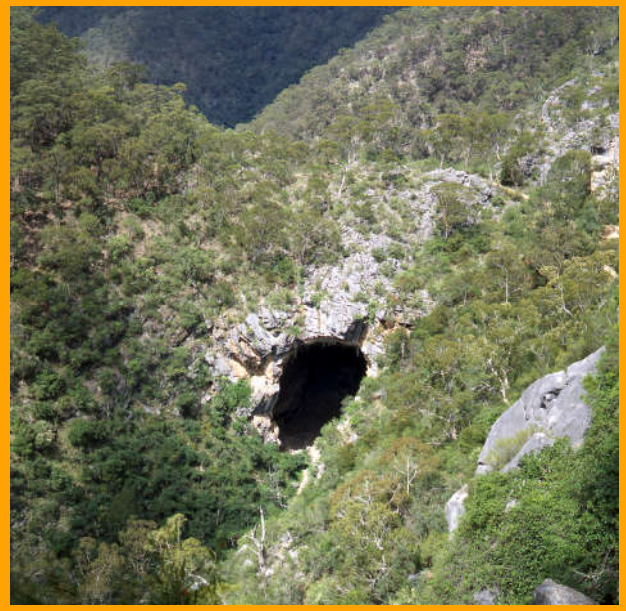
# Illite Dates from the World's Oldest Caves



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