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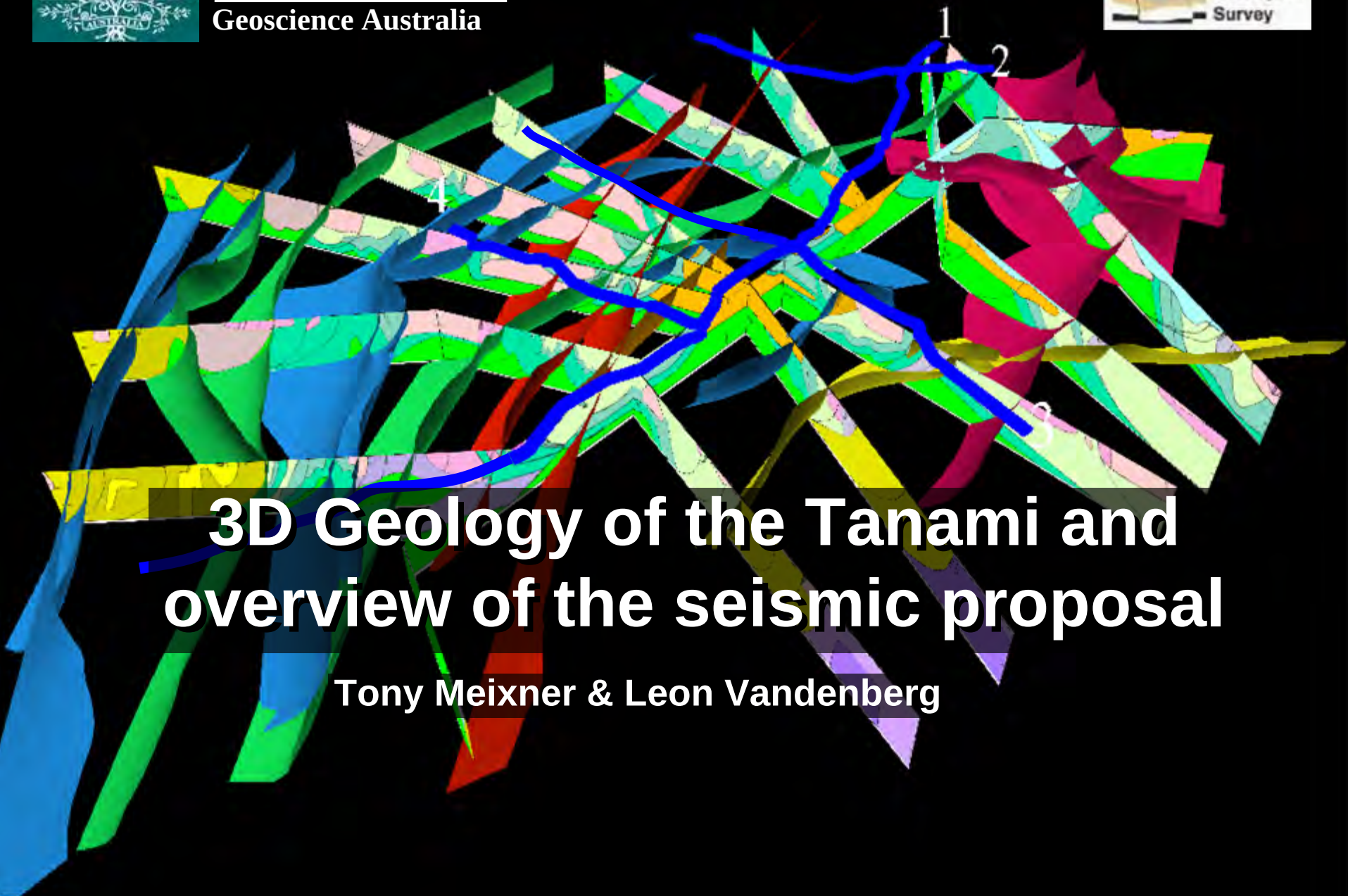

3D Geology of the Tanami and overview of the seismic proposal

Tony Meixner & Leon Vandenberg

The Tanami 3D model

Tony Meixner[1] Leon Vandenberg[2]

(GA[1]- NTGS[2] collaborative)

Acknowledgements

Richard Larson (GoCad), Malcolm Nicoll (GoCad),

David Beard and team (VRML)

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Building the 3D model

Step 1 - Strip off the cover

- Geological mapping, drill hole information
- Interpretation of Magnetic and Gravity images

Solid geology interpretation maps

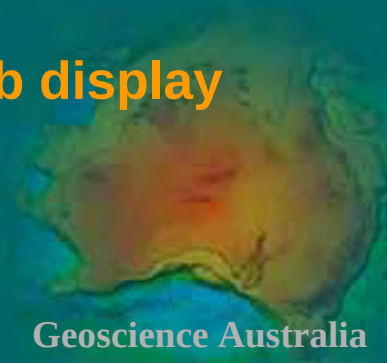
Step 2 - Construct 2D modelled sections

- Generate a series of 2D geological sections
- Tested by potential field (Gravity and Magnetics) forward modelling incorporating rock property data (~250 samples)

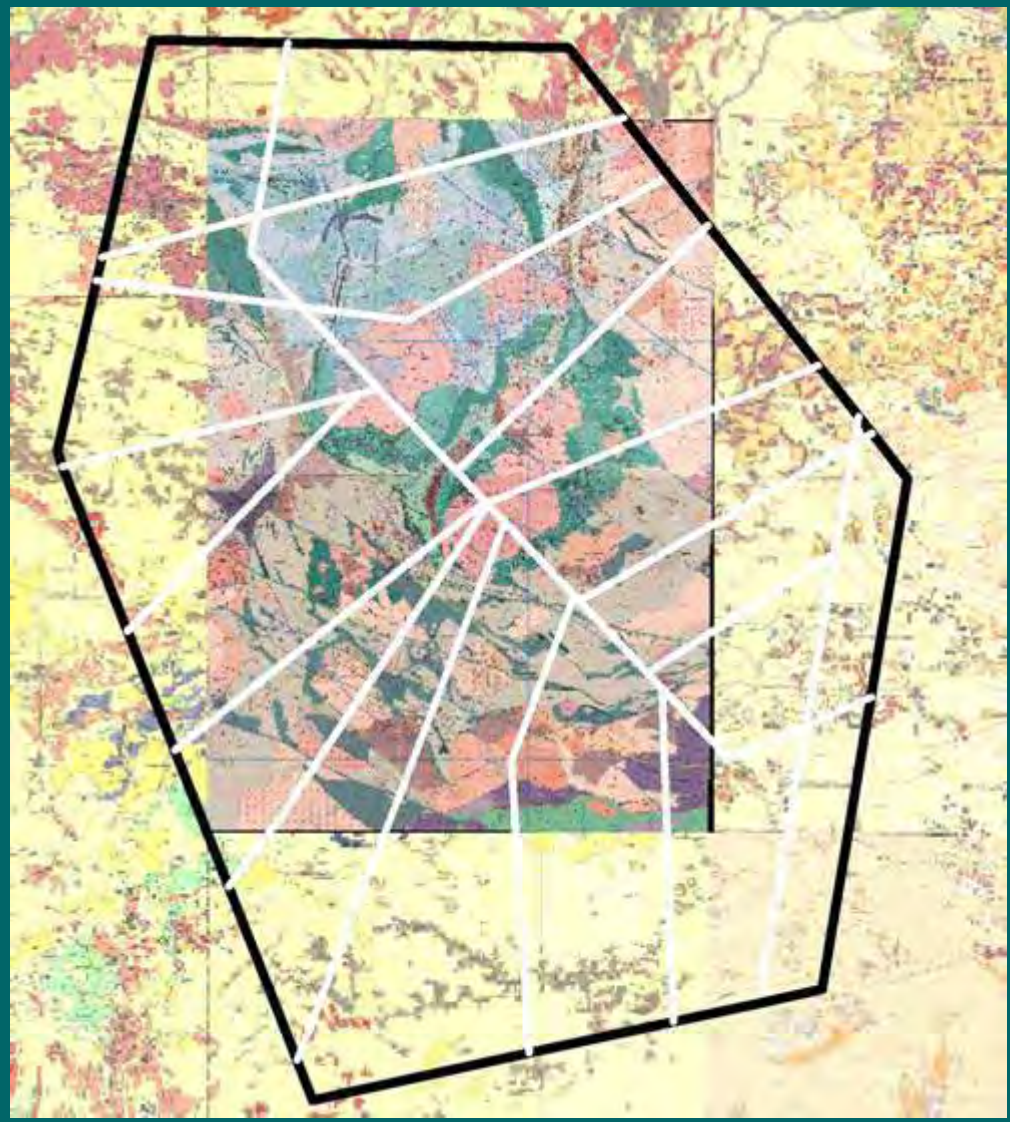
Integrating Geology and Geophysics

Step 3 - Constructing 3D geometries

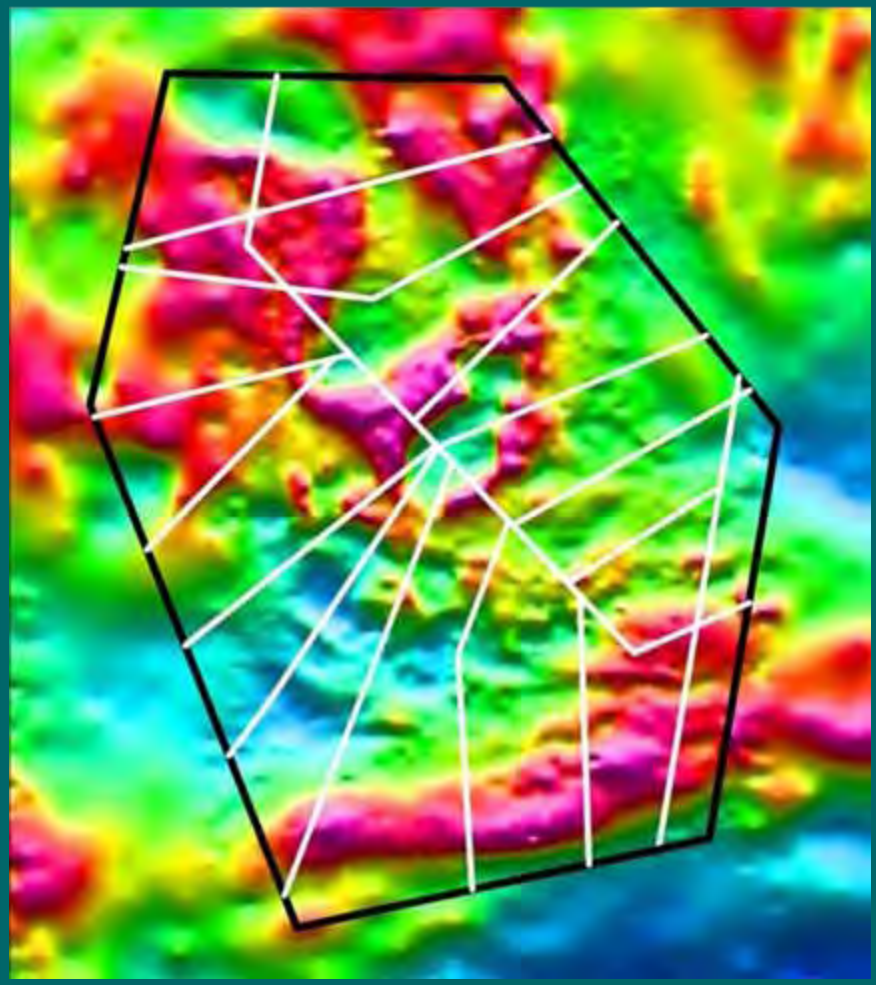
- Generate 3D surfaces in GoCad
- Importing the 3D surfaces into VRML language for web display



