End Permian Armageddon asteroid cluster that almost ended life on Earth. Climate change on steroids.

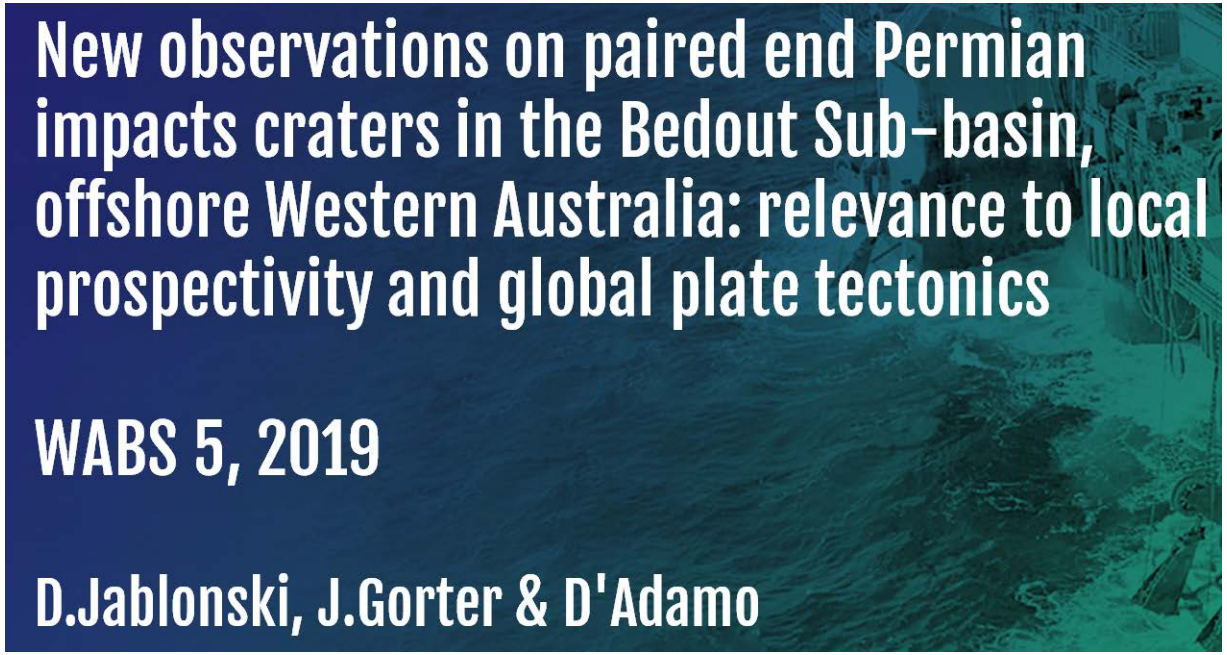
Impact on the prospectivity of the Bedout Sub-basin and surrounds, GNWS, Western Australia

PESA Webinar, Dariusz Jablonski, Oct 2020

Acknowledgements

DJgeoscience

- Spectrum
- Searcher Seismic
- Finder Energy



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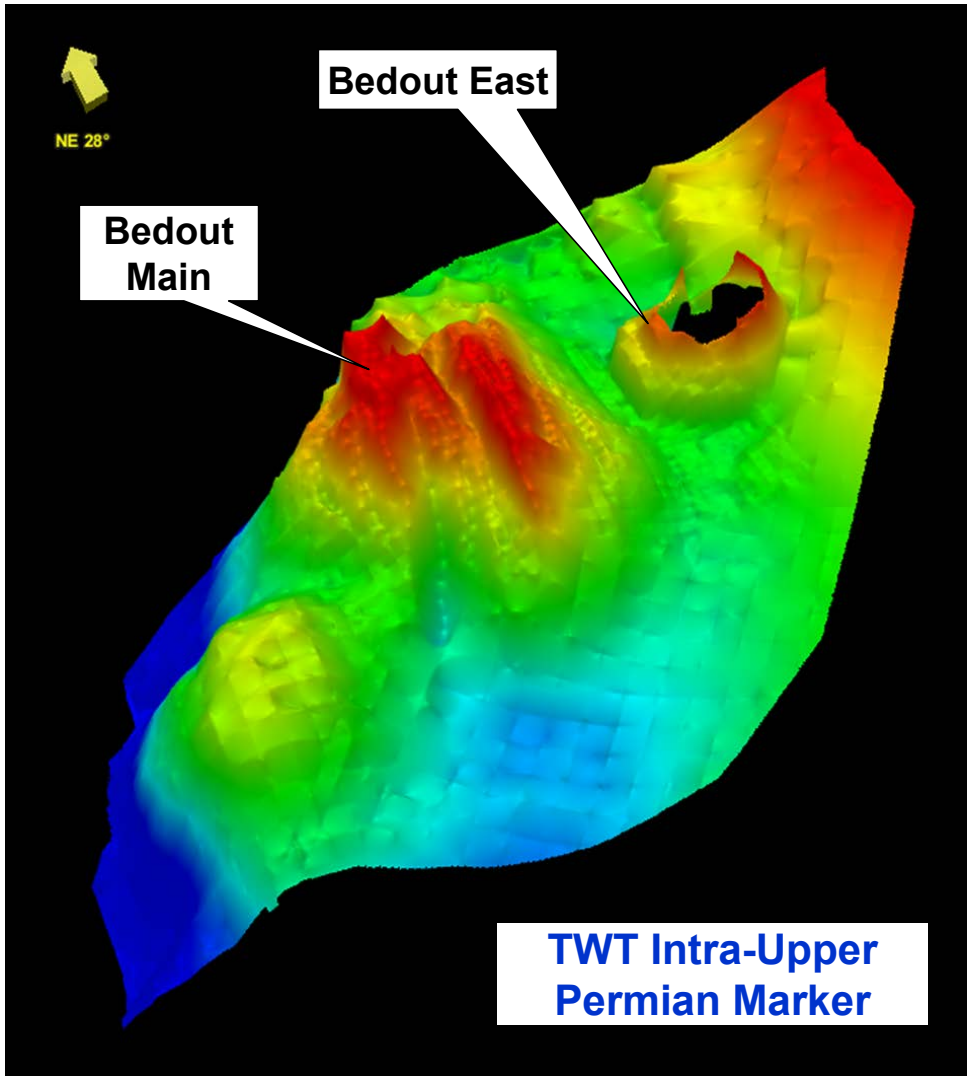
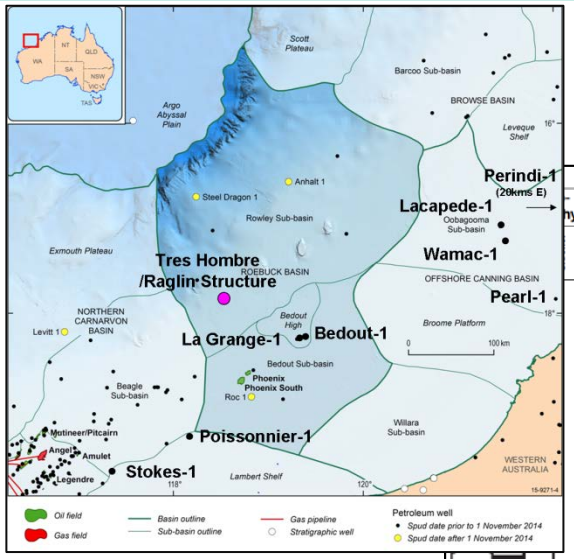
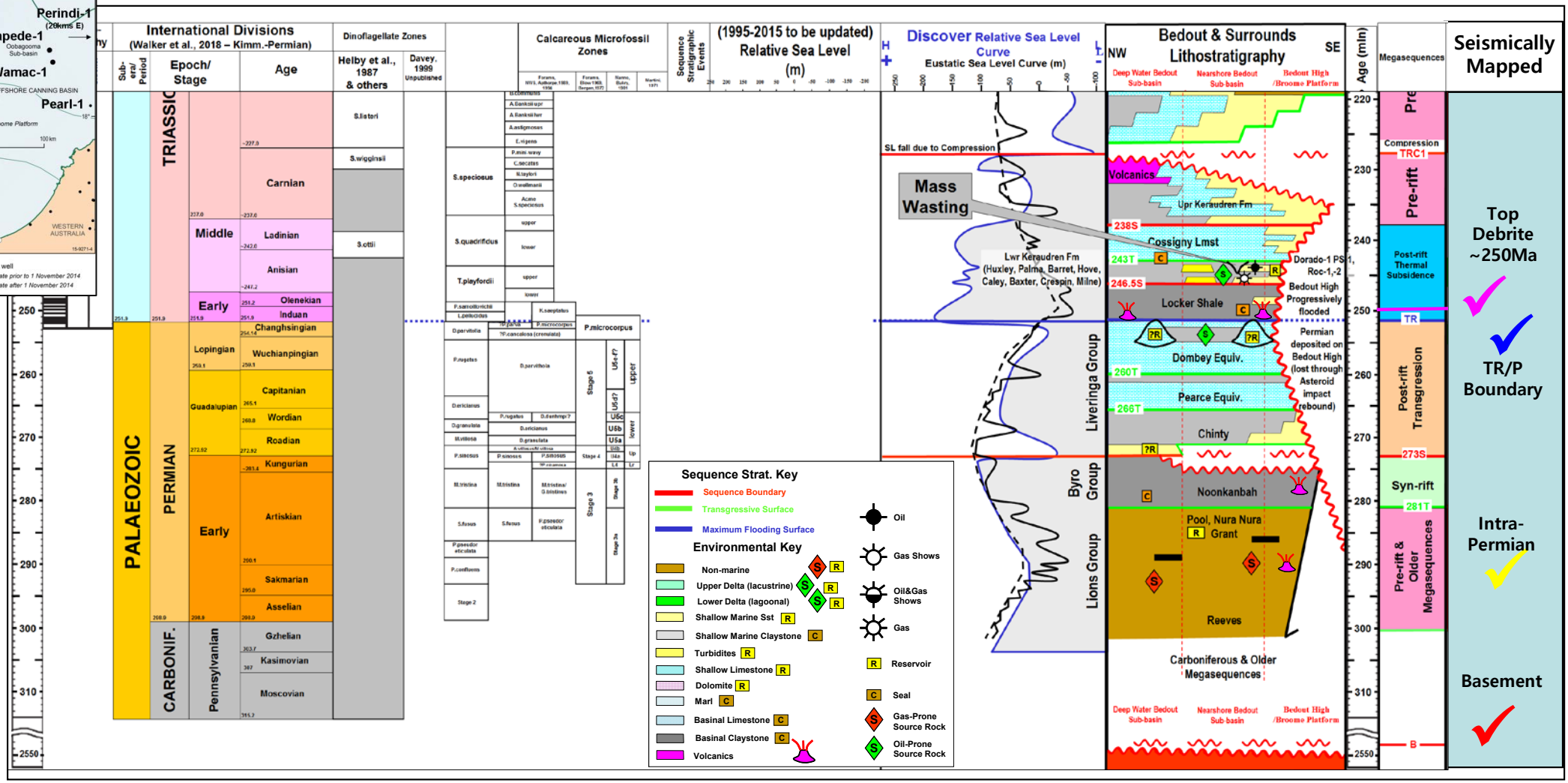


Location and Stratigraphy





Original Data

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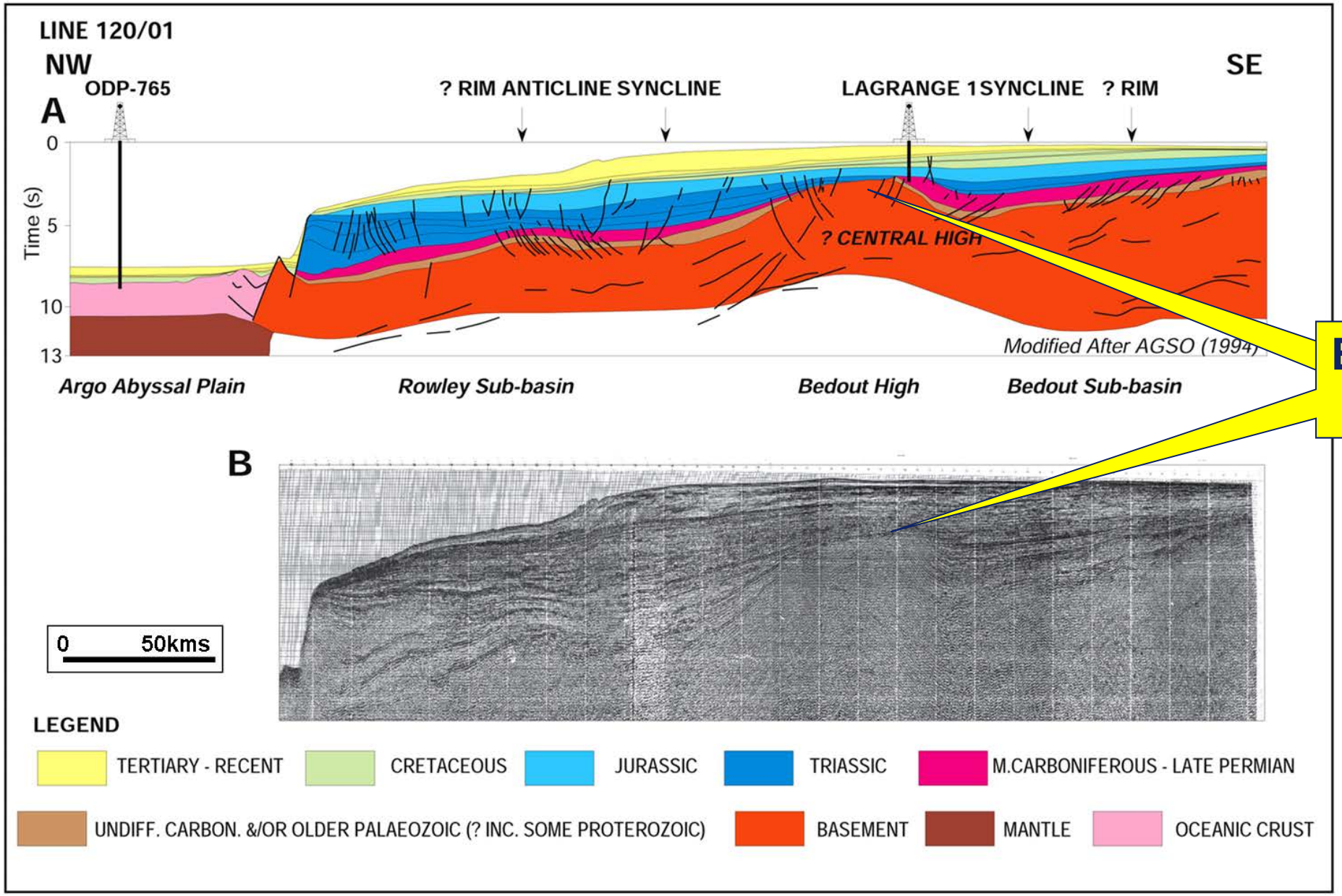

Basement at 4kms

Local Well Correlation flattened on 273S – Absolute age 253+/-5Ma

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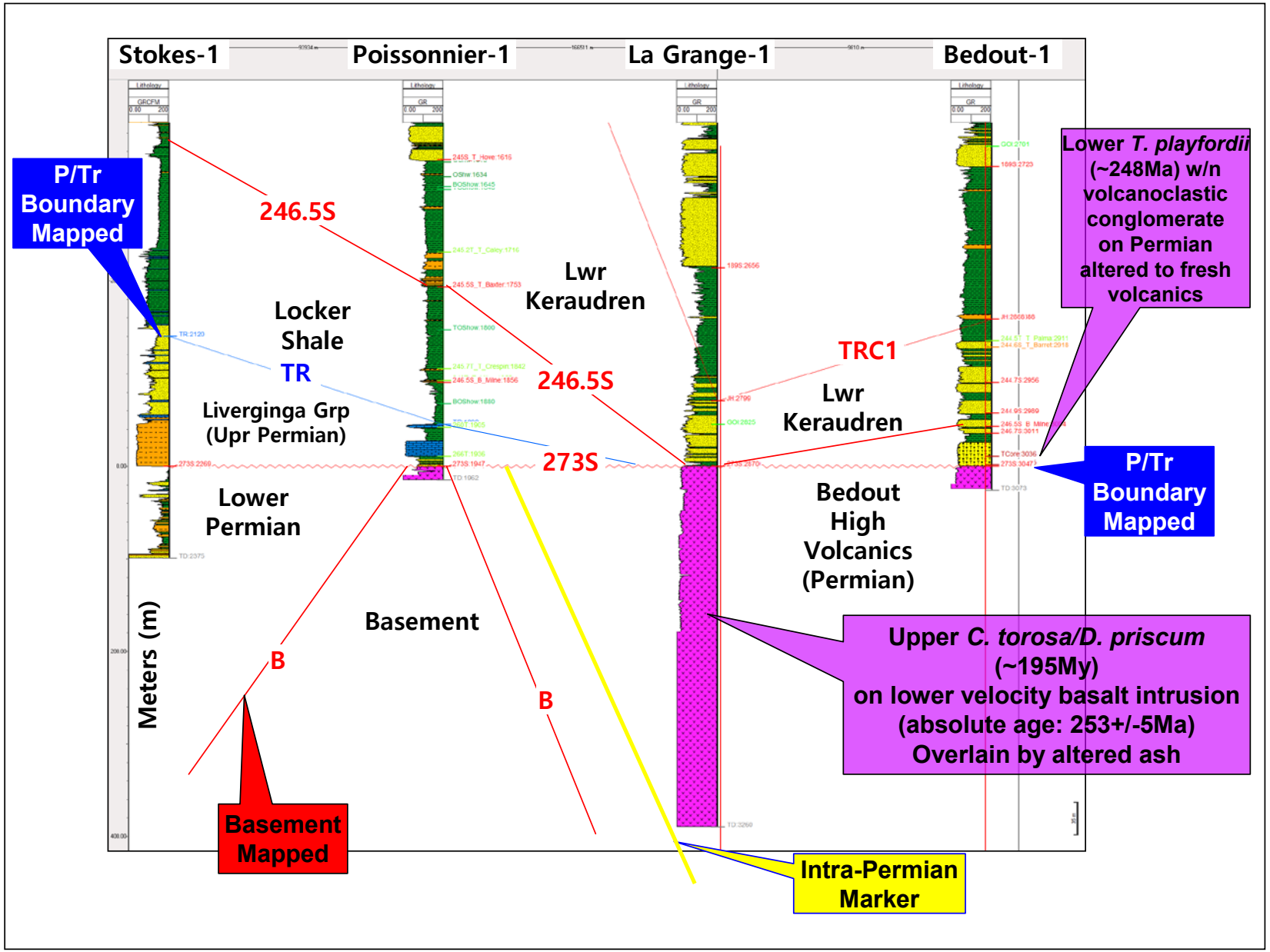