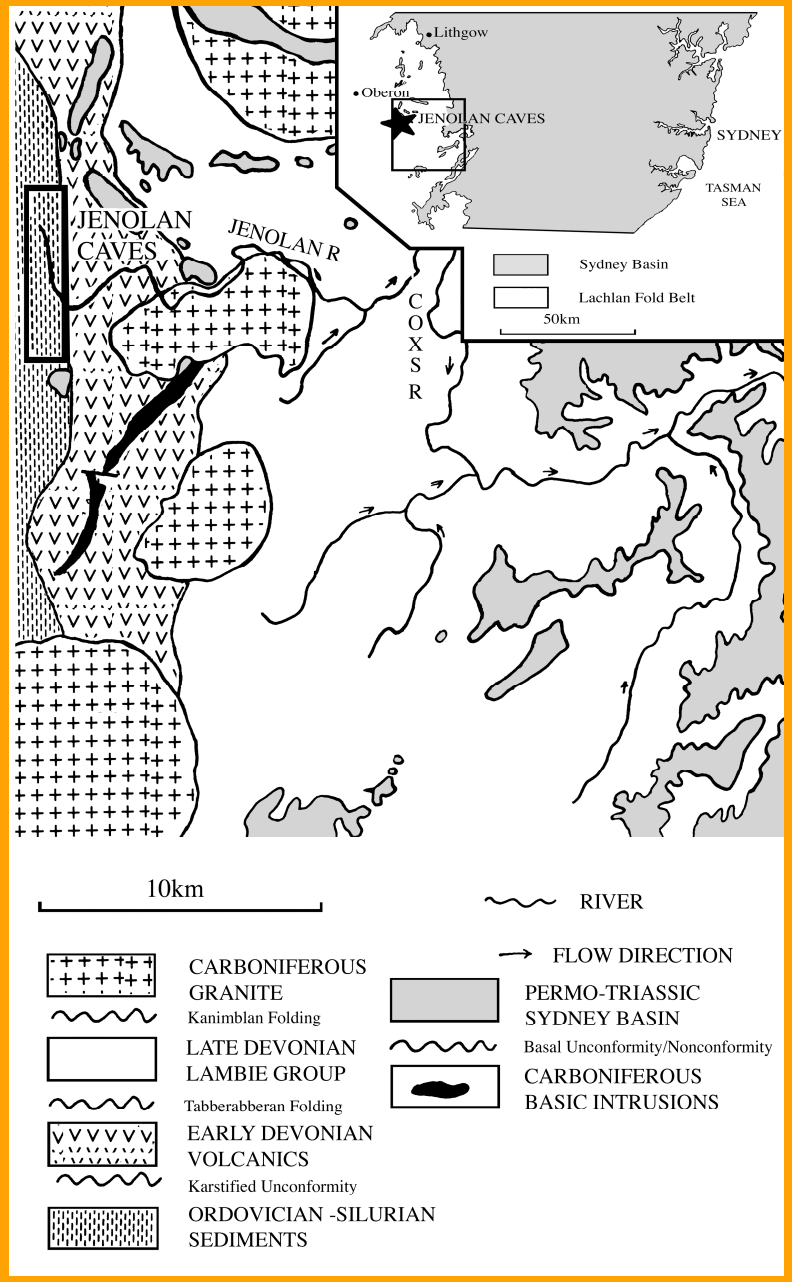
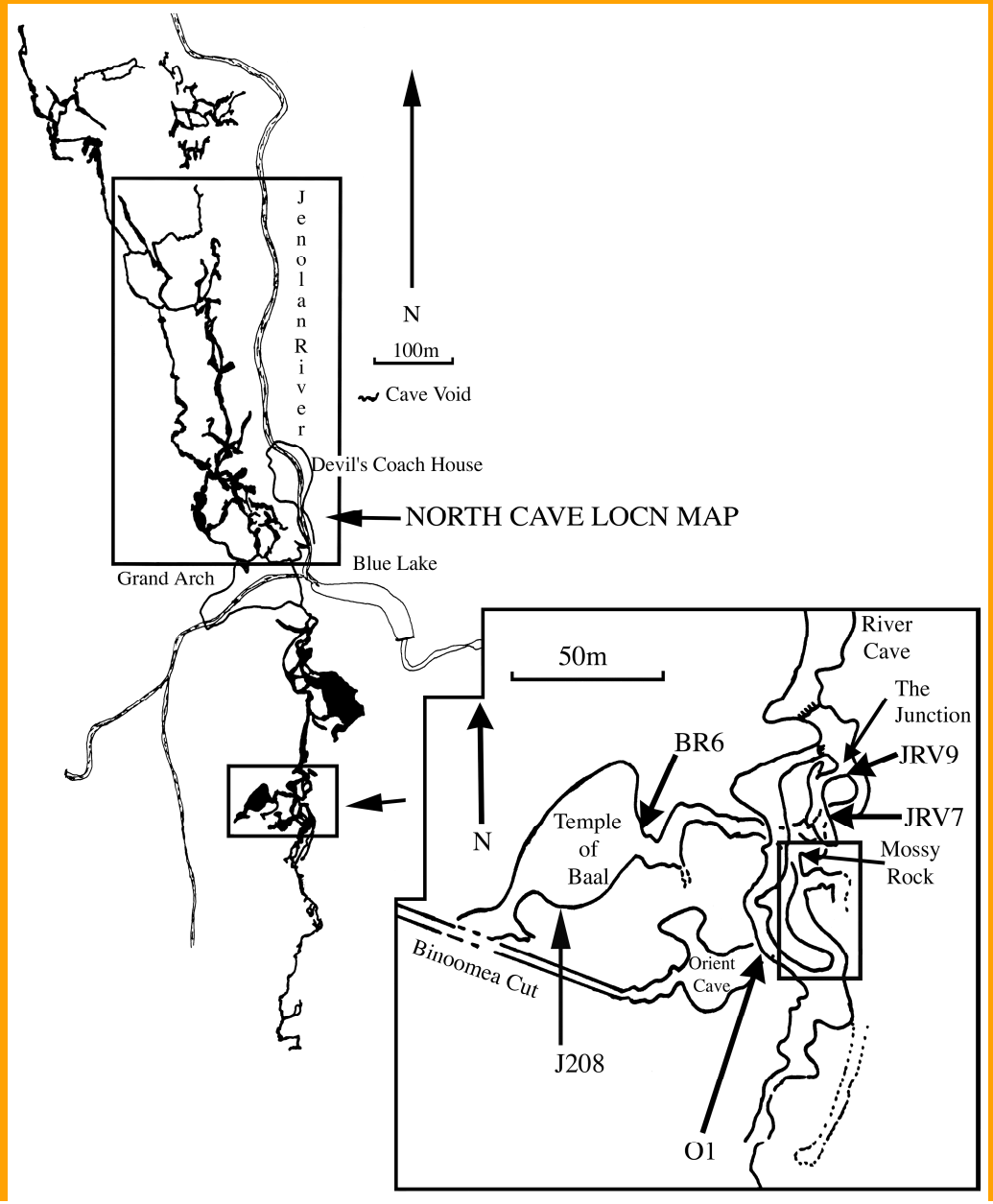
# Background/Significance