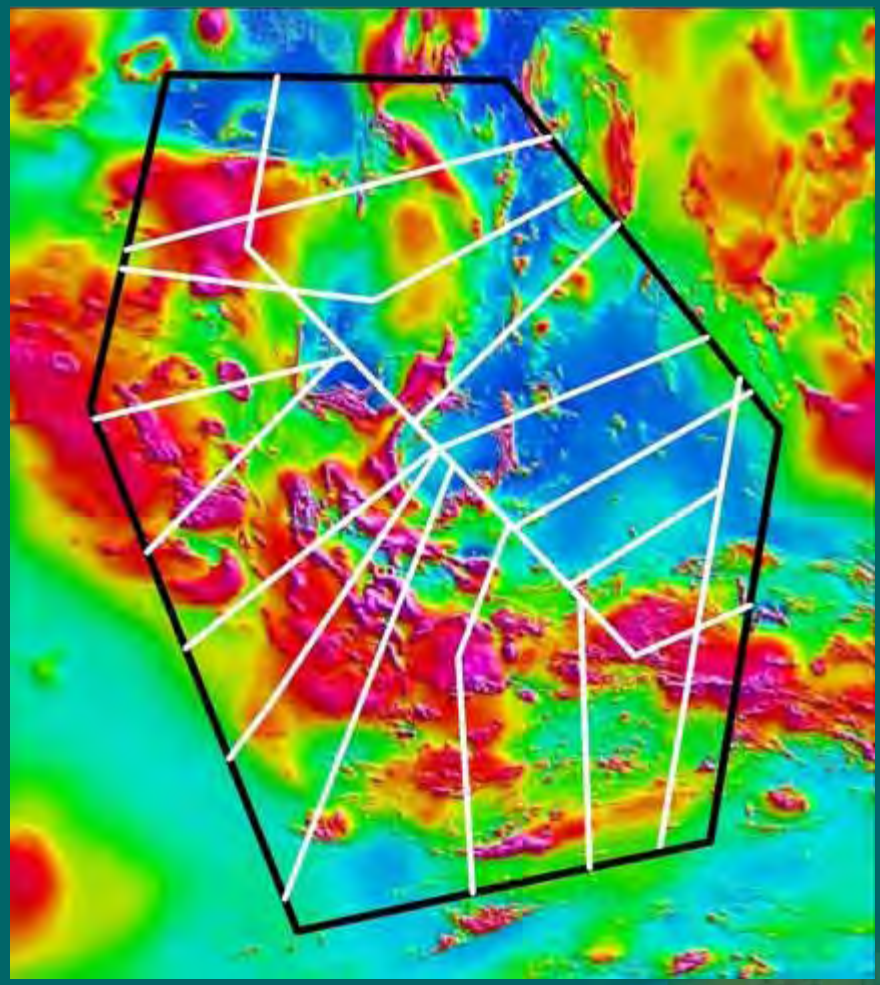
Geological section location



Geological section location

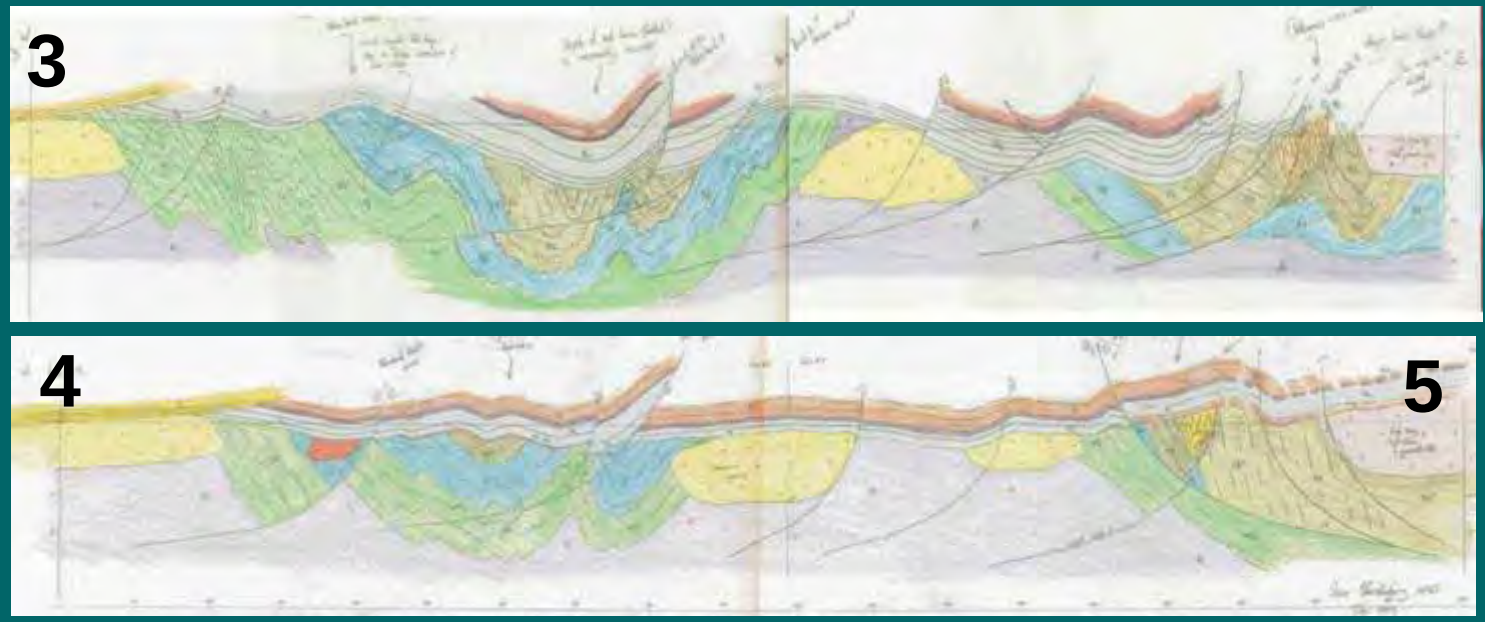


Gravity image



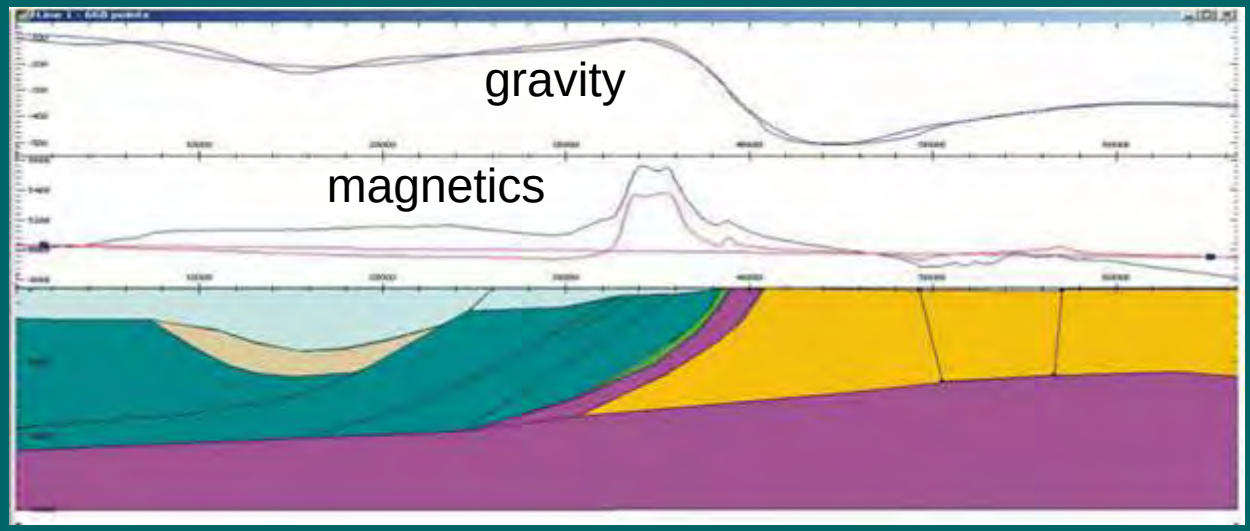
Magnetic image

Geological cross-section construction

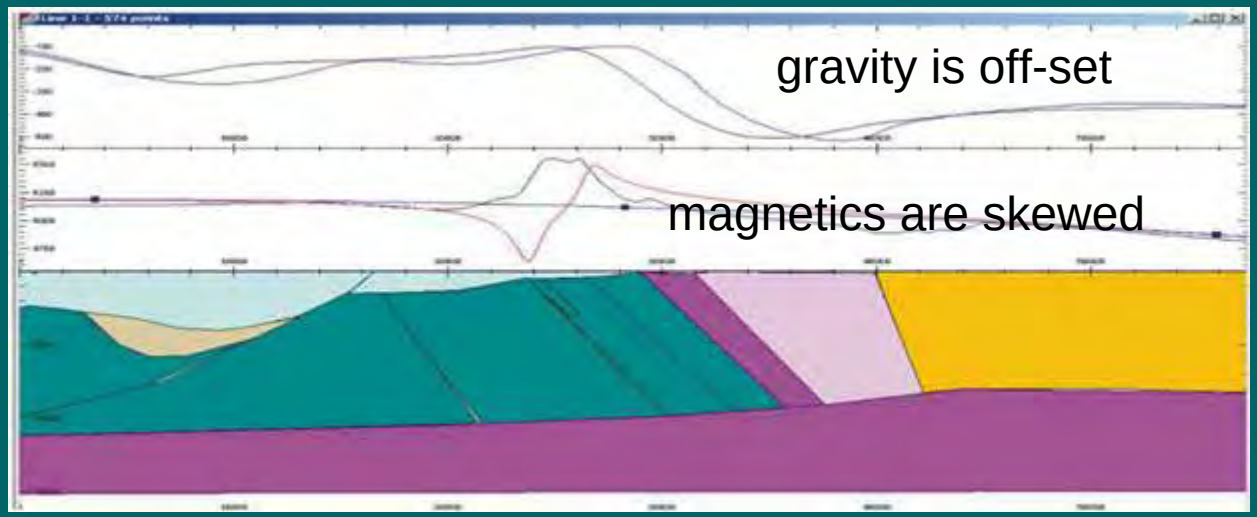


- Sections through the cover are relatively straight forward
- Sections through underlying Tanami basement are not so easy...
  - extrapolation of field data from off section
  - reliance on solid geology interpretation maps
- Consistency of major geometrical relationships through adjacent sections

