TerraneChron® - Remote sensing with detrital samples

Elena Belousova, William L. Griffin, Norman J. Pearson, Suzanne Y. O'Reilly and Yoann Gréau

ARC Centre of Excellence for Core to Crust Fluid Systems (CCFS)

Australian Government
Australian Research Council

MACQUARIE UNIVERSITY

GEMOC

THE UNIVERSITY OF WESTERN AUSTRALIA
Achieving International Excellence

Centre for EXPLORATION TARGETING

Curtin University

Geological Survey of Western Australia

TerraneChron®

CCFS

- unique methodology for studying the evolution of Earth's crust
- exploration reconnaissance tool
    - tectonic mapping
    - evaluation of prospective terrains
    - target prioritisation

MACQUARIE UNIVERSITY

GEMOC

Geochemical Remote Sensing

CCFS

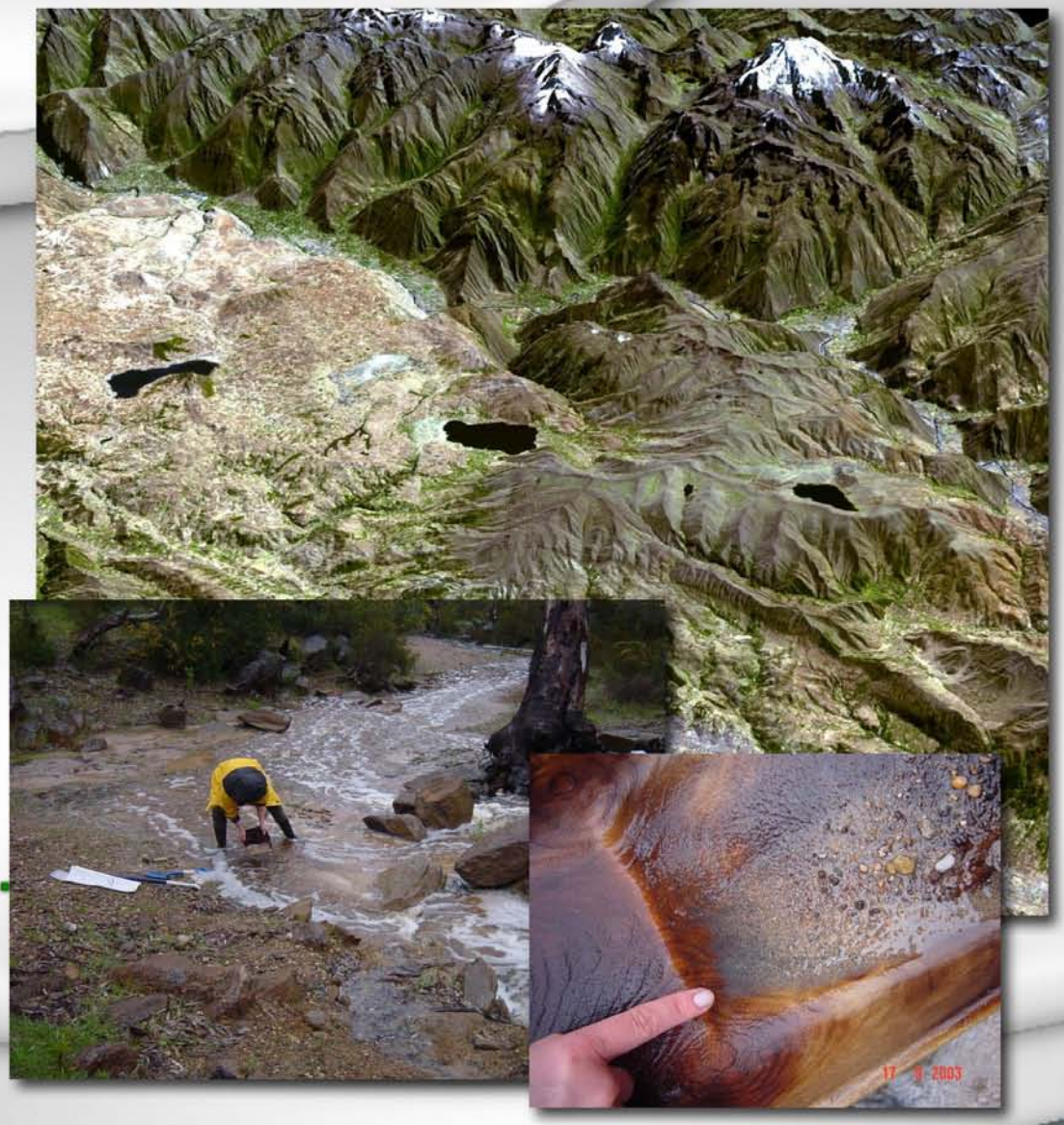
- ***TerraneChron®***

Probes inaccessible regions remotely:

**** rapid & cost effective***

Collect stream gravels - nature has sampled the mountains by erosion

Separate *zircon*…

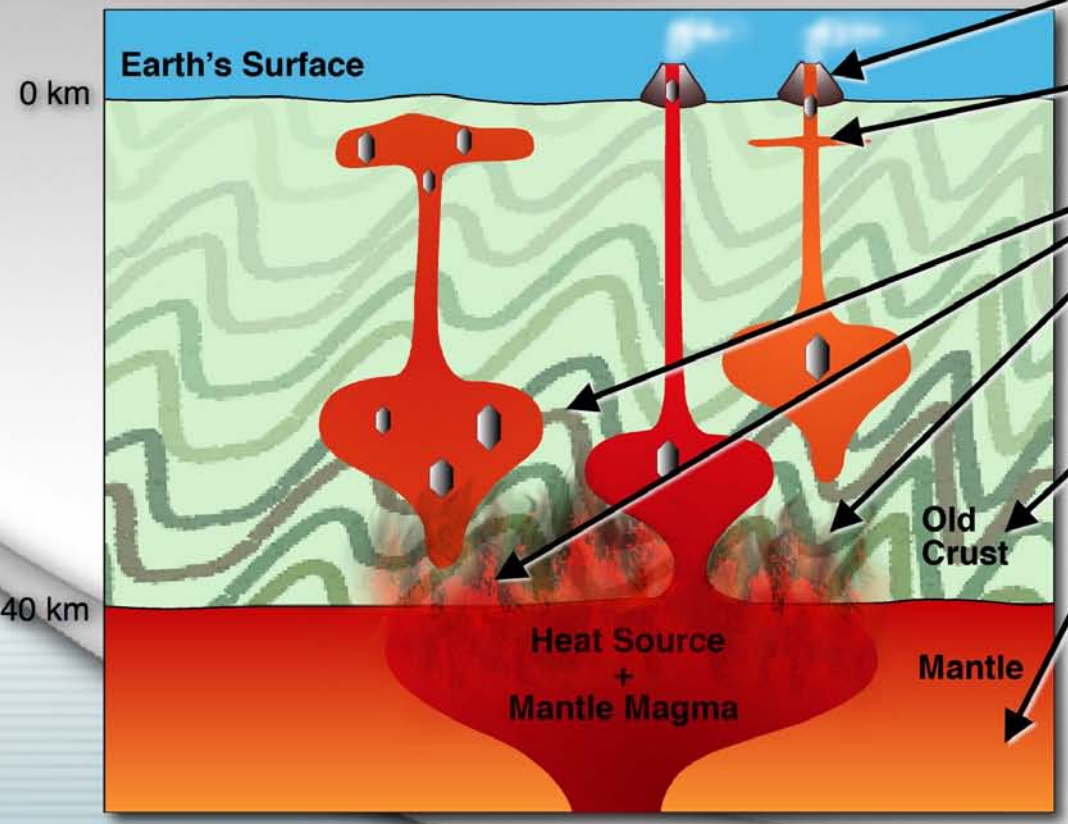


MACQUARIE UNIVERSITY

GEMOC

What *Zircon* Has to Offer...