- Dominant view till 1980s that caves were young (Pleistocene).
- “No demonstrably old fill”
- Previous dating methods had short range (U/Th) or have not detected old material.
- K/Ar clay dating has good range and there are at least some K-bearing clays in caves.
- These results are the first evidence that eastern Australian (open) caves are old, and the oldest absolute date for a cave deposit by some 248 Ma.
- No cave deposits (not palaeokarst) older than Tertiary recognized in Australia until now.
- We now have a technique to unlock the record stored in caves.

# LOCATION/REGIONAL GEOLOGY



# Jenolan Show Caves



# PRIMARY SAMPLES 1

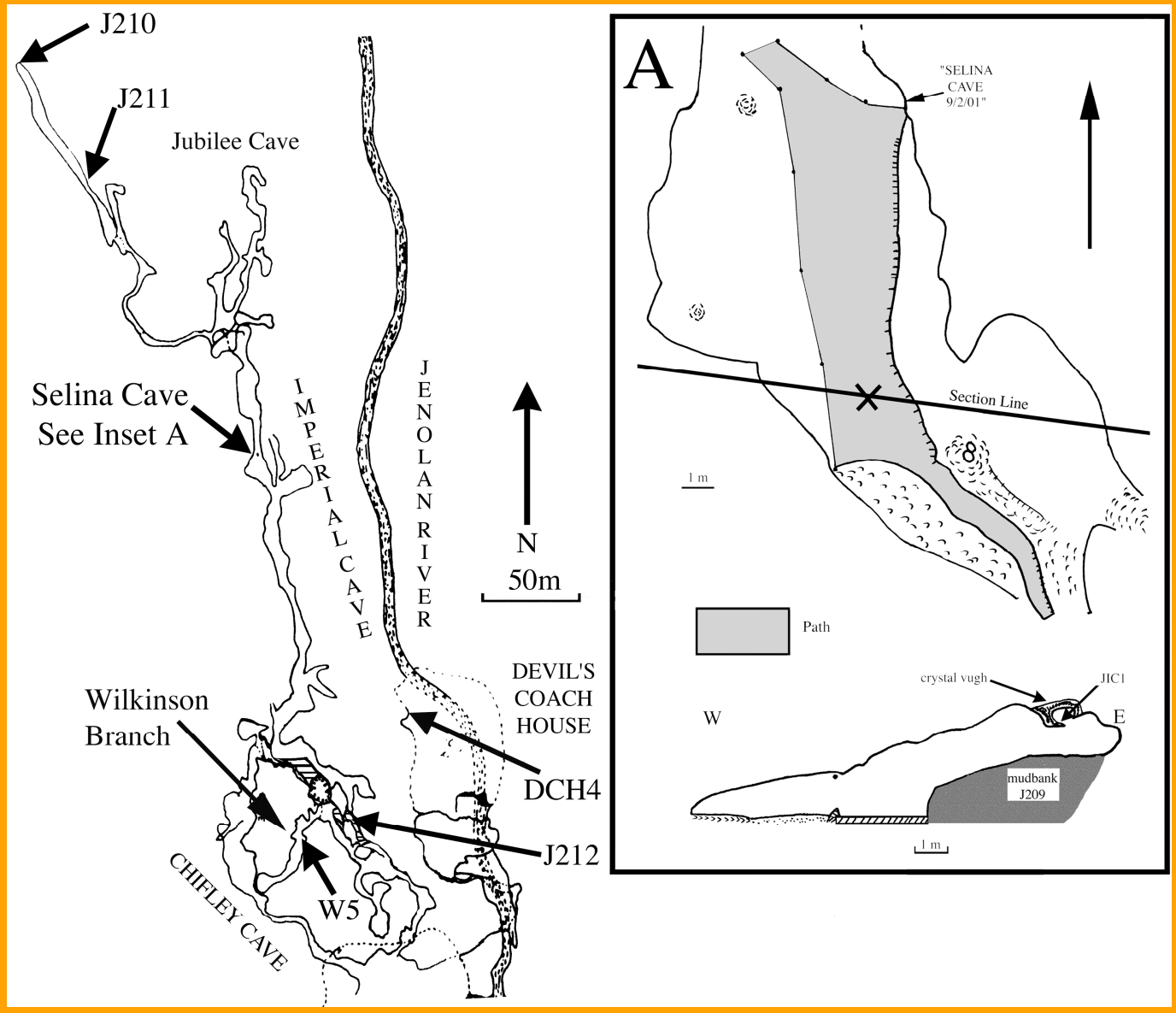

O1 ORIENT CAVE

BR6 TEMPLE OF BAAL

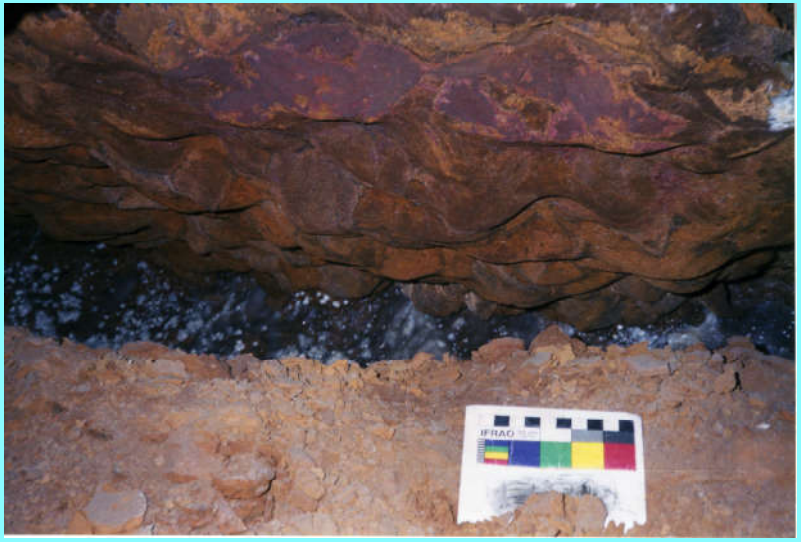
JRV7 RIVER LETHE

JRV9 THE JUNCTION

# Northern Show Caves

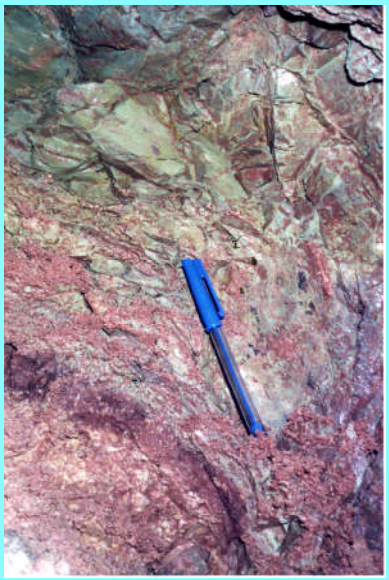


# PRIMARY SAMPLES 2



JIC1 SELENA CAVE

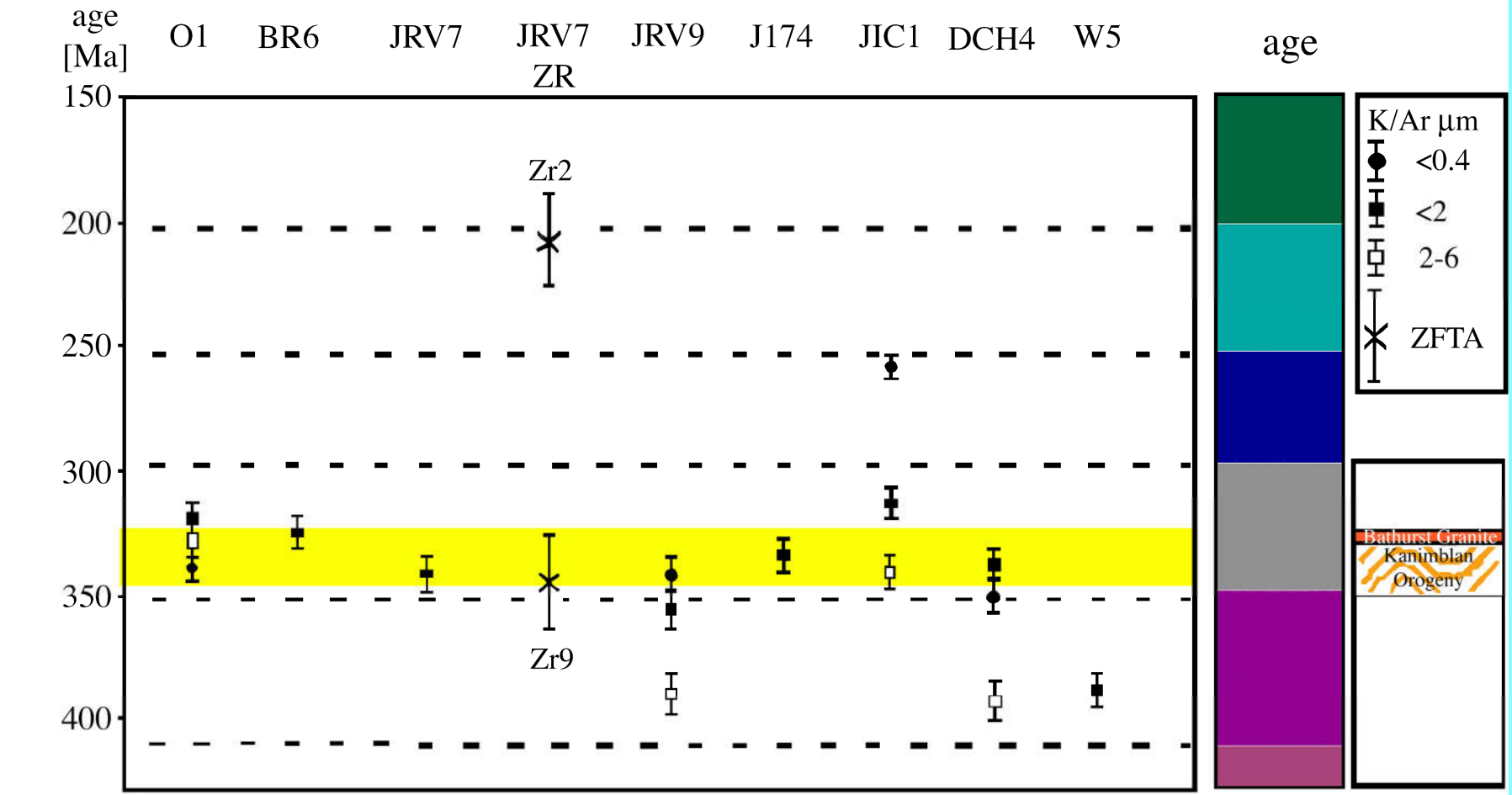
DCH4 DEVIL'S COACH HOUSE



