Australian Government

Geoscience Australia

Large-Scale Exploration Targeting for Uranium Mineral Systems within the Eromanga Basin.

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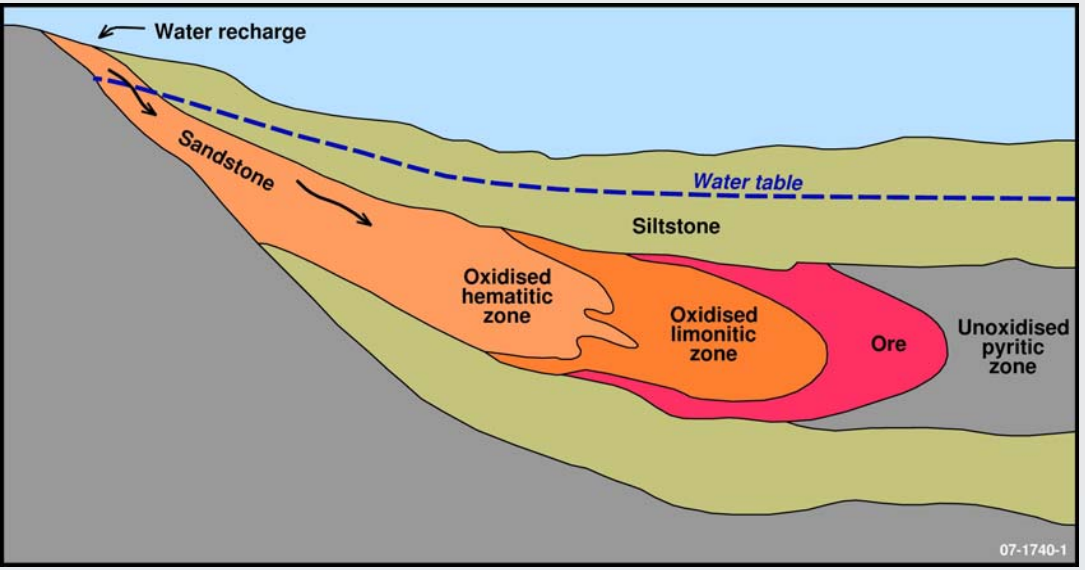
With contributions from: *Alison Kirkby, Allison Britt, Anthony Schofield, Roger Skirrow, Evgeniy Bastrakov, Andrew Cross, Malcolm Nicoll, Terry Mernagh, Andrew Barnicoat*.

Talk Outline

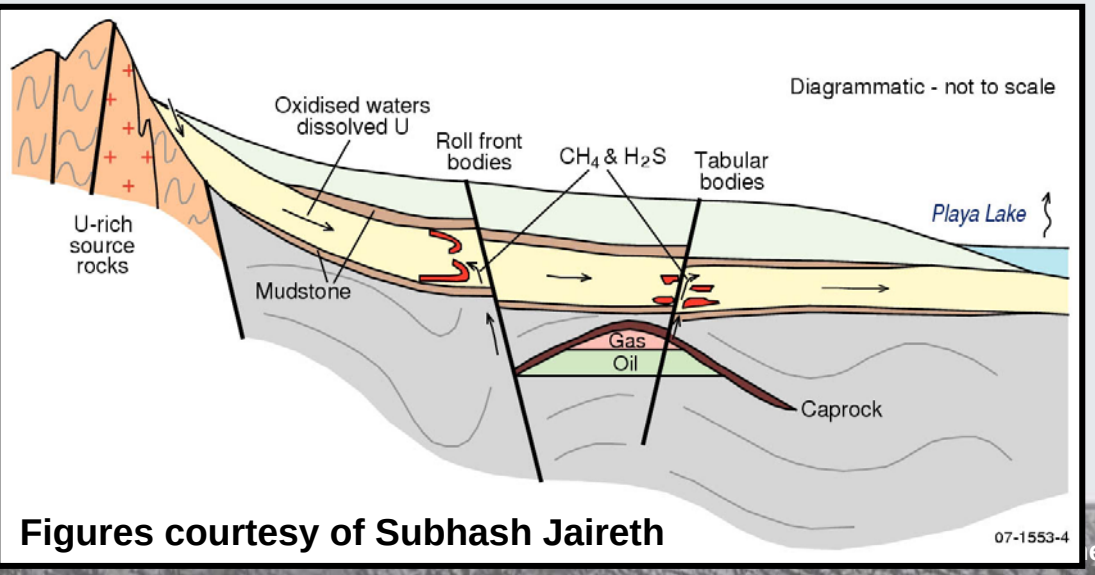
- **Sandstone hosted uranium system model**
- Locality map
- Methodology on how the Eromanga 3D map was constructed
- Eromanga Basin geology
- Prospectivity Analysis:
  - Euroka Arch region
  - Lake Eyre region
- Conclusions

Conceptual Sandstone U System Models



Single fluid model

- Oxidised fluid carrying Uranium.
- In-situ reductant.



