

Karst in Mid-Proterozoic dolomite, Pungalina Station, NT, Australia

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Introduction

- Karstification in dolostone less common than limestone but NT has a lot!
- Australia regarded as being very limited in karst (Jennings, 1974).
- Karst of NT very under explored until about 20 - 25 years ago.
- Opportunities for speleothem related climate work in tropical Australia.
- Interesting biology



Regional Setting

- Gulf of Carpentaria area
- Hot monsoonal climate:
 - Summer wet, winter dry
 - Annual average temperature 26.4°C
 - Humidity high
- Open savannah woodland with other vegetation along main water courses.



Biological values

- Unusual savannah woodland
- Reptiles
- Invertebrates
- Bats:
 - Ghost bats
 - Orange-bellied horseshoe bat



Geology

- Shallow marine
- Proterozoic
- 1600 Ma cherty dolostone
- Stromatolitic
- Karns Dolostone overlain by Upper Pz sediments especially banded chert
- Marine Cretaceous sediment isolated outliers
- Some continental Cz sediments and laterite

- Not metamorphic; limited deformation
- 100 - 200m thick
- Shallow marine tidal environment of deposition
- Stromatolites: *Conyphyton*
- Episodic tidal packages

Karns Dolostone



Exploration



- Limited karst was known from the 1970s.
- 2005 - 2010 series of expeditions by Victorian Speleological Association to the Pungalina Station.
- Pungalina Station = small cattle property that had been converted to a safari park business. Purchased by Australian Wildlife Conservancy in late 2008.
- Reconnaissance and documentation of existing known caves and karst features and exploration of new features.
- Needs the ability for access by cavers with 4WDs, GPS, communication equipment and the time, money and energy to do it.
- Potential for more karst!

Expedition Trips by VSA

- VSA + others
- Self funded independent expeditions
- No trip this year but 2012 when RGSQ has an expedition.

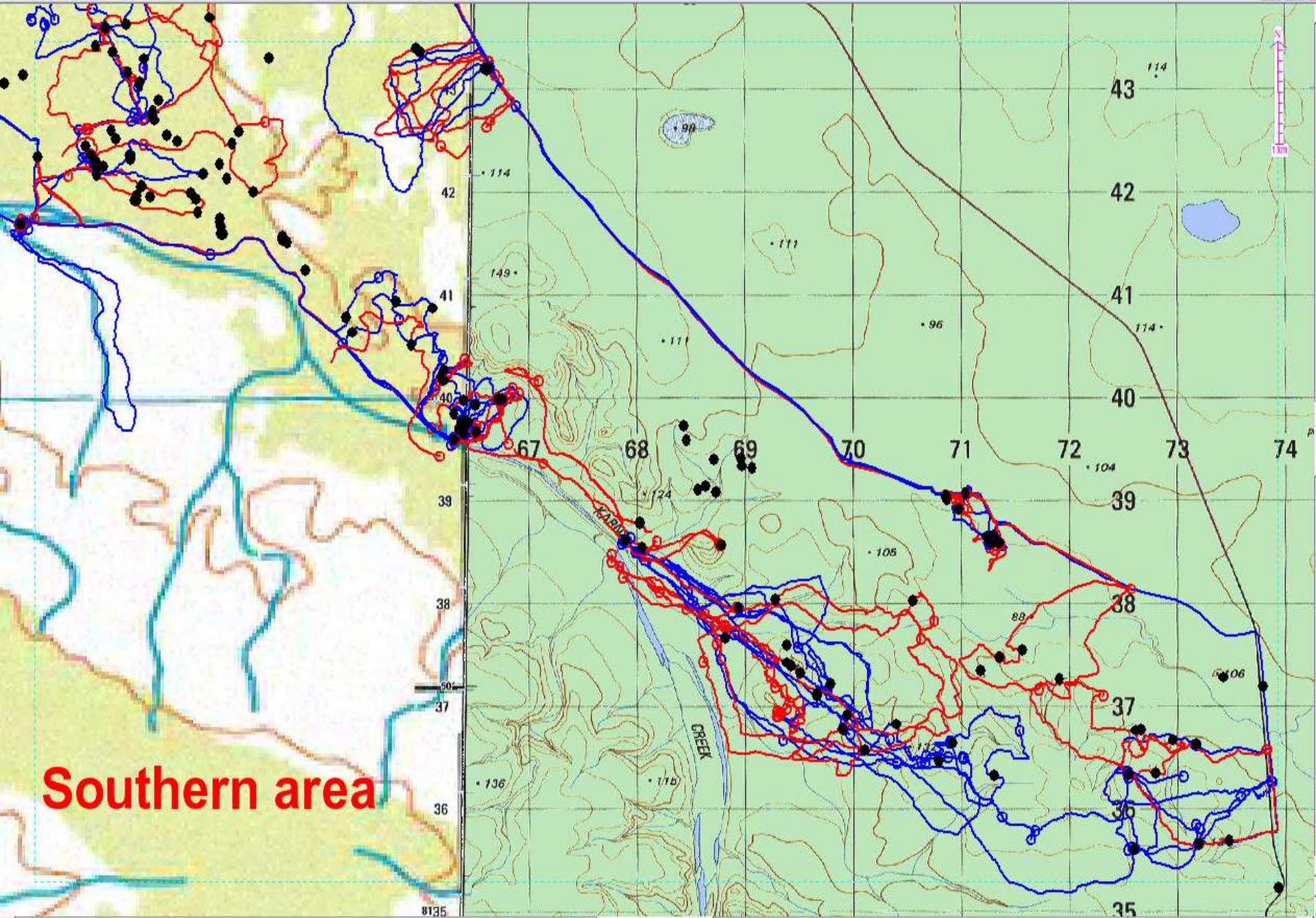




Documentation

- NT bases its areas on 1:100k map series
- Pungalina on 2 sheets:
Pungalina & Selby =>
PUN and SEL numbers.