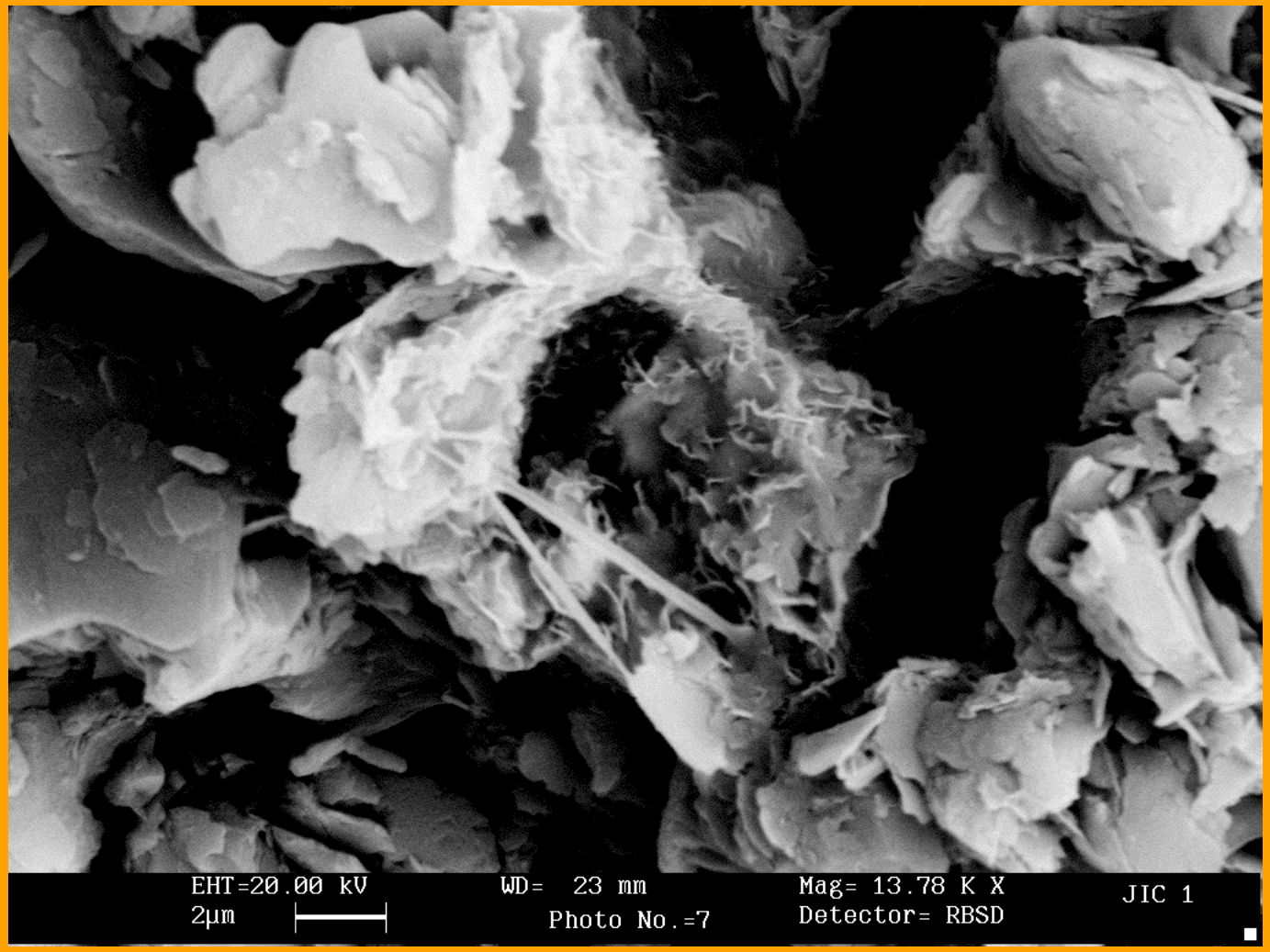
W5 WILKINSON BRANCH

J174 MUD TUNNELS

# Initial Dating Results



# JICI
# Note fibrous illite



# Initial Response to Dates

- ✓ Permian date is secondary fibrous illite.
- ✓ Devonian dates are volcaniclastic palaeokarst and rip-up clasts from it.

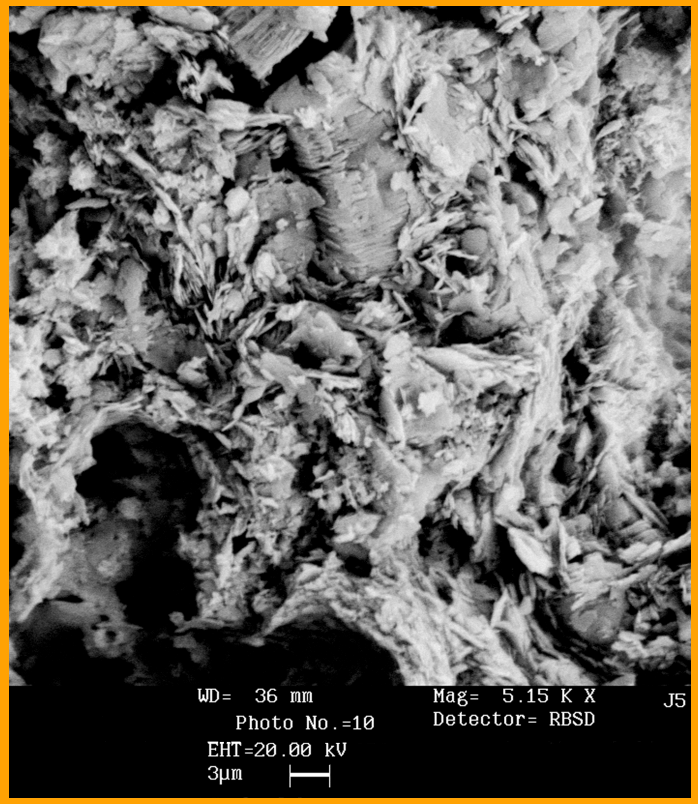
BUT

- X Carboniferous dates seemed too old
- X No local source
- X Volcanic indicators present
- X SEM indicates no transport=>

Cave is that old!