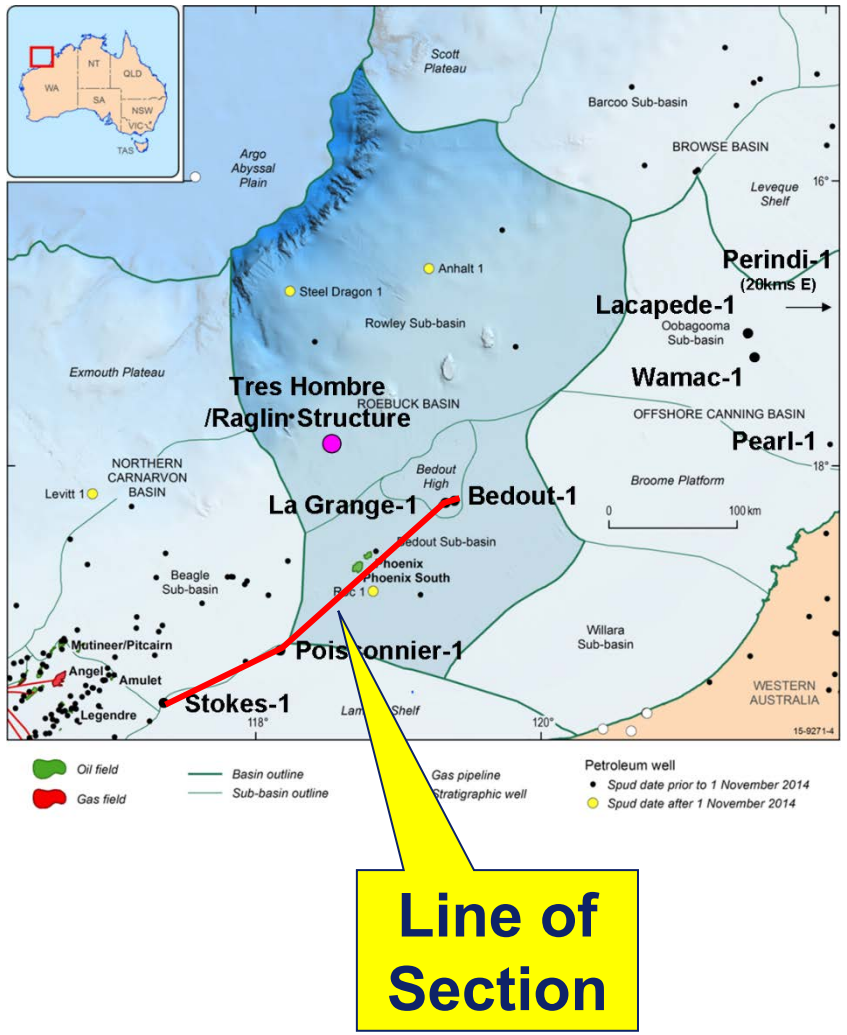

Well Information – Bedout-1 Core

No Planar Deformation Features (pdfs) in La Grange-1 and Bedout-1

(Glikson, 2004)

High Energy Volcanic Conglomerate

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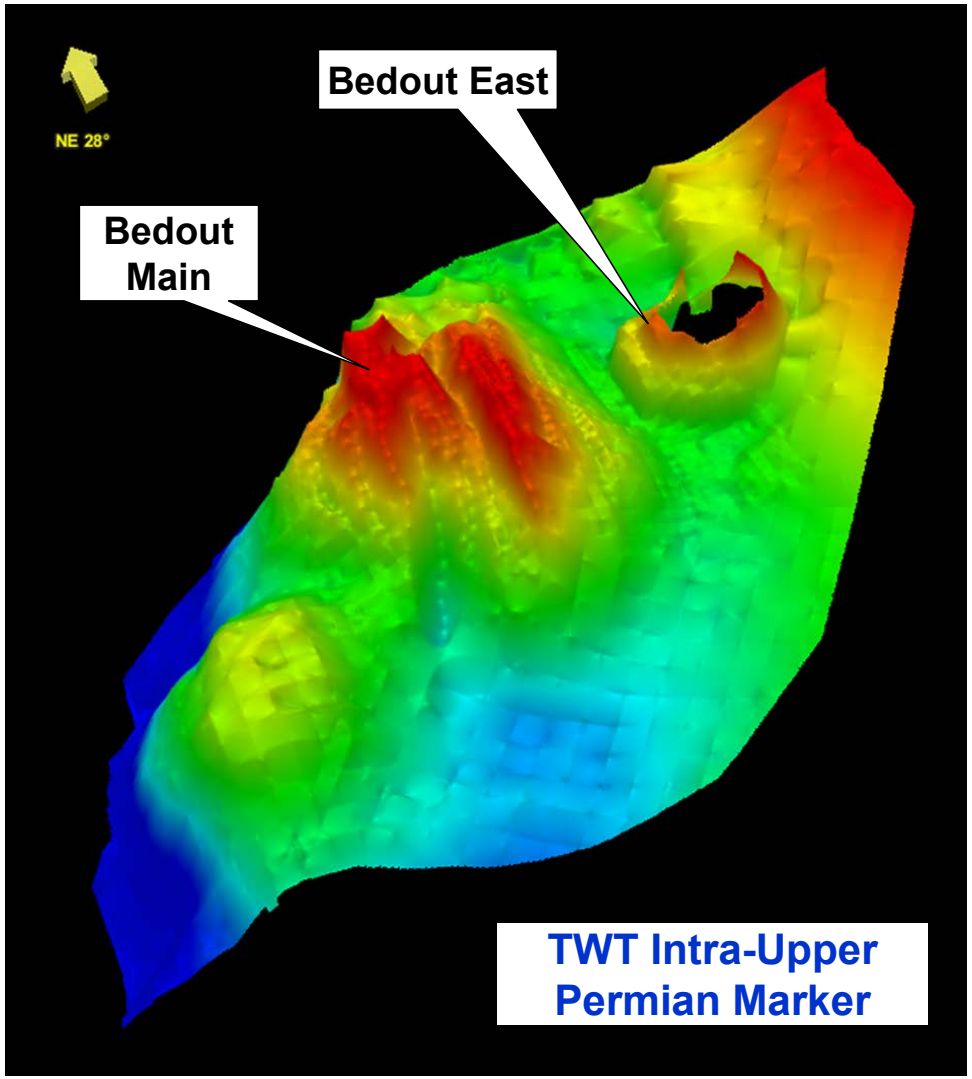

Bedout East Crater (25kms in diameter with up 1km uplift)

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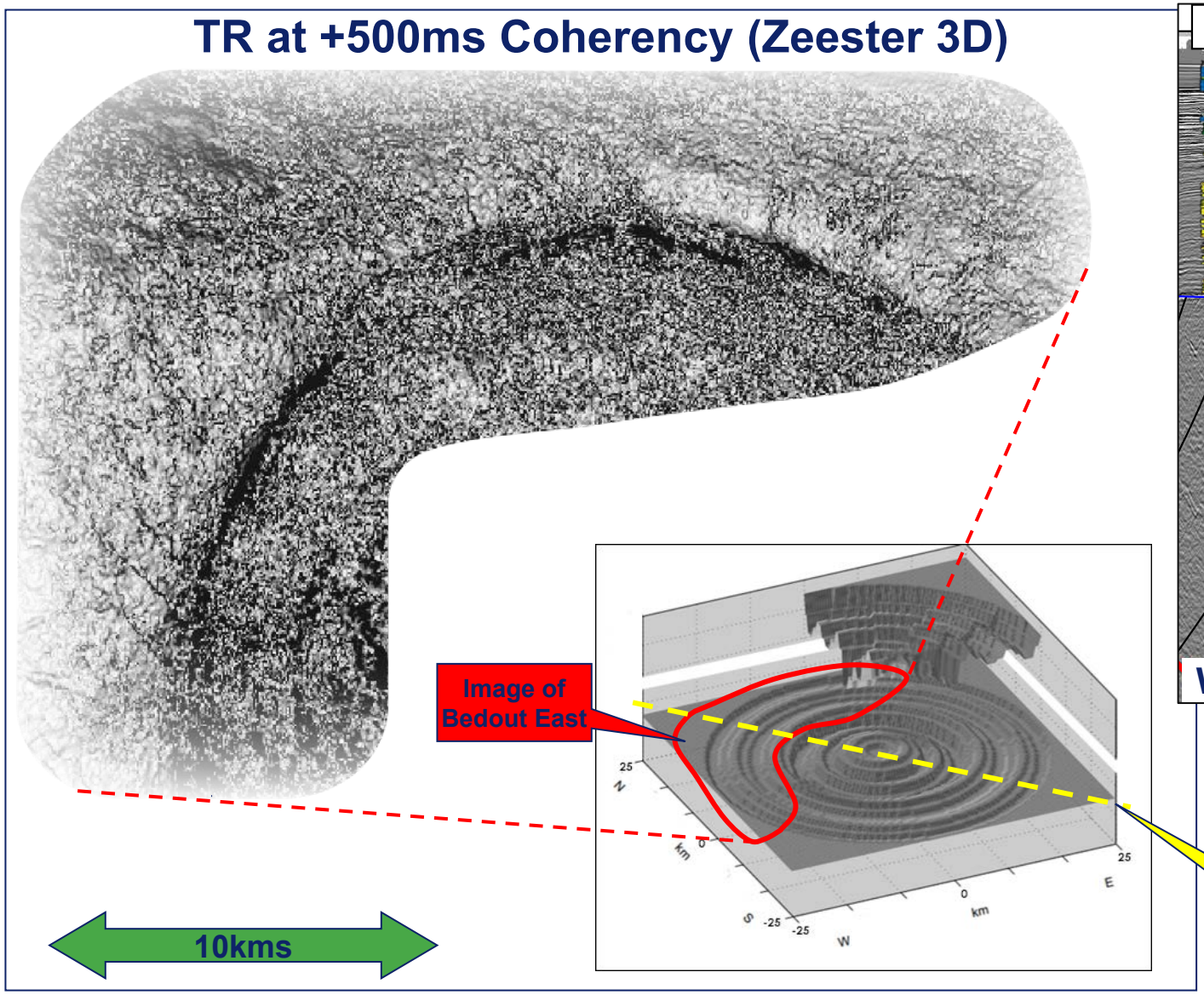
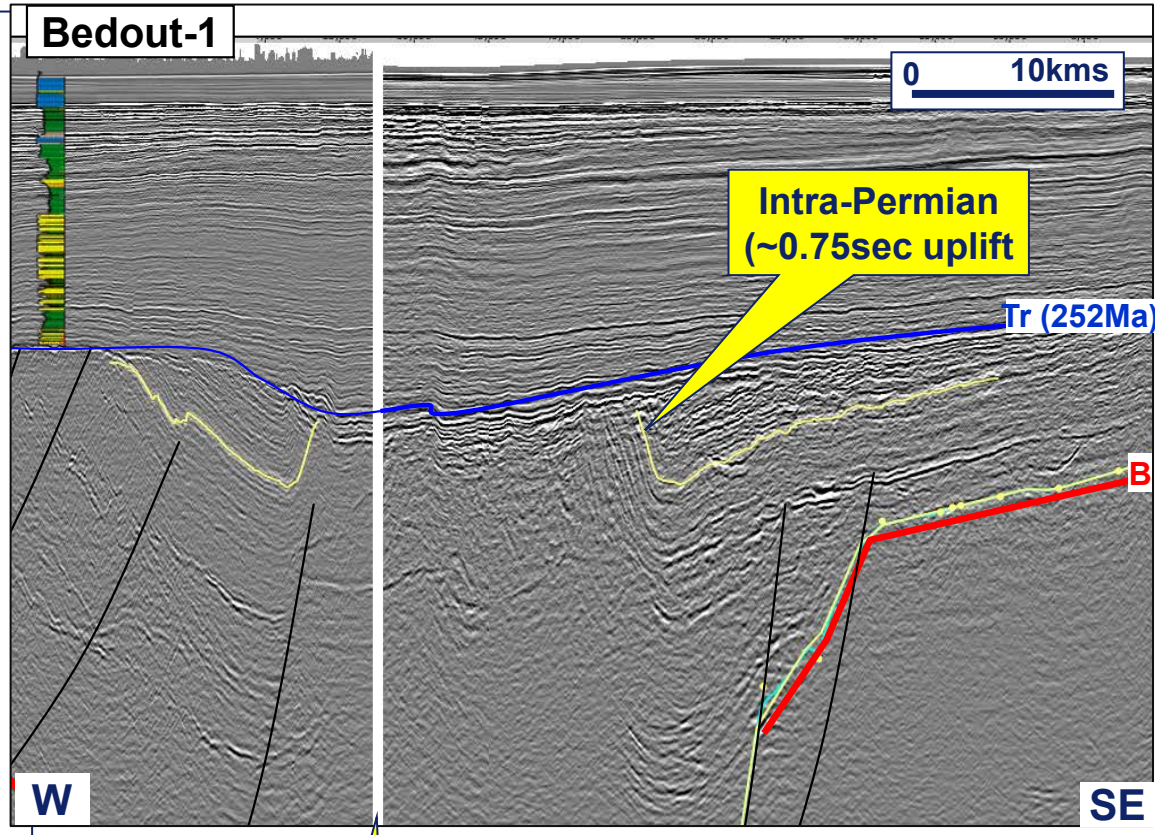
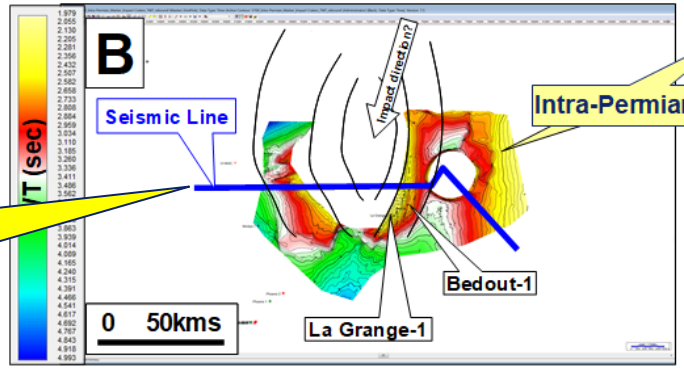