Testing alternative geometries

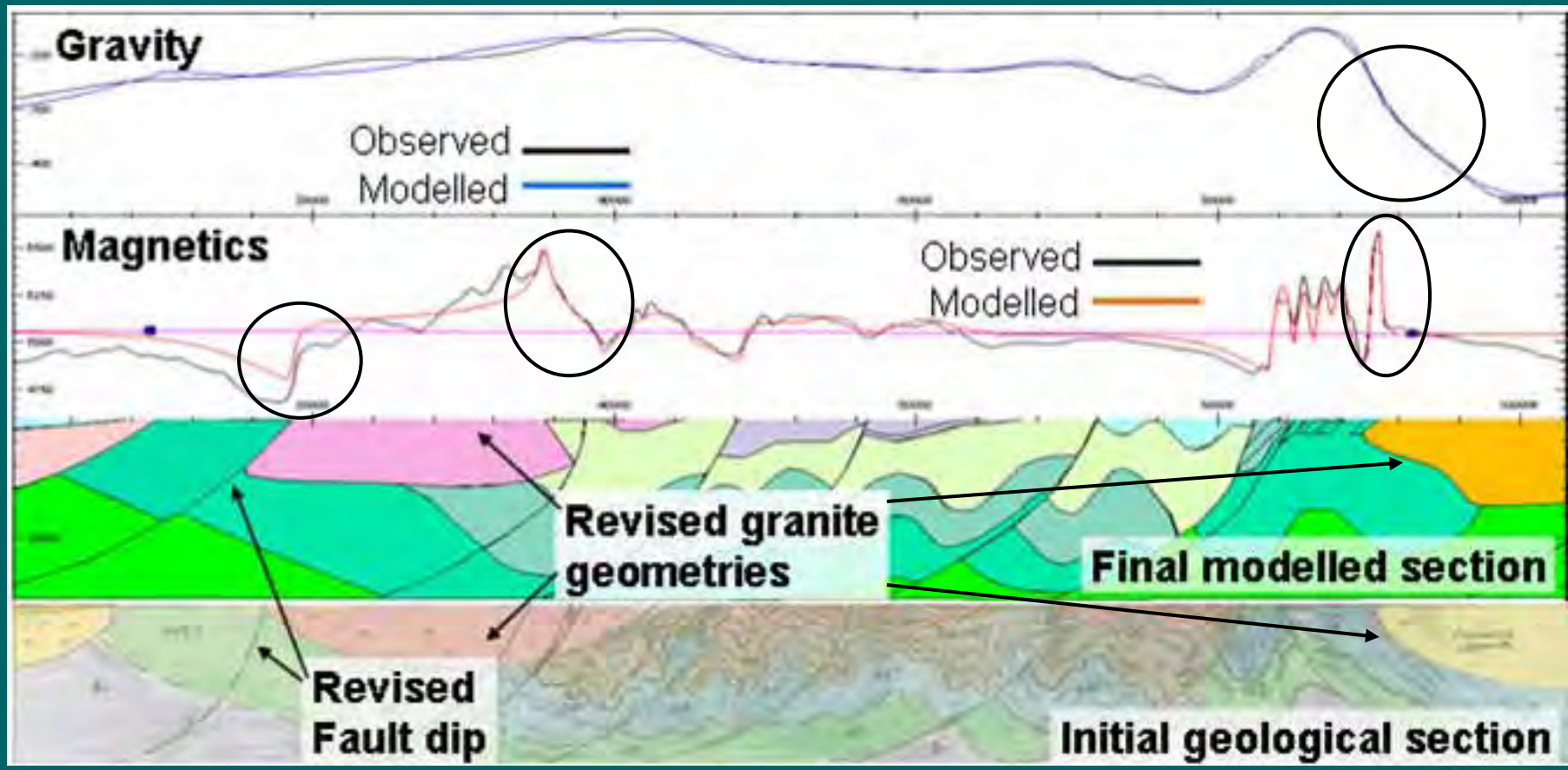


Section 1 model corresponding to cross-section



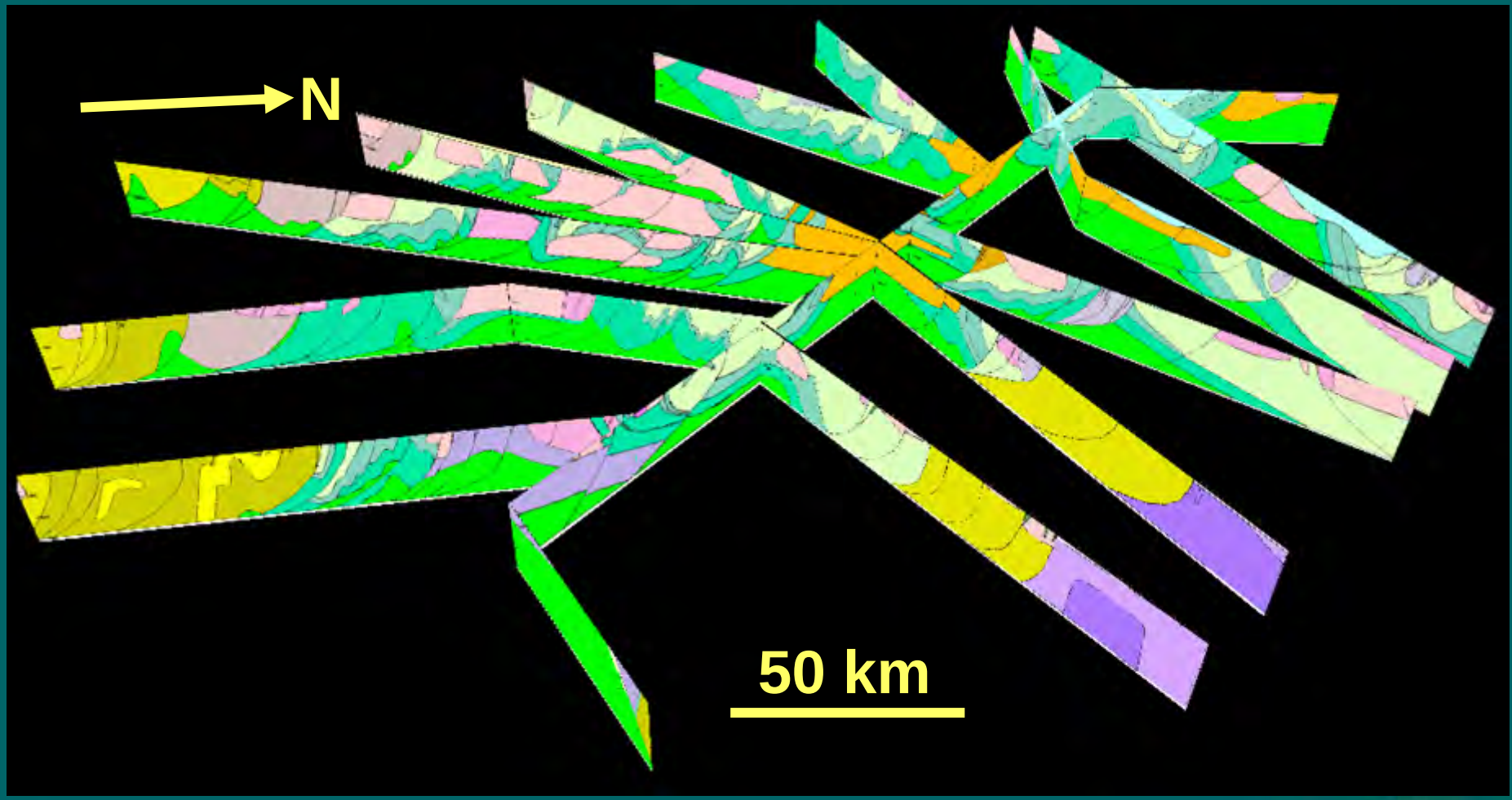
Section 1 reversed

Testing the geological sections



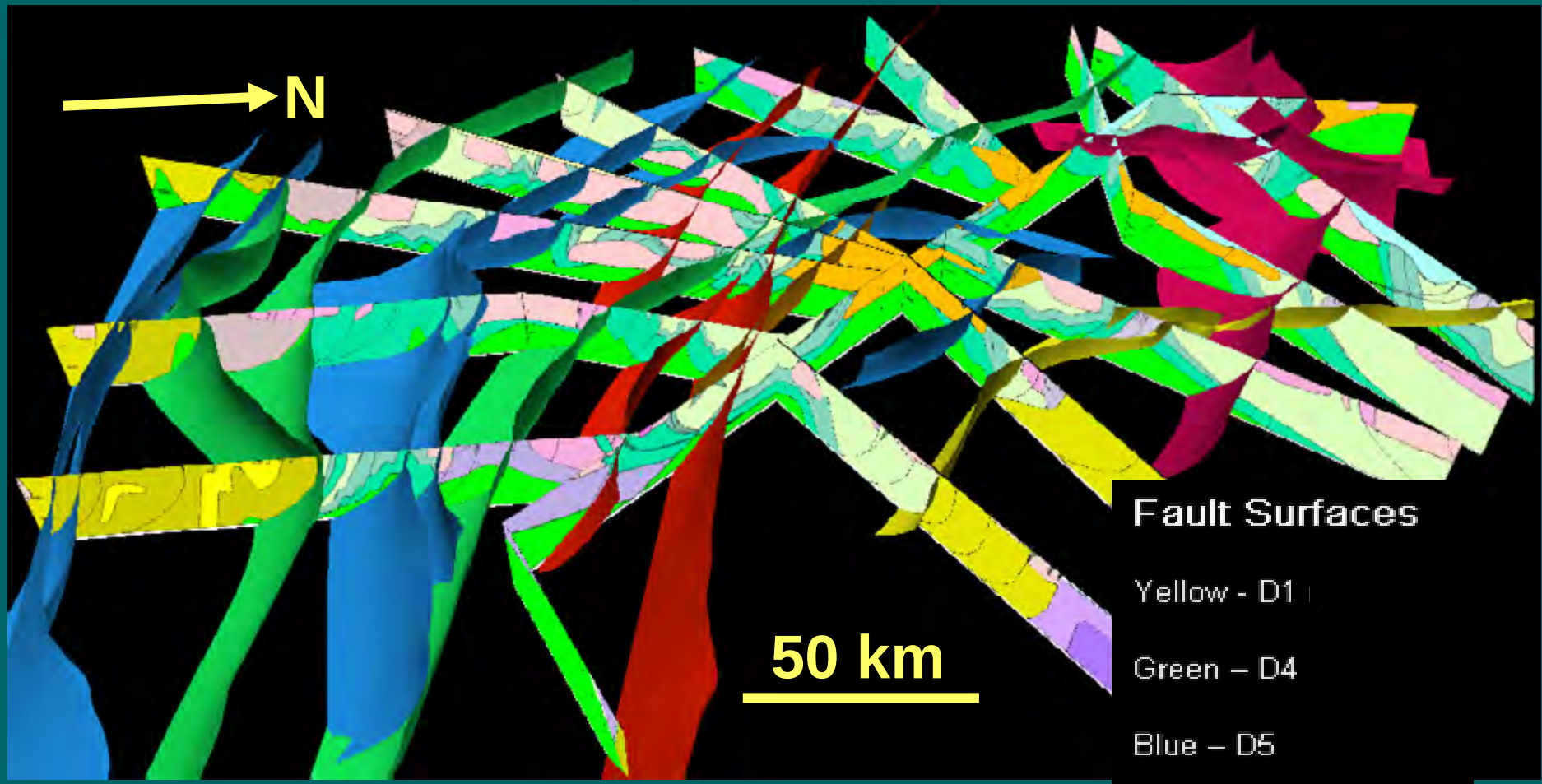
Section 7

2D modelled sections

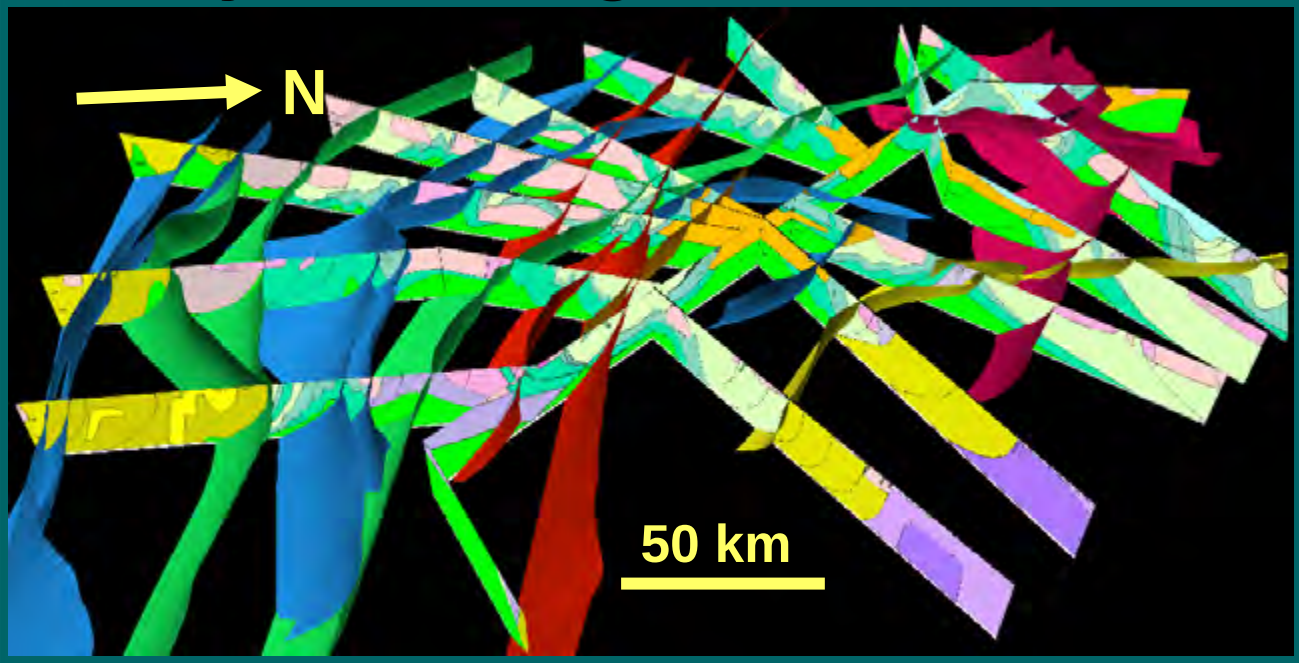


- Consistent with mapped geology
- Consistent with solid geology interpretations
- Consistent with magnetic and gravity data

3D surface generation – GoCad



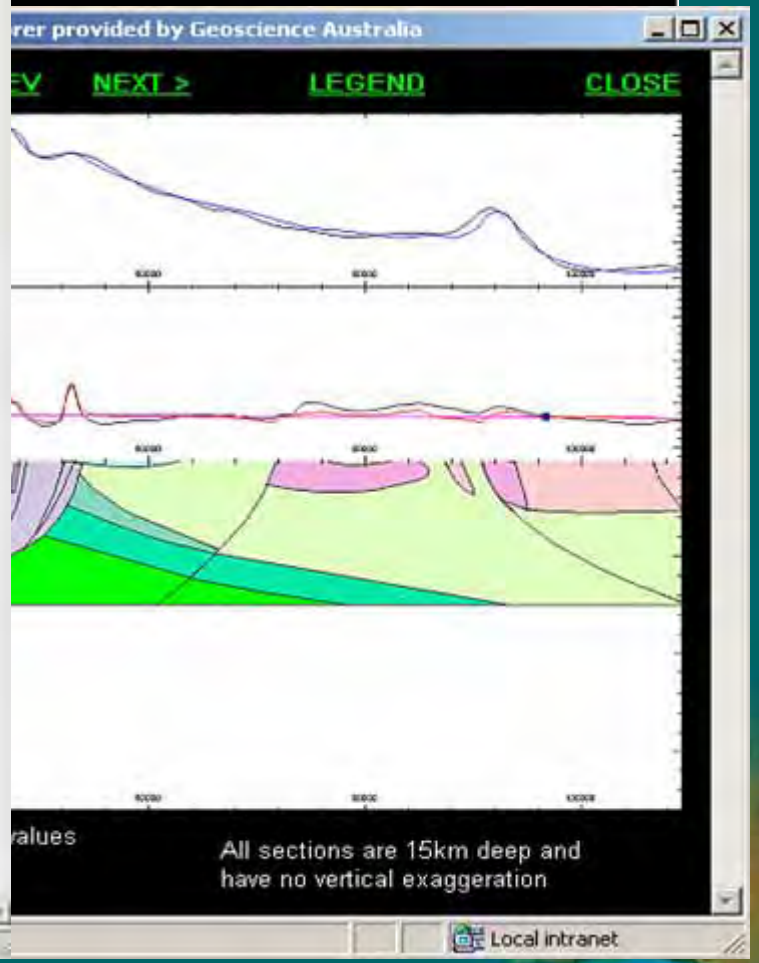
Major findings derived from the modelling



