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

Ed Rhodes & Andrew Ivester
University of Sheffield, UK
ed.rhodes@sheffield.ac.uk
Earth, Planetary, and Space Sciences, UCLA, USA
erhodes@epss.ucla.edu

Preliminary results from joint NSF-GEO-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

Although very successful, some contexts problematic

IRSL = Infra-Red Stimulated Luminescence

Offset fluvial terraces
Marlborough, New Zealand

These images © Van Dissen – Please do not reproduce
High energy settings → concerns about complete zeroing of SG K-fspsr 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)

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

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!

EGU2020-19294