Line of Section



Zeester 3D - 500ms below base Triassic

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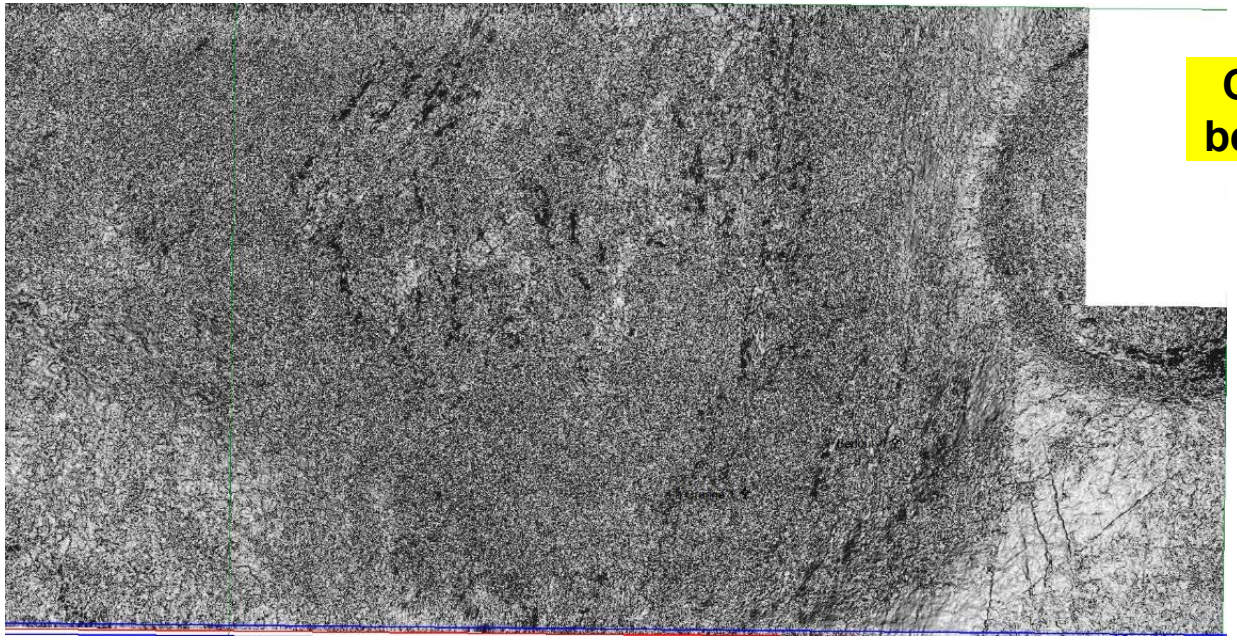
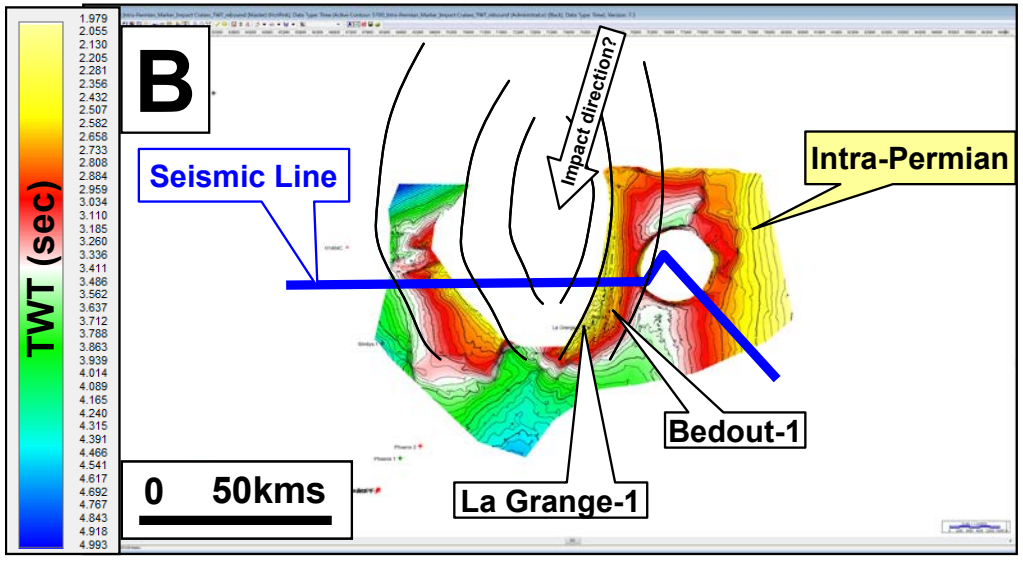
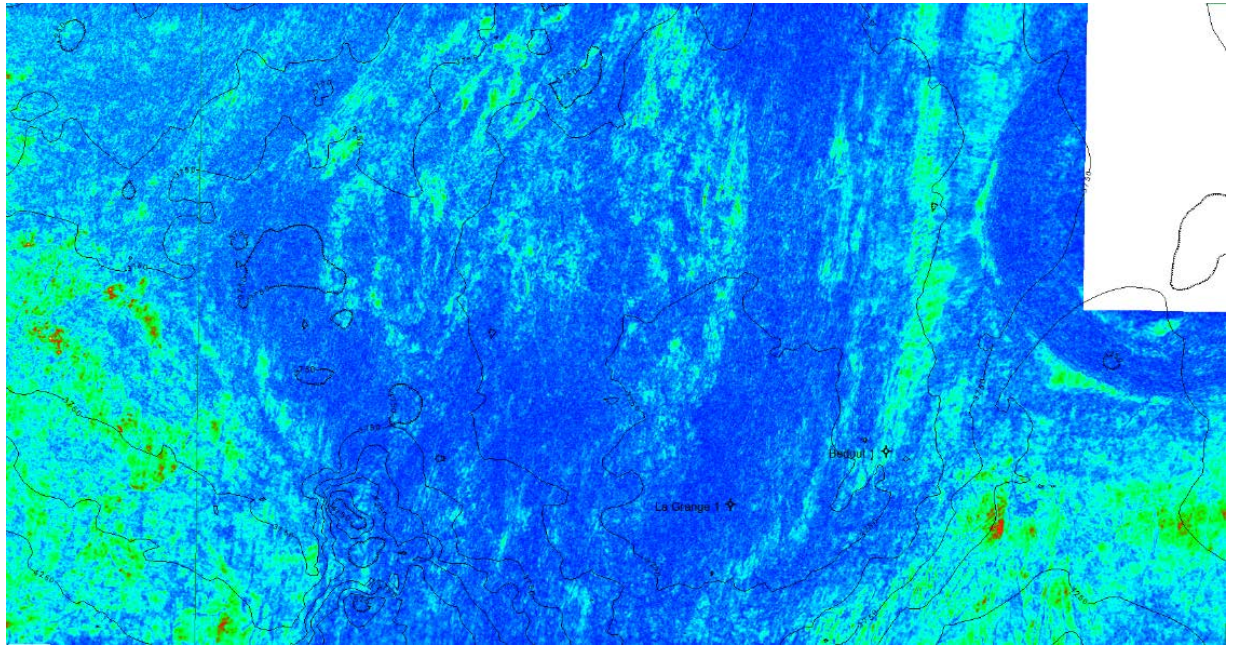


Coherency 500ms below base Triassic

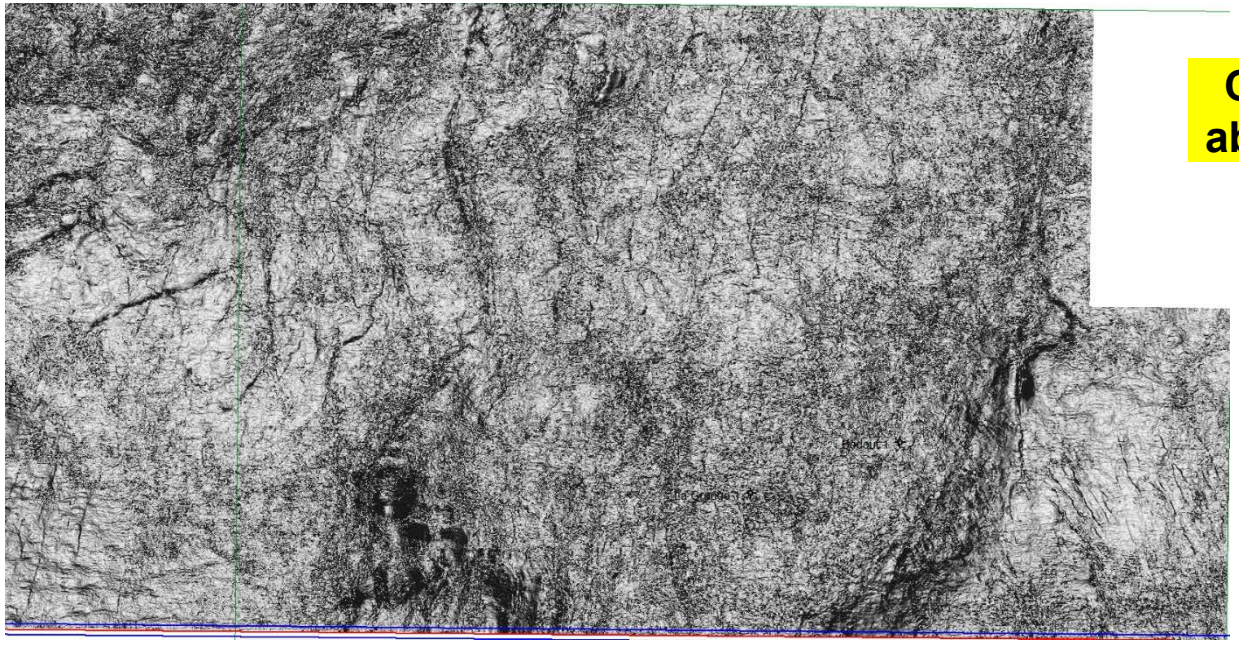


RMS Amplitude 500ms below base Triassic

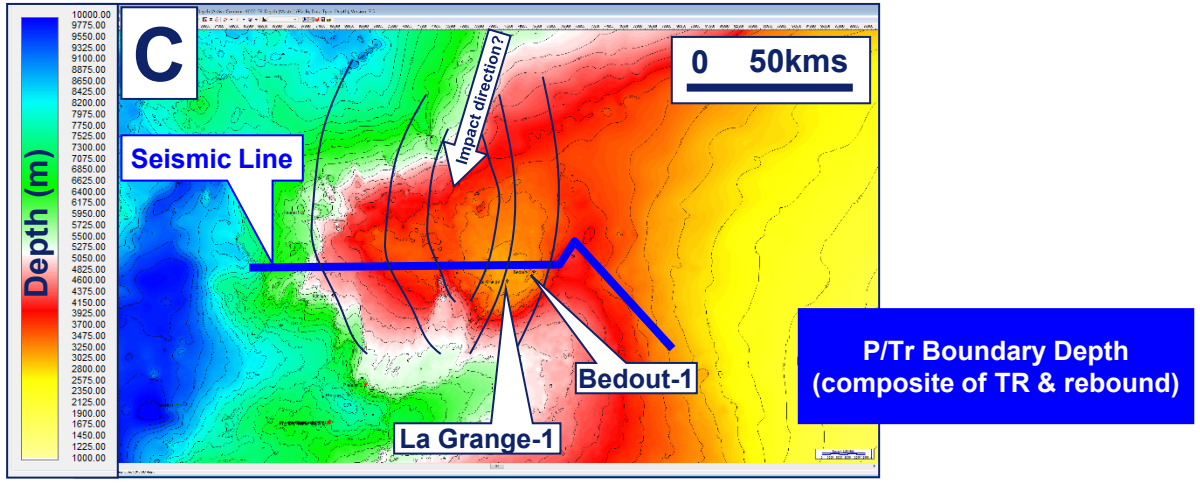


Zeester 3D - 100ms above base Triassic

DJgeoscience

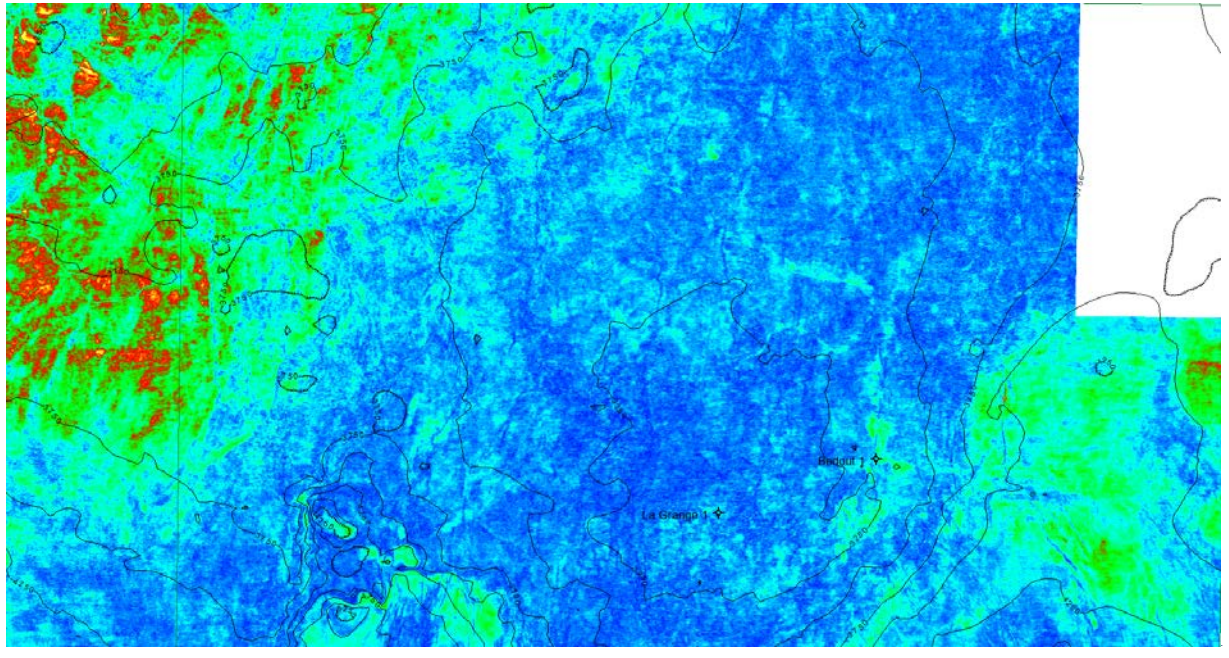


Coherency 100ms above base Triassic

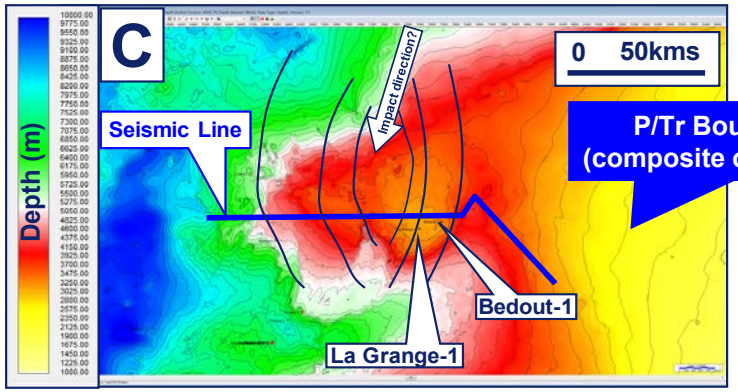


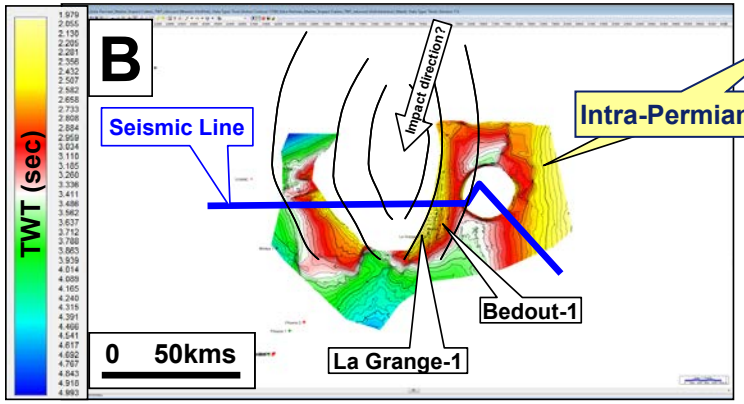
P/Tr Boundary Depth (composite of TR & rebound)

