

HALLIBURTON

**Joining the Dots: Sequence Stratigraphy-Based
Regional Geology**

Mike Simmons

Disclaimer

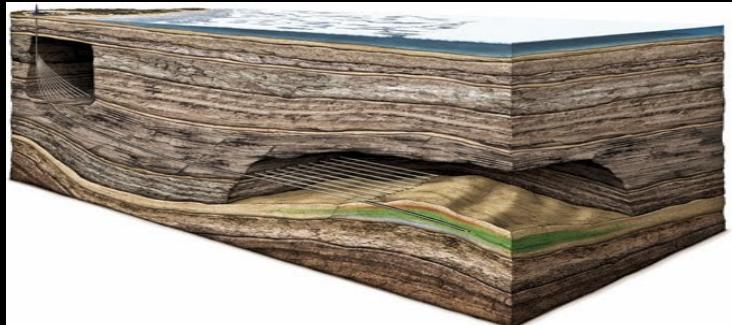
The contents of this presentation are for informational purposes only. Halliburton* makes no representation or warranty about the accuracy or suitability of the information provided in this presentation and any related materials. Nothing in this presentation constitutes profession advice or consulting services. No contractual relationship with Halliburton is established by attending or viewing this presentation. No rights to intellectual property of Halliburton are grated through this presentation. The opinions in this presentation are those of the author and do not necessarily represent views of Halliburton.

*Halliburton means Halliburton Energy Services, Inc., Landmark Graphics Corporation, and their affiliates.

Prediction & Geoscience

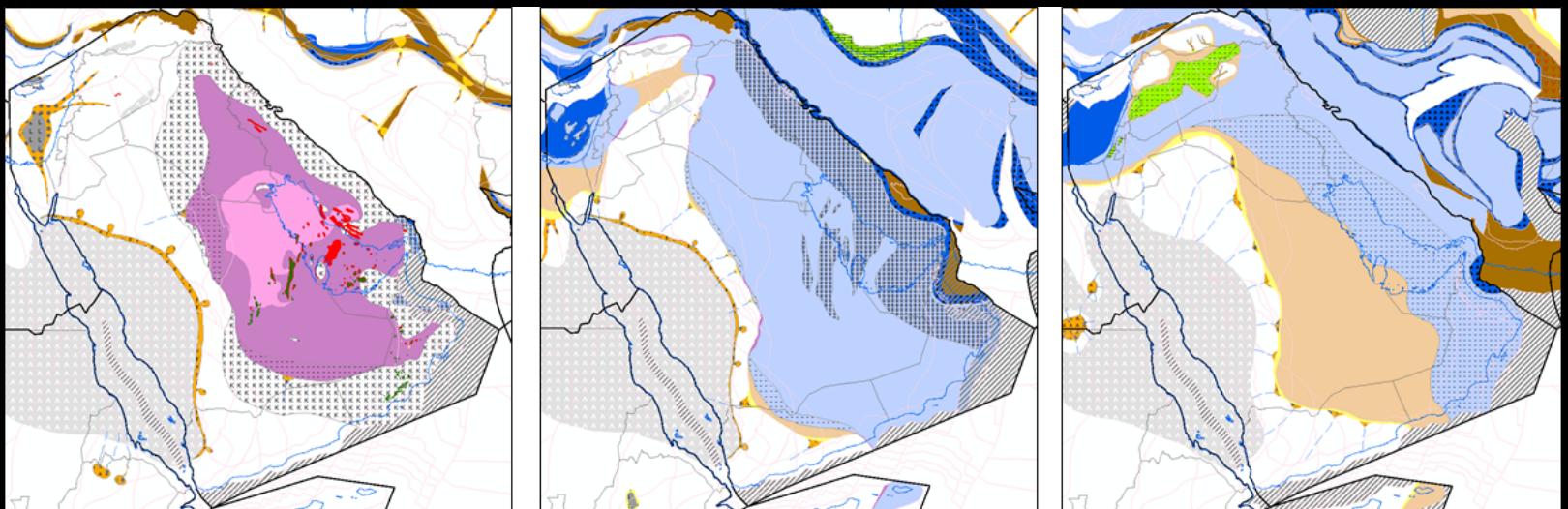
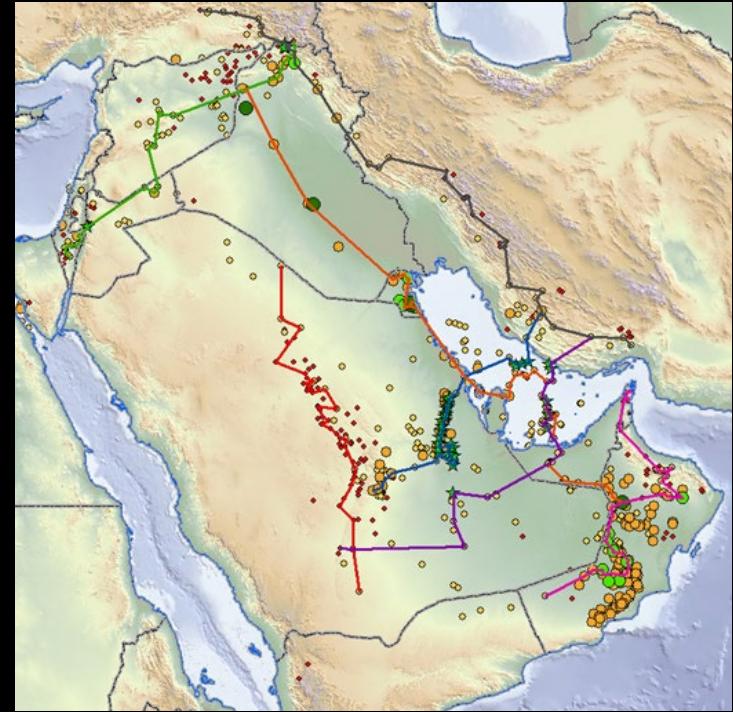
- Prediction (or extrapolation) is an essential aspect of geoscience – what lies in the unknown between data
- Geologists are often involved in the creation of a 3D or 4D model of the Earth or part of it
- This can be for the search for resources or to answer fundamental questions about the history of the planet and how it operates.