Southern area



Karst features

Surface

- Poorly developed karren
- Dolines
- Polje
- Karst springs
- Thick regolith

Underground

- Caves - 2 levels
- Limited speleothems
- Lakes
- Calcified chert breccia
- Very hot and humid cave climate

Dolines



Drainage

- Karst springs at lowest elevations close to current streams
- Upwelling through regolith
- Indicate that groundwater flow is slow

Bubbling Springs



Karren

- Poorly developed
- Indication of the lower solution on dolostone



Caves

- Over 50 known caves: small to large
- Many vertical entrances and some collapse dolines; mechanical removal of overlying regolith
- Phreatic passage networks, often ending in apparent solid rock
- Passage modification by roof collapse
- Intermittent lakes & static pools in deeper caves
- Upper caves are dry
- Some speleothems; dating
- Differential weathering of silicified stromatolites



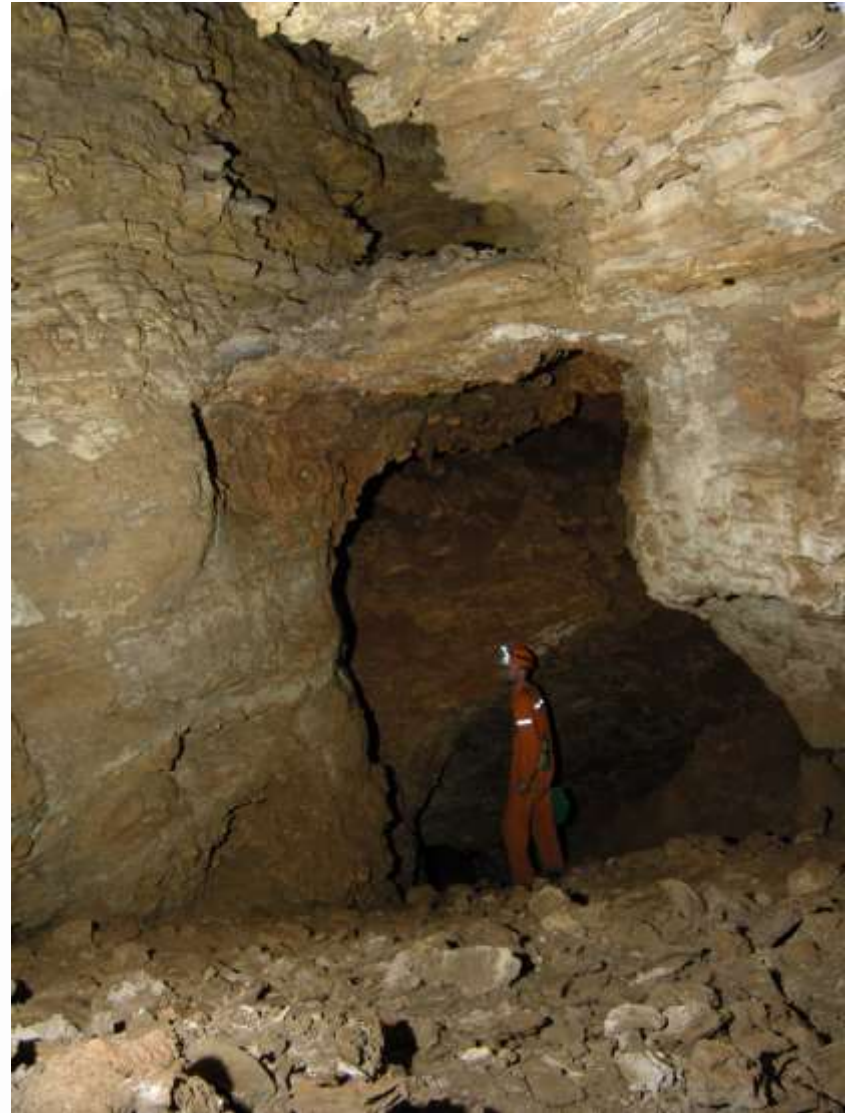
Gargoyle Cave



Raft Saddle Cave

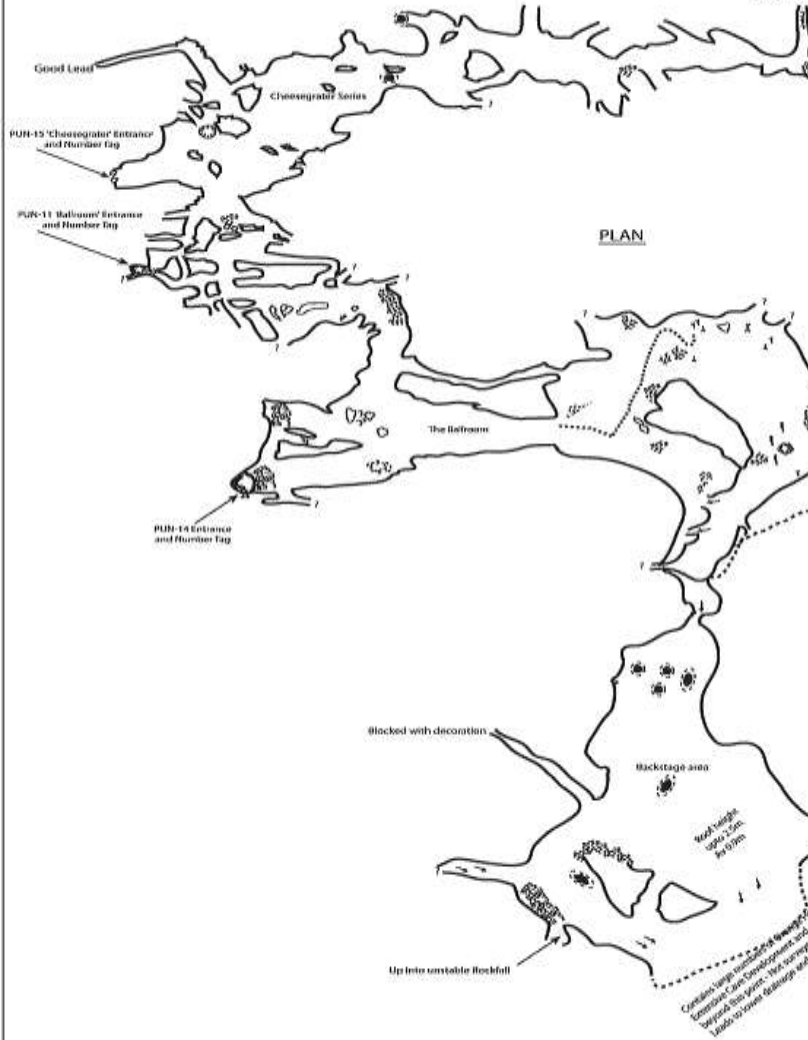


Passage shapes



Ball Room Cave

Passage continues beyond
calcite blockage

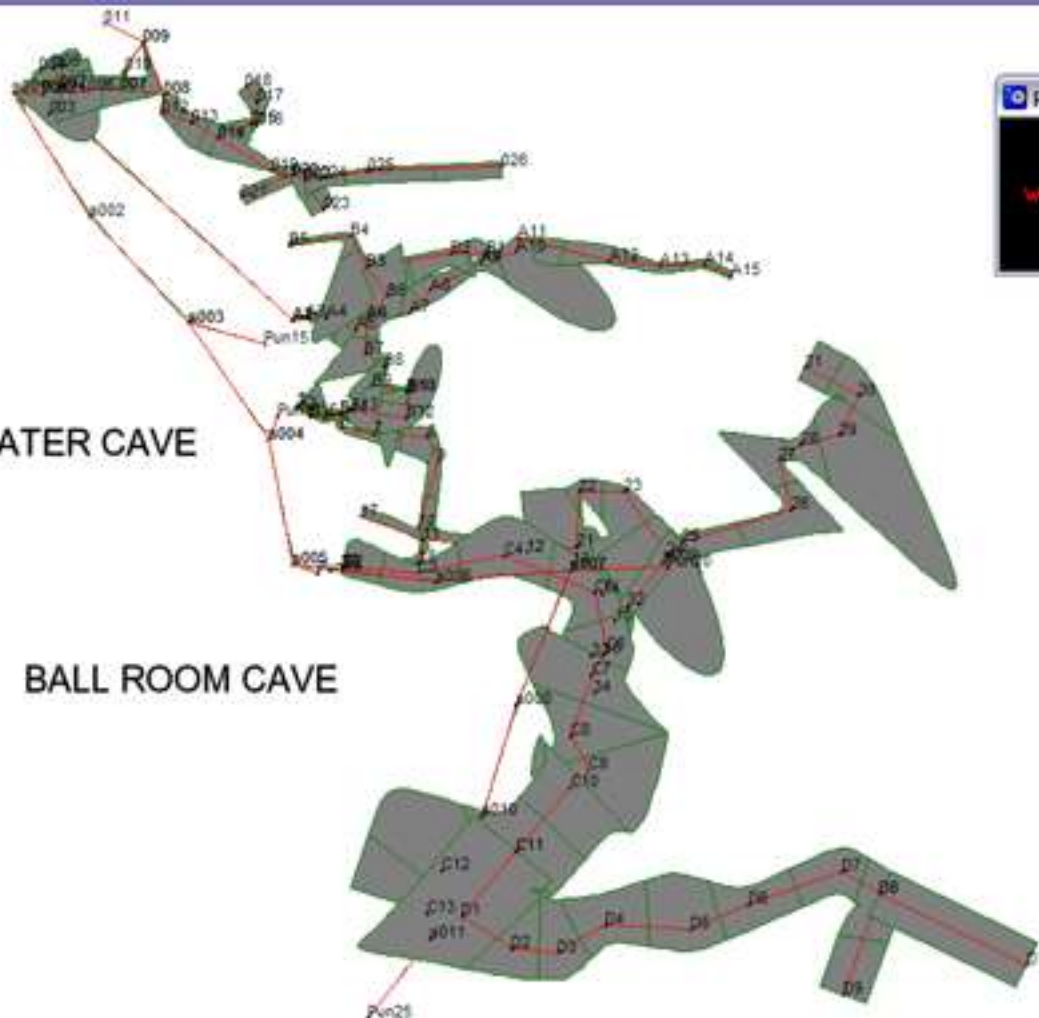


Legend

- | | |
|----------------------|----------------------|
| Talus | Stalagmite |
| Flowstone | Tree Root (vertical) |
| Column | Floor Slope |
| Stalagmite | Survey Station |
| Grass/Stalk | Entrance Tag |
| Column (significant) | Tourist Path |

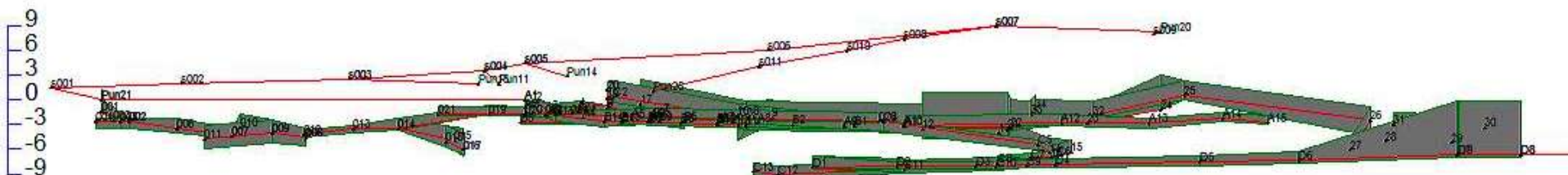
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ASF Grade 5,4
ASF Map Number
BPUN11/5A413