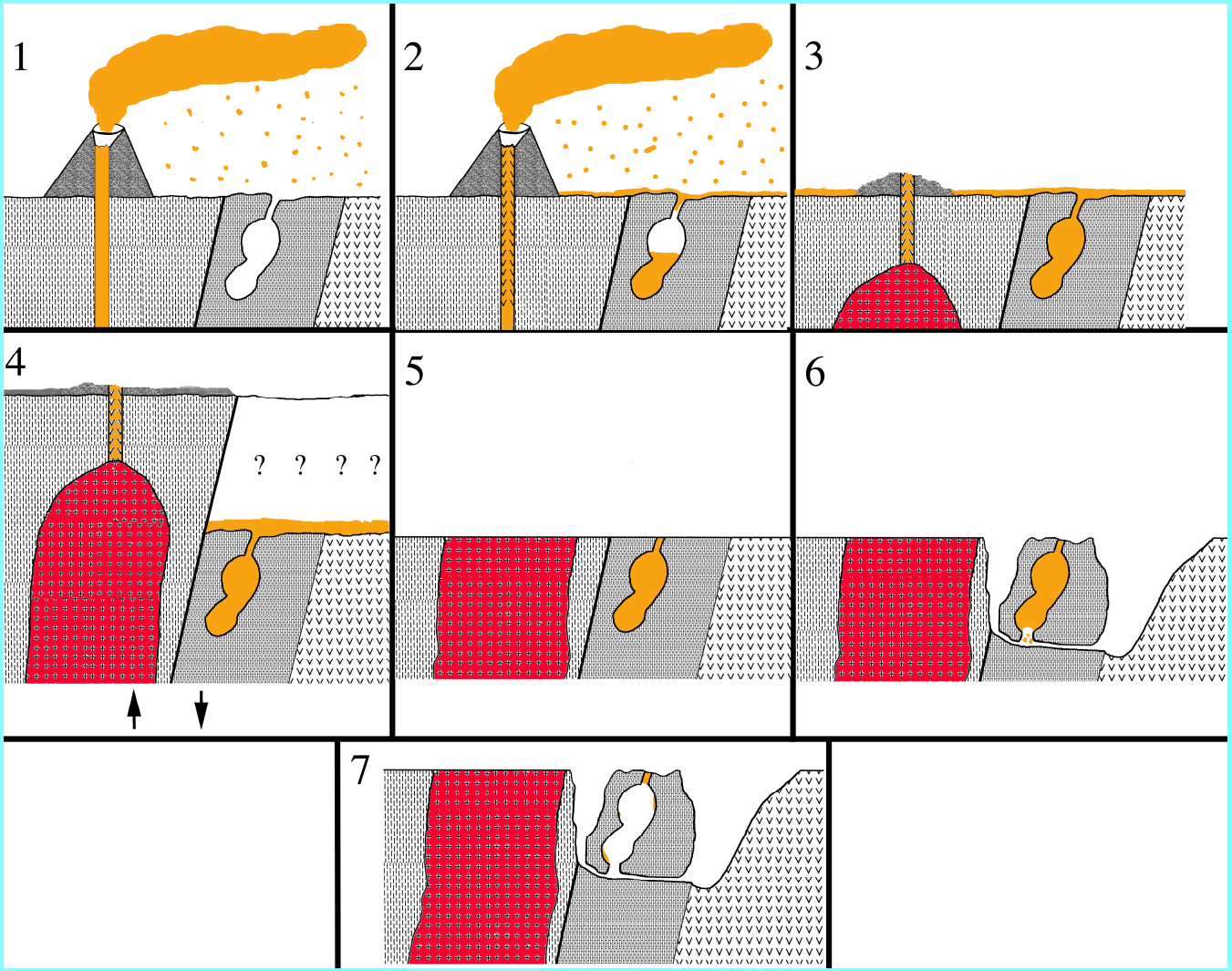
BUT

How could the cave survive?