					7			
		2	4		6	3		
	1	7				9	6	
5	8						3	
				9				
	7						4	2
	9	4			6	5		
		5	2		8	1		
			5					

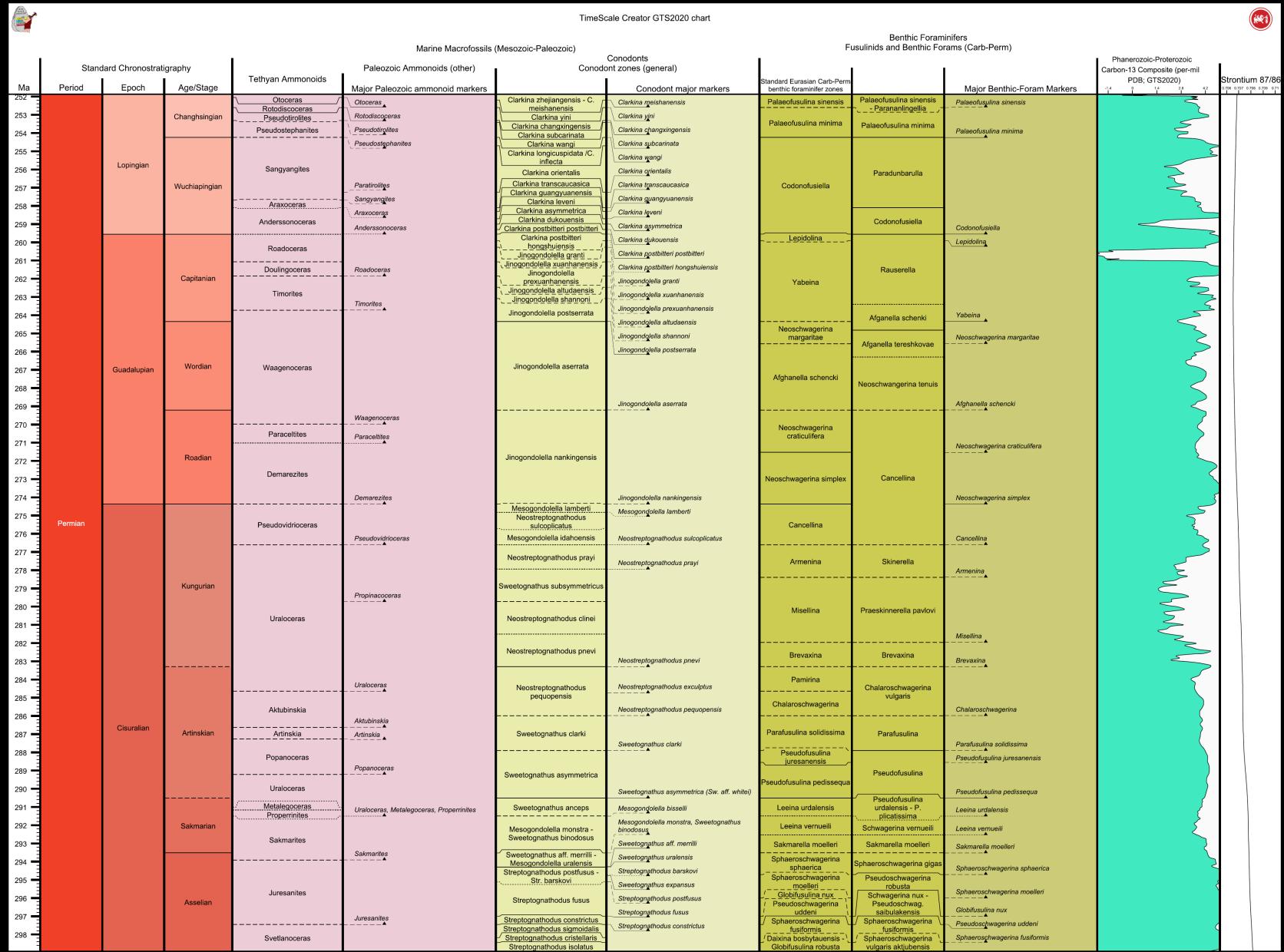


Tools for “Joining the Dots”