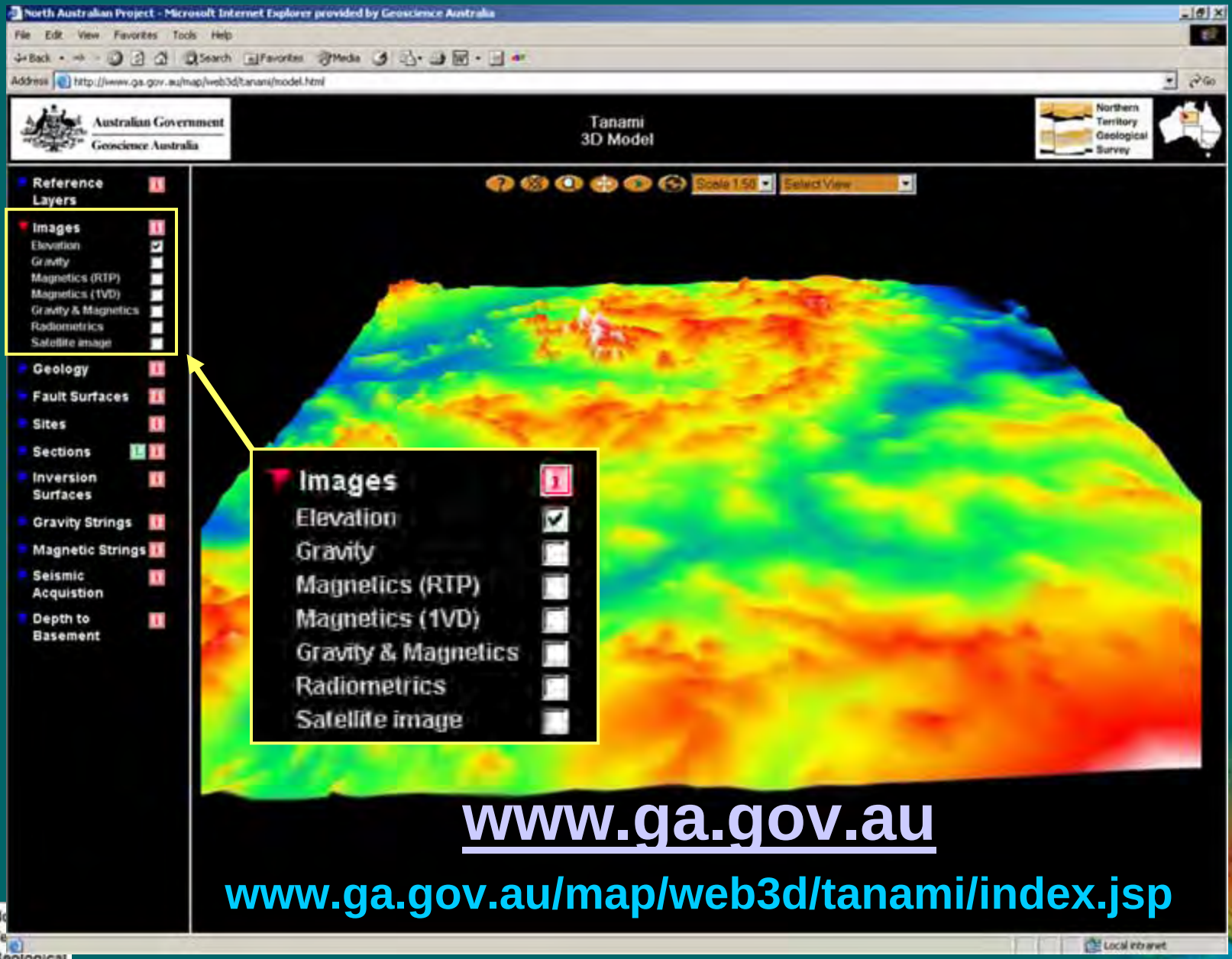
- Large granite bodies (Coomarie, Frankenia and Browns Range) up to 8 km thick
- Birrindudu cover up to 5 km thick
- West of Coomarie granite stratigraphy and structures are dominantly west dipping

- East of Coomarie granite stratigraphy has easterly dips
- Main regional folds are approximately 10-25 km in wavelength
- Granite cored doubly-plunging antiformal structures occur in the south-west
- Tanami stratigraphy probably underlain by Archaean basement
- Willowra gravity ridge coincides with north dipping Archaean basement and Proterozoic basement of higher metamorphic grade – suggesting uplift of deeper crustal levels

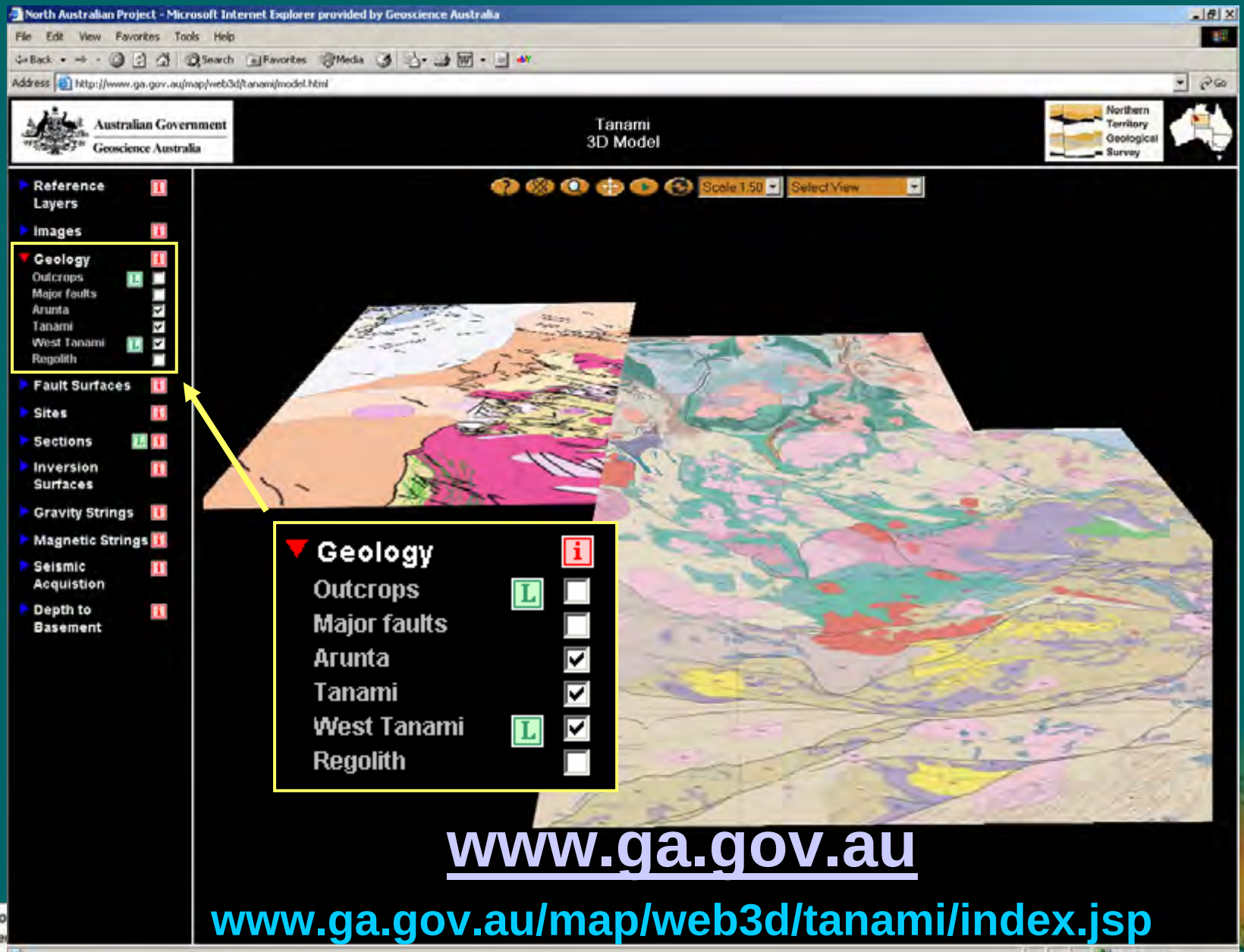
Web viewable – VRML



Web viewable – VRML



Web viewable – VRML



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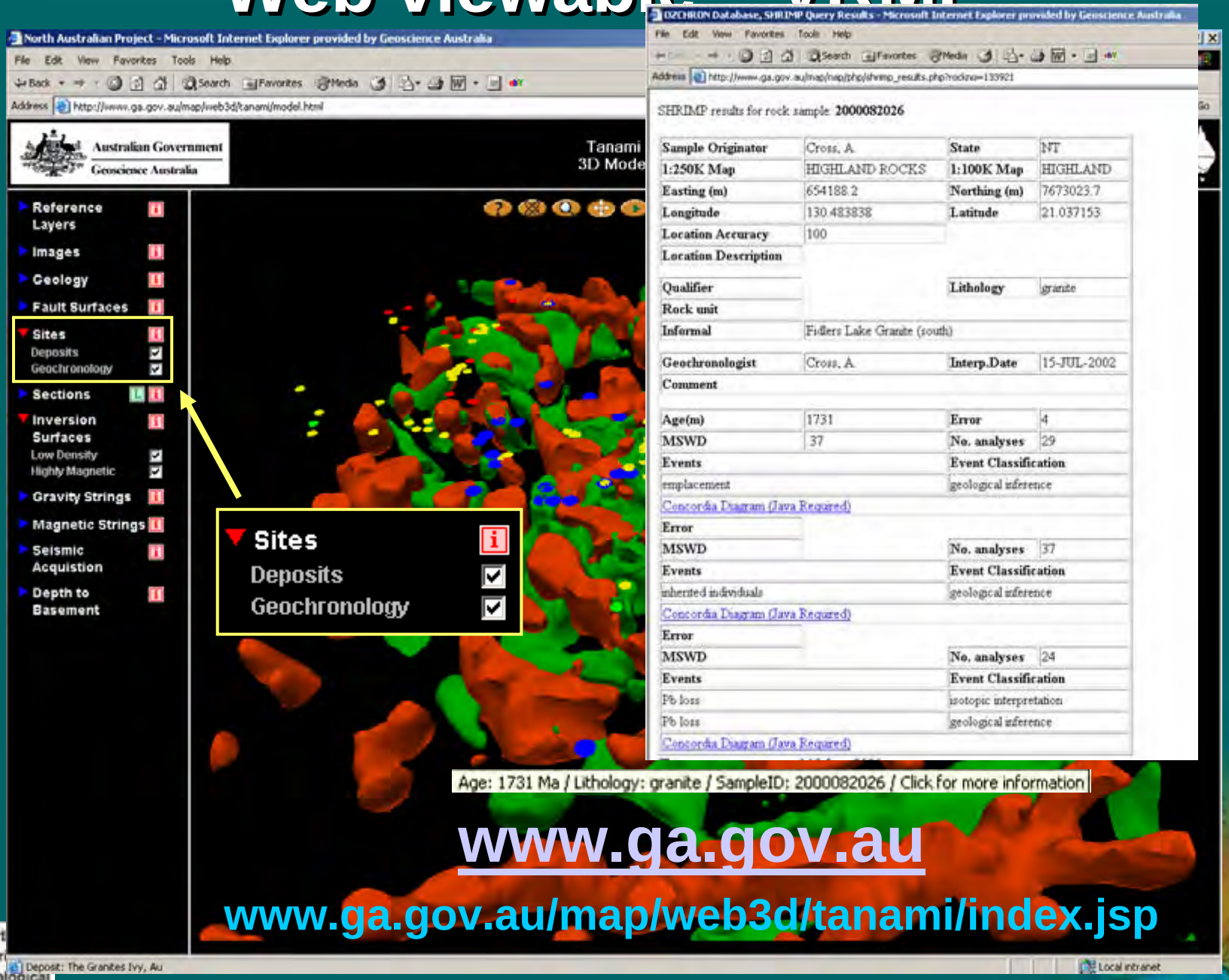
www.ga.gov.au/map/web3d/tanami/index.jsp

Web viewable – VRMI



SHRIMP results for rock sample: **2000082026**

Sample Originator	Cross, A.	**State**	NT
1:250K Map	HIGHLAND ROCKS	**1:100K Map**	HIGHLAND
Easting (m)	654188.2	**Northing (m)**	7673023.7
Longitude	130.483838	**Latitude**	21.037153
Location Accuracy	100		
Location Description			
Qualifier		**Lithology**	granite
Rock unit			
Informal	Fullers Lake Granite (south)		
Geochronologist	Cross, A.	**Interp.Date**	15-JUL-2002
Comment			
Age(m)	1731	**Error**	4
MSWD	37	**No. analyses**	29
Events		**Event Classification**	
emplacement		geological inference	
Concordia Diagram (Java Required)			
Error			
MSWD		**No. analyses**	37
Events		**Event Classification**	
inherited individuals		geological inference	
Concordia Diagram (Java Required)			
Error			
MSWD		**No. analyses**	24
Events		**Event Classification**	
Pb loss		isotopic interpretation	
Pb loss		geological inference	
Concordia Diagram (Java Required)			