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BALL ROOM CAVE

Scale: 13.6 mic Zoom: 0.96 Pan X,Y,Z: -0.02 -0.02 -0.02 Angle: 0.0 Pitch: 0.0 Mode: Zoom Plan 66.7



Ballroom Cave



PUN 21

PUN 15

PUN 11

PUN 14

PUN 20

PUN 16

PUN 25

Image © 2008 DigitalGlobe

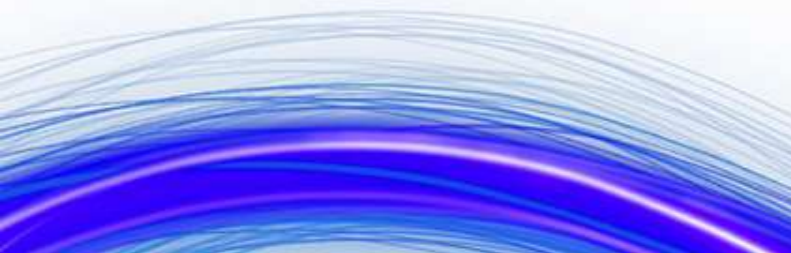
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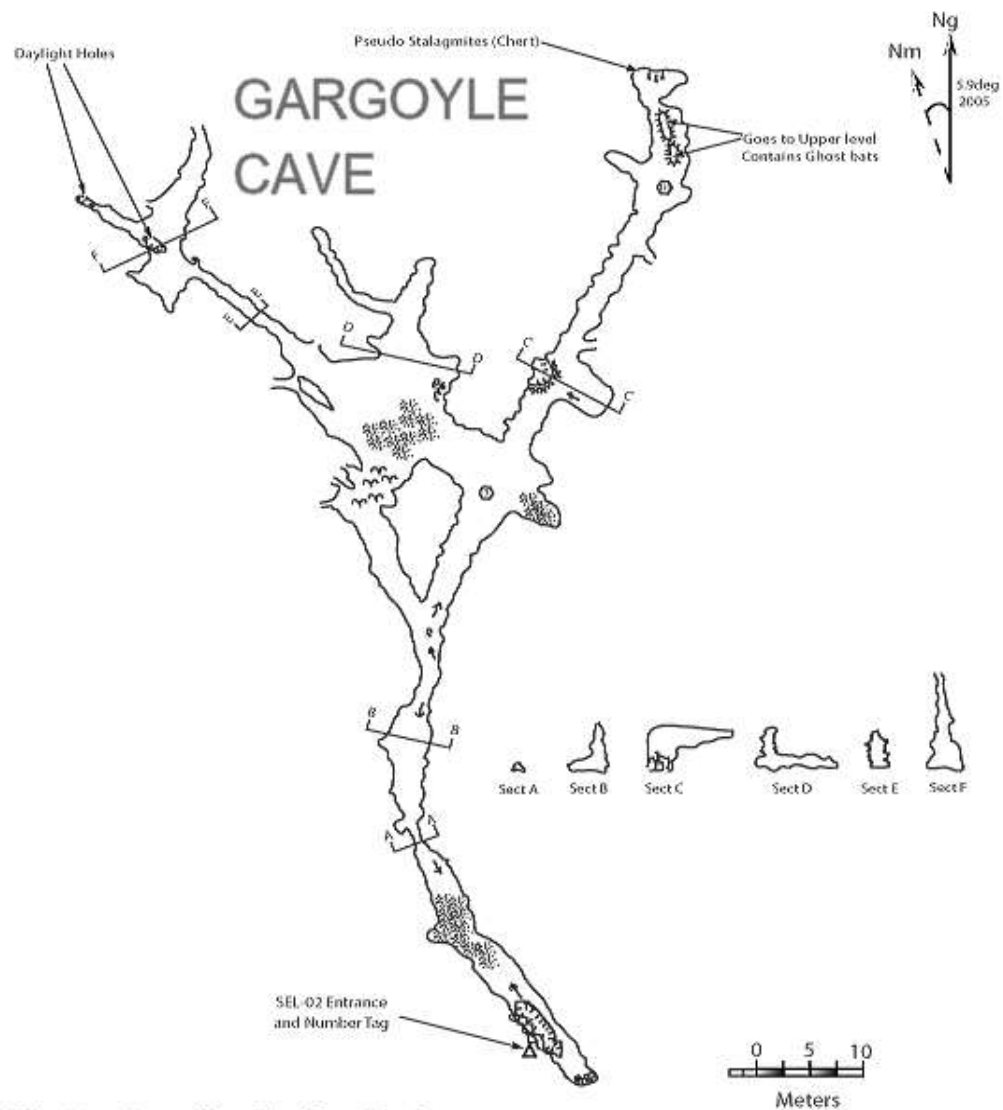
117 m