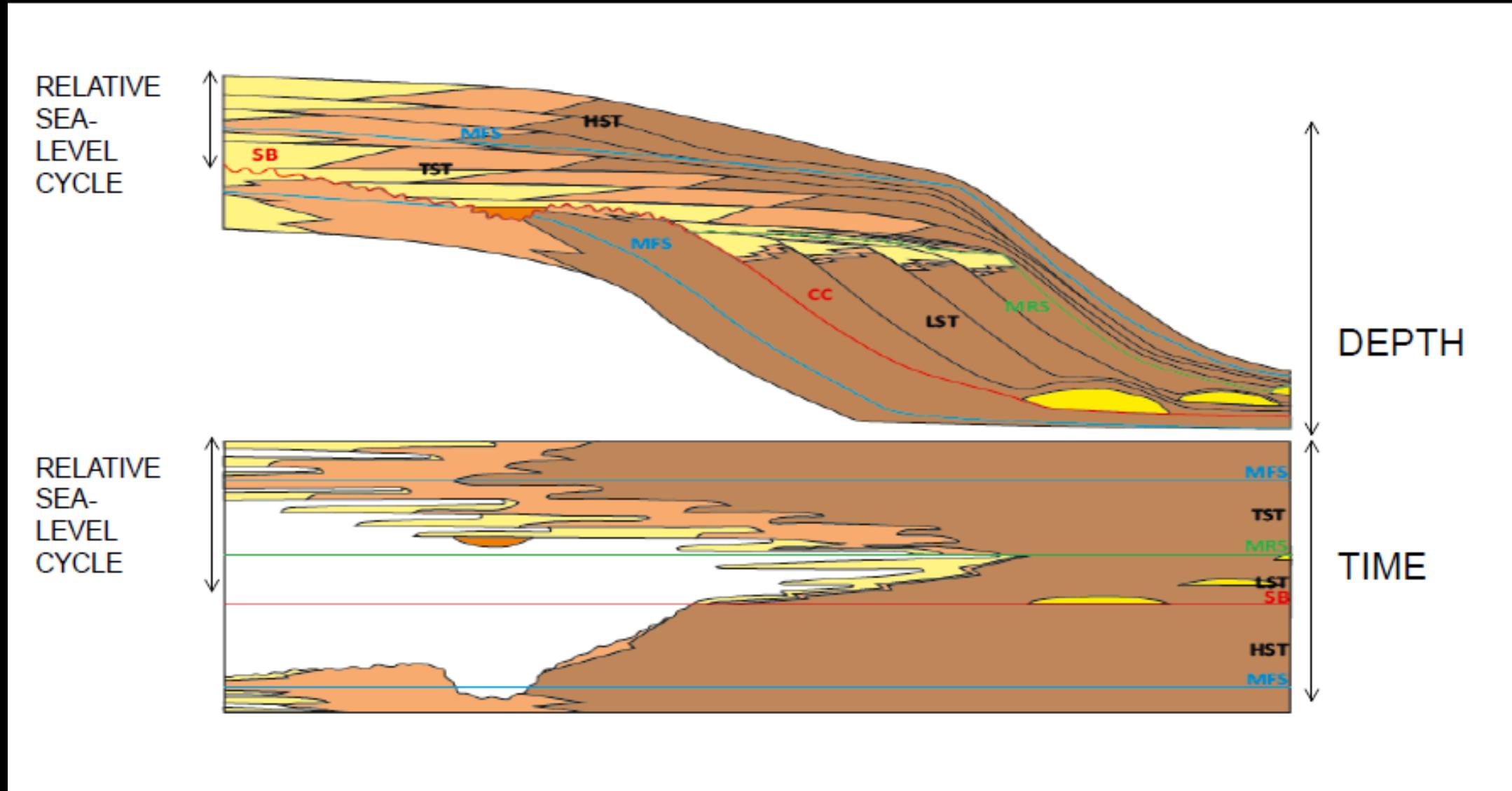
- Biostratigraphically Constrained Sequence Stratigraphy and Eustasy
- Geodynamics: Global and Regional Tectonics
- Palaeoclimate & Source to Sink Relationships – Earth Systems Science