CCFS

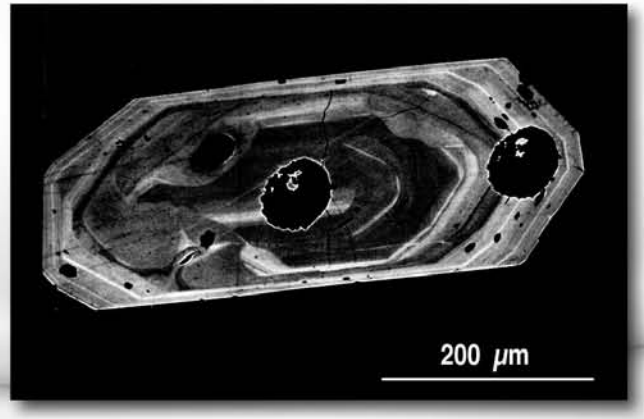


1 Age of magma (U-Pb)

2 Type of magma (TE)

3 Age of source region in deep crust (Hf isotopes)

4 Deep crust or mantle source?? (Hf, O isotopes)



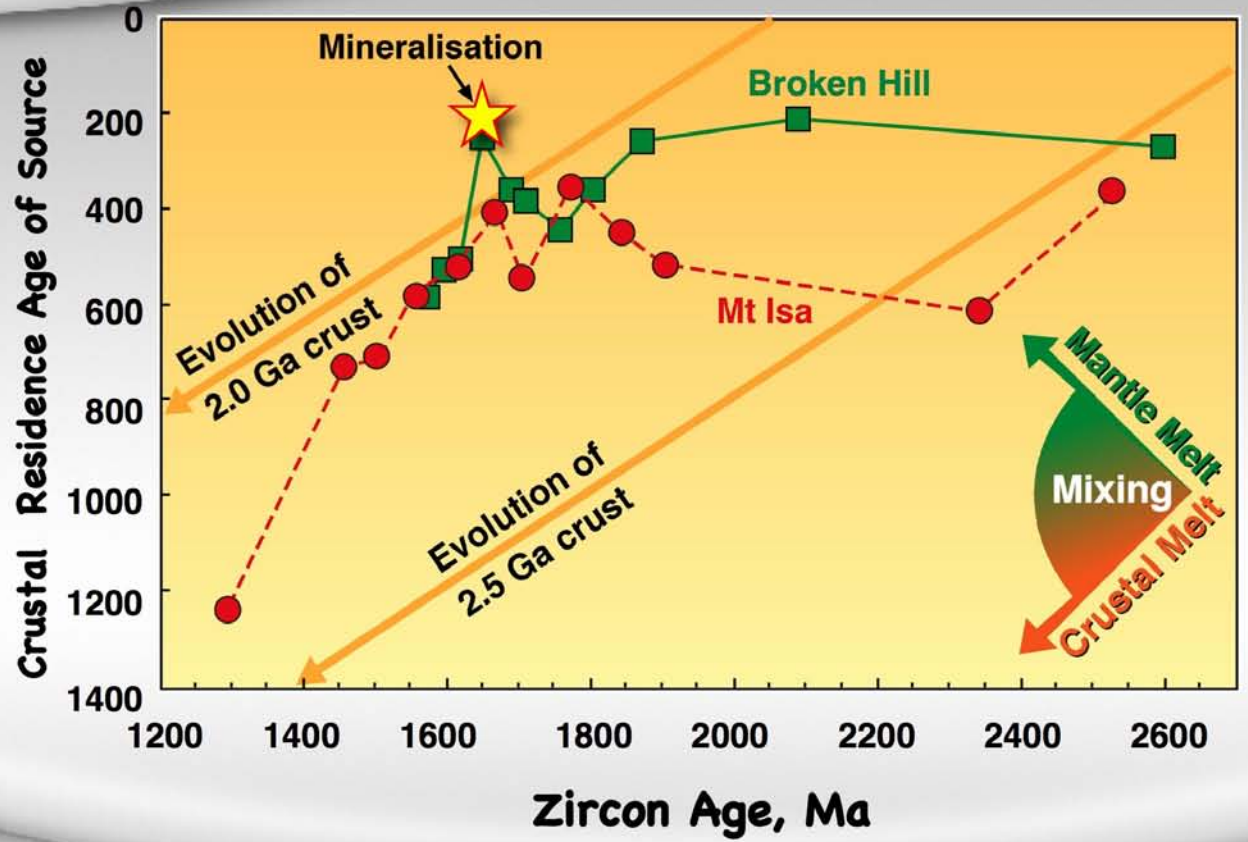
MACQUARIE UNIVERSITY

GEMOC

Event Signature

TerraneChron®
for Mt Isa and Broken Hill

Tracking relative geological histories



✓ ***Pinpointing time of mineralisation***

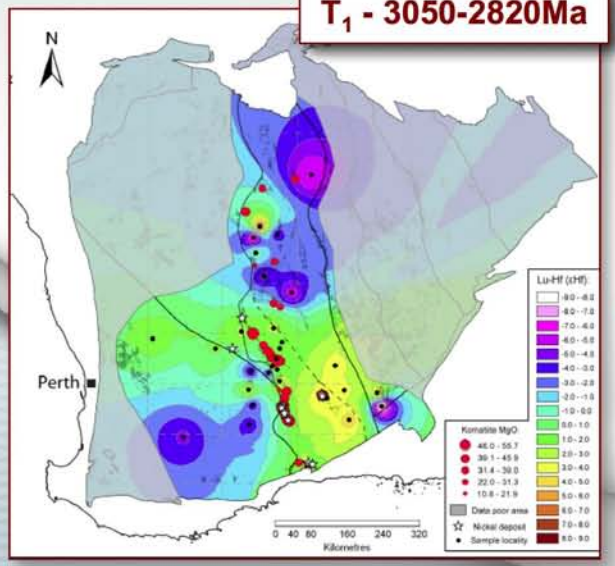
Hf-isotope mapping