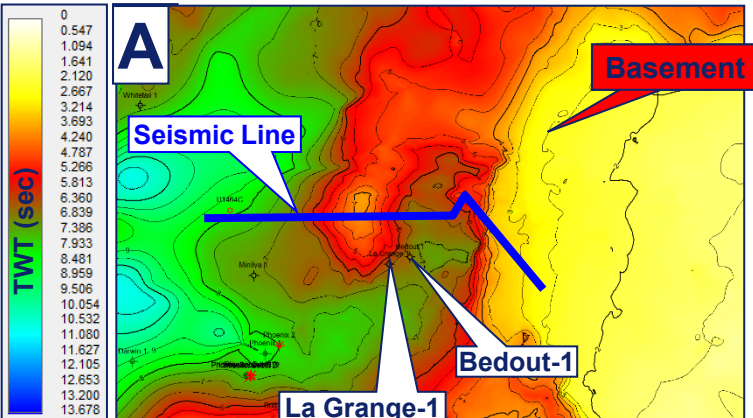
RMS Amplitude 100ms above base Triassic

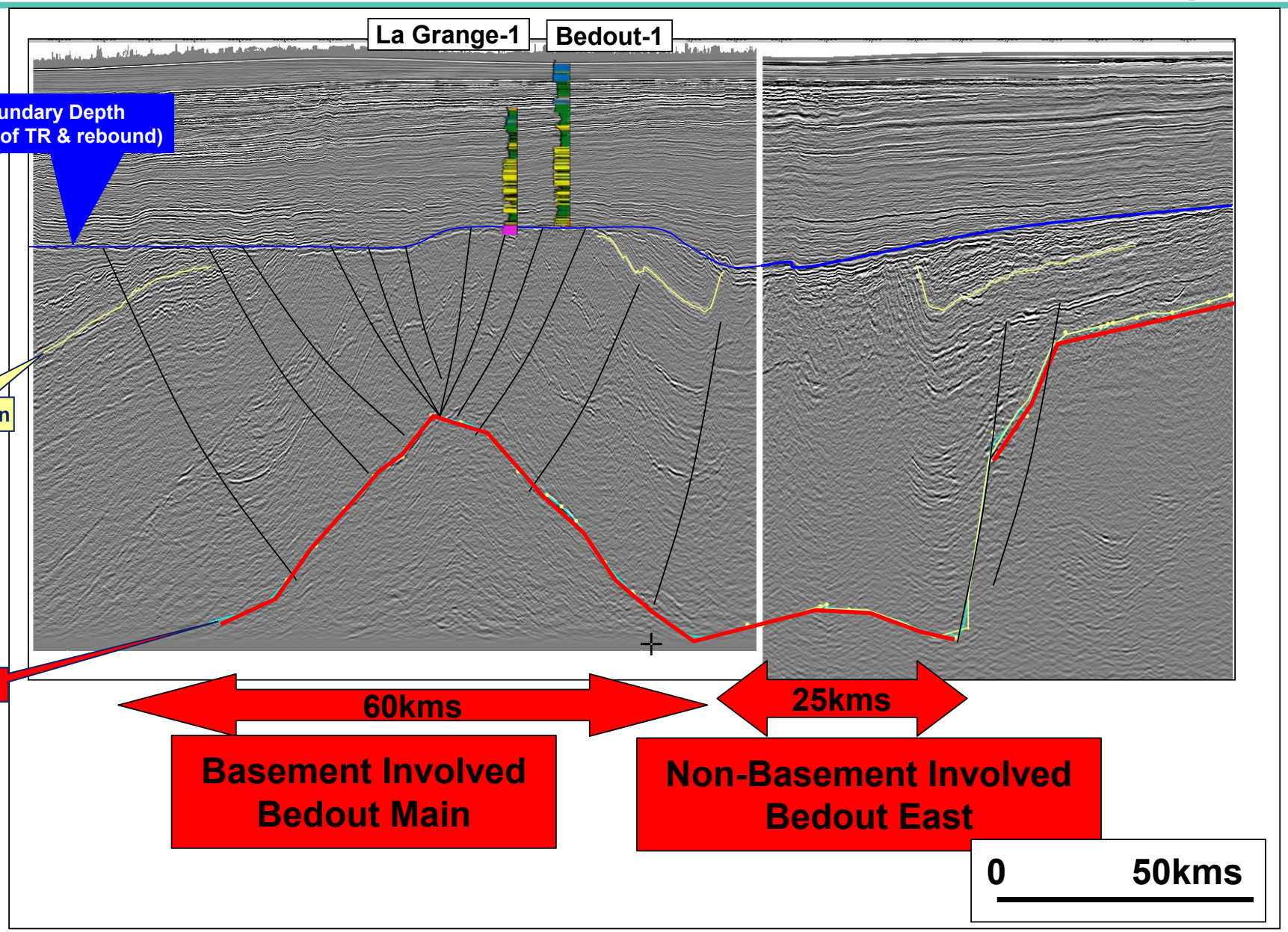


Interpretation & Composite Seismic Line

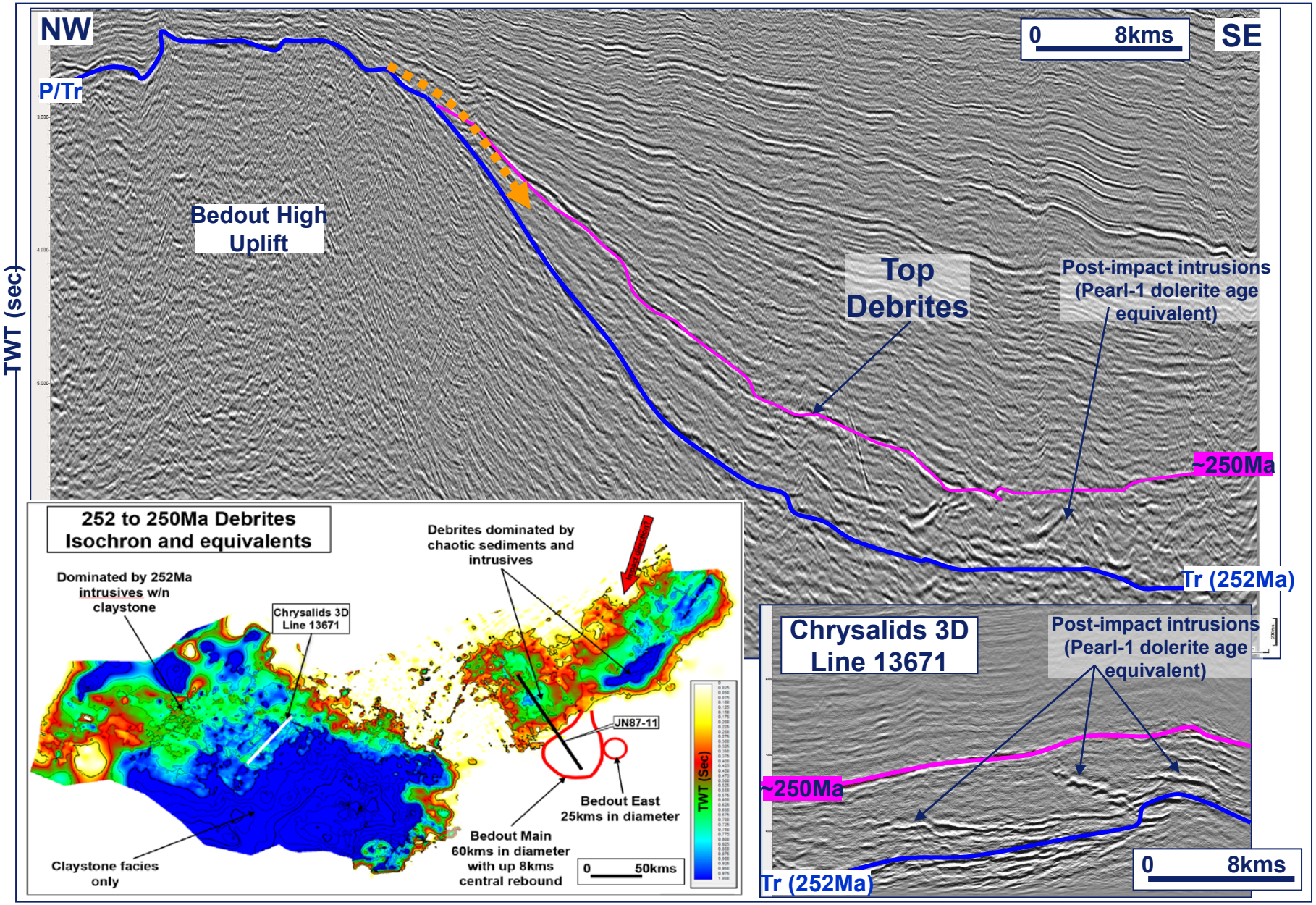








Base Triassic Debrites and Intrusions



Open File Gravity

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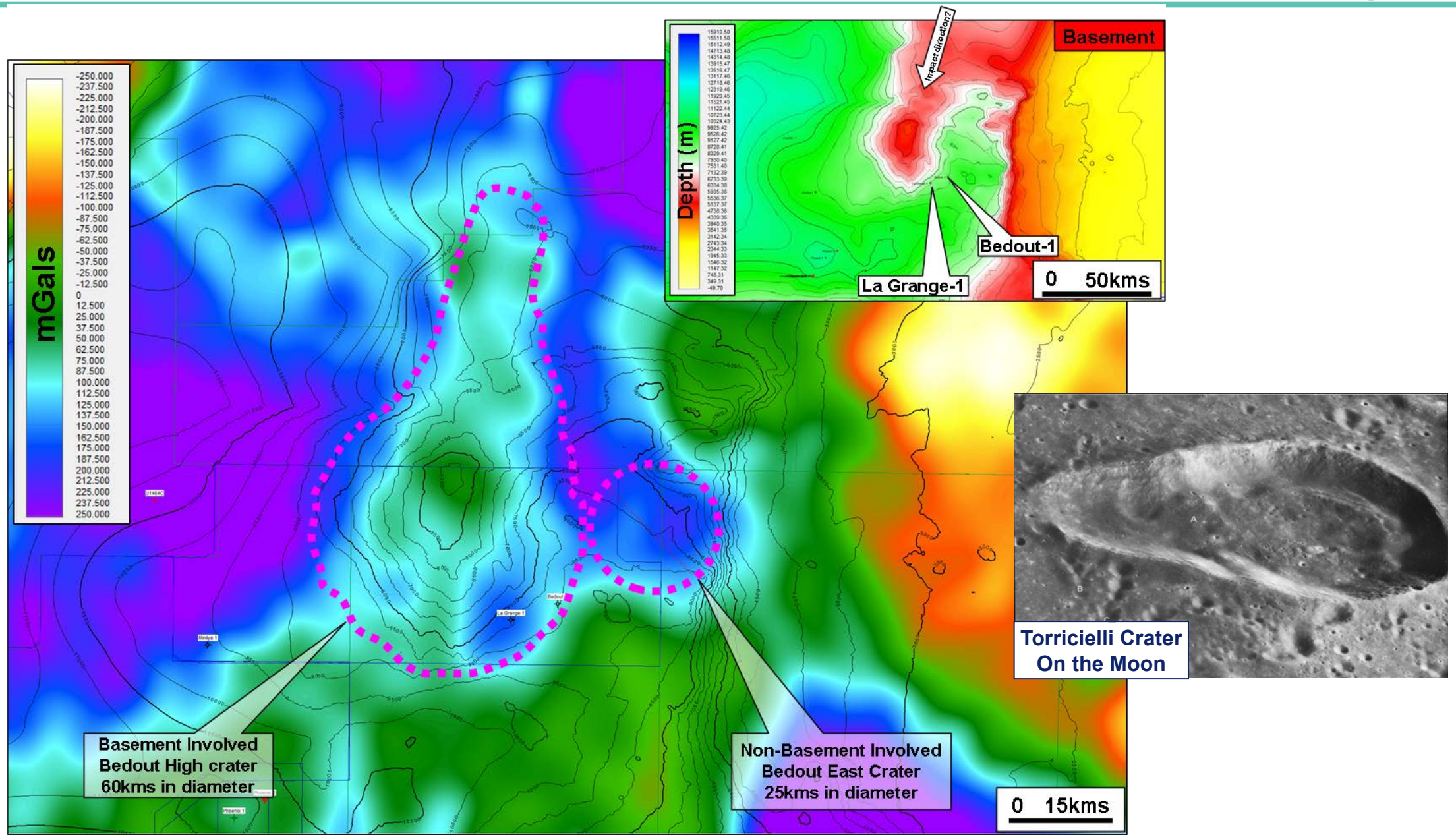

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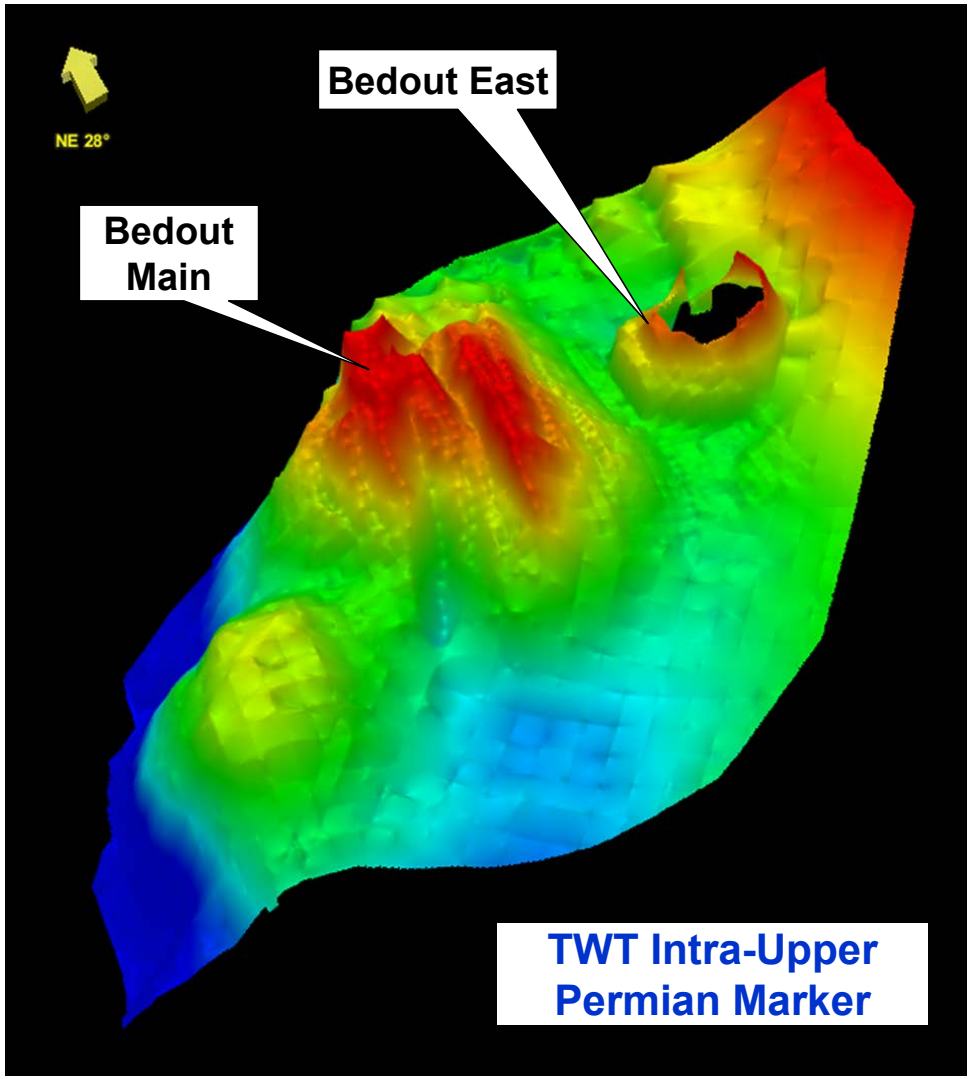

Bedout Main and Bedout East – what they are not

DJgeoscience

1. Not a compression – isolated & wrong age (230Ma compression-the Bowen Compression when NZ accreted to eastern Australia)
2. Not a “classic” basement high with sediment onlaps
3. Not an intrusive (in contrast to John Minken, 2019)
4. Not a volcanic pile – layered section with no significant lateral thickness variations
5. Not salt – wrong geometries, Bedout high is too big, no gravity anomalies
6. Not batholiths/ asthenospheric plumes – no gradual growth, but a sudden uplift
7. If no pdfs (planar deformation features), then the Bedout Main can’t be an asteroid impact….?

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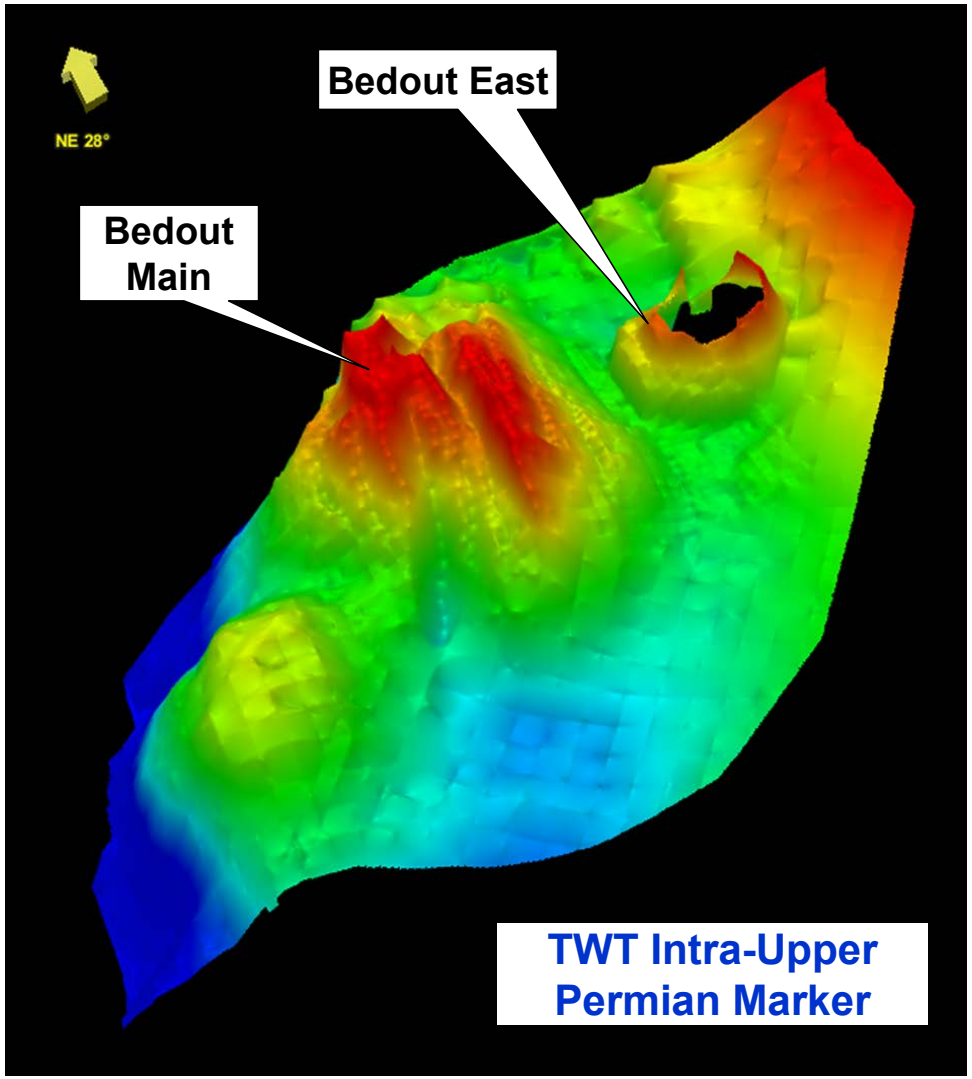
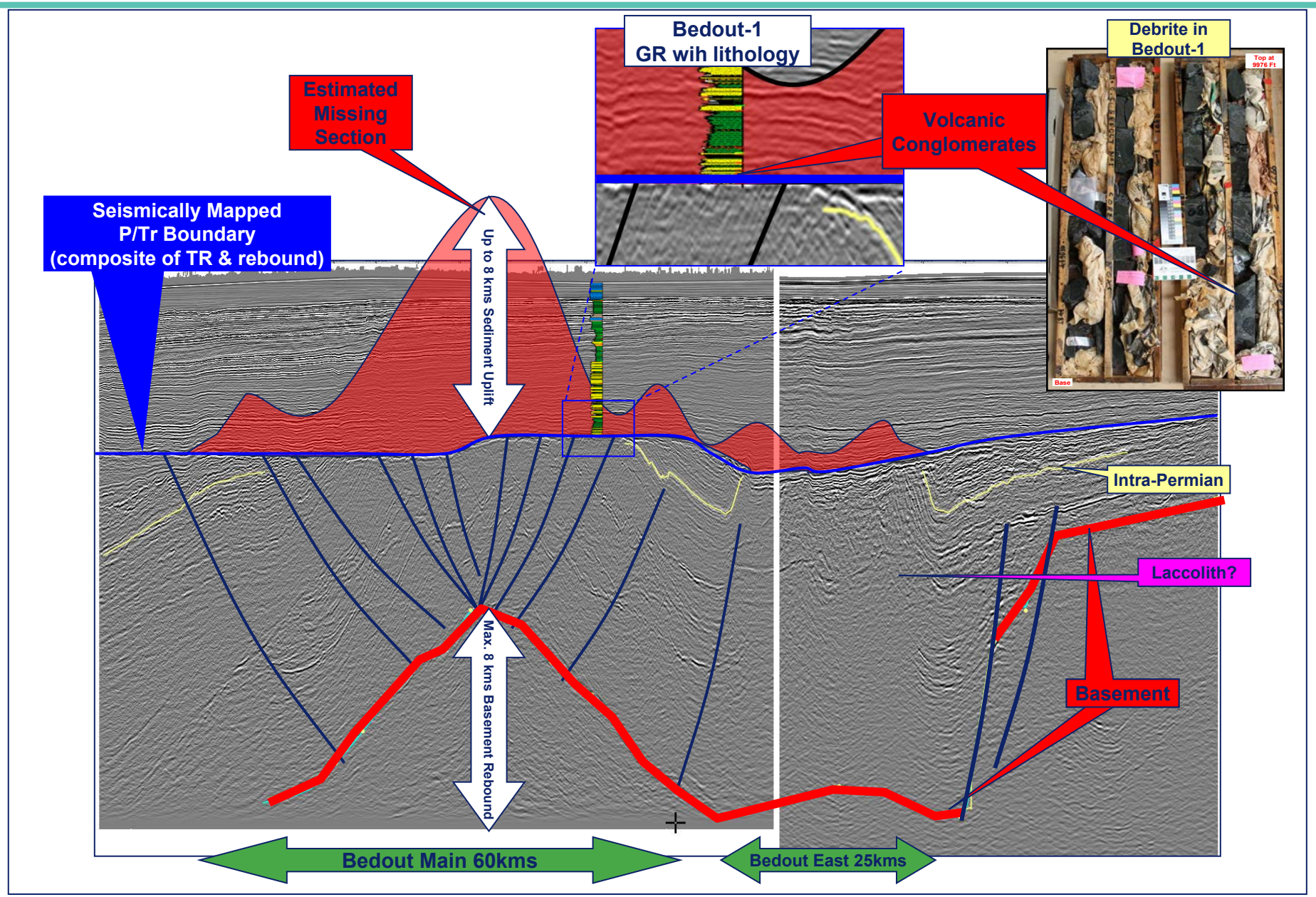