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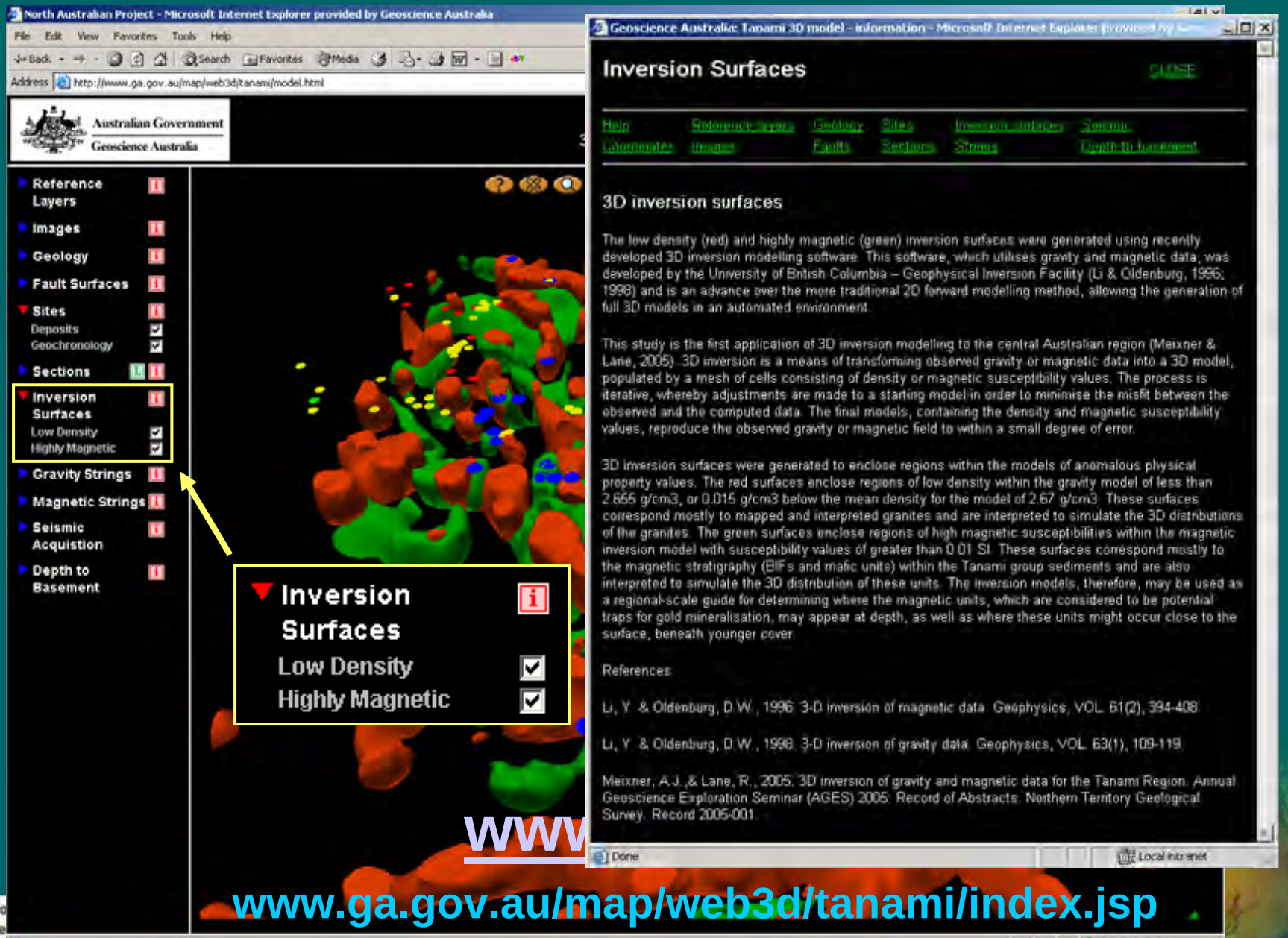
www.ga.gov.au/map/web3d/tanami/index.jsp

Web viewable – VRML



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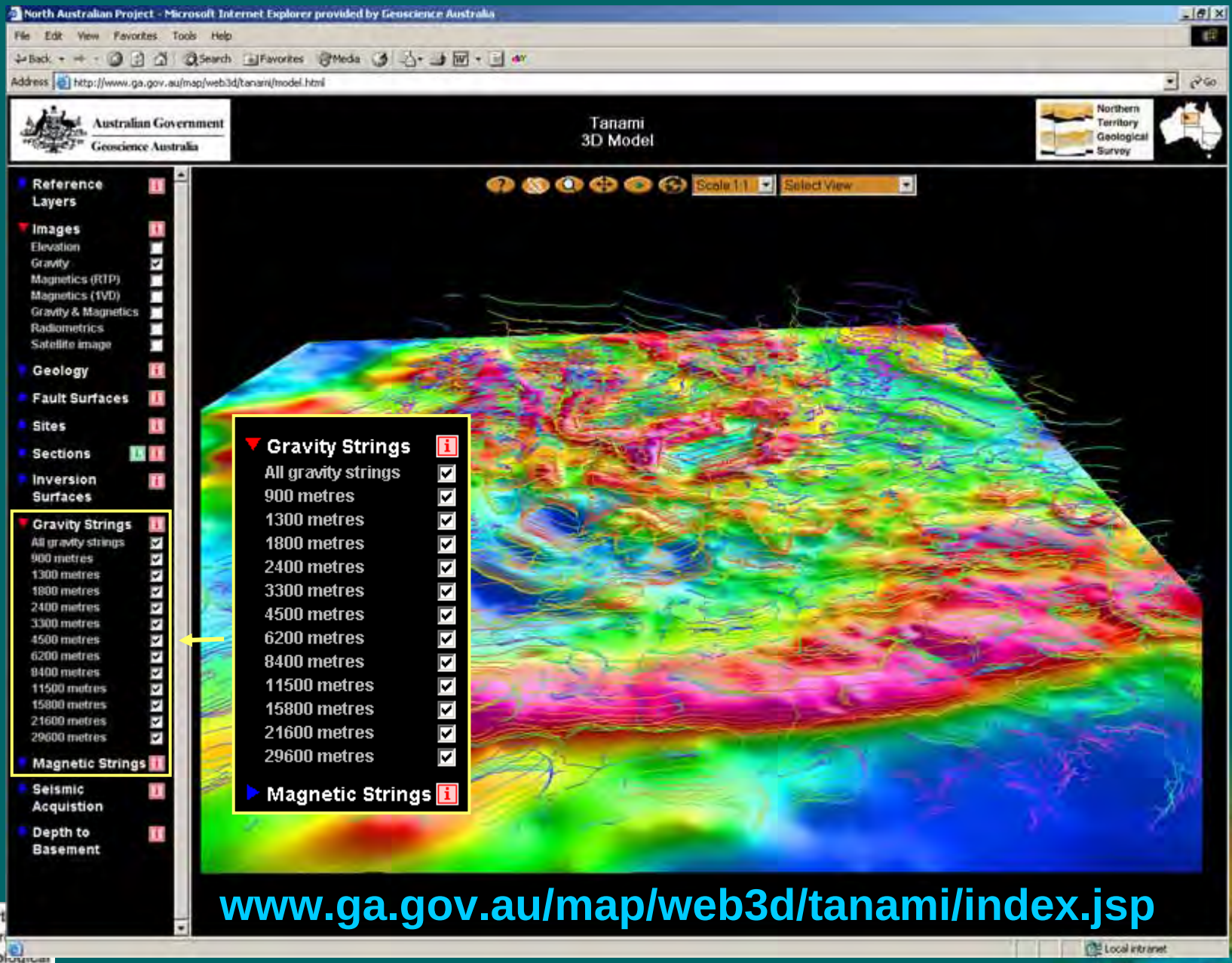

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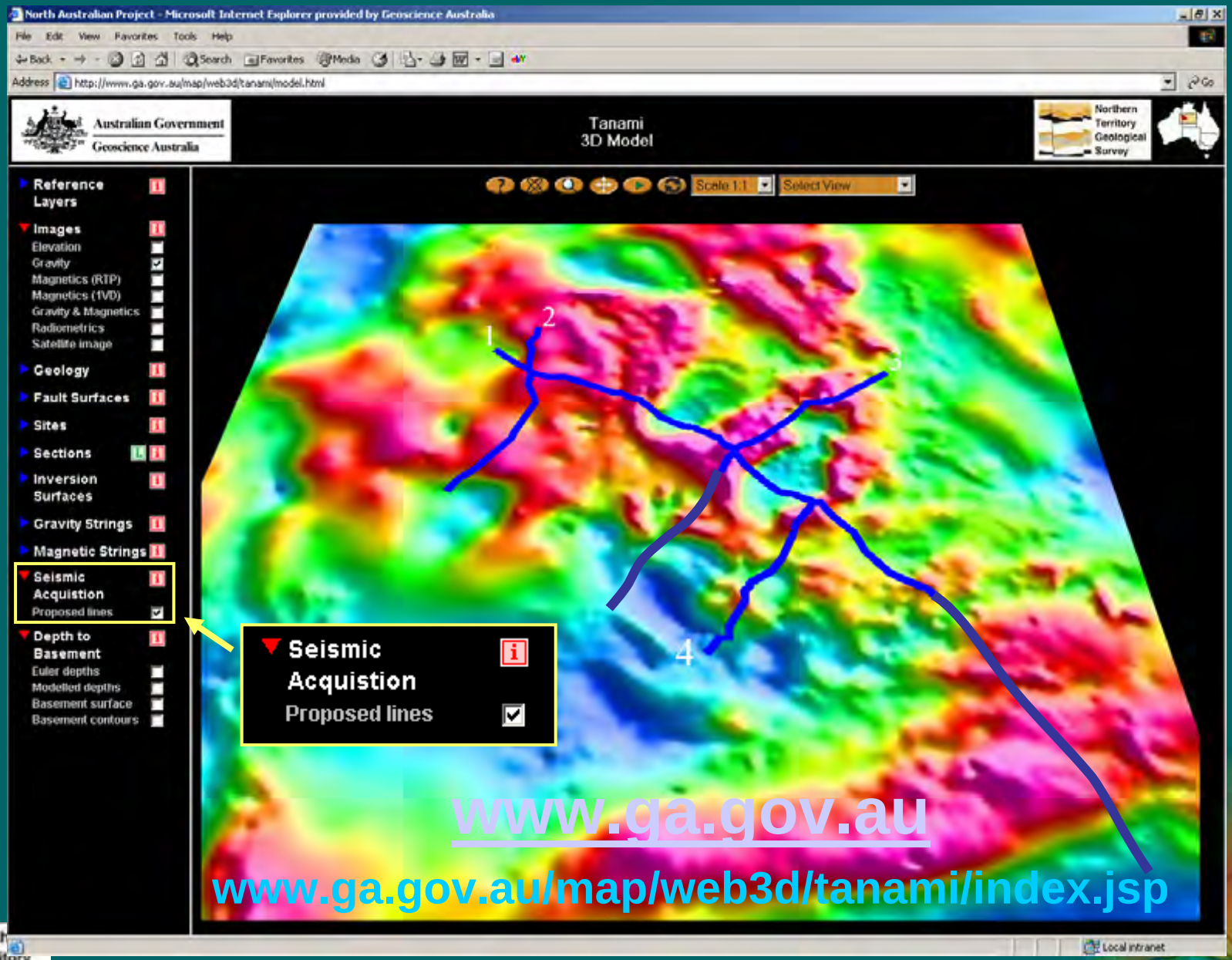

