

# Outline

## Intrusion-related mineral systems of north-east Queensland – GSQ-funded collaborative research project (2014-2017)

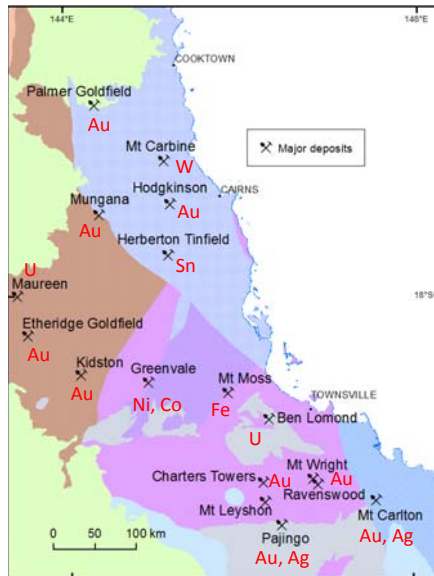
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Geological Survey of Queensland

- This seminar focuses on results of the current 3.5-year GSQ-funded project
- Project background and history
- Results have been progressively reported since 2015 – most are summarised today
- Final project deliverables are getting finalised

Townsville, 7 December 2017

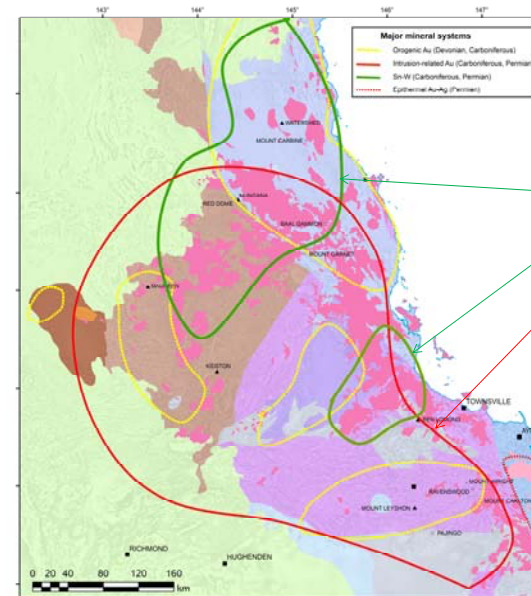


## Project area



- Rich metal endowment:
  - Au (-Ag) – Charters Towers (6.5 Moz), Kidston (5 Moz), Pajingo (5 Moz), Ravenswood (4 Moz), Mt Leyshon (3 Moz), Mt Carlton (>2.2 Moz), Palmer (1.5 Moz), Mt Wright (1 Moz)
  - Sn, W – Herberton, Mt Carbine
  - Ni, Co, Pb, Zn, Cu, Fe, U, Mo...
- Limited new discoveries since Mt Carlton (2006)
- What research could help?

## Initial problem statement (2013)



- Several distinct partially overlapping mineral systems:
  - Orogenic Au
  - Sn, W
  - Intrusion-related Au
  - Epithermal Au-Ag
  - Porphyry Mo-Cu
- Major knowledge gaps:
  - geochronology**,
  - deposit types,
  - mineralisation controls

## Project background

- **July 2013** – the Industry Priorities Initiative of Queensland Government: GSQ to assess and fund research proposals deemed most likely to assist mineral exploration
- Two high-ranking proposals focused on Permo-Carboniferous metallogeny of NE QLD: from EGRU and Terra Search – Klondike Exploration
- For efficiency and synergies between the groups, the proposals were amalgamated
- Facilitated by GSQ, the scope and structure of the combined project were defined, through extensive consultations between the groups – taking into account feedback from local industry (February 2014; May 2015)

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## Collaborative research on intrusion-related mineral systems in north-east Queensland

### Funding (2014-2017):

\$2.5 million from GSQ (Industry Priorities Initiative), additional funding from Evolution Mining, in-kind contributions from the collaborative partners

### Implementation:

Multiple sub-projects, performed as a collaboration between JCU, Terra Search, Klondike Exploration and GSQ

### Industry Support:

Evolution Mining, Carpentaria Gold, Vital Metals, Carbine Tungsten, Consolidated Tin, Mantle Mining, Ramelius, Basin Gold, Glencore - Copper, Auctus Minerals, ActiveX – and many other companies in NE Queensland

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## Research directions (2014)

- Geochronology of metallogenic and associated magmatic events across the region?
- Spatial extents of specific intrusion-related mineral systems – and their geochemical variants?
- Mineralogical and geochemical alteration signatures – recognising hydrothermal alteration?
- Geophysical expressions in regional and more detailed datasets?
- Consistent validated regional metallogenic datasets – geochemistry, shallow intrusions, solid geology?
- Exploration targeting – strategies, tools and targets?

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## EGRU (James Cook University)

- Dedicated research team: 3 post-docs, 6 JCU staff, 4 PhD students, 1 MSc student, Honours students
- Deposit and mineral district studies:
  - Mt Carlton epithermal Au-Ag-Cu deposit
  - Permian metallogeny of the northern Bowen Basin
  - Sn-W metallogeny
  - Wolfram Camp, Watershed, Mt Carbine, Chillagoe
- Magma fertility, geochemistry, prospectivity analysis
- JCU project leader – Dr Zhaoshan Chang

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## Terra Search – Klondike Exploration

- Updated geology of the Charters Towers and Ravenswood 1:100,000 mapsheets
- Geophysical and geochemical signatures of intrusion-related deposits in the Charters Towers Province
- Metallogeny of the Charters Towers Province
- Palaeozoic gold metallogeny of the Georgetown region of the Etheridge Province
- Project leaders – Dr Simon Beams and Dr Gregg Morrison

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## Major analytical datasets

- Extensive new geochronology over the entire region: igneous rocks, alteration and mineralisation
  - JCU – U-Pb - 150, Re-Os - 17, Ar-Ar - 42
  - Terra Search - >40 K-Ar dates from gold deposits in the Charters Towers and Etheridge provinces
  - Collaborative work, coordinated by GSQ: samples from GSQ, JCU and TS-K processed by GA, ANU and University of Alberta (Canada) – **Re-Os – 21**; U-Pb (SHRIMP) – 12; Ar-Ar – 6
- Multi-element geochemistry of alteration and mineralisation from numerous gold deposits
- Zircon isotope and trace element geochemistry

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## Reporting project results

- Seminar in Townsville and the Exploration Round-up in Charters Towers in May 2015 (feedback used to confirm research directions)
- GSQ-AIG-GSA seminar and GSQ Digging Deeper – Brisbane, 17-18 August 2016
- FUTORES II – Townsville, 4-7 June 2017
- This seminar – Townsville, 7-8 December 2017
- Special Issue of *Economic Geology* – in progress
- Terra Search reports on the Charters Towers Province – available on request from GSQ
- All final reports – to be released through GSQ's QDEX in early 2018

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## Questions, comments, feedback?

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