Up 8kms Uplift & Corresponding Erosion



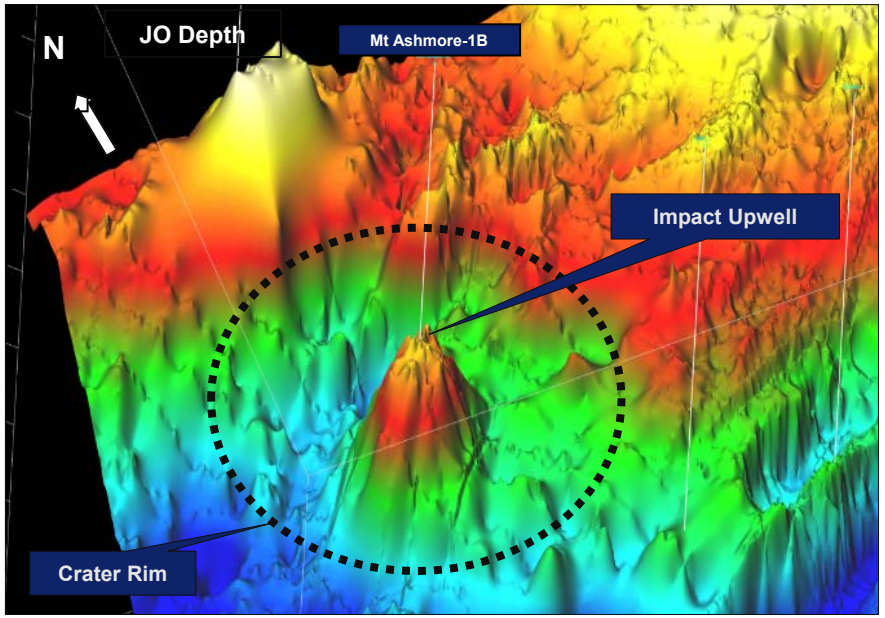
No Planar Deformation Features (pdfs) in La Grange-1 and Bedout-1

(Glikson, 2004)

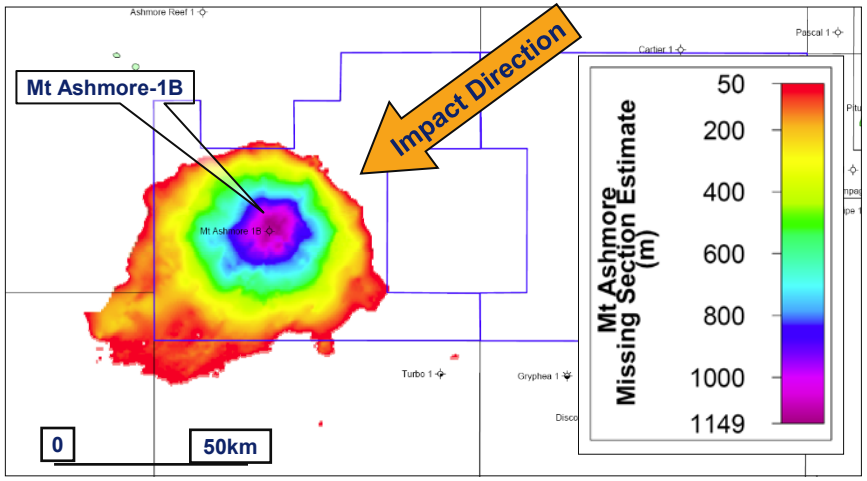
Bedout-1 & La Grange-1 -3kms and 6kms impacted sediments are not preserved through subsequent erosion

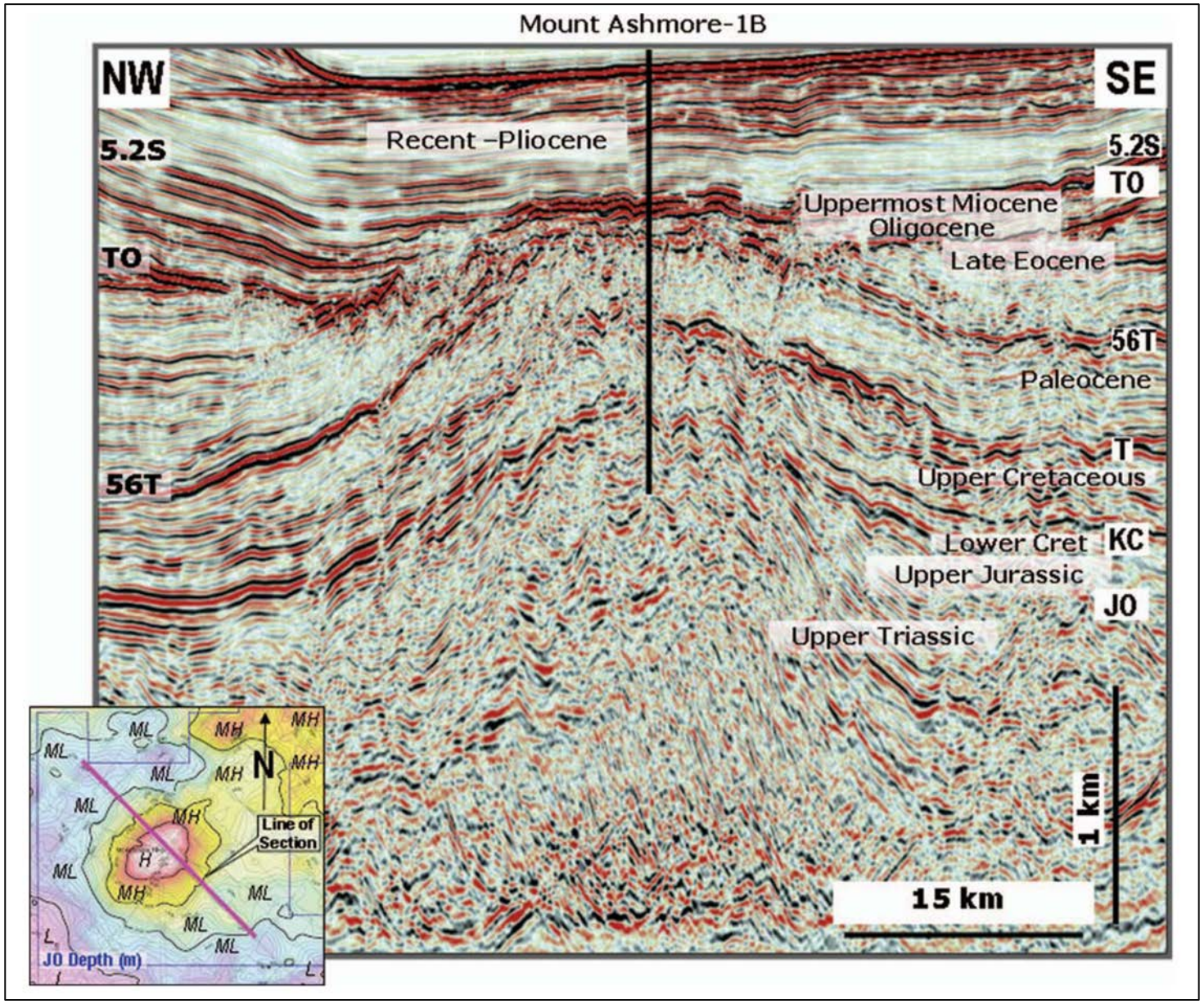
Mount Ashmore-1B – Asteroid Impact (Glikson et al. 2010)

DJgeoscience



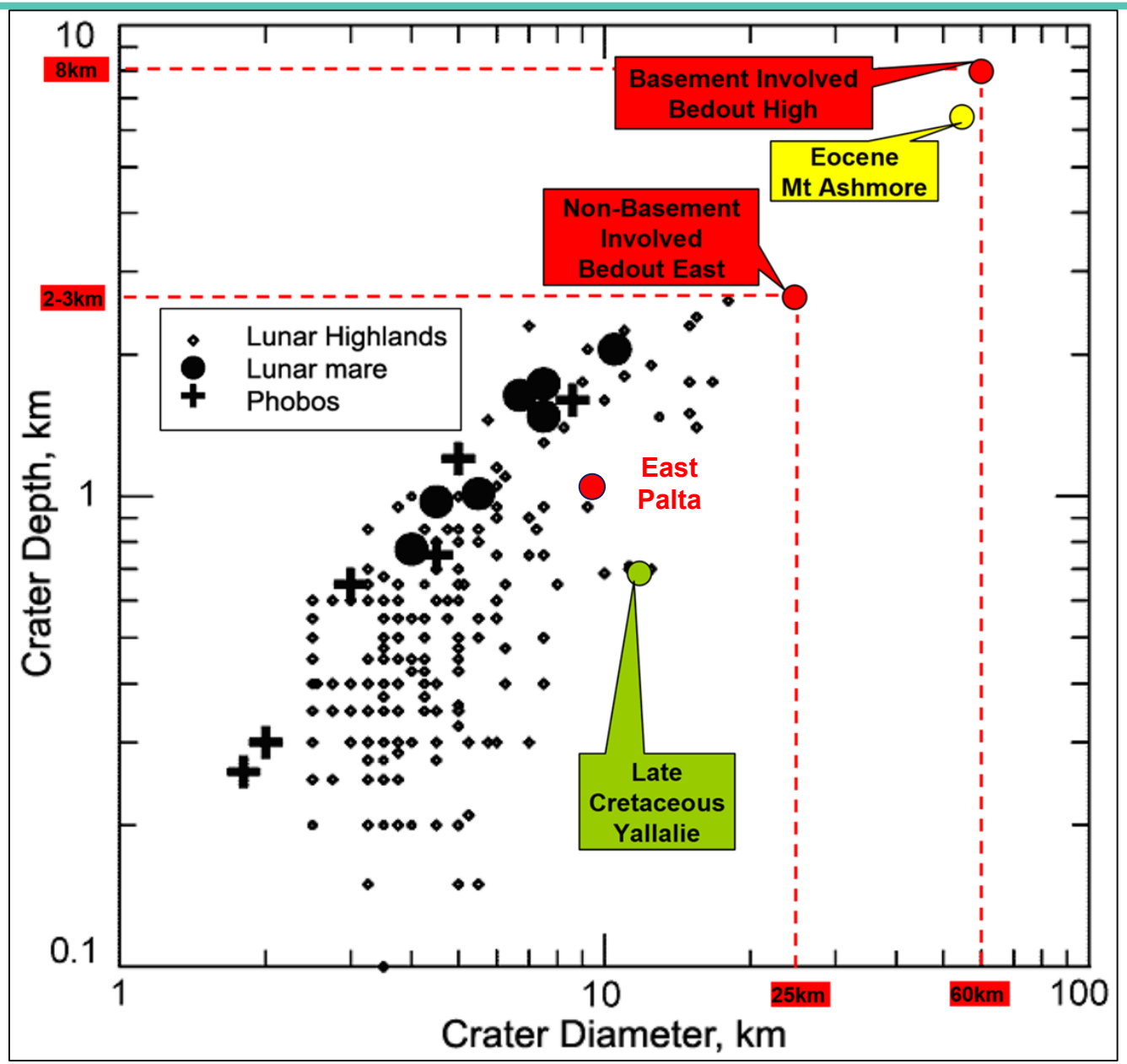
Missing Section Map at TO





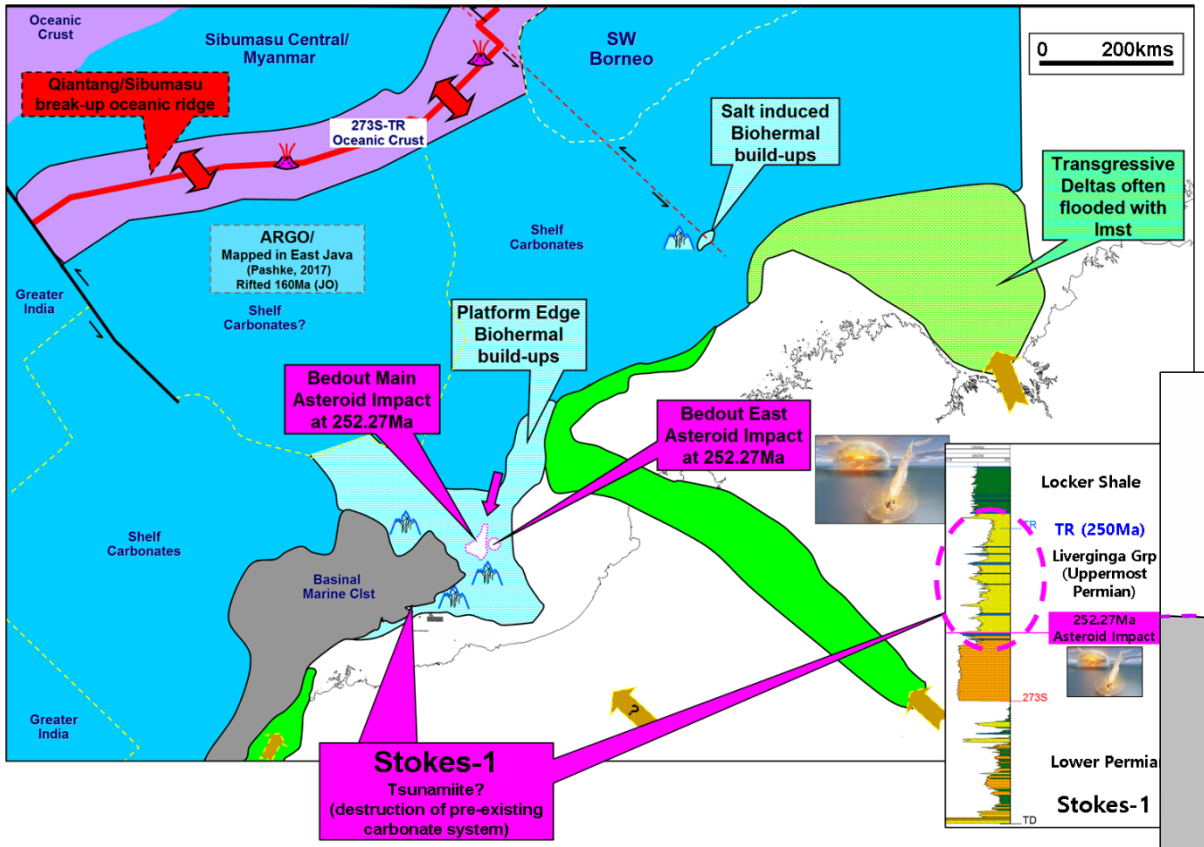
Bedout rebounds are on trend with other craters