53 K 762925.06 m E 8142467.59 m S

elev 77 m

Eye alt 508 m





8SEL-02 Pungalina, Northern Territory

Surveyed by P. Brooker, N. White, B. Brooker
& J. Martini of VSA 6-2007

Compiled by P. Brooker, 5-2008

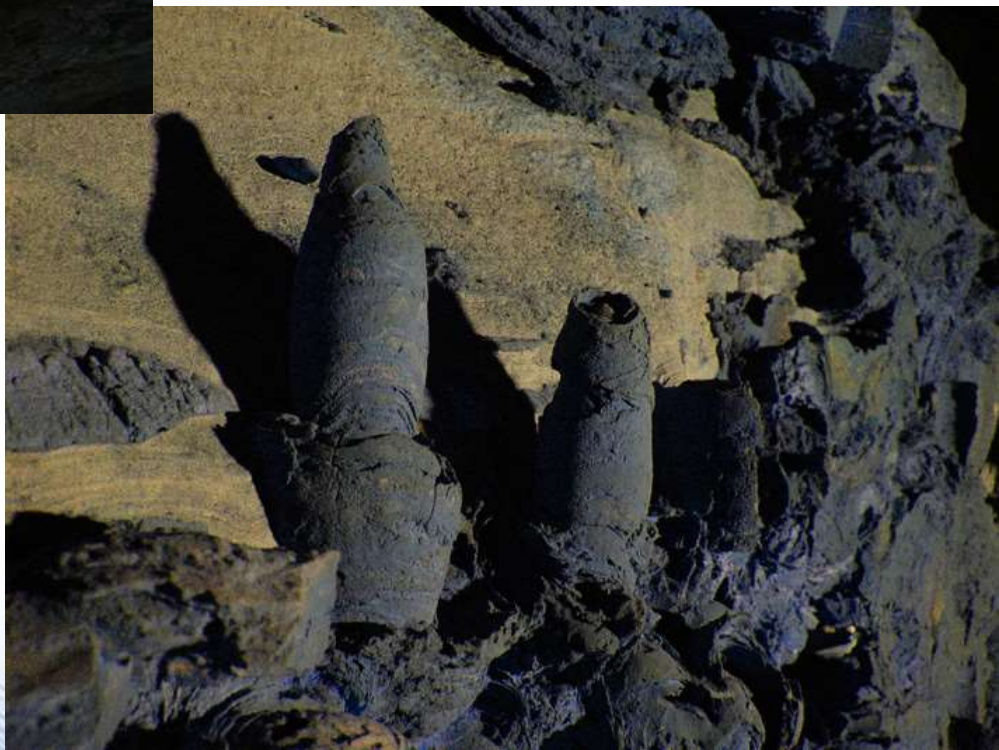