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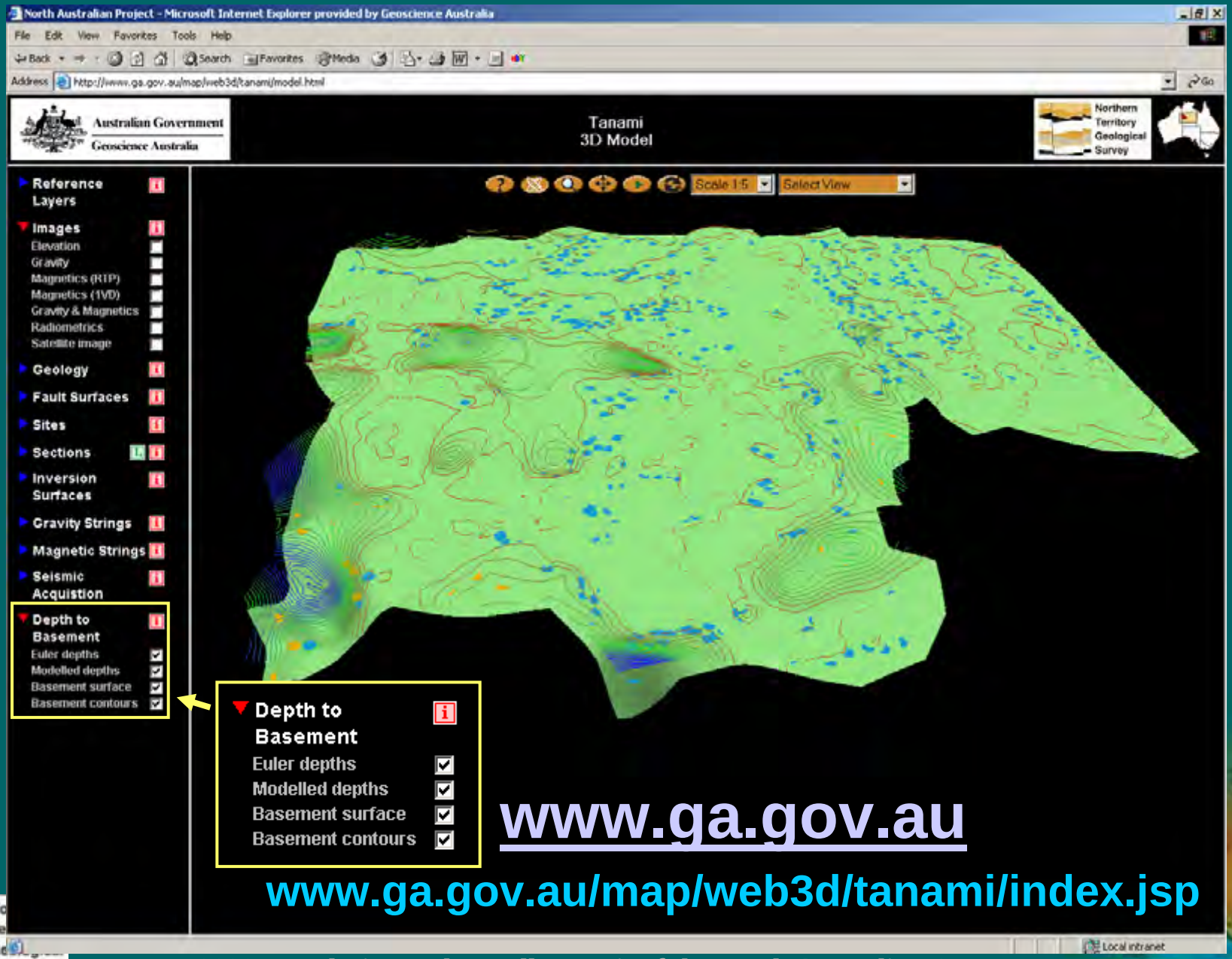


Future directions

- Incorporate the results of the Tanami seismic survey
  - relocate a number of sections to match the seismic lines
  - remodelling, where necessary, the 2D sections
- Use the modified sections as the constraints to build a new 3D model using GeoModeller

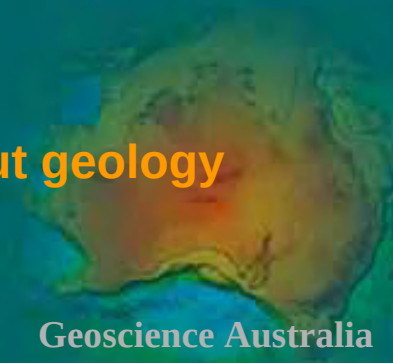
  Constructs 3D surfaces from geological information as opposed to GoCad which is a 3D drafting package

  - Define geological pile (conformable, onlap or erosional contacts)
  - Define structural events and their relationships to each other and the geological pile
  - Input geological information (contacts between units and dip information) from geological maps and 2D sections

  Advantages

  - 3D surface generation takes little time
  - The model is easily modified by changing the input geology

New version out early 2007



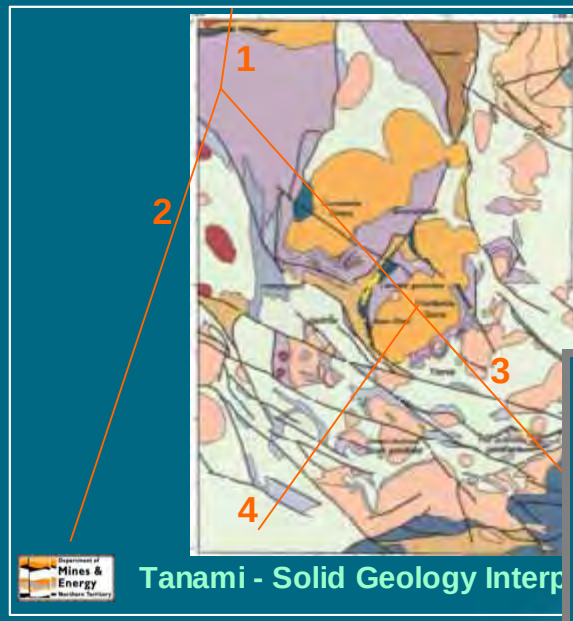
Potential Field Modelling of Proposed Land Seismic Transects in the NT

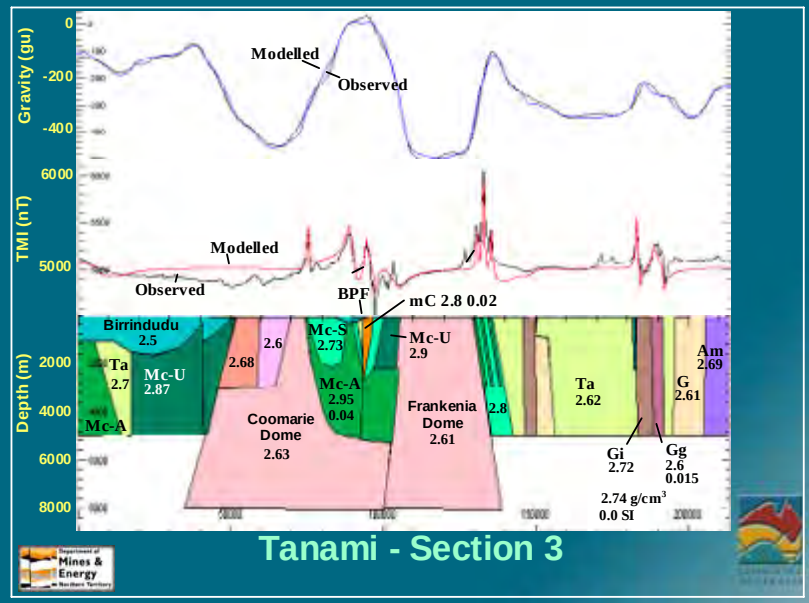
Tony Meixner, David Maidment, Jim Jackson

Geoscience Australia
www.ga.gov.au

AGES 2002

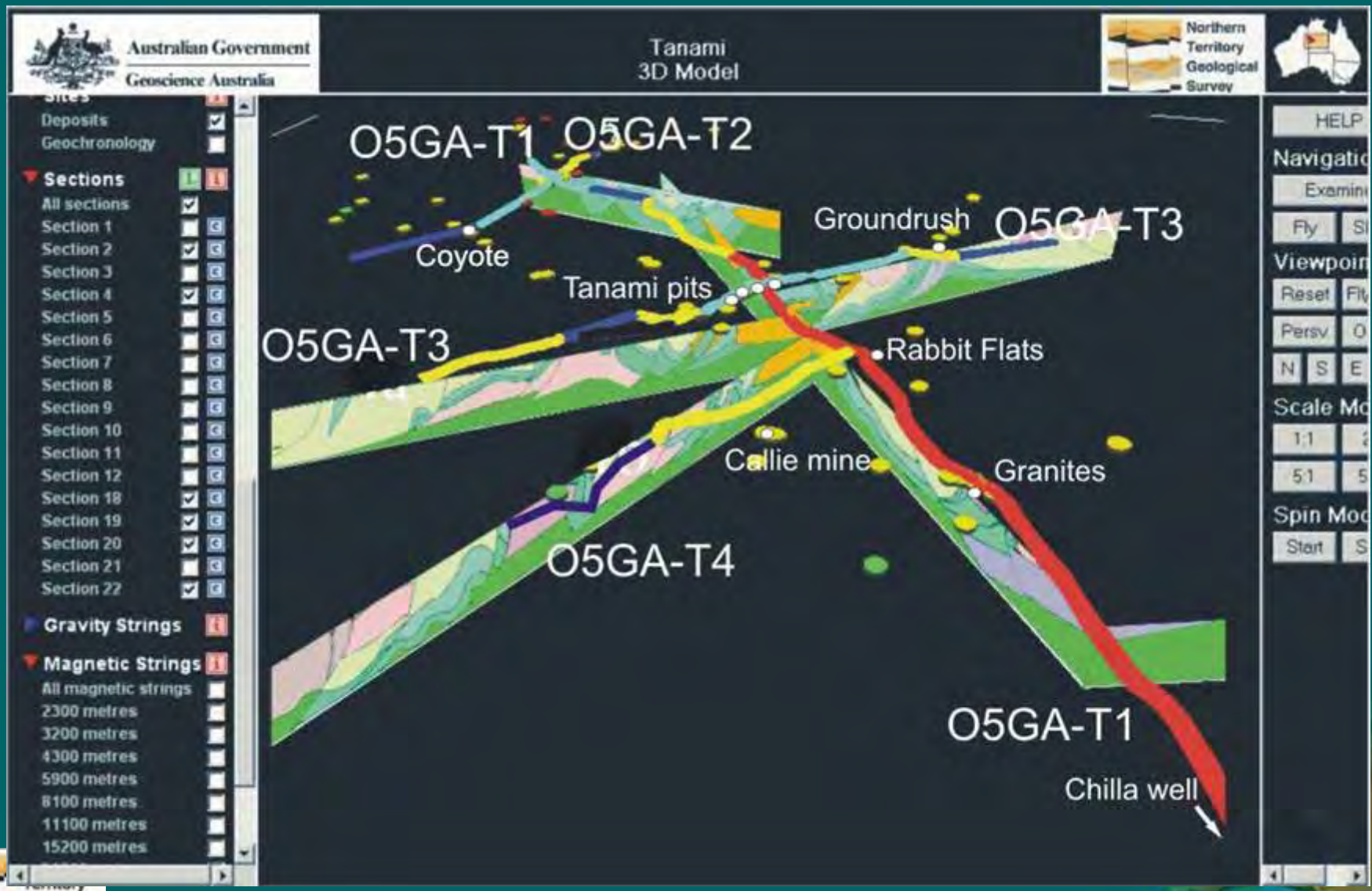
(Australian Geoscience Exploration Seminar)