DJgeoscience

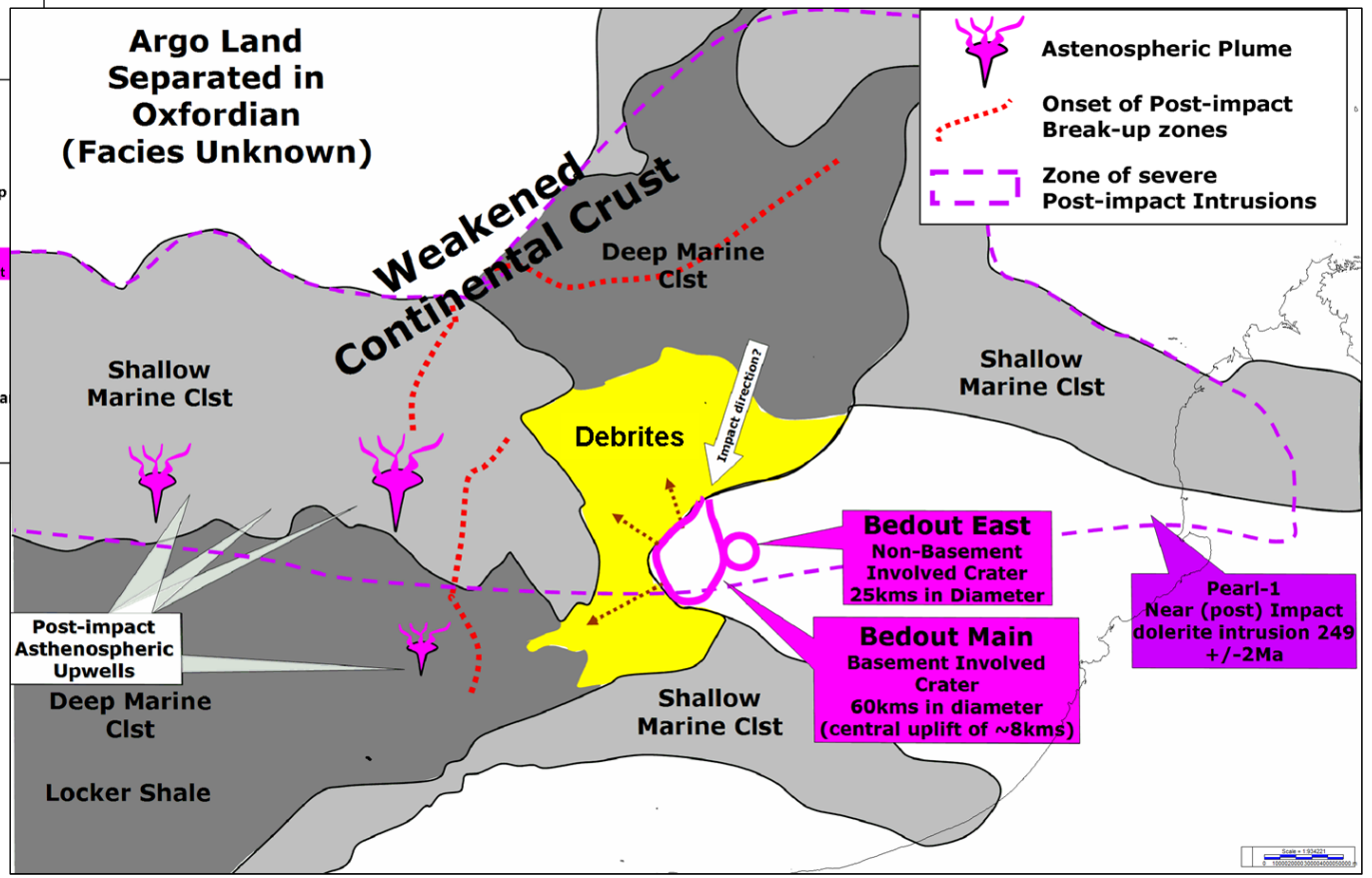


Impact on Deposition – From Limestone to Claystone

DJgeoscience



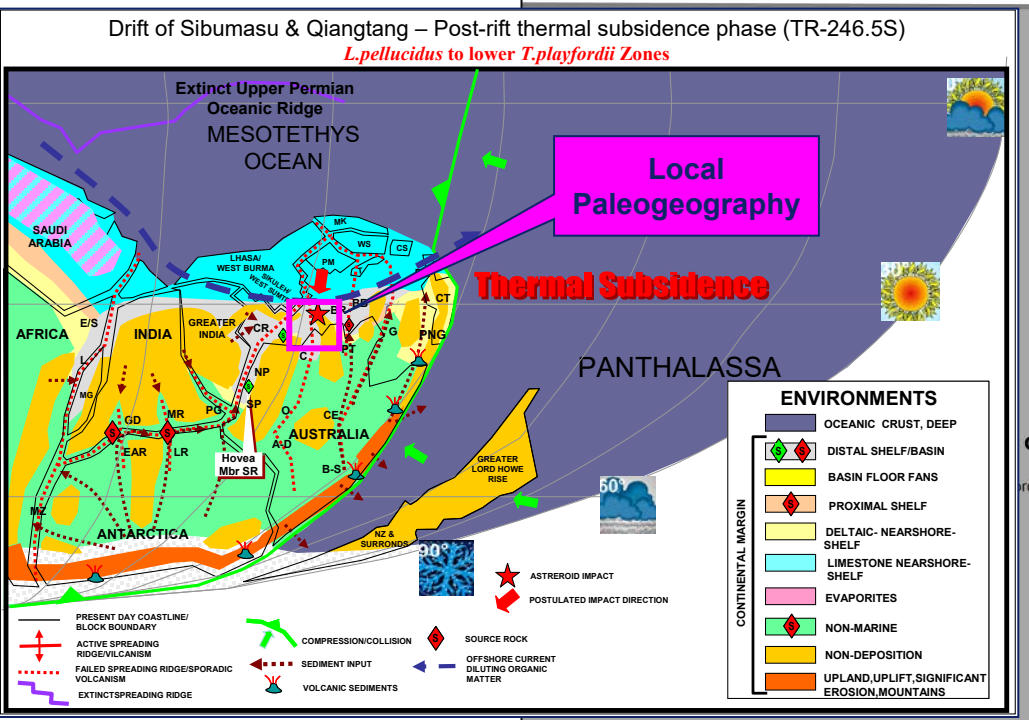
Bedout High Formed w/n seconds



Hence sheltered SRs for Dorado & Co

SR in Bedout Sub-basin – sheltered from open oceanic circulation Lagoonal SRs

DJgeoscience



Courtesy of

Finder energy

Post-Impact Re-deposition of Rebounded Sediments

Offshore Marine (No SRs diluted by offshore marine currents)

Lower Delta (low energy, barriers, lagoons, SRs)

Deep Water >700m (limited circulation ->???SR)

Lower Delta (low energy, barriers, lagoons, SRs)

Shape controlled by Permian Carbonate Platform edge

Keraudren Upper Delta from Australian hinterland (higher energy, no SR)

Swan Canyon

Canyons filled with transgressive clst

Mass wasting at edge of rapidly prograding delta into deep water-Swan Canyon in front of Swan River, Perth WA)

U1464C

Bedout

La Grange 1

Minerva 1

Phoenix 1

Phoenix 2

Darwin 1

Cimba 1

Dejouch 1

North Turtle 1

Picard 1

Roc Rock 2

Keraudren 1

Roc South_prop

Dorado 1

Tayra 1

Ronsard 1

Jarman 1

Trafalgar (WA) 1

Serval 1

Big Brooks_prop

Button Crossing_prop

Poissonnier 1

Aurora 1

Cossigny 1

Calypso 1

Grey 1

Patriot 1

Nelson Rocks 1

Charm 1

Forestier 1A

Legendre 2

Bugle 1

Cygnus 1

Buck 1

Skippy Rock

Stokes 1

Hauy 1

Muggles 1

Cerberus 1

Plate tectonics caused by Asteroid Impact? -Depth to Basement (m)

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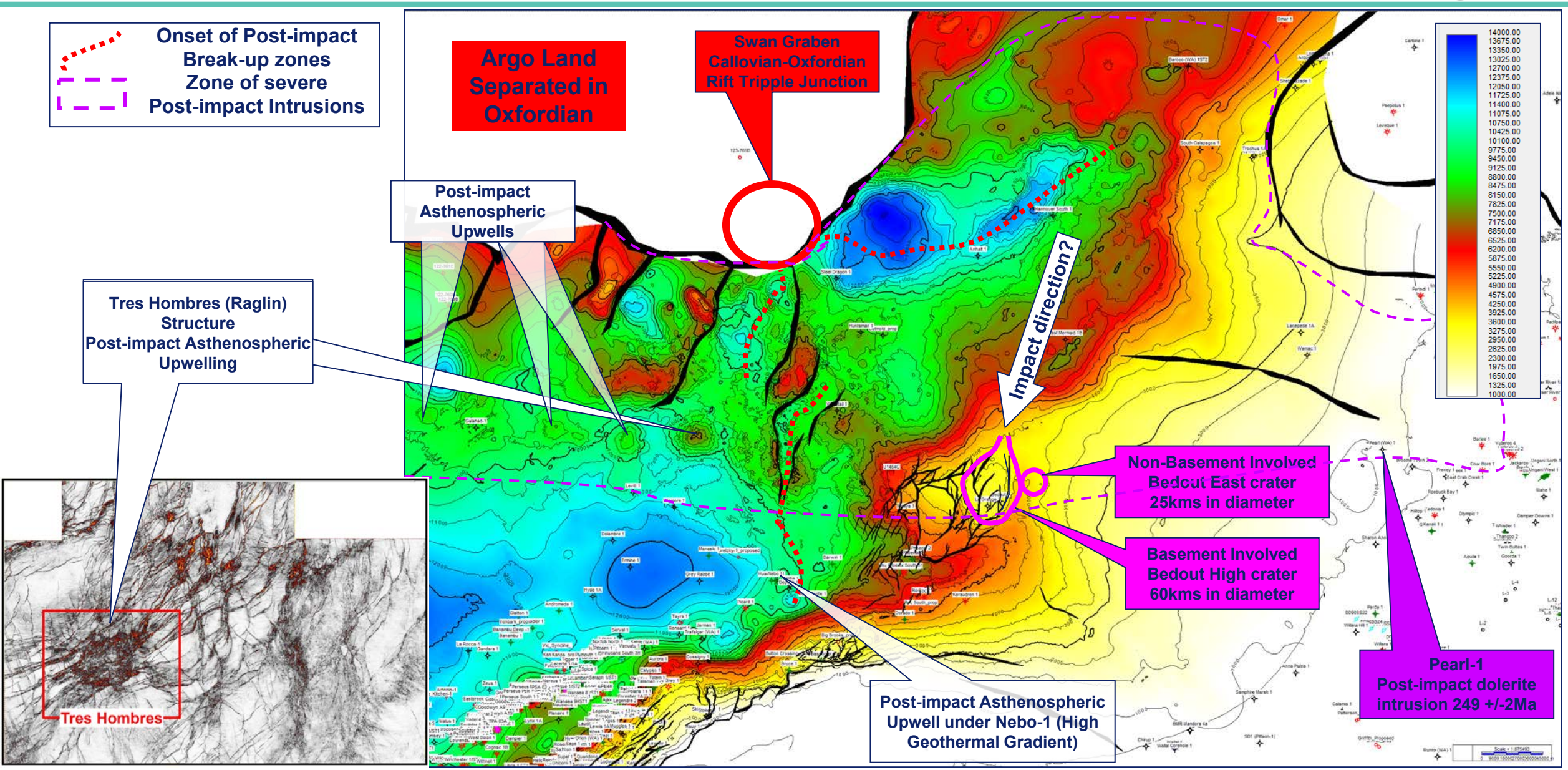

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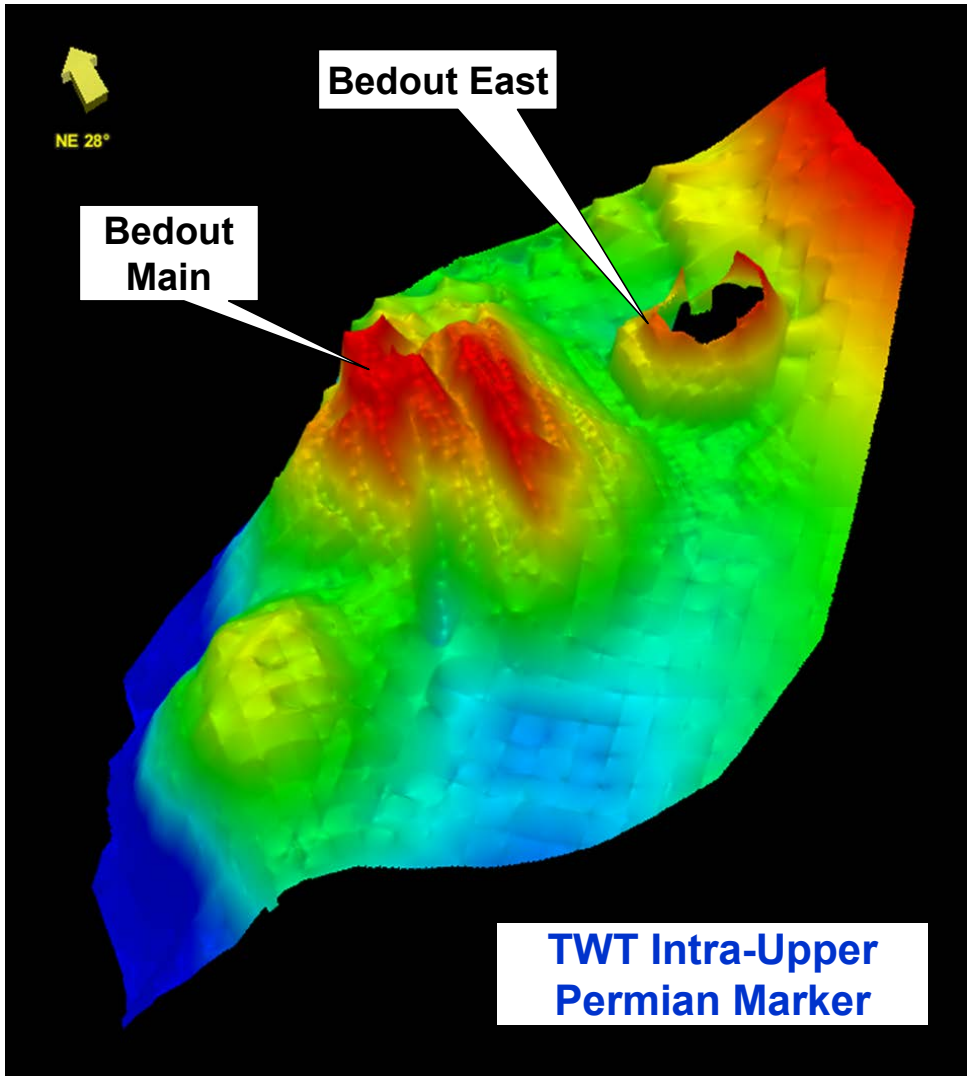

More than One asteroid w/n 24hrs?