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Chillicon 2011

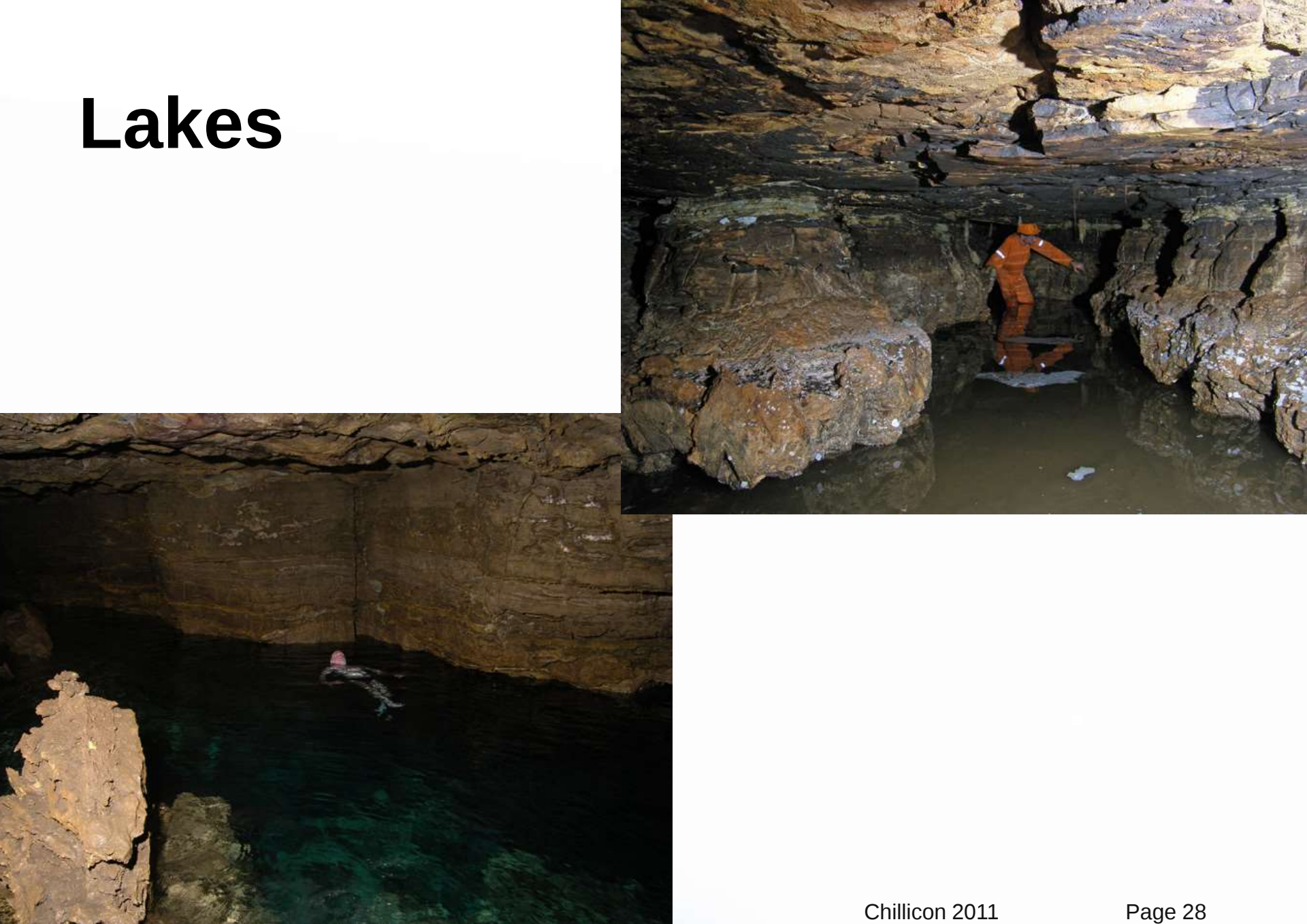
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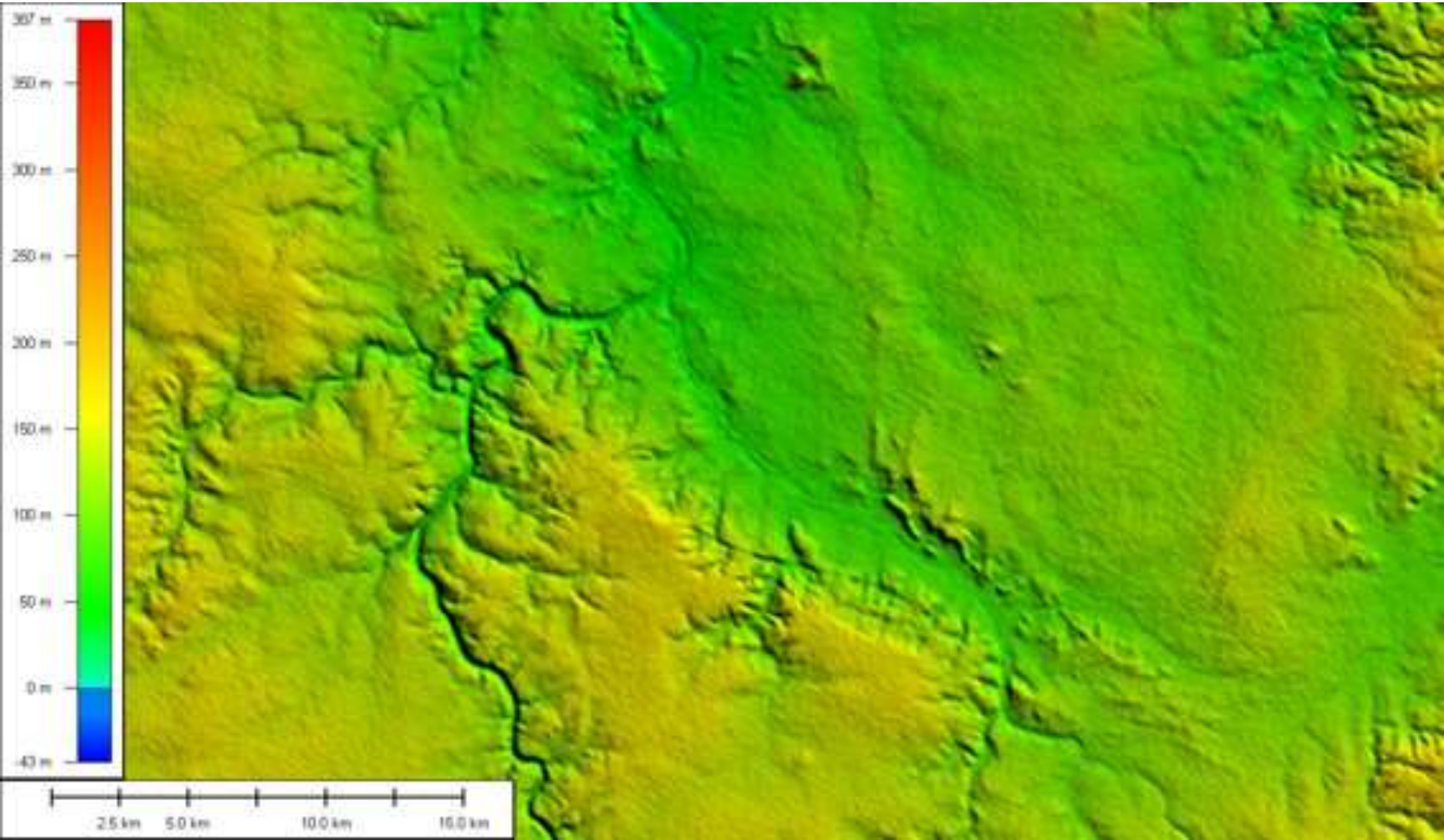
Lakes



