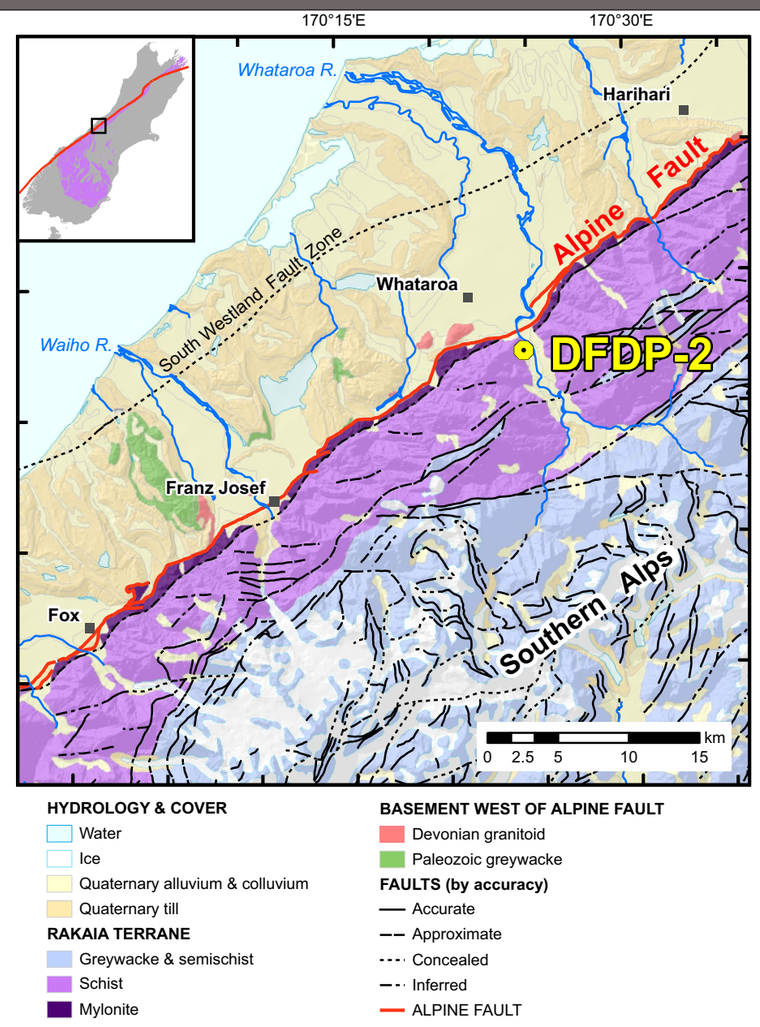


Fig. 1: Map showing location of DFDP-2 drill site

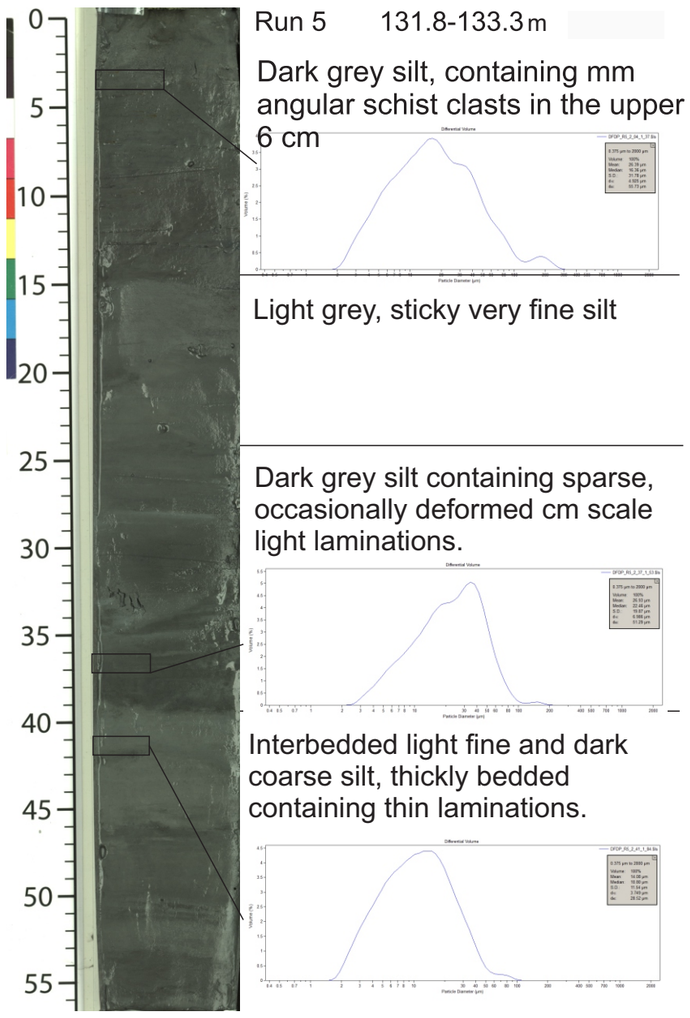


Fig. 3: Section of core showing cm scale bedding, deformation and grainsize analysis

Project Outcomes:

1) Accurate description and sampling of the core sequence.

2) Application of an innovative and cost effective Olympus Innov-X pXRF analysis. This has allowed elemental data to be generated on over 100 samples throughout the sequence- a process that would usually cost upwards of $10,000 to generate. Preliminary data is shown in Fig. 2, highlighting a relationship between variations of Fe and Al concentration down hole.

3) Grainsize analysis on the cored sequence has indicated the presence of numerous upward fining sedimentary packages. Previous work on lacustrine sedimentary sequences have used comparable hyperpycnal deposits as indicators of paleo-seismicity. This provides potential to utilise these packages in examining seisming seismic events on the Alpine Fault

Future Work

- We aim to use Raman spectroscopy to examine graphite present in the section- a developing field of research which may provide insight into the landscape development of the Southern Alps. Also, due to success and cost effectiveness of pXRF, we are currently processing organic fragments in the lower part of the sequence, with the goal of obtaining C14 dates.

We acknowledge both GNS Science and Victoria University of Wellington for funding this project. Samples and facilities used for sample preperation and analysis were provided by both these parties and we thank them for this also. Thanks also to the DFDP 2 Science team for providing access to the core and cuttings samples used for analysis.