Figures courtesy of Subhash Jaireth

Two fluids model

- Oxidised fluid carrying Uranium.
- Reduced (hydrocarbons or H_2S) fluid acting as a reductant.

Locality Map

Study Area

NW Corner: -150,000 mE;

-1,250,000 mN.

SE Corner: 1,700,000 mE;

-3,800,000 mN.

Eromanga Basin:

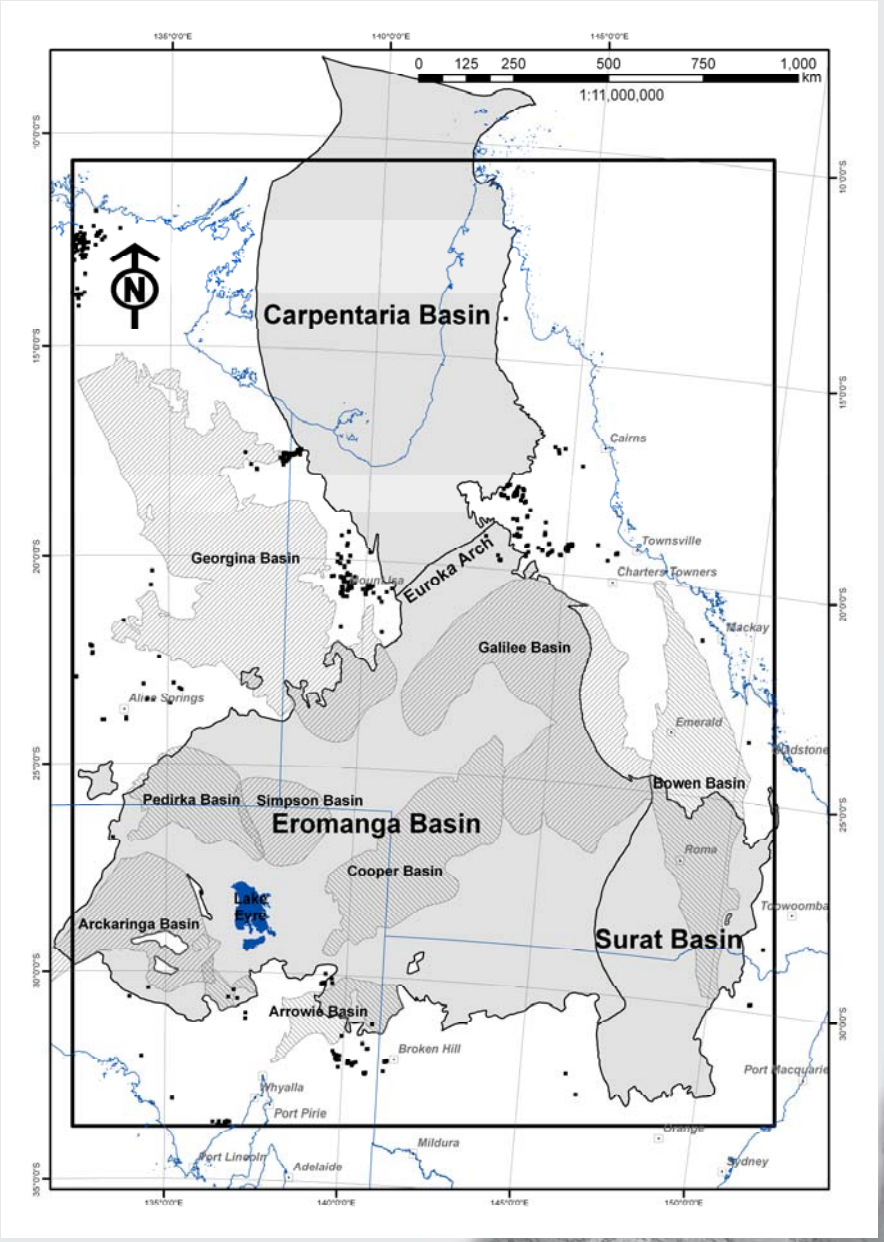
1,224,506 km^2

Surat Basin:

257,460 km^2

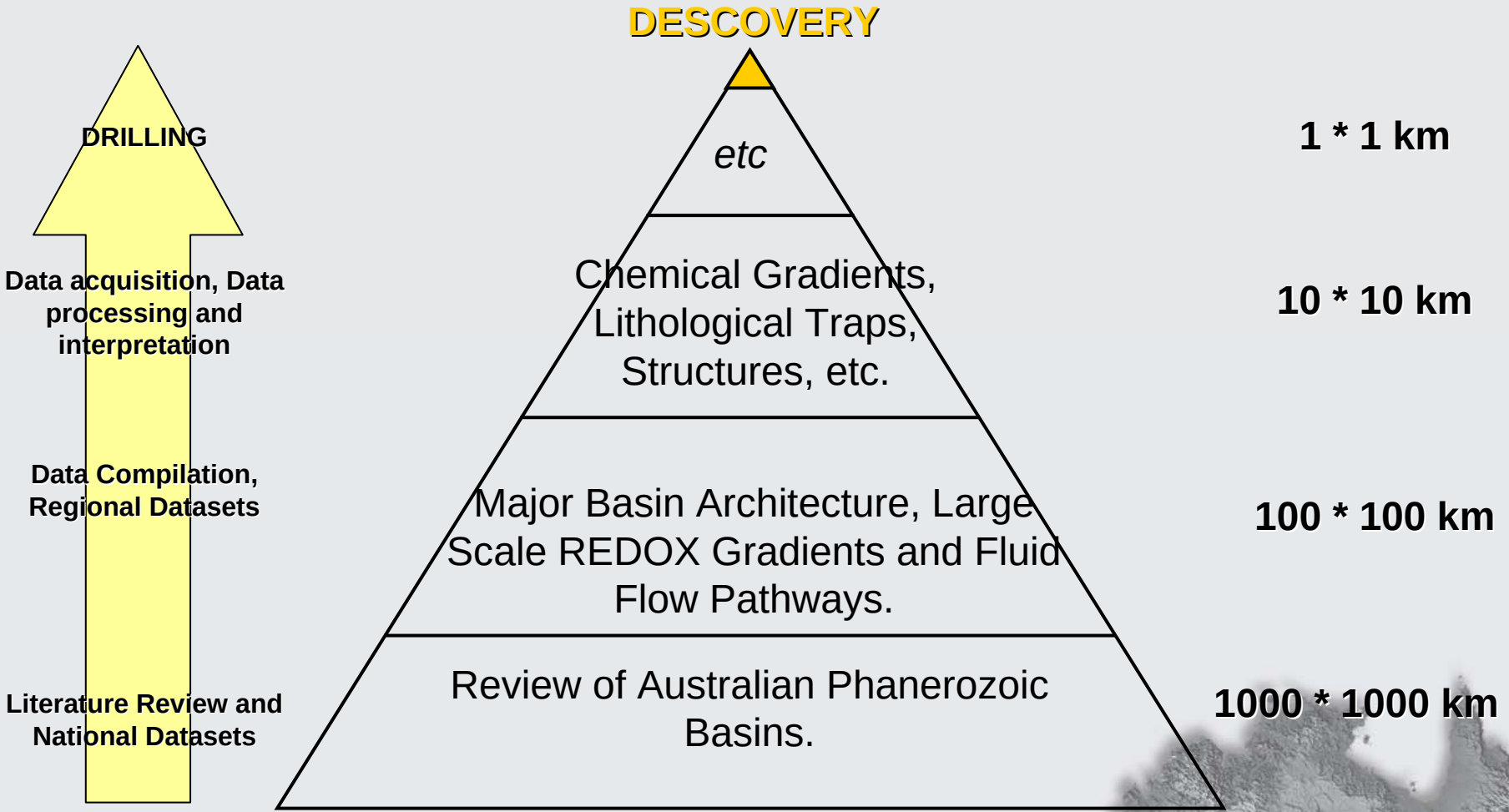
Carpentaria Basin:

696,090 km^2



AREA REDUCTION:

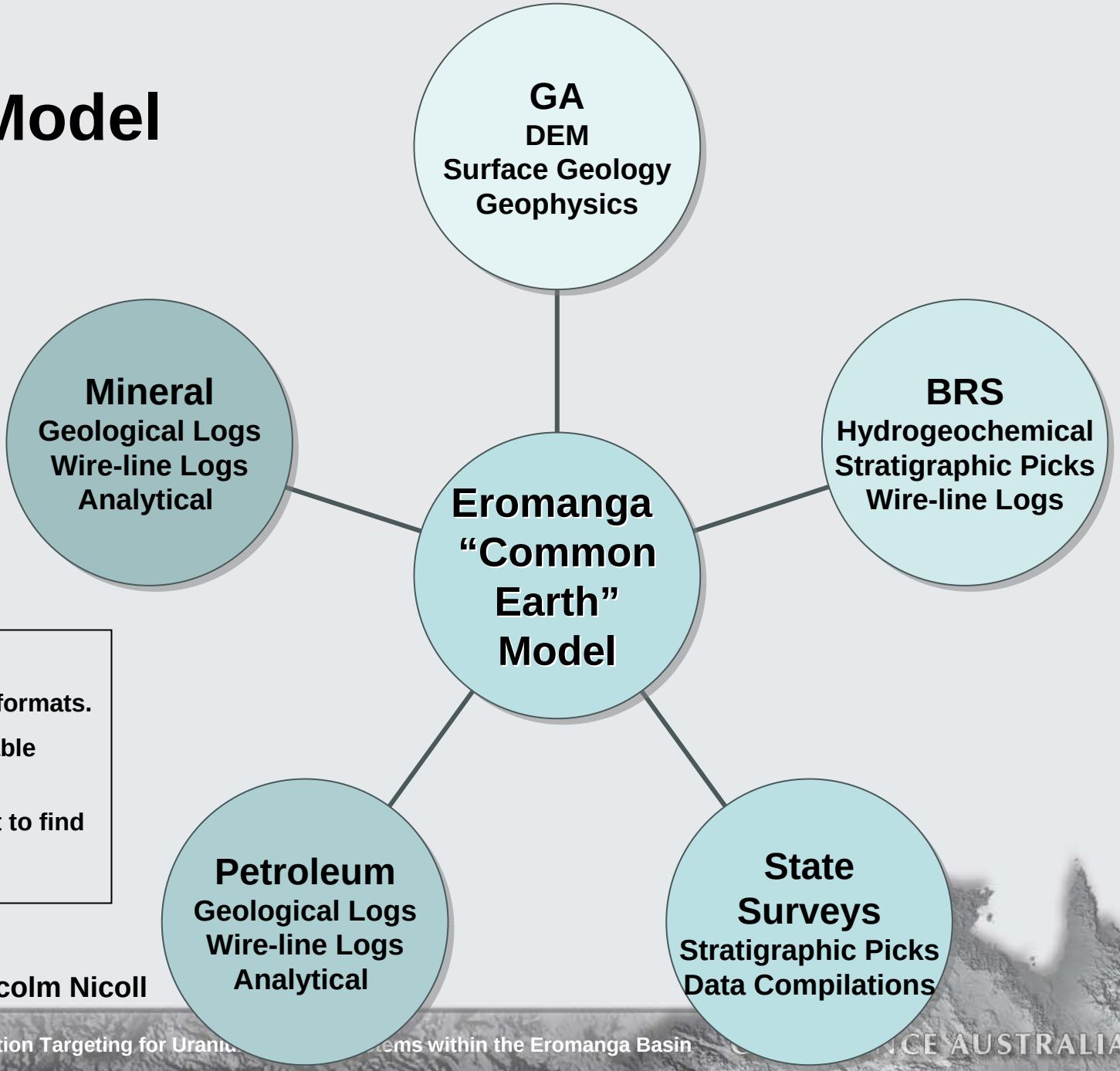
How do we reduce the area from size of western Europe (~2,000,000 km^2) to the size of Monaco (~2 km^2)???



The Approach…

1. **Integrate existing datasets into a 3D environment (this case gOcad)**
2. Use existing datasets to build a 3D map of the Eromanga Basin
3. Identify what datasets can be used to map the major mineral system ingredients
4. Produce a 3D minerals system assessment for the Eromanga Basin
5. Ground truthing**:** Conduct detailed geochemical and petrographic studies over areas highlighted to determine whether a uranium mineral system has been active

Data Model



Problems:

1. No consistent formats.
2. Data is of variable quality.
3. Data is difficult to find (not readily searchable).

Figure courtesy of Malcolm Nicoll

Stratigraphic Framework

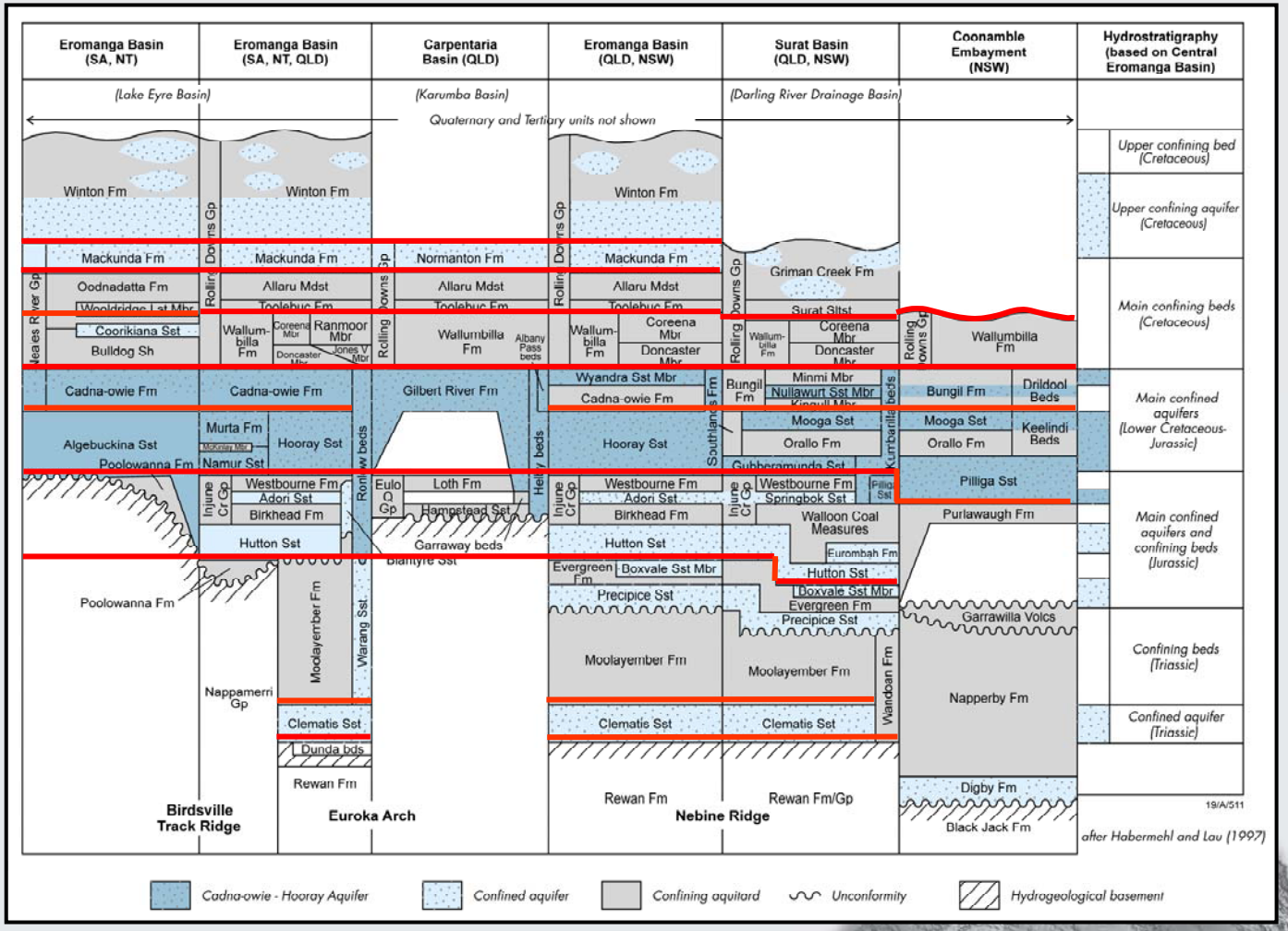
00_DEM (Topography)

01_Ksrw (Winton)
02_Ksrm (Mackunda)
03_Klro (Toolebuc)
04_Ksr (Rolling Downs)
05_Ksco (Cadna-owie)
06_Jsyh (Hooray)

07_Jsbh (Hutton)

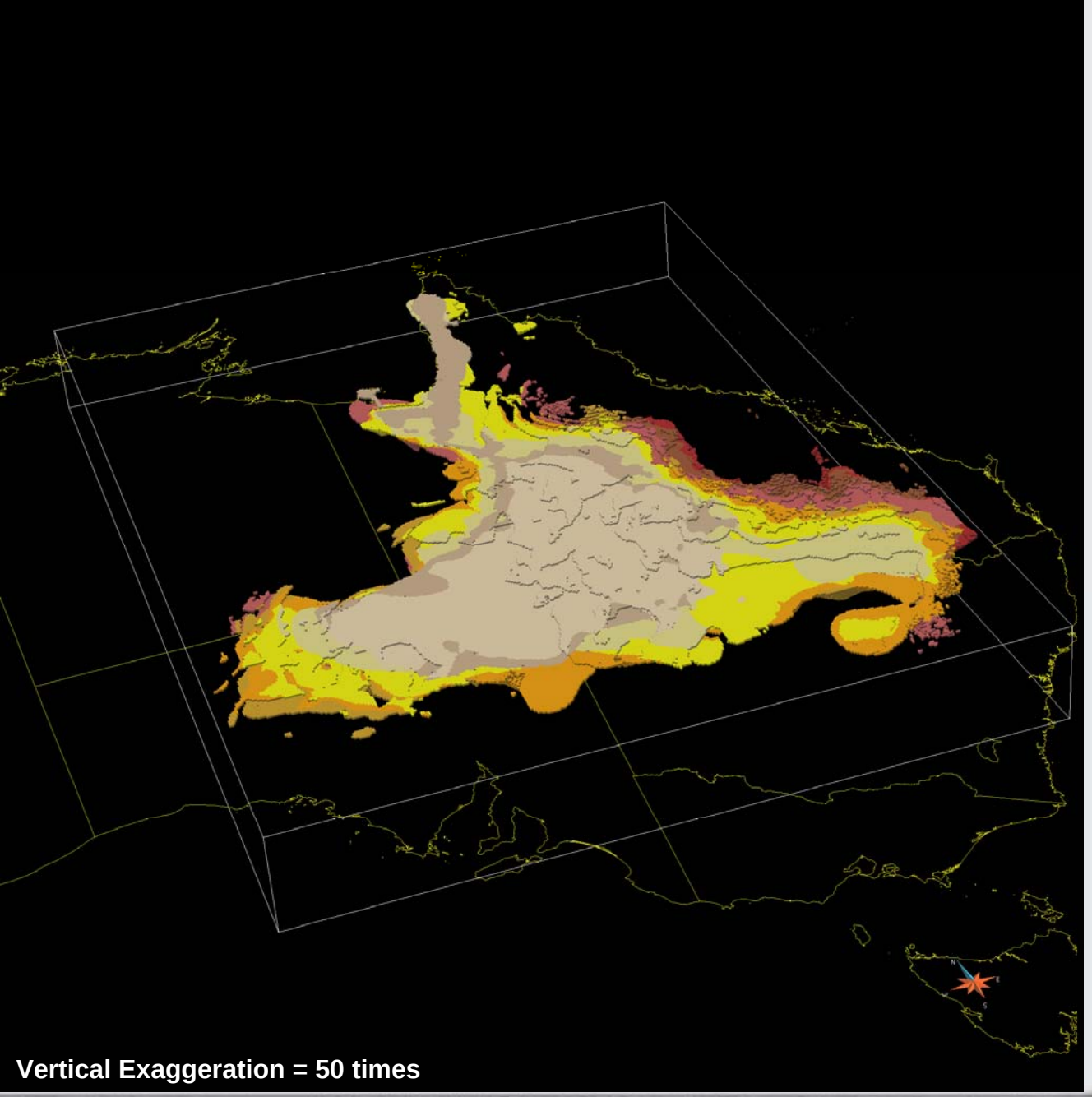
08_Rsmo (Moolayember)
09_Rsl (Clematis)