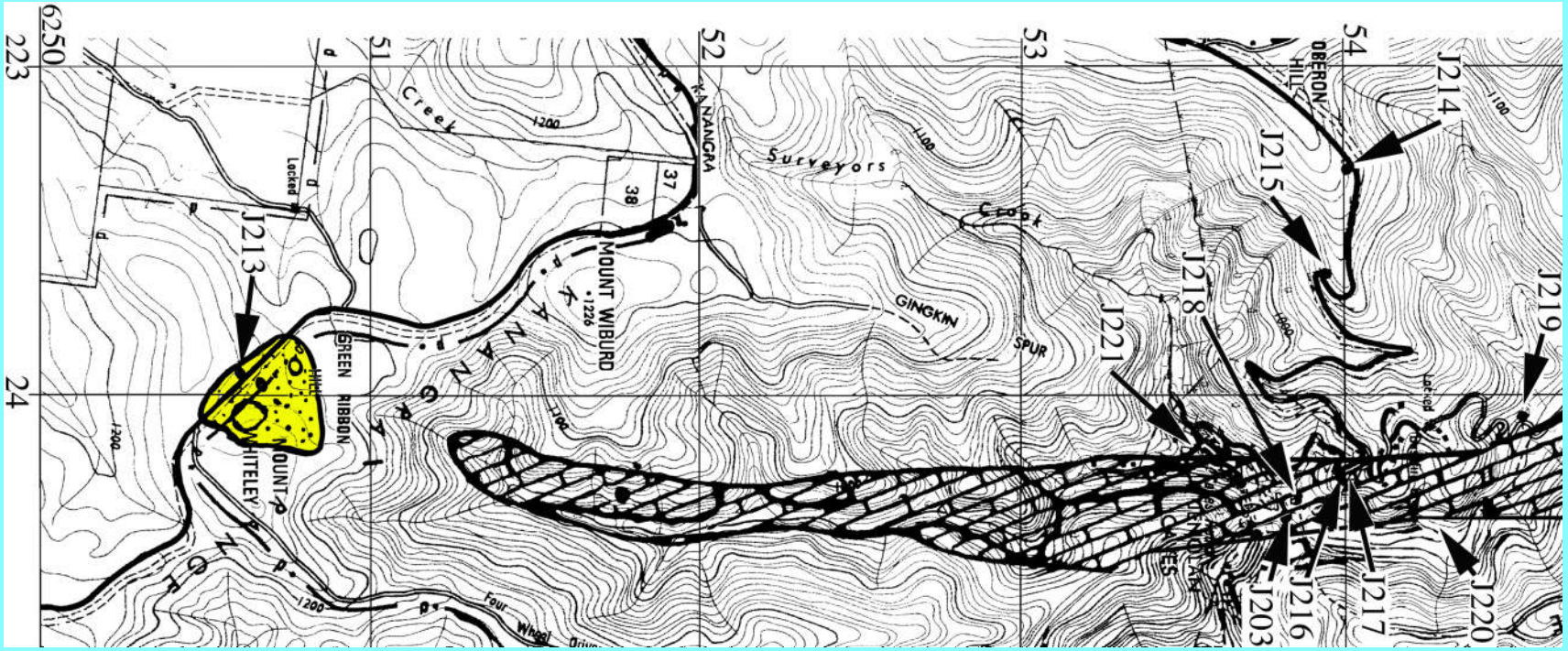



O1 Note articulated plates

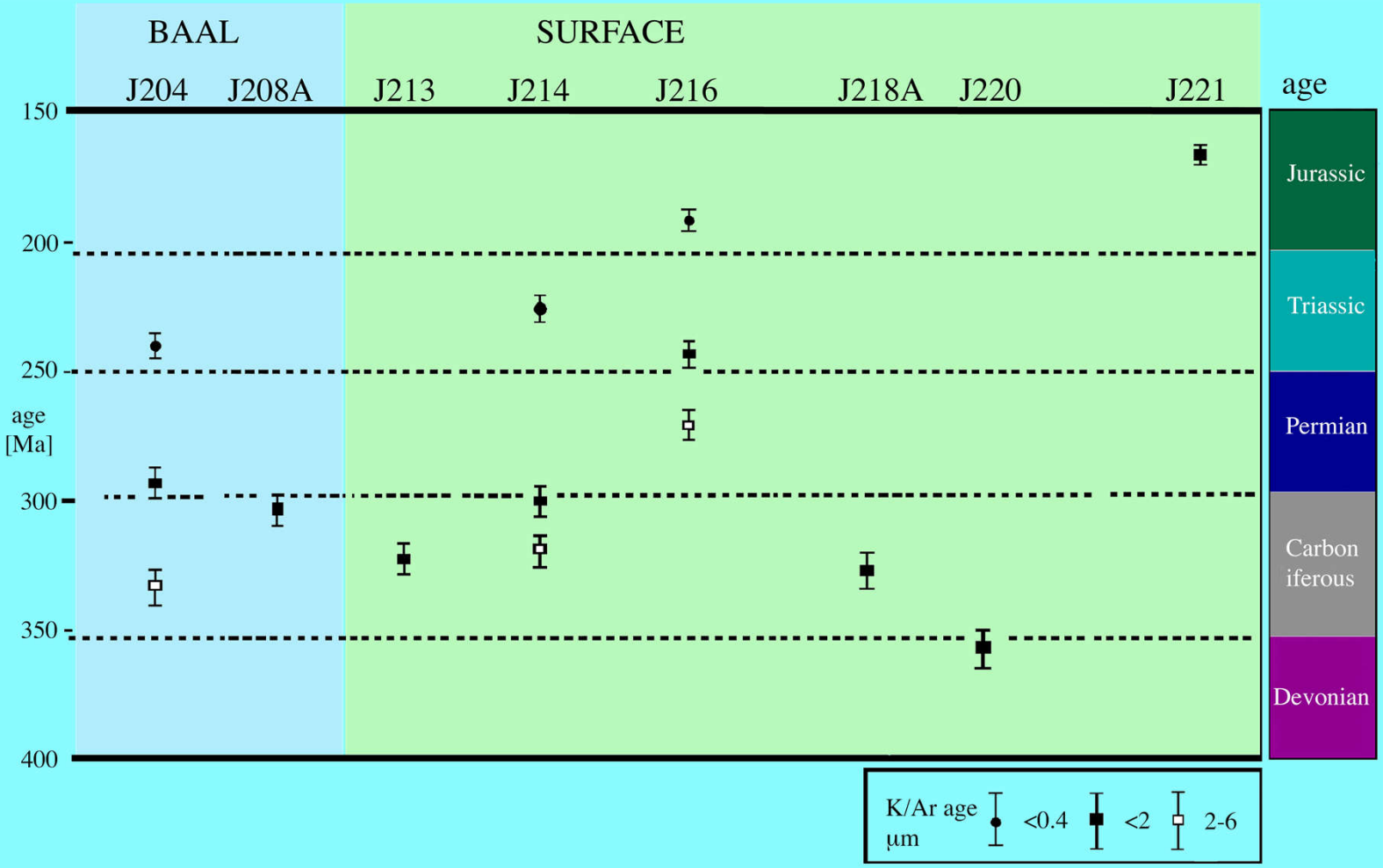
# Once upon a time…..