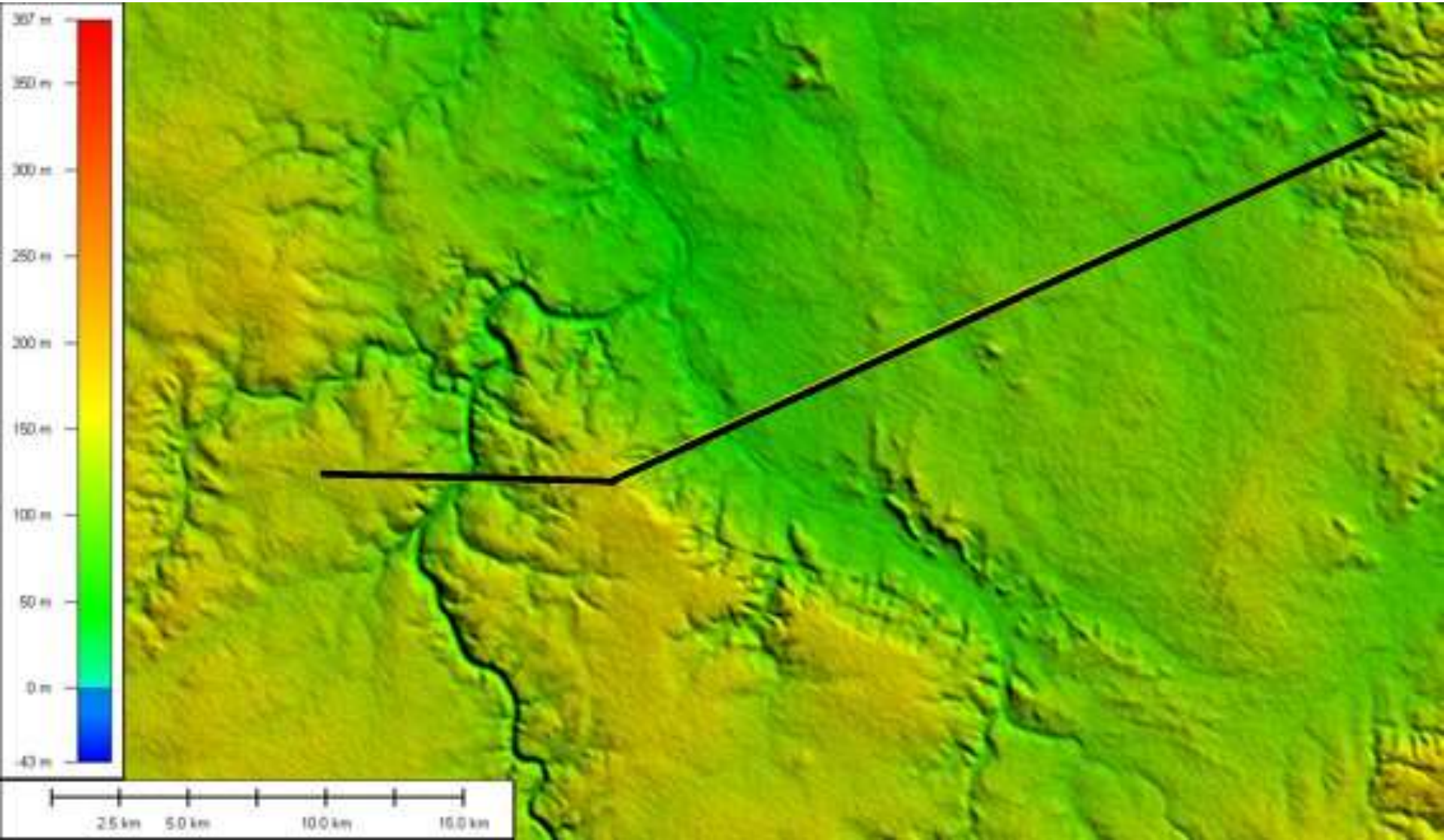




Digital Elevation Model

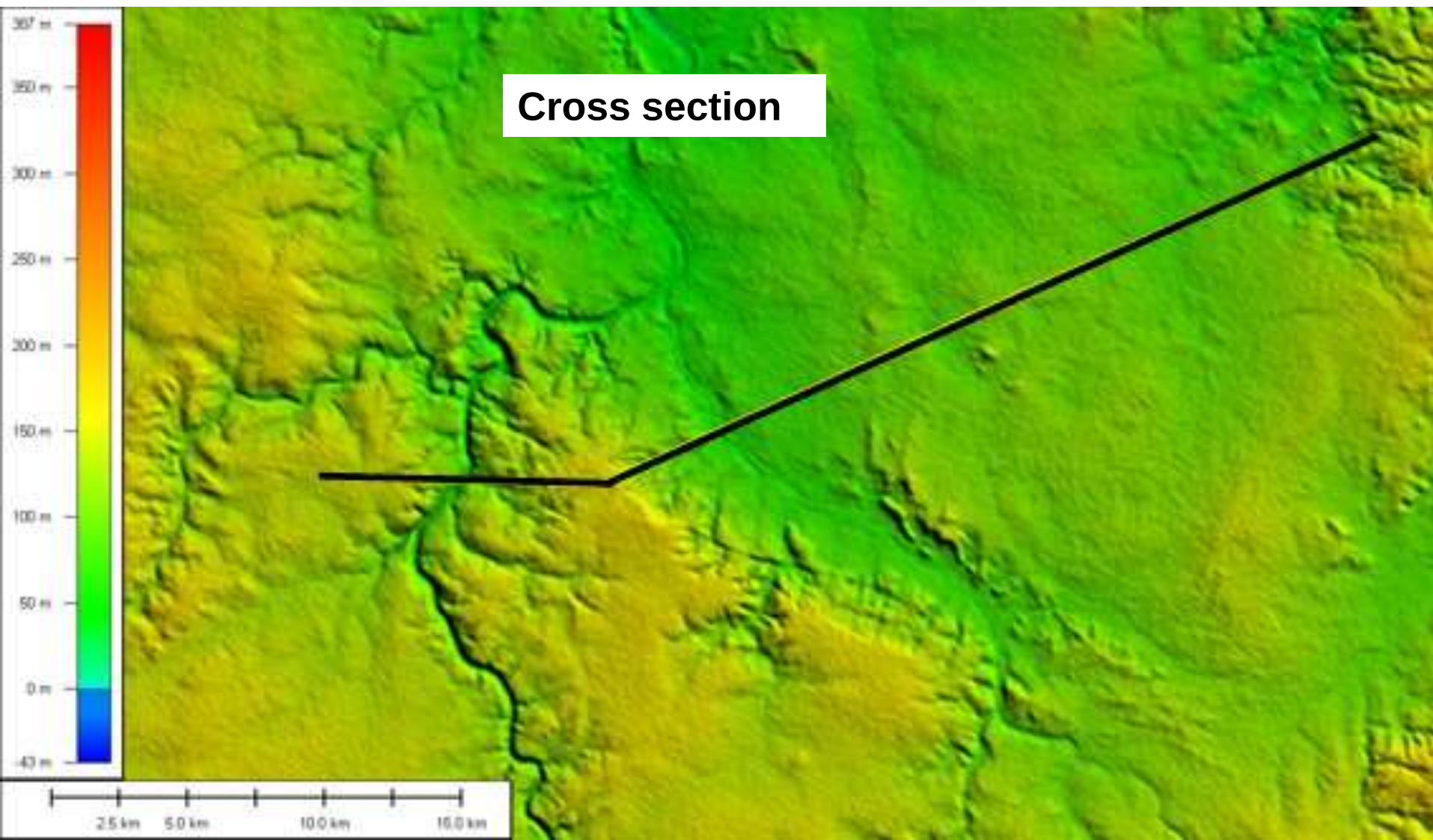
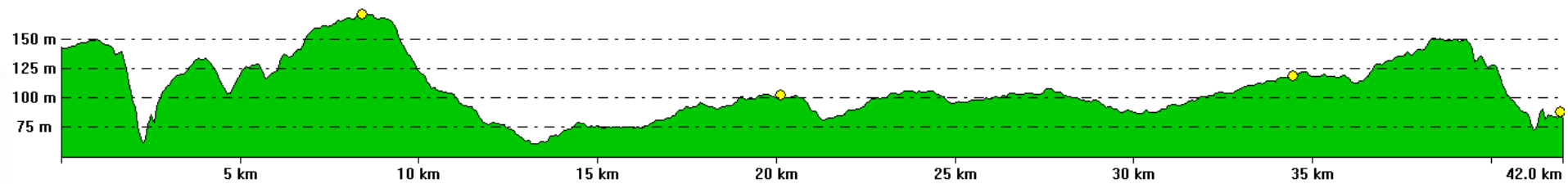