- Forward Stratigraphic Modelling
- Illustrated by examples from the Arabian Plate
- N.B. I am not a Permian specialist!



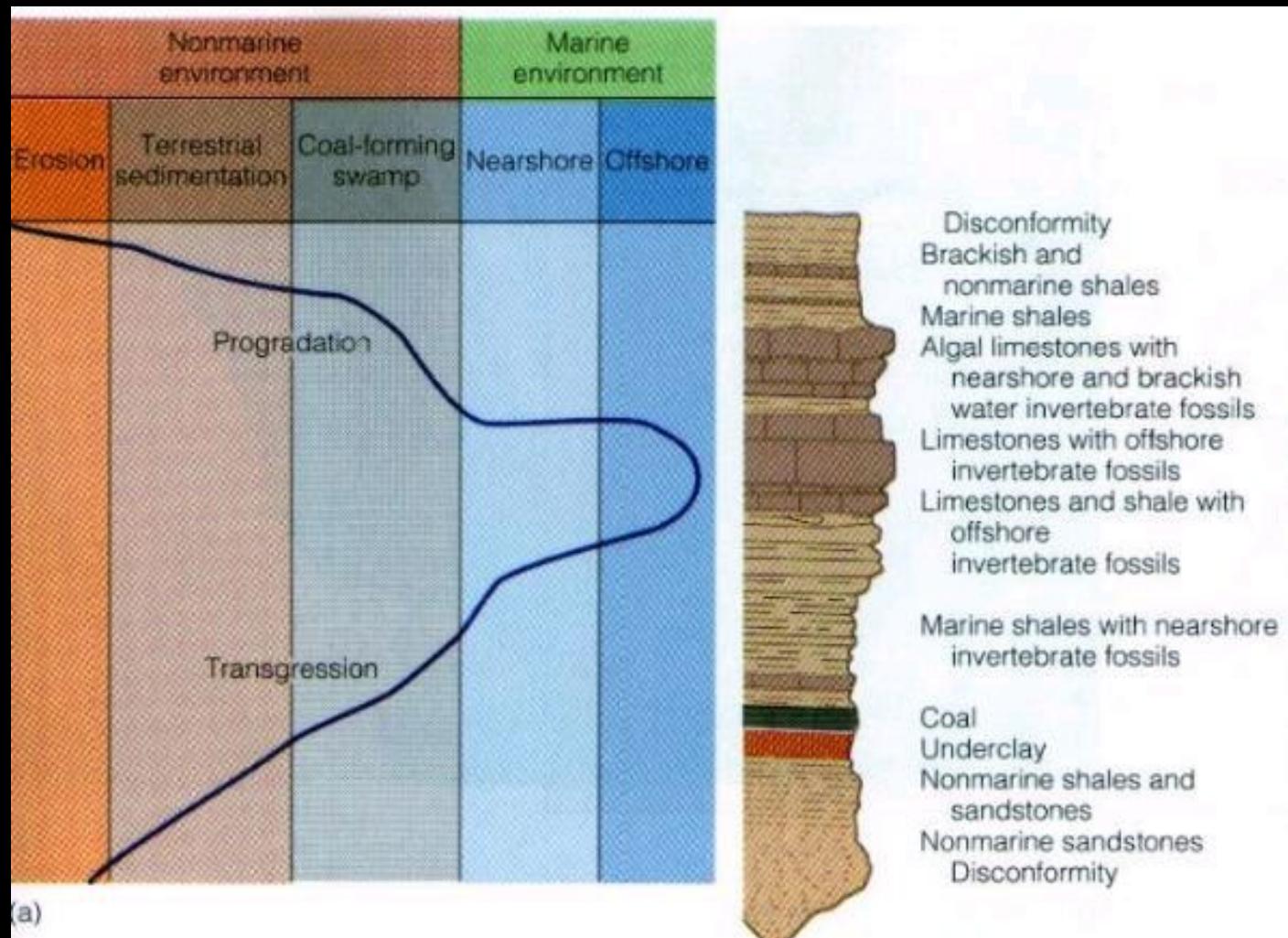
A Framework for Correlation: Biostratigraphy & Isotopes