10_Basement



Radke et al., 2000

Production of a 3D Geological Block Model (gOcad voxet)



Vertical Exaggeration = 50 times

01_Ksrw (Winton)

02_Ksrm (Mackunda)

03_Klro (Toolebuc)

04_Ksr (Rolling Downs)

05_Ksco (Cadna-owie)

06_Jsyh (Hooray)

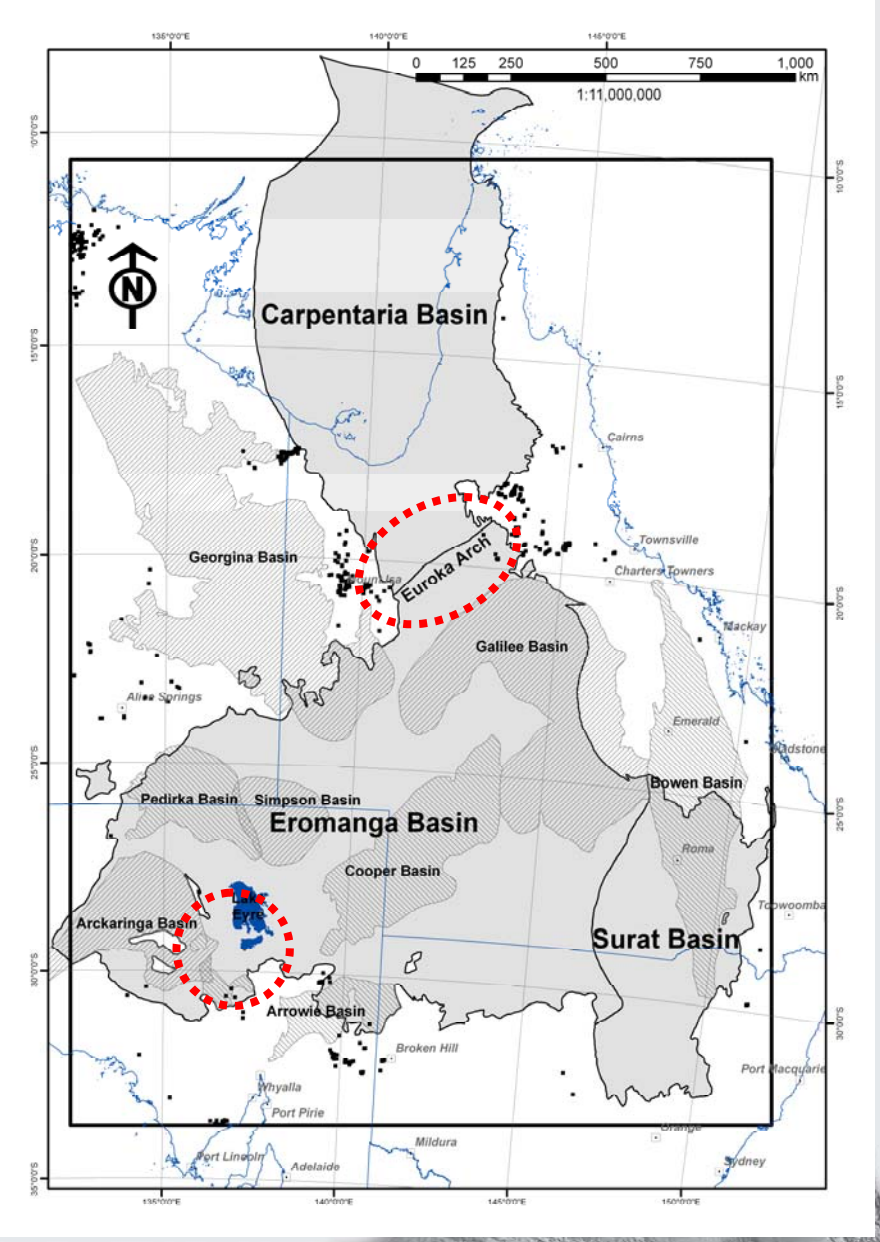
07_Jsbh (Hutton)