"Paleogeophysics/paleaotectonics"

CCFS

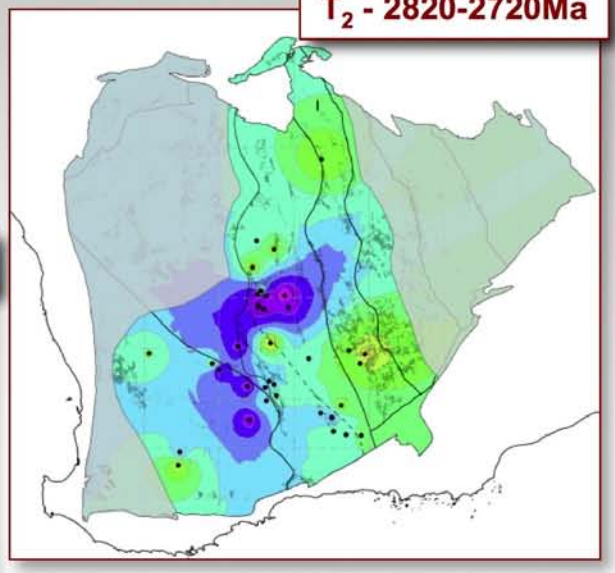
Lithospheric architecture of Yilgarn Craton by time-slices

Mole et al., 2014 PNAS (in rew.)

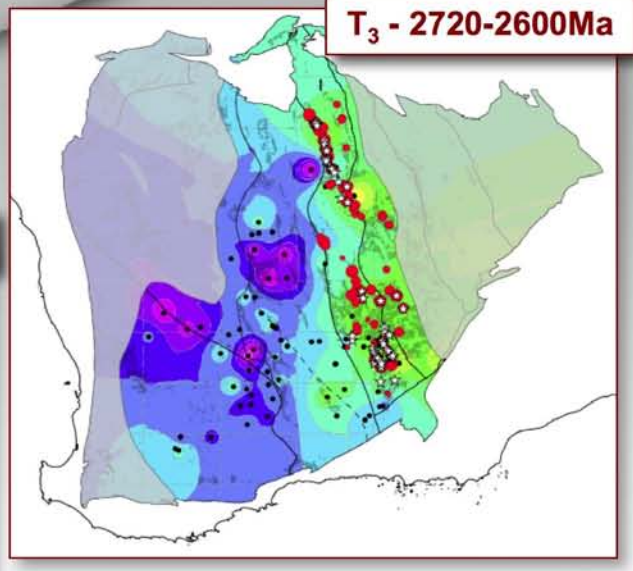
T_1 - 3050-2820Ma



T_2 - 2820-2720Ma



T_3 - 2720-2600Ma



εHf as a proxy for lithosphere thickness:

- ✓ potential to delineate crustal domains
- ✓ first-order control on the location, character, geochemistry and prospectivity of a komatiite system

MACQUARIE UNIVERSITY

GEMOC