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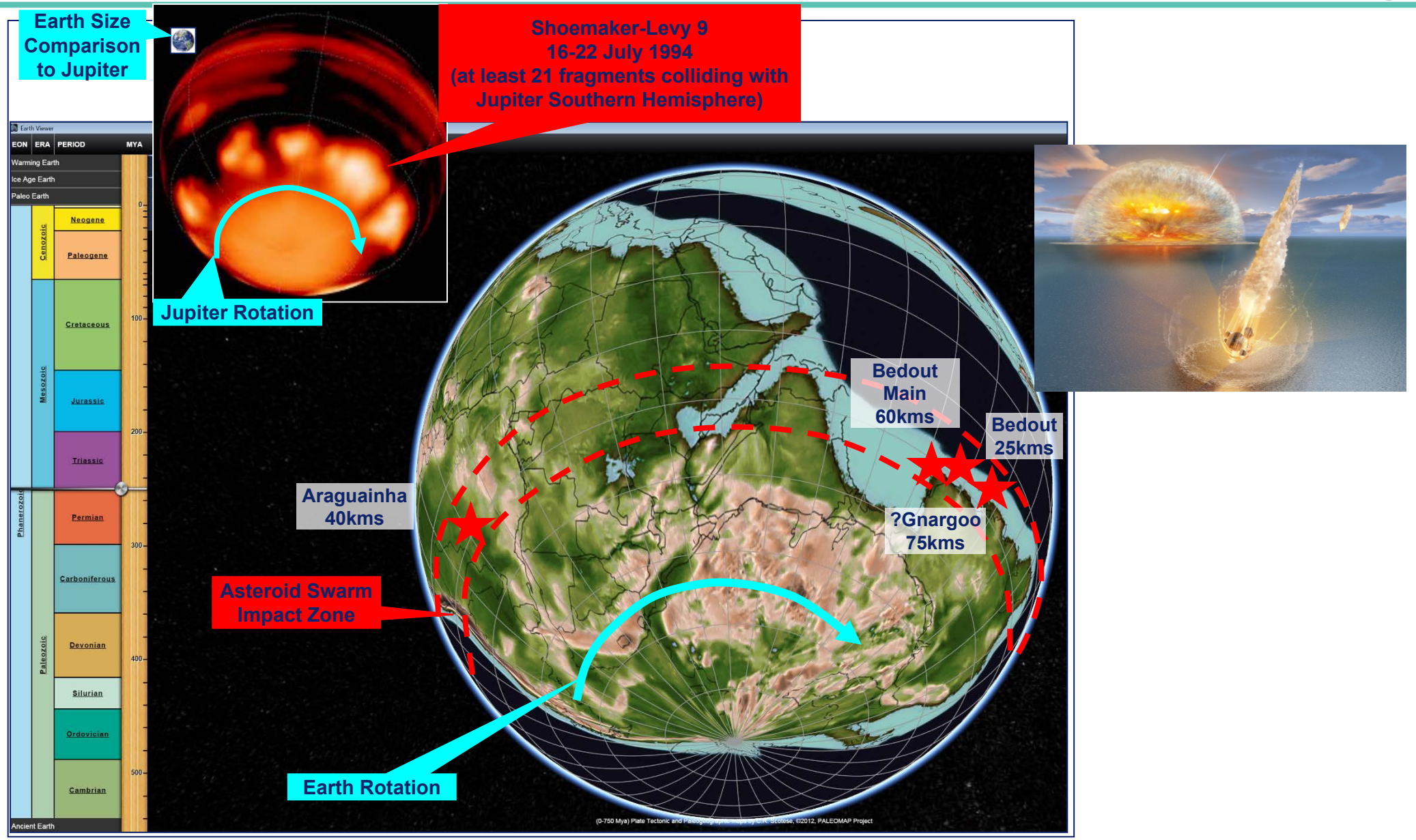

96% Species extinction is not instantaneous (Sydney Basin Core)

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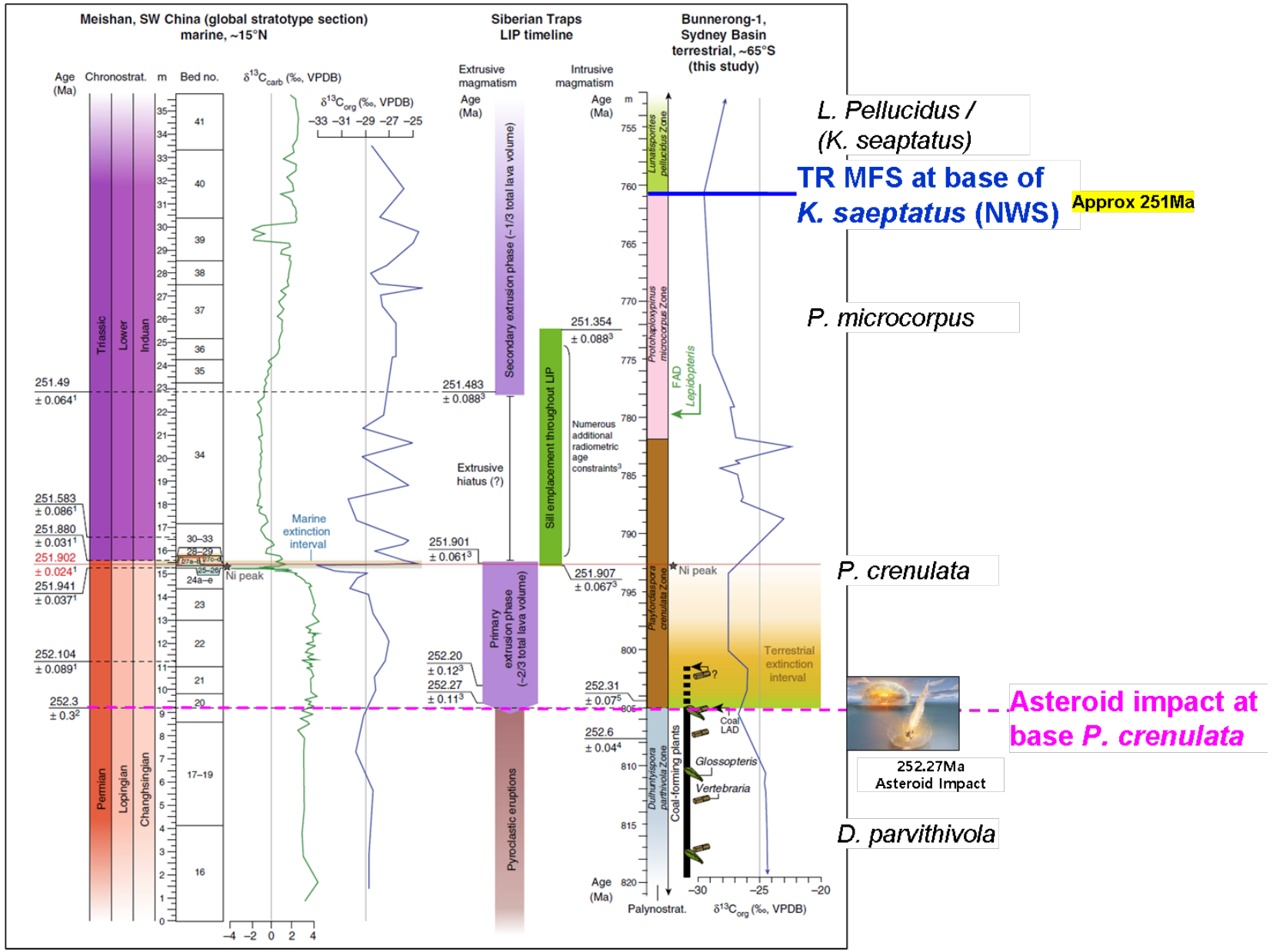


L. Pellucidus / (K. seaptatus)

TR MFS at base of *K. saeptatus* (NWS) Approx 251Ma

P. microcorpus

P. crenulata

Asteroid impact at base *P. crenulata*

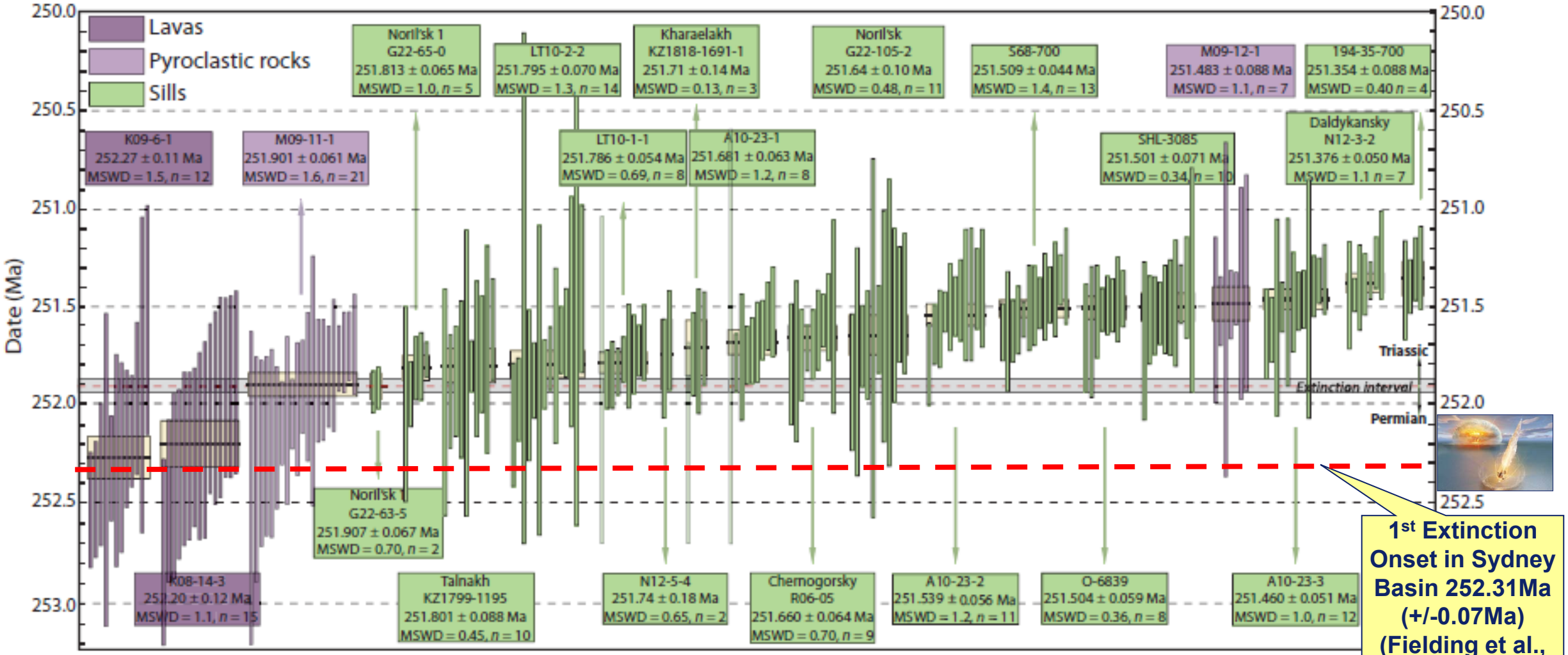
252.27Ma Asteroid Impact

D. parvithivola

Mod. from Fielding et al. (2019)

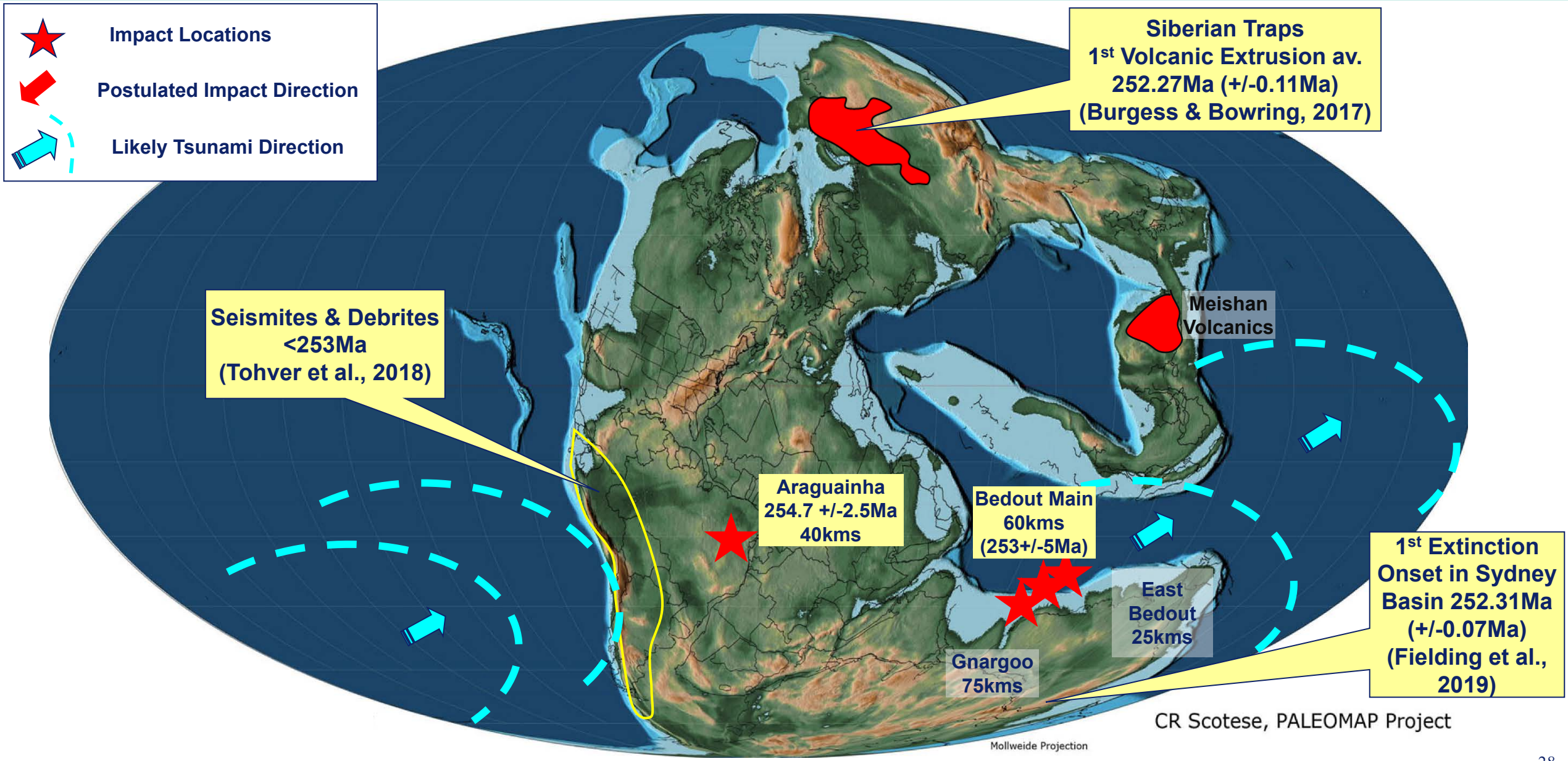
Siberian Volcanism absolute ages (Burges & Bowring, 2017)