08_Rsmo (Moolayember)

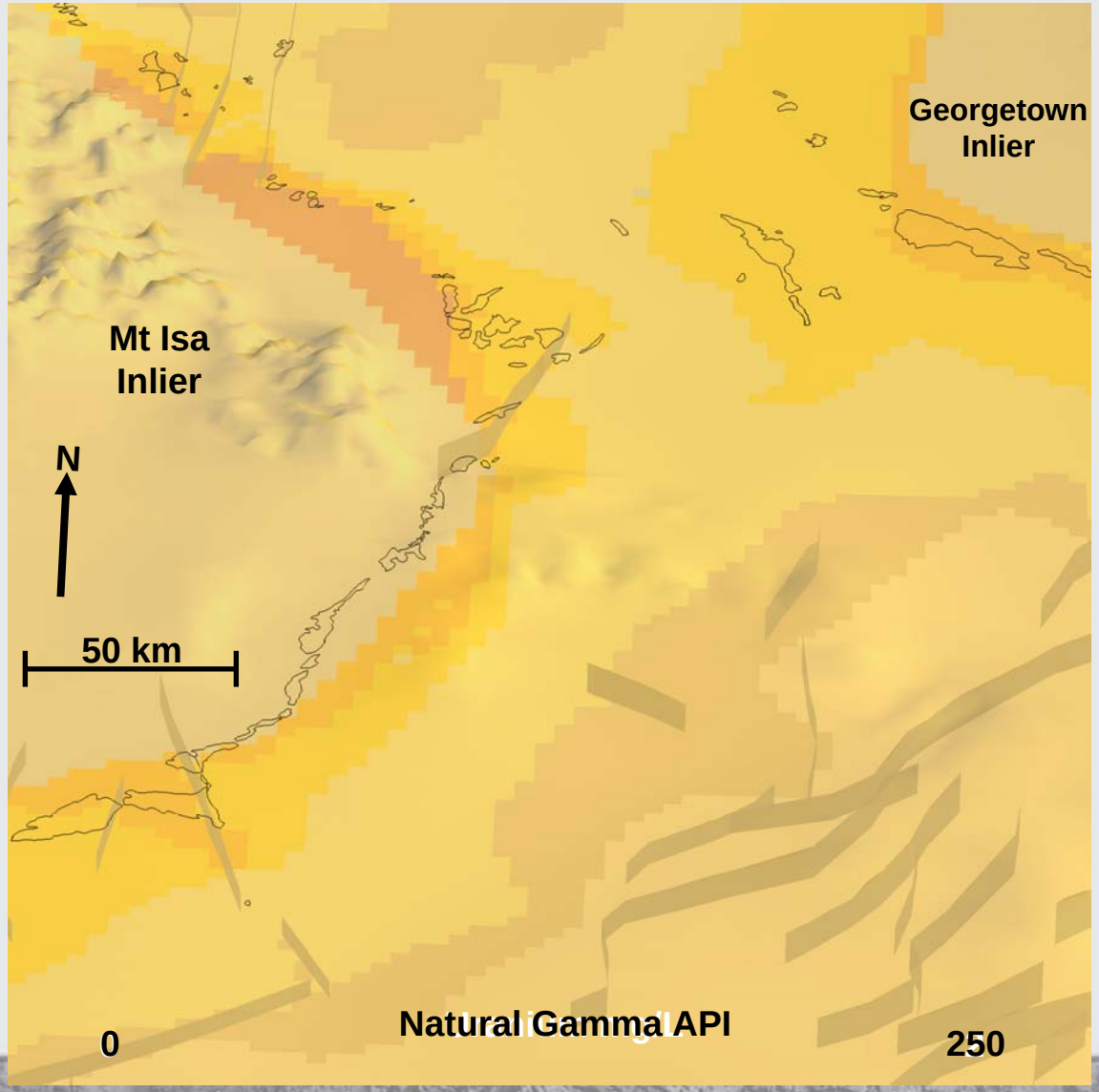
09_Rsl (Clematis)