Sequence Stratigraphy & Chronostratigraphic Charts

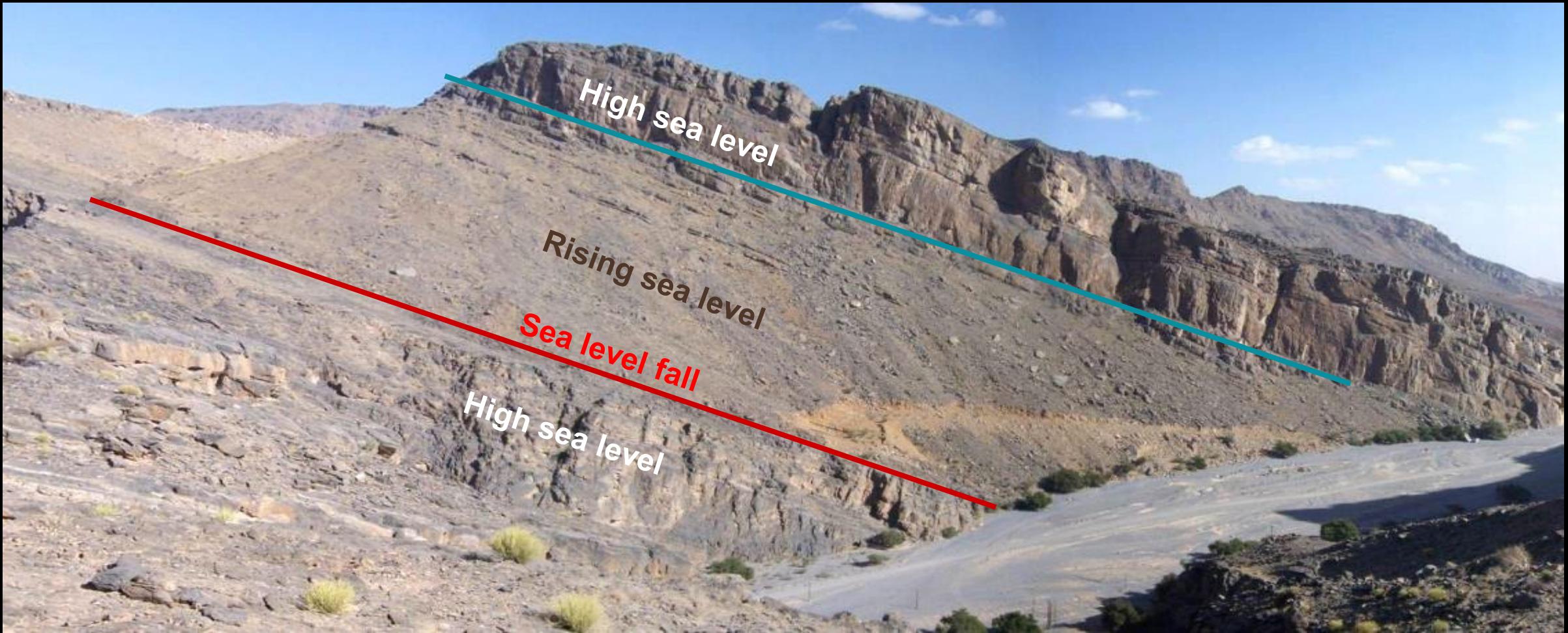


Recognising Sequences: Classic Late Palaeozoic Cyclothem Interpretation