# But what if it sat around and washed in yesterday?



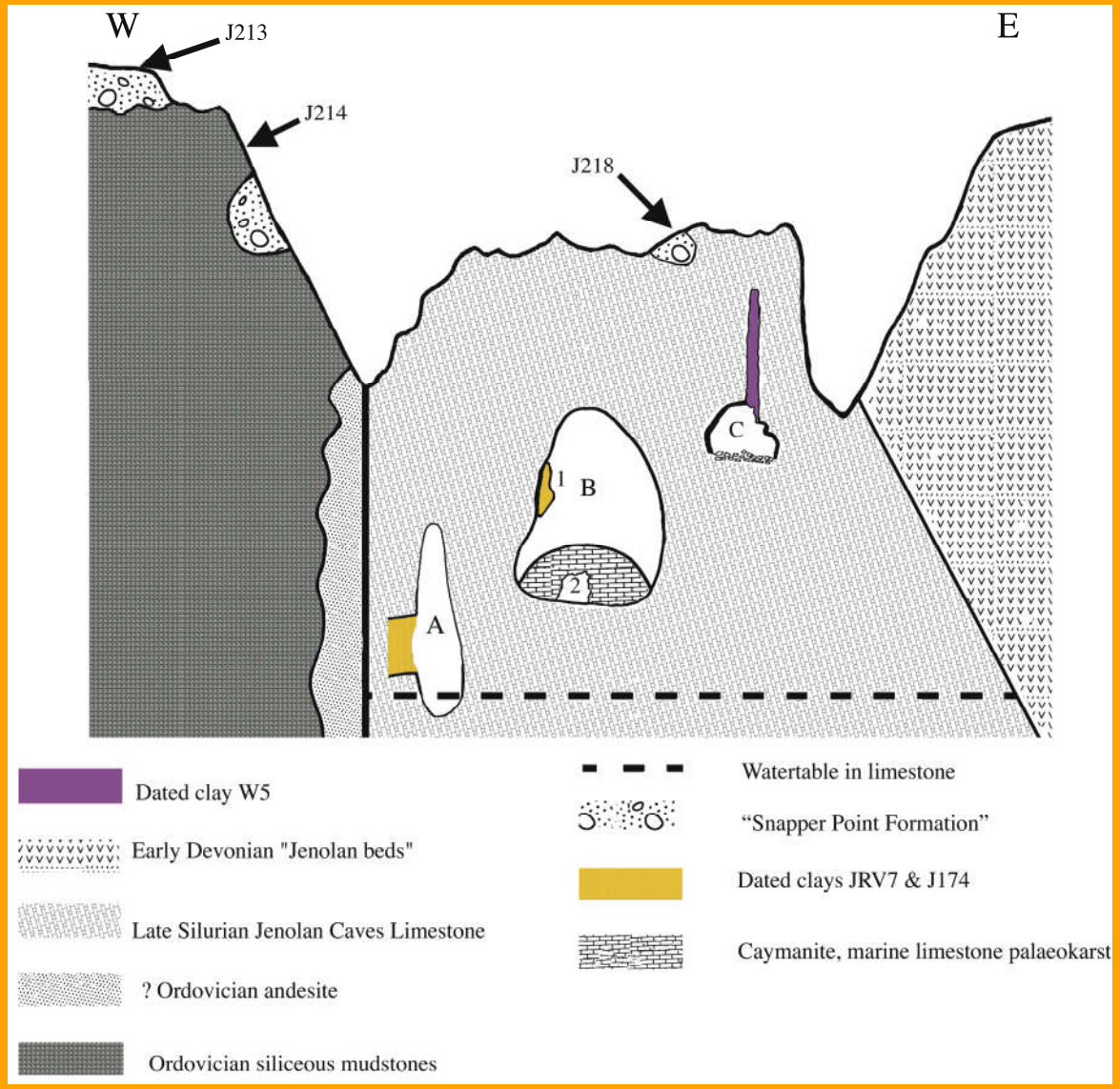
# Additional Dating Results



# Surface Illite Reservoirs

| SPEC | LOCATION/ DESC | AGE | FWHM | SEM | POSSIBLE SOURCE? |
|---|---|---|---|---|---|
| J213 | Kanangra Rd Diamictite | 320 | 0.426 | RAGGED | SEM & FWHM rule out |
| J214 | 2 Mile Hill Weathered Slate | 319-226 | 0.510 | SUBHEDRAL | SEM & FWHM rule out |
| J216 | 2 Mile Hill Red Clay | 271-192 | - | - | Too Young |
| J218A | Old School Gravel Matrix | 327 | 1.120 | RAGGED | SEM & FWHM rule out |
| J220 | Weathered Volcanics | 357 | - | - | Too Old |
| J221 | Weathered Andesite | 167 | - | - | Too Young |

# RELATIONSHIP DIAGRAM



# Geological Implications

- Kanimblan folding must be older than thought.
- Caymanites must be Early Carb. => Early Carb. Marine Transgression.
- “Snapper Point Fm” probably Carb. Tangerang Group.
- *Terra Rossa* is too young to be insoluble residue from limestone.
- Andesite may be Mesozoic, whole rock dating needed.

# Speleological Implications

GENERAL

- Long-term cave survival is possible
- Uncemented relict sediments may be older than lithified palaeokarsts

JENOLAN

- Devonian volcaniclastic palaeokarst identified
- Probably only 1 thermal event
- Carboniferous thermal cave system extensive.
- Initial excavation of Jenolan River Valley and diamictite in Baal probably Late Carboniferous

# *Thanks*

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