DJgeoscience

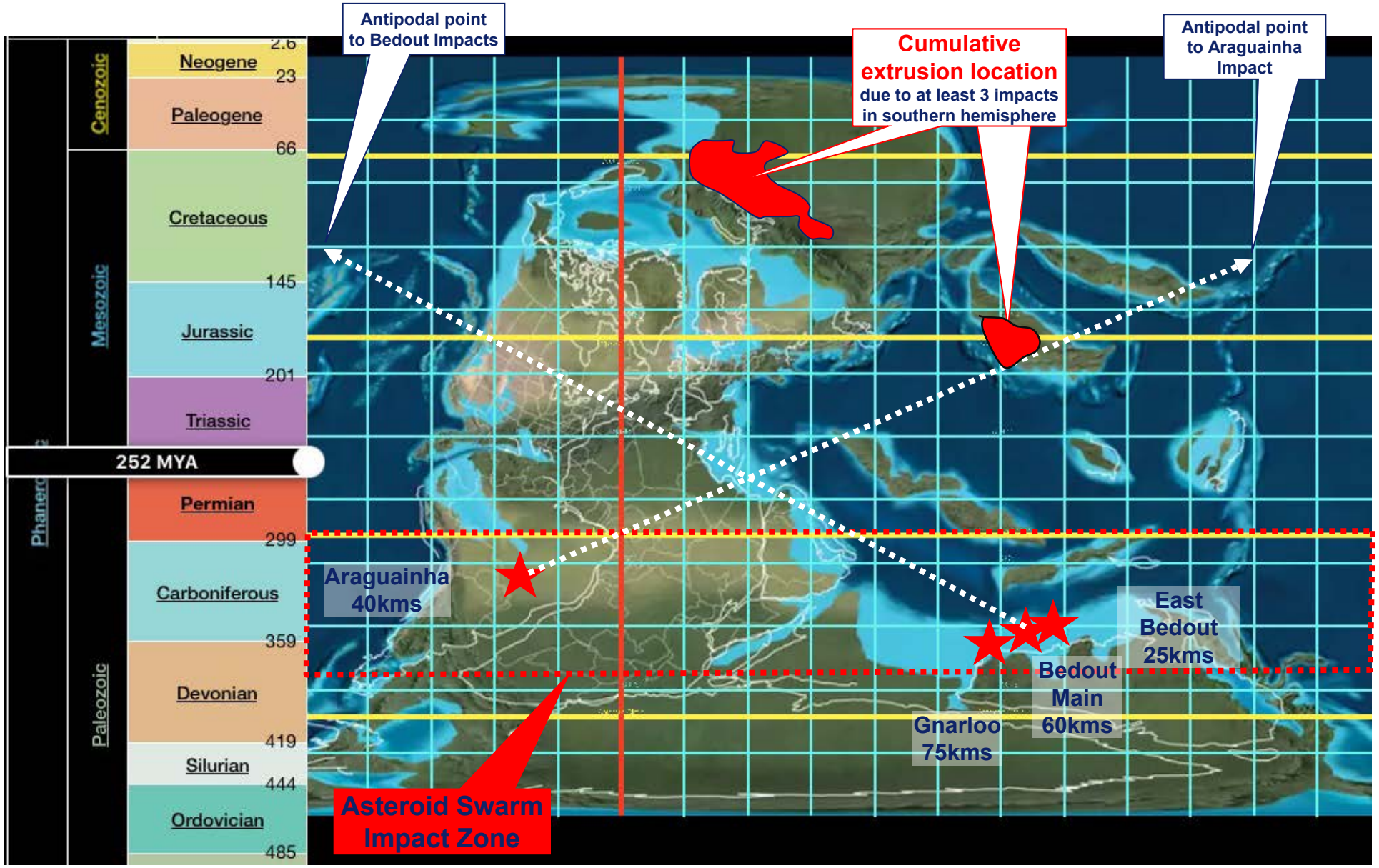


Near P-TR Boundary – Impact Locations, Debrites & near P/T Volcanics

DJgeoscience



Impacts and Location of Siberian & Meishan Volcanism



From Scotese 2012 using EarthViewer software

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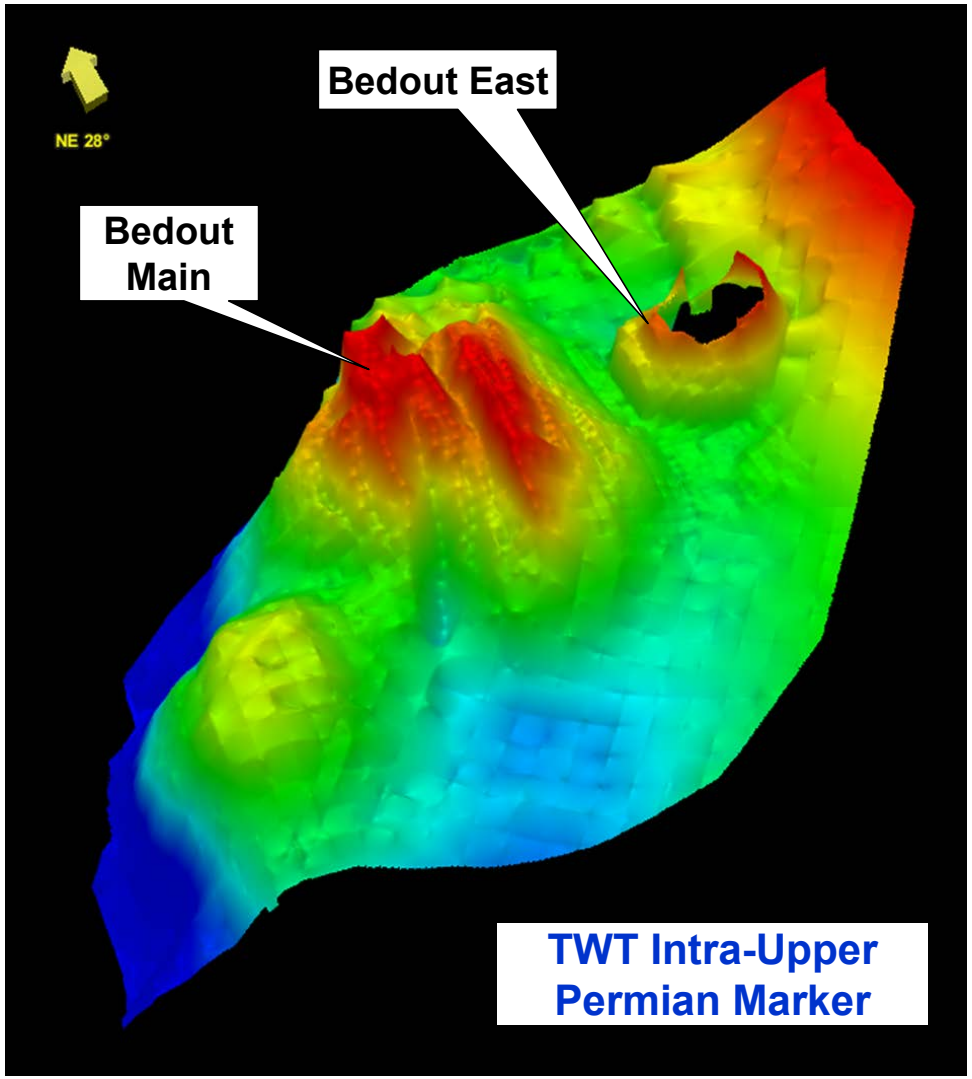
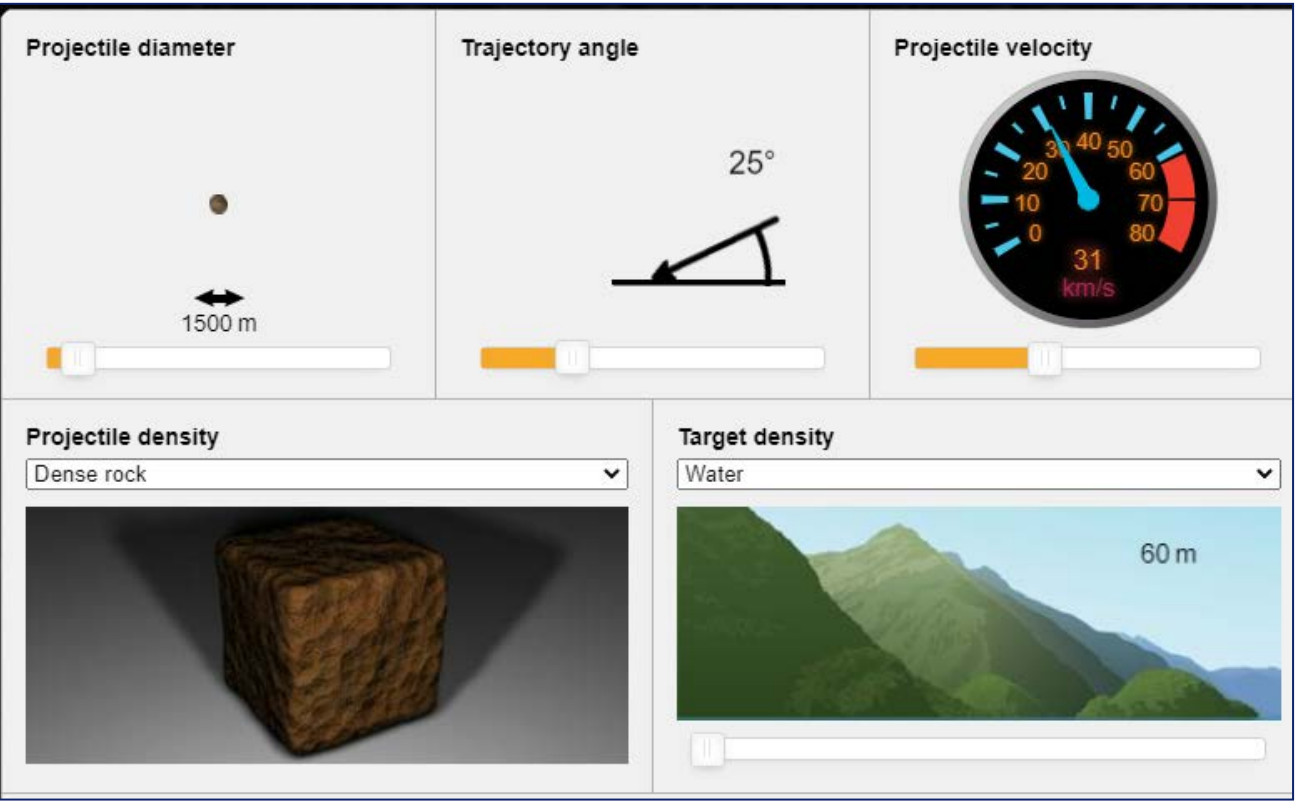
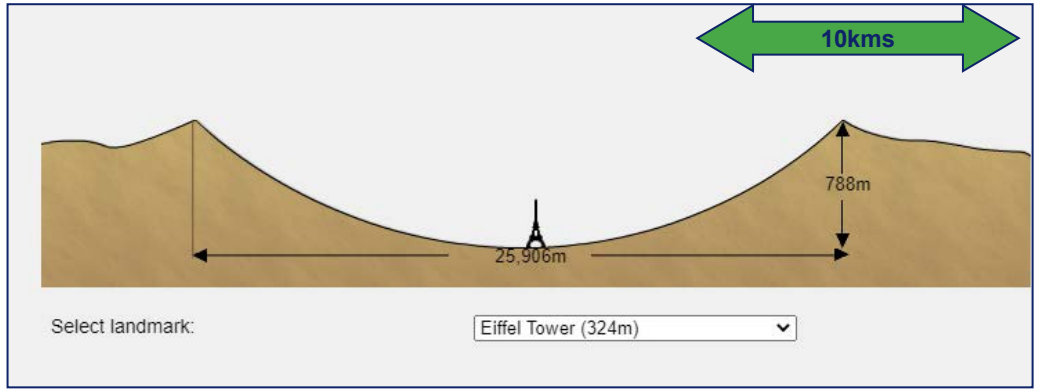
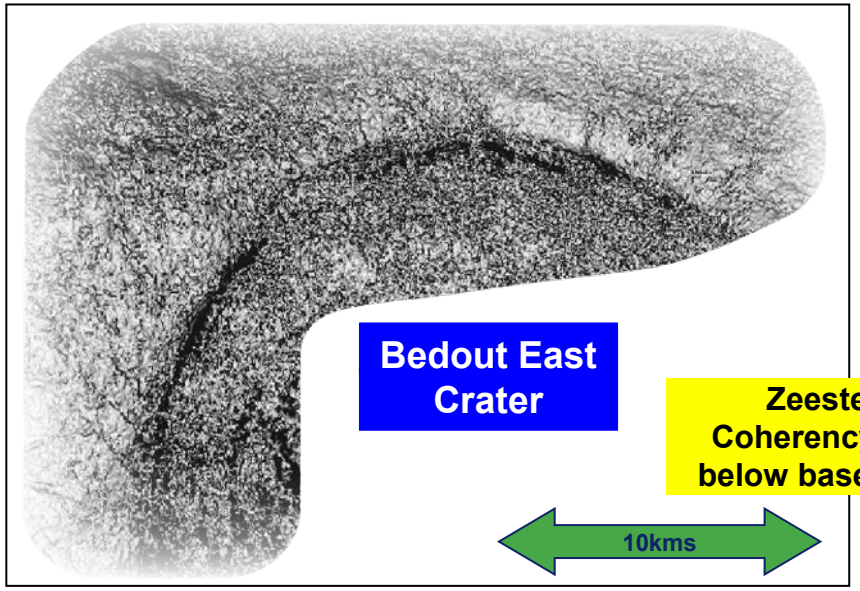


Simple Modelling (1.5km asteroid can produce 25kms crater with 780m uplift ->Bedout East)

DJgeoscience







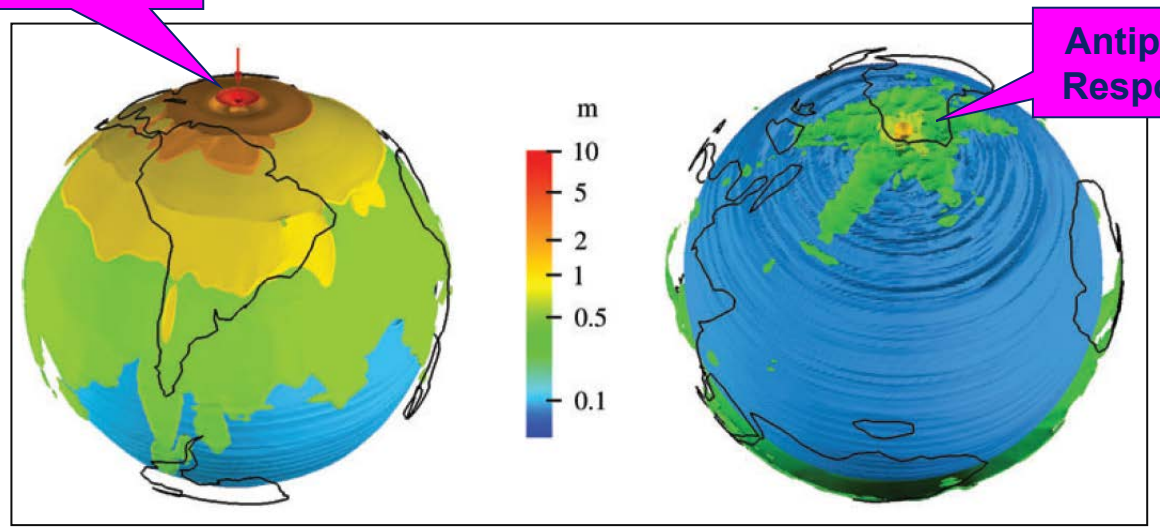
http://down2earth.eu/impact_calculator/planet.html?lang=en-US

Numerical Modelling using Chicxulub Impact (Meschede et al., 2011)

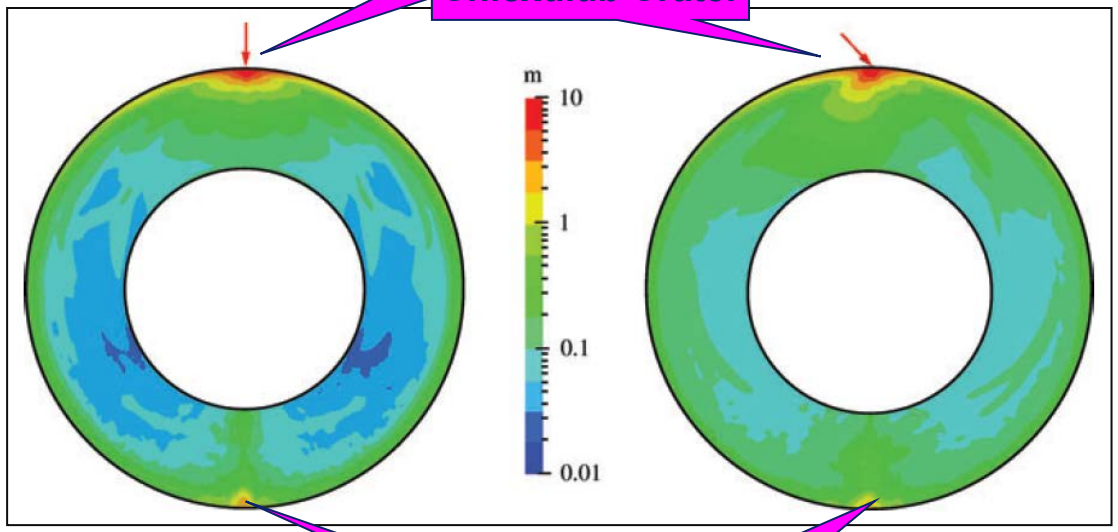
DJgeoscience

150kms diameter Chicxulub Crater

Reconstruction using present day continent locations



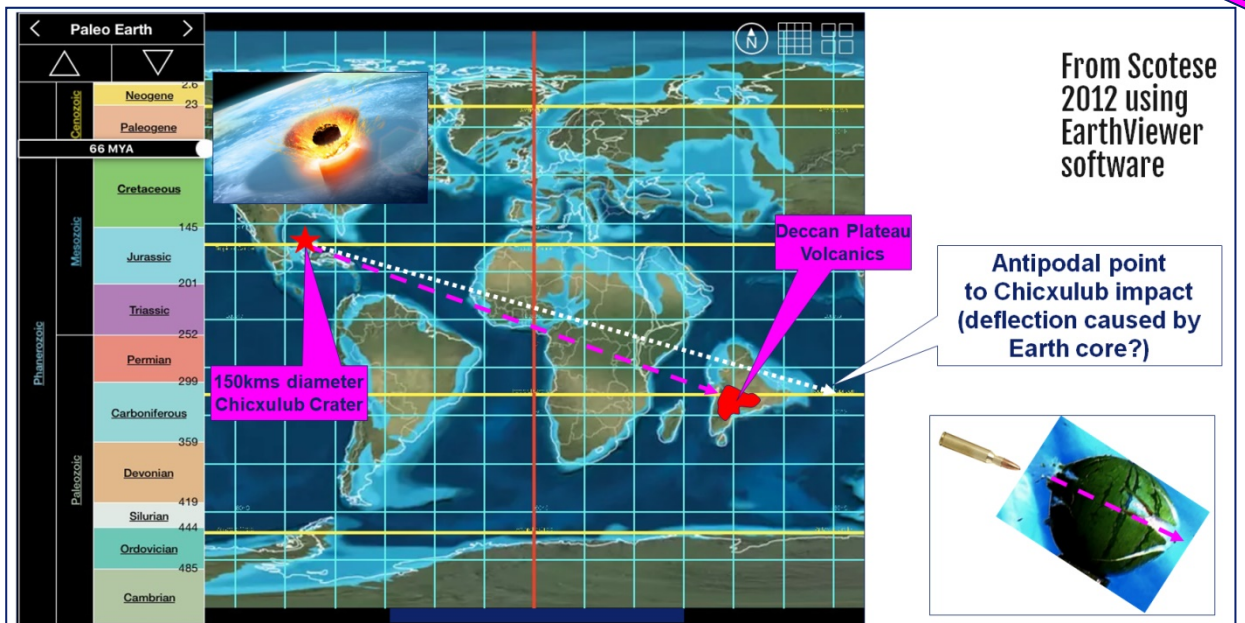
Antipodal Response



150kms diameter Chicxulub Crater

Antipodal Response regardless of the impact angle

End Of Cretaceous Continent Locations



From Scotese 2012 using EarthViewer software

Antipodal point to Chicxulub impact (deflection caused by Earth core?)

Conclusions

DJgeoscience

1. Bedout High is interpreted to be formed by impact of 2 asteroids at the same time with estimated central uplift of ~8kms.
2. Bedout Sub-basin was formed within seconds creating embayment for future low energy Lower Triassic SR conducive environments for Dorado oil discovery.
3. Impacts, Extinction and P/TR Chronology:
   a) **252.31Ma** (+/-0.07Ma) **asteroid impacts** – onset of Bowen Basin extinction (Fielding et al., 2019)
   b) **252.27Ma** (+/-0.11Ma) 1st STILP extrusion (Burgess & Browning, 2017)
   c) **251.902Ma** (+/- 0.004) 2nd STILP extrusion boundary within P.crenulata biostratigraphic zone (Fielding et al., 2019) marking **P/TR boundary**
   d) P/TR currently mapped at K.saeptatus/P.microcorpus biostratigraphic zone boundary (should be revised lower?)
4. Impacts offers a simple trigger mechanism for a follow-up massive volcanism elsewhere and collapse of ecosystems.
5. Locations of volcanic centres are the result of the cumulative impact locations from multiple sources (extrusions are not necessarily at antipodal locations).
6. Offers a possible trigger for plate tectonics and break-up processes (Argo triple junction).
7. Follow up modelling is required to test connection between impacts and volcanism and plate tectonics at end of the Permian
8. Never drill impacts on NWS as most likely seal and SR destroyed.

Questions?