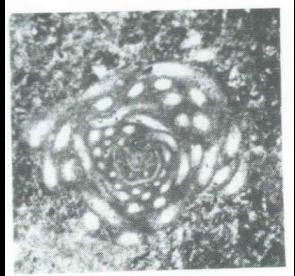
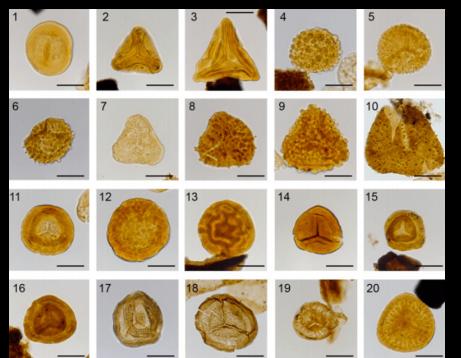
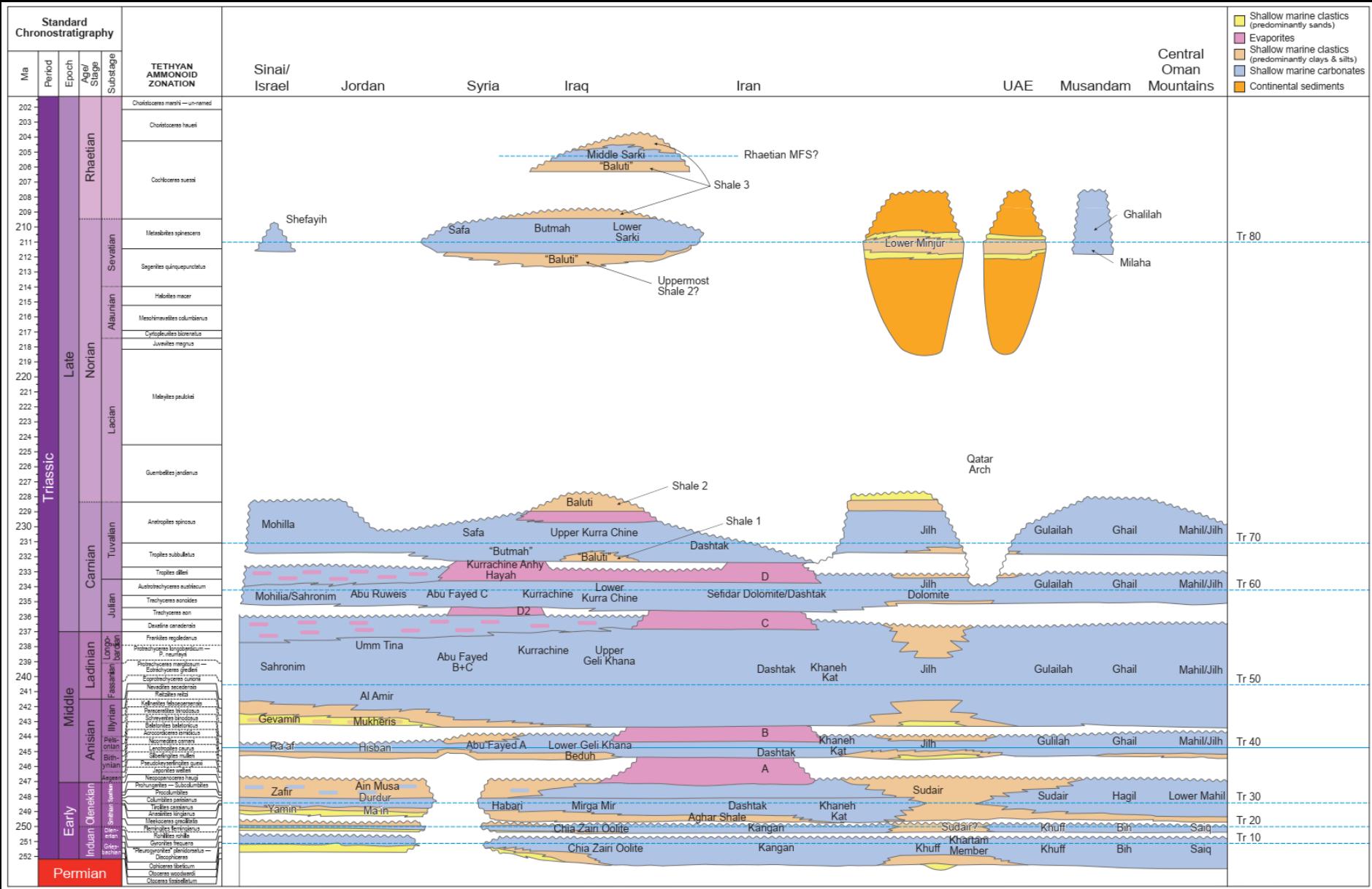
Cyclicity in Arabian Plate Stratigraphy