Targets

- Target One
  - Euroka Arch
- Target Two
  - Lake Eyre Region

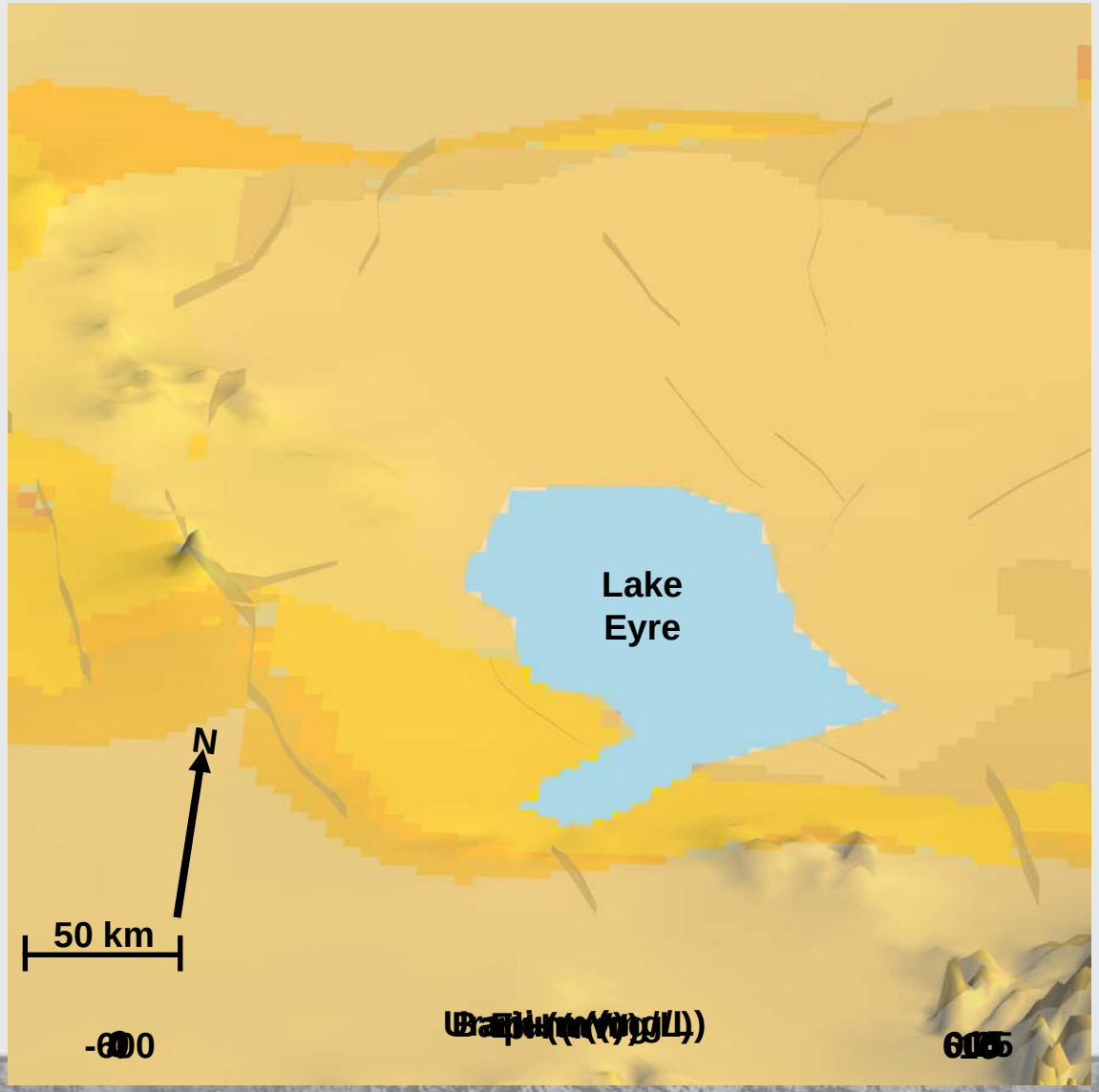


Euroka Arch



- **DEM surface**
- Geology
- Natural Gamma
  - Logs (black)
  - Gridded Data
- Radiometrics
  - Uranium on DEM
- Hydrochemistry
  - Points
  - Gridded Uranium

Lake Eyre



- **DEM Surface**
- Geology
- Hydrochemistry
  - Points
  - Gridded Eh
  - Gridded Ba
  - Gridded pH
  - Gridded U

Conclusions

- **Applying Mineral System concepts reduces exploration risk by rapidly decreasing the search area**
- First time disparate datasets for the Eromanga Basin have been integrated and visualised together
- The Eromanga 3D Map has potential applications to other geoscience research:
  - Geothermal prospectivity
  - Petroleum prospectivity
  - Groundwater studies
  - Carbon Capture and Storage (CCS) studies