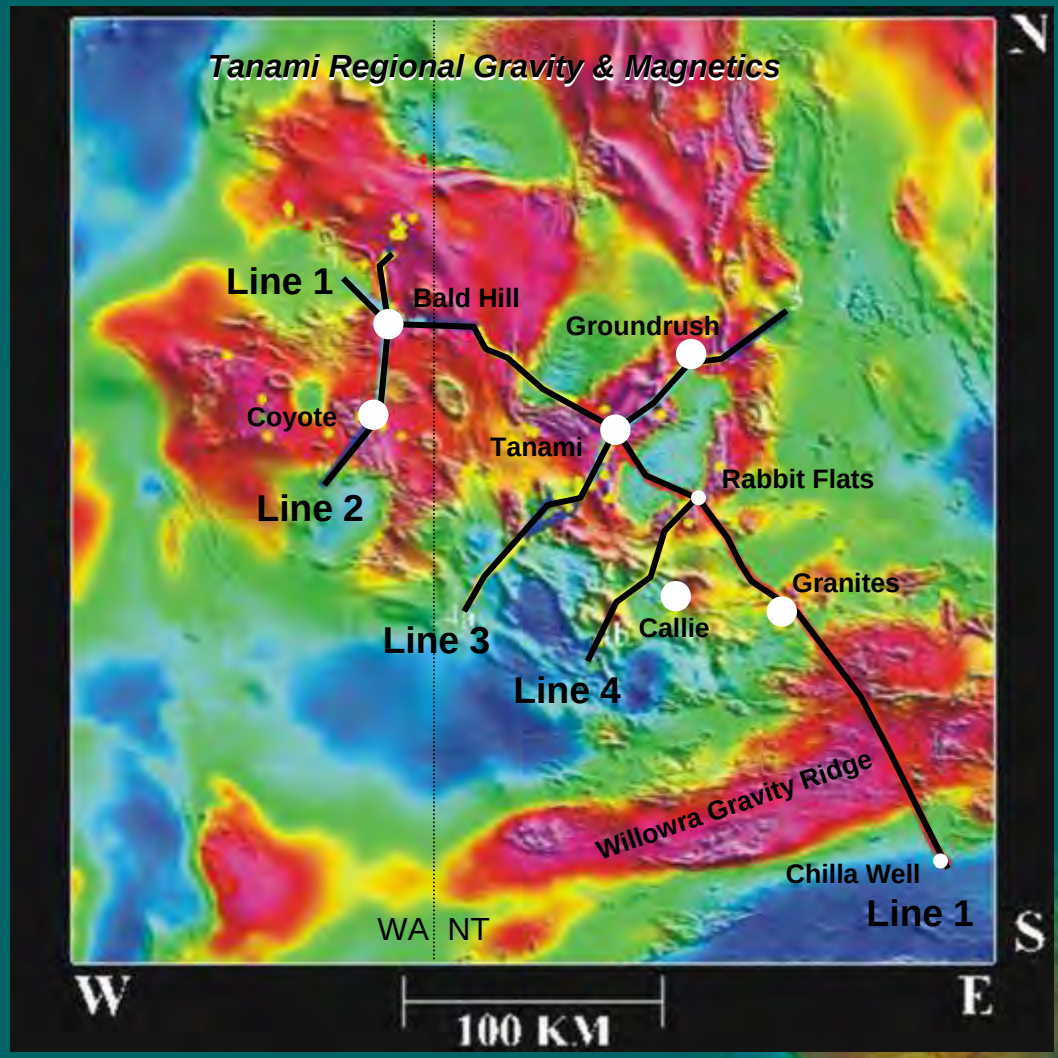
Northern Territory Geological Survey

Tanami Seismic Reflection Proposal 2004/05



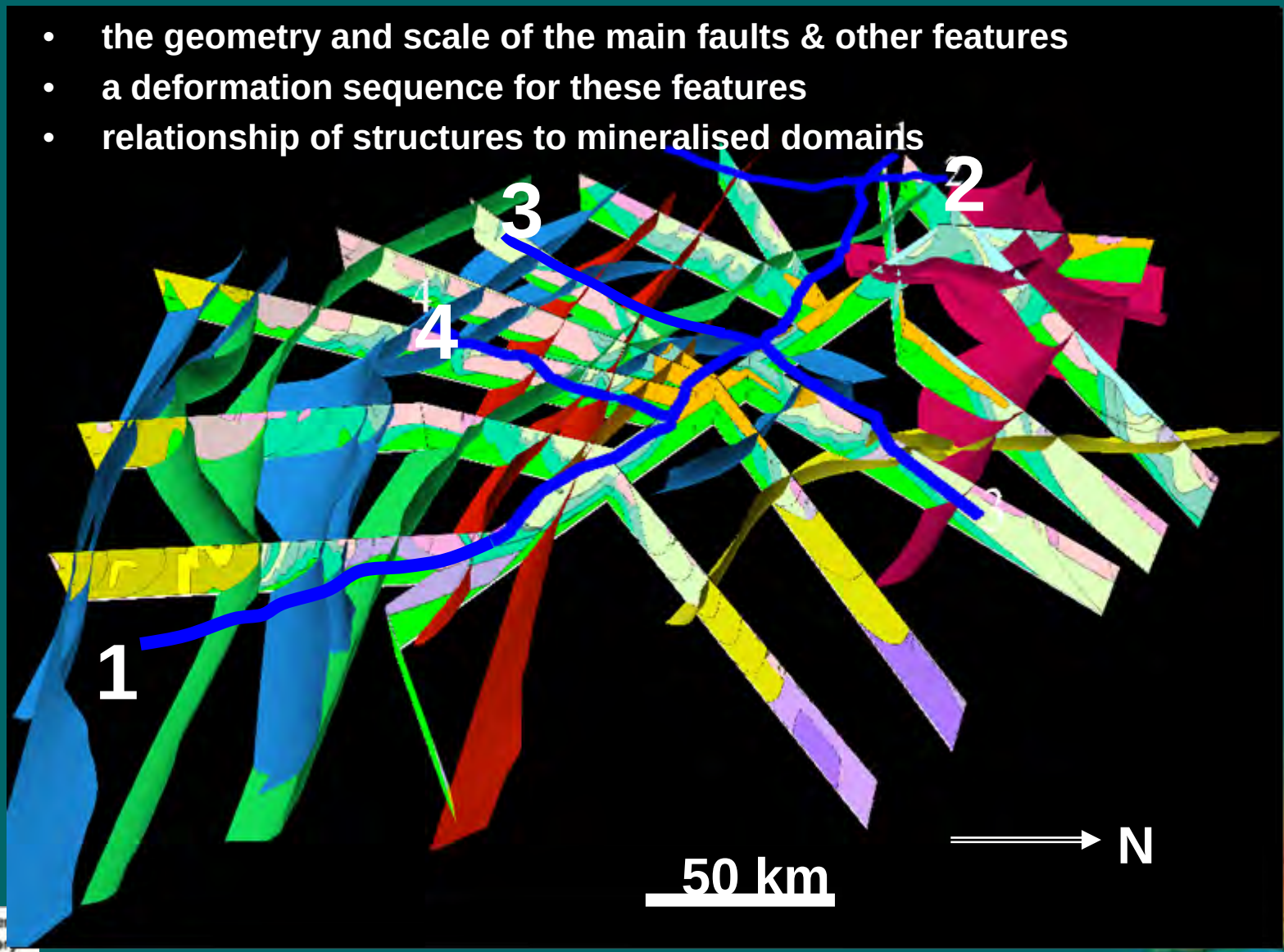
Location of Seismic Lines

720 line km of seismic reflection data



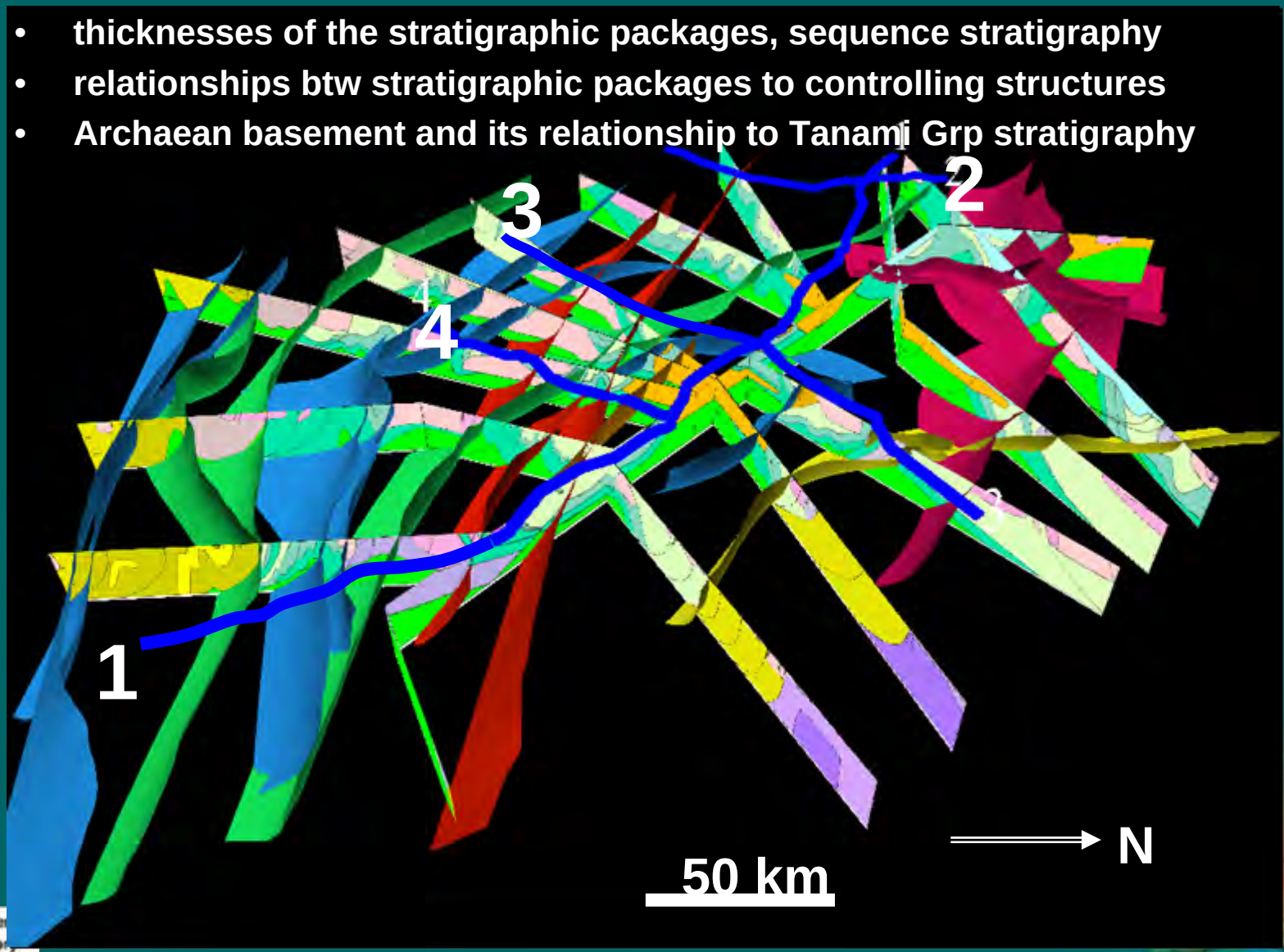
Structural & stratigraphic architecture

- the geometry and scale of the main faults & other features
- a deformation sequence for these features
- relationship of structures to mineralised domains