- Sequence Stratigraphy an ideal methodology for placing complexity into systematic order

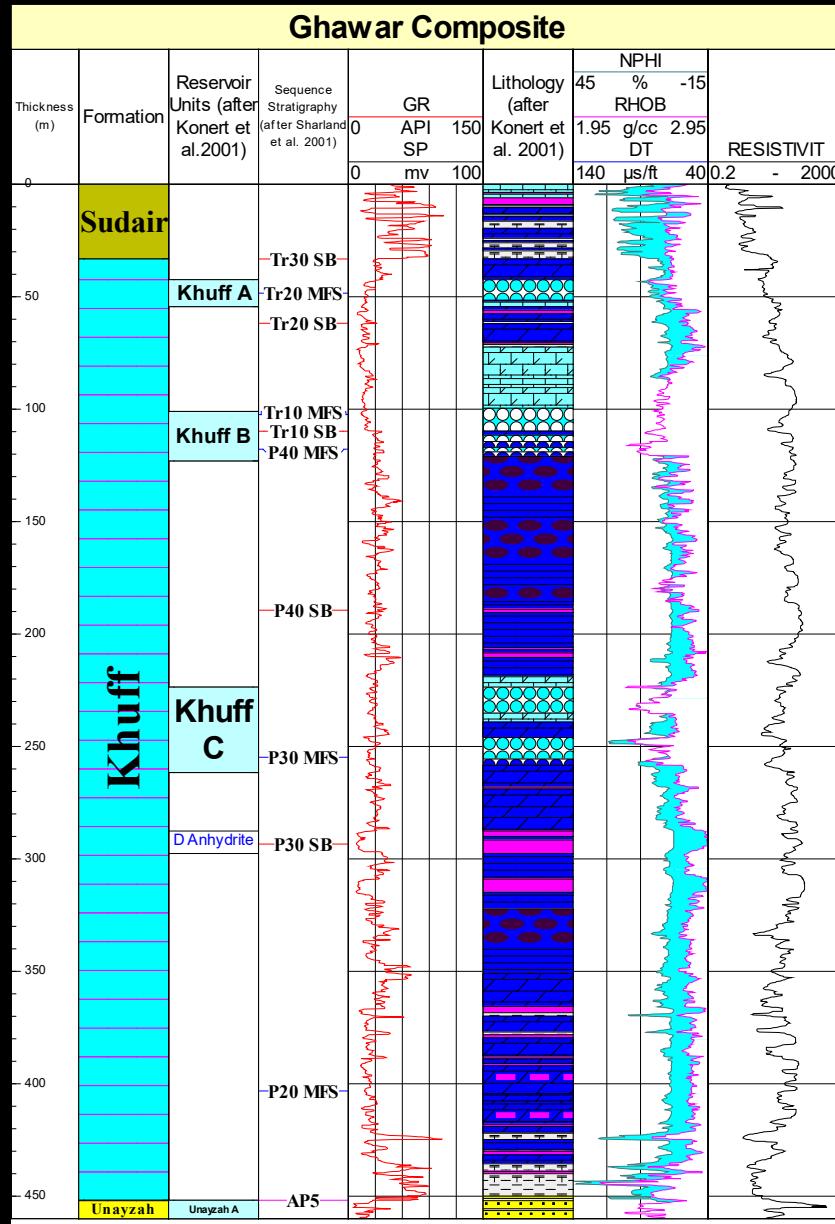