DEM & X section location



From Pos: 137.3166728169, -16.7902230853

To Pos: 137.6888618235, -16.7040281506



Caves at break of slope



Can we put a time scale on this?

- The rock is ~ 1.6 billion years old
- The latest major marine deposits are Cretaceous ie older than 65million years
- Some later Cenozoic alluvium
- Plenty of time for caves to form.
- No infilled palaeokarst found as yet
- Initial speleothem dates

Dated Speleothems from Totem Pole Cave (Pun 7)

Initial U/Th
dates

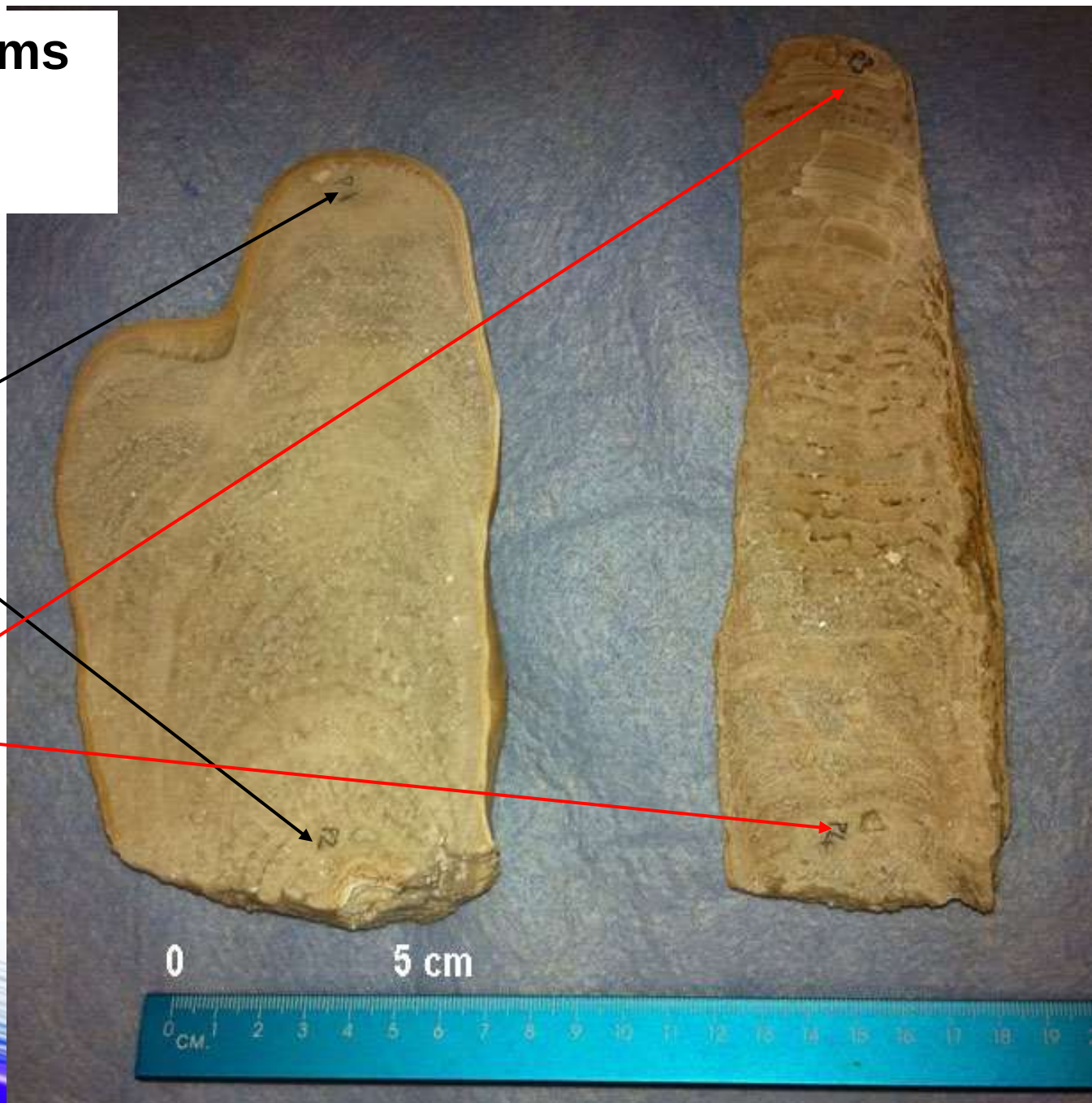
3.5 ± 0.06 ka

4.9 ± 0.06 ka

106.6 ± 0.88 ka

141.2 ± 0.8 ka

J. Hellstrom
University of Melbourne



Landscape evolution

- Highly eroded landscape - low eroded open plateau with incision of drainage lines
- Ridges across the direction of drainage
- Main drainage lines north to the coast
- 2 periods of karst development
 - Old drainage lines on tops of ridges
 - Poljes
- Subjacent dolines collapsing into underlying dolostone
- Lots more to be done!



Questions ?