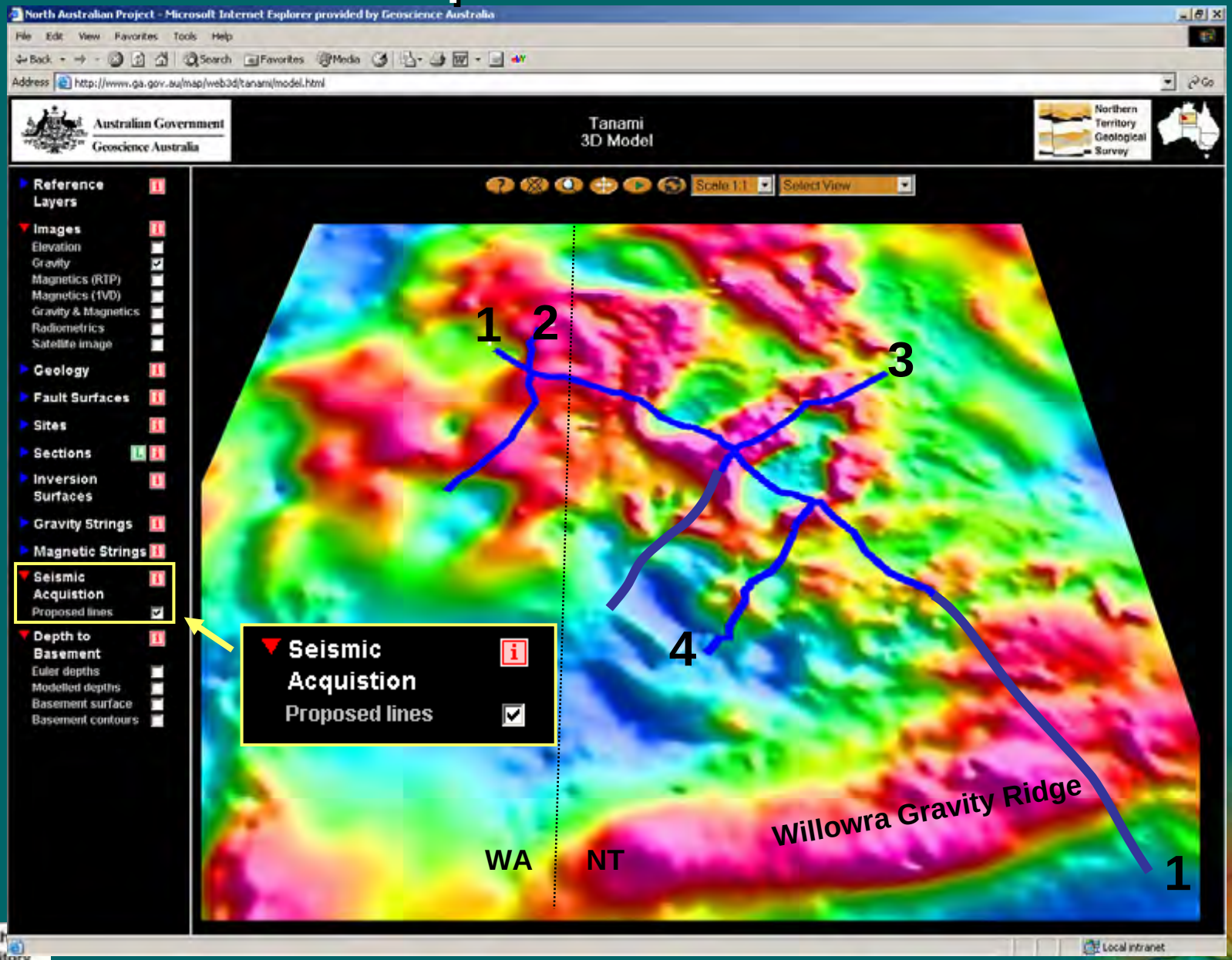


Structural & stratigraphic architecture

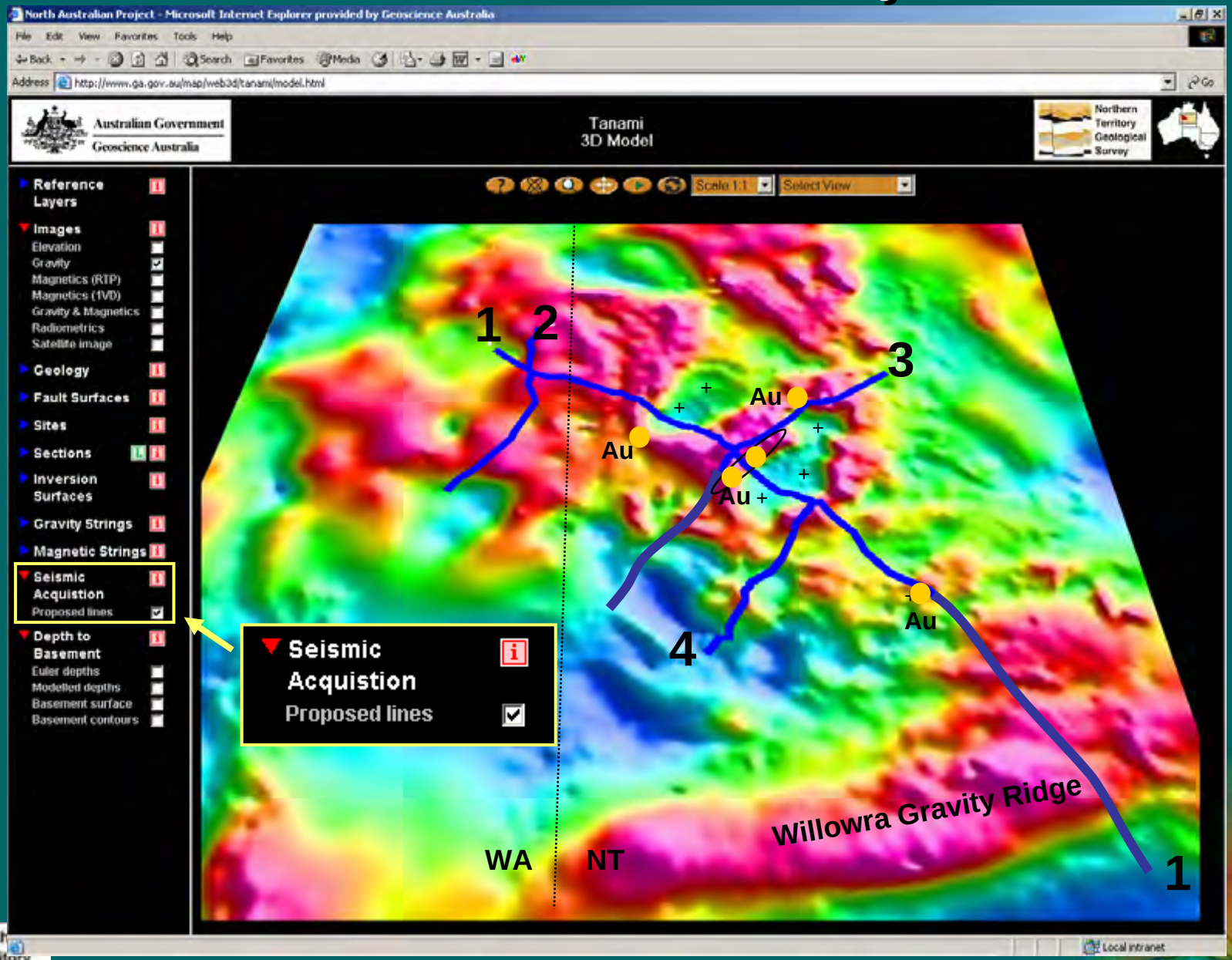
- thicknesses of the stratigraphic packages, sequence stratigraphy
- relationships btw stratigraphic packages to controlling structures
- Archaean basement and its relationship to Tanami Grp stratigraphy



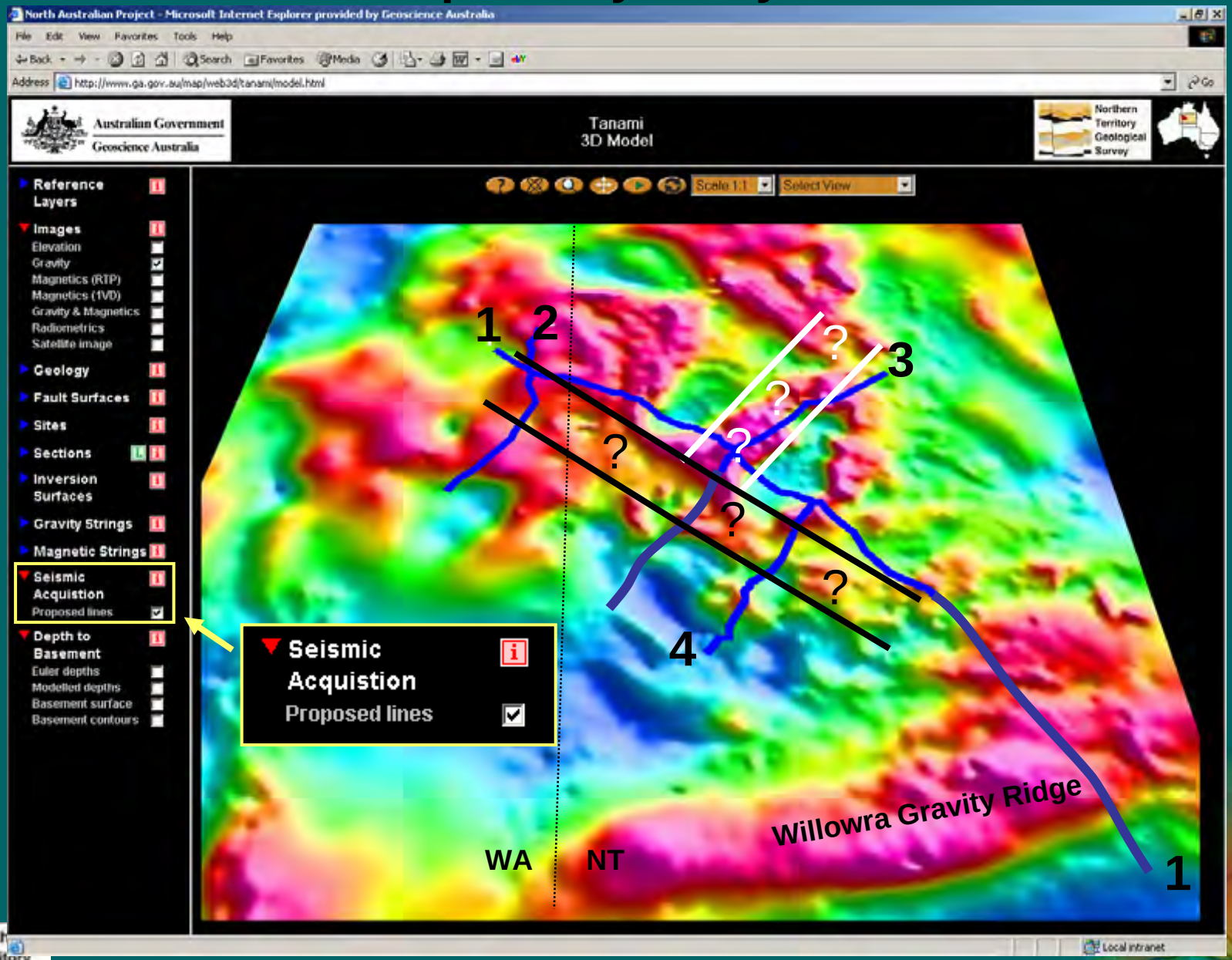
Deep Crustal Features



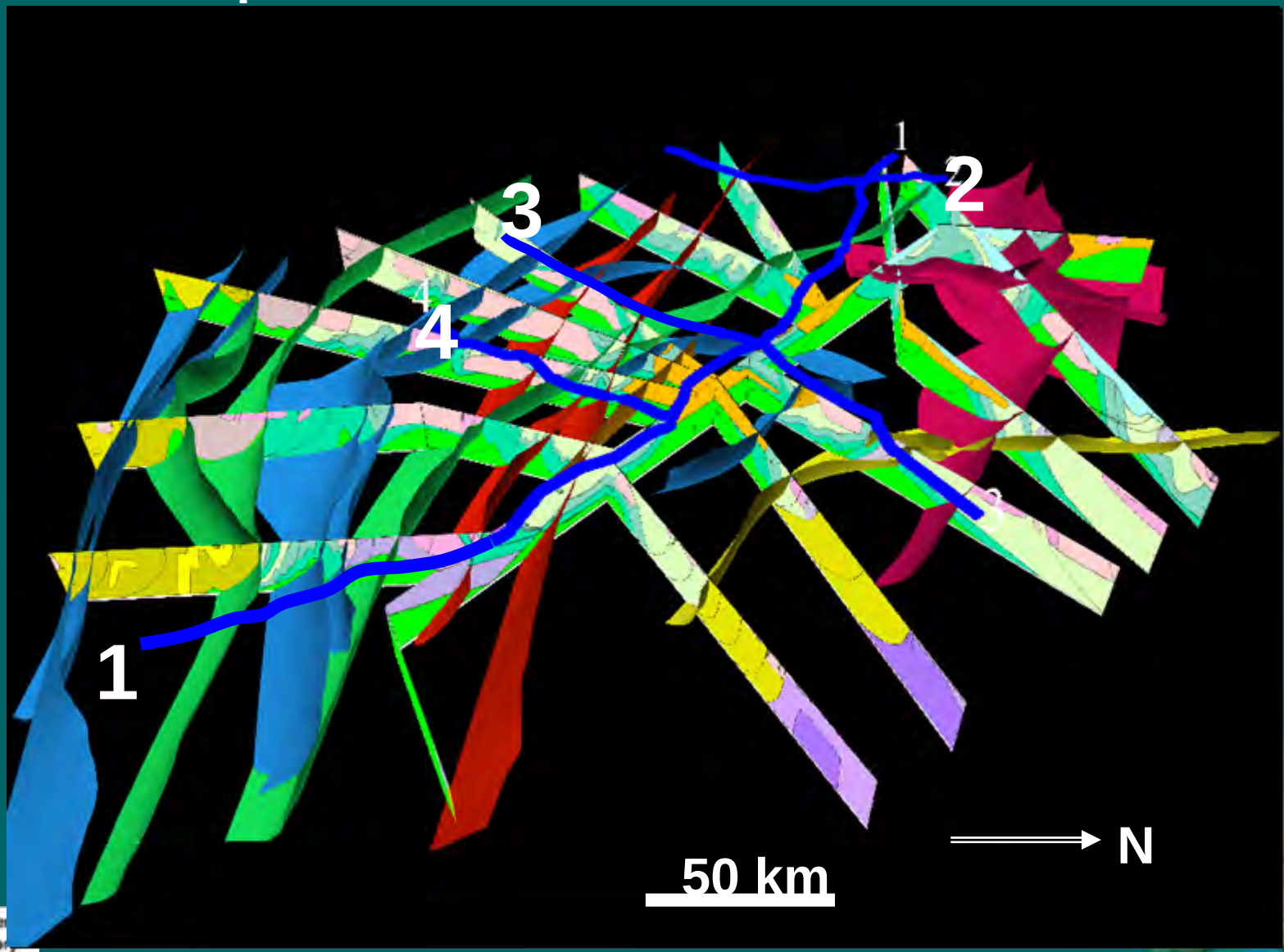
Pluton related mineralised systems



Fluid pathways & systems



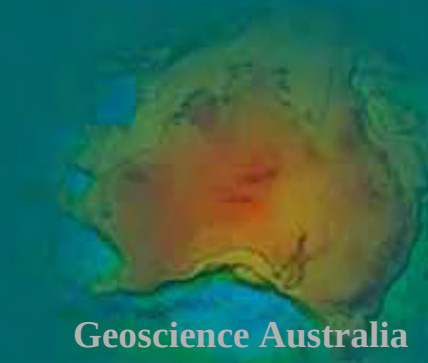
Leading to……
predictive mineralisation models



In General….

- Broad correlation between the geological relationships in the current seismic interpretations to those modelled in the Tanami 3D web-model, with improvement to the 3D web-model following incorporation of the new seismic data

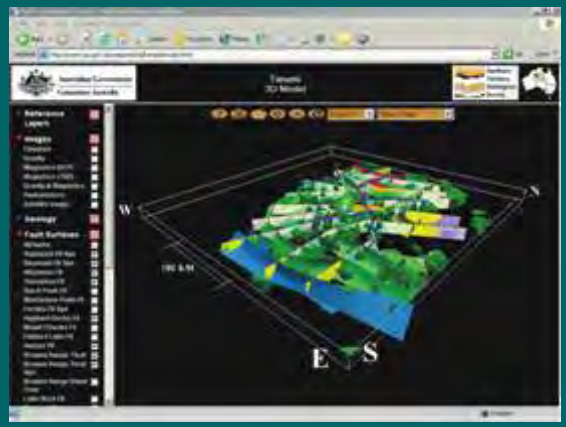
- Predictive capability- anticipated significant impact on current and future exploration strategies in the Tanami Region



Websites

•GA website
http://www.ga.gov.au/

•GSWA website
http://www.doir.wa.gov.au/gswa



•GA website
http://www.ga.gov.au/map/web3d

•NTGS website
http://www.minerals.nt.gov.au/ntgs/