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Improving the robustness of single grain K-feldspar IRSL sediment age estimates from active tectonic contexts



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Preliminary results from joint NSFGE0-NERC project NE/S007091/1

Thanks to collaborators

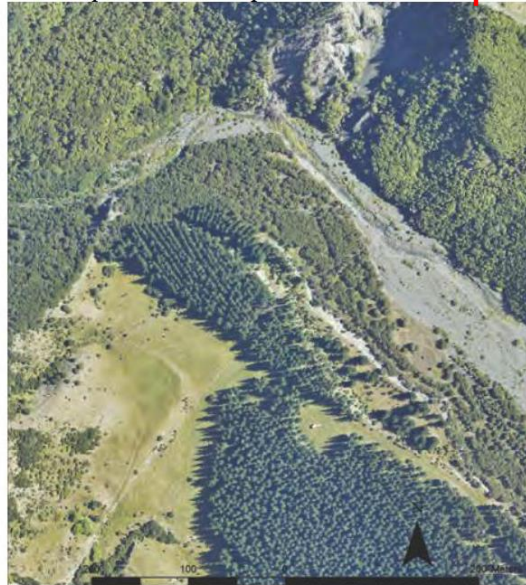
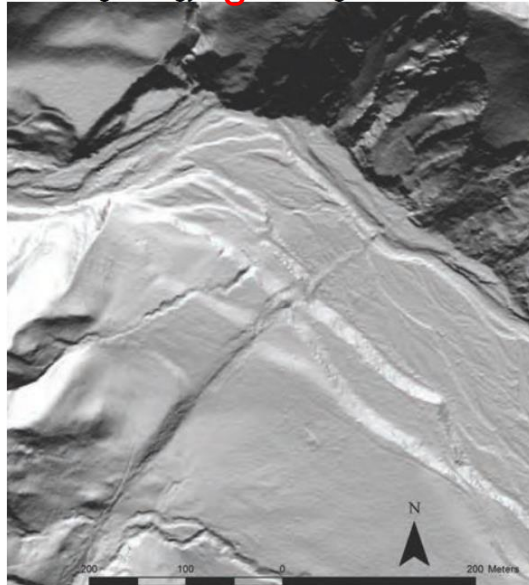
James Dolan, Judith Gauriau (USC), Russ van Dissen (GNS Science), Tim Little (VUW)

Improving robustness of SG K-fspr IRSL sediment ages – tectonic contexts

Date sediments disturbed by faulting:

- Paleoseismology (dates of past EQs)
 - Fault slip rates
- using offset morphology

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Offset fluvial terraces
Marlborough, New Zealand

Although very
successful, some
contexts problematic

IRSL = Infra-Red Stimulated
Luminescence

High energy settings → concerns about complete zeroing of SG K-fspr IRSL signal

3ET-IRSL – 3 Elevated Temperatures

3 different IRSL measurements same grain

Filter single grain (SG) results:

Determine apparent age agreements for each grain = “plateau”

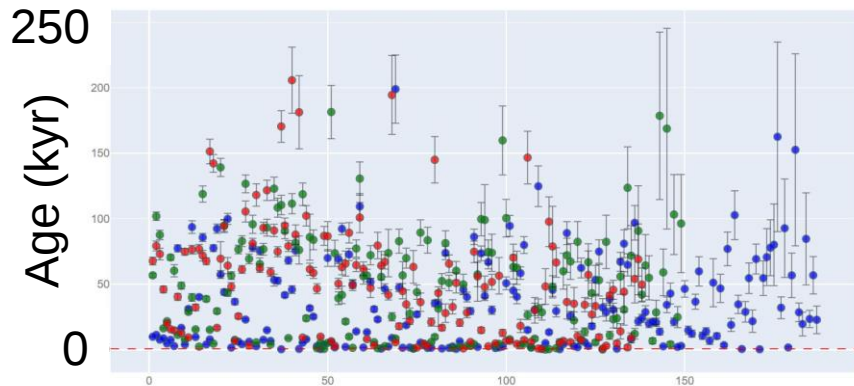
Keep as secure result => well bleached

Shared minimum group of results based only on well-bleached grains – more robust



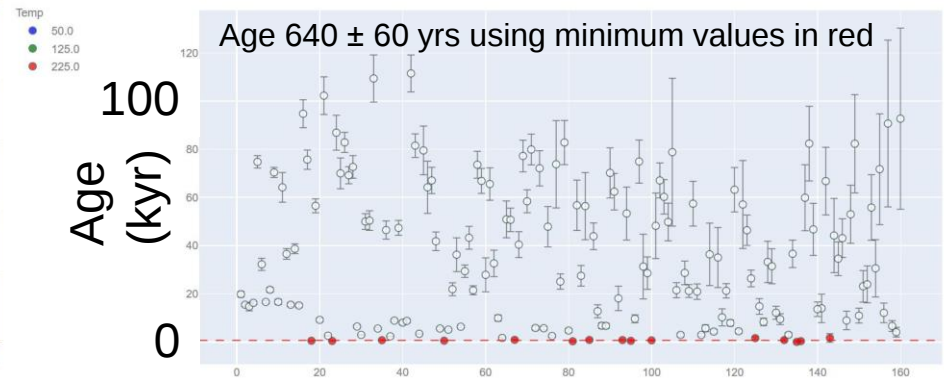
Site affected by 2016 M_w 7.8 Kaikoura EQ – single sample as example:

All apparent ages 1 sample (below)
at three temps (50, 125, 225 °C)



Grain number (rank order sensitivity)

Isolation of results from “plateau” grains
Calc. each plateau age, base age on min.



Grain number (rank order sensitivity)

Apparent age of terrace 640 ± 60 years, based only on well-bleached grains (red)

Preliminary results & Conclusions

3ET-IRSL – 3 Elevated Temperatures

- Technique works well to isolate IRSL results only from well-bleached grains
- Can apply over 100 – 100,000 yrs in highly challenging locations
- Significant development for dating active tectonic contexts

Many thanks!

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