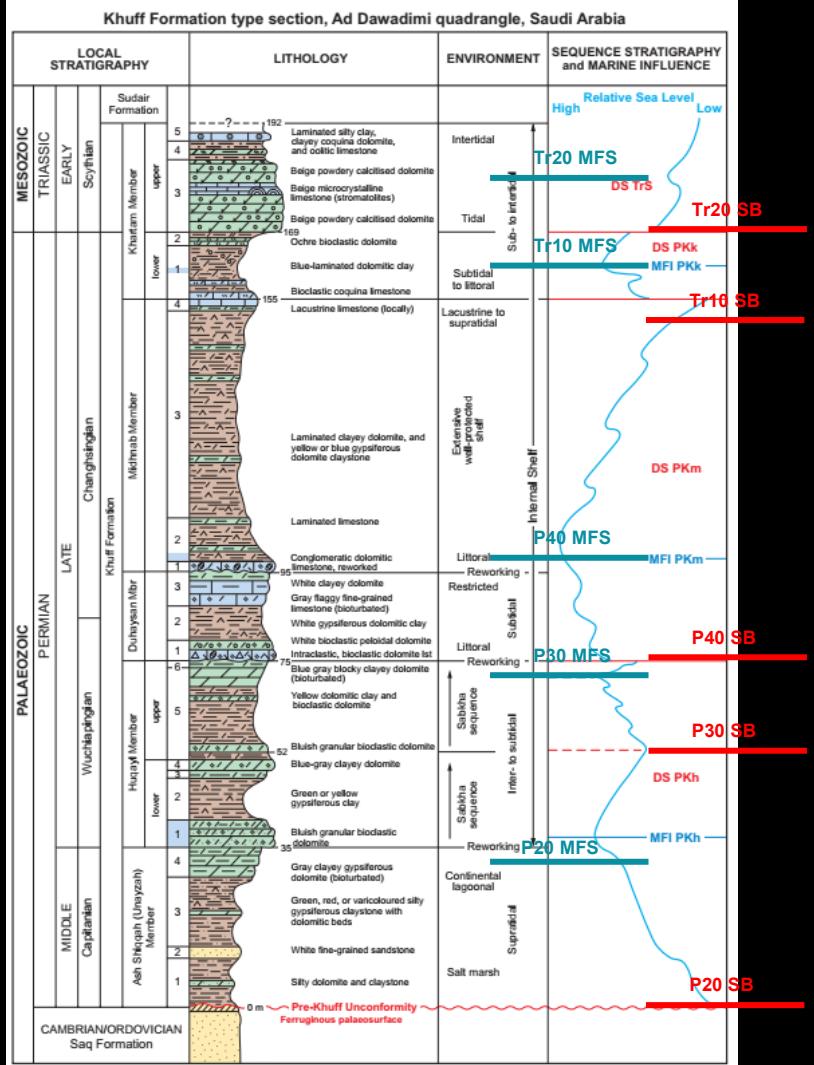


Mid-Cretaceous Succession, Wadi Mi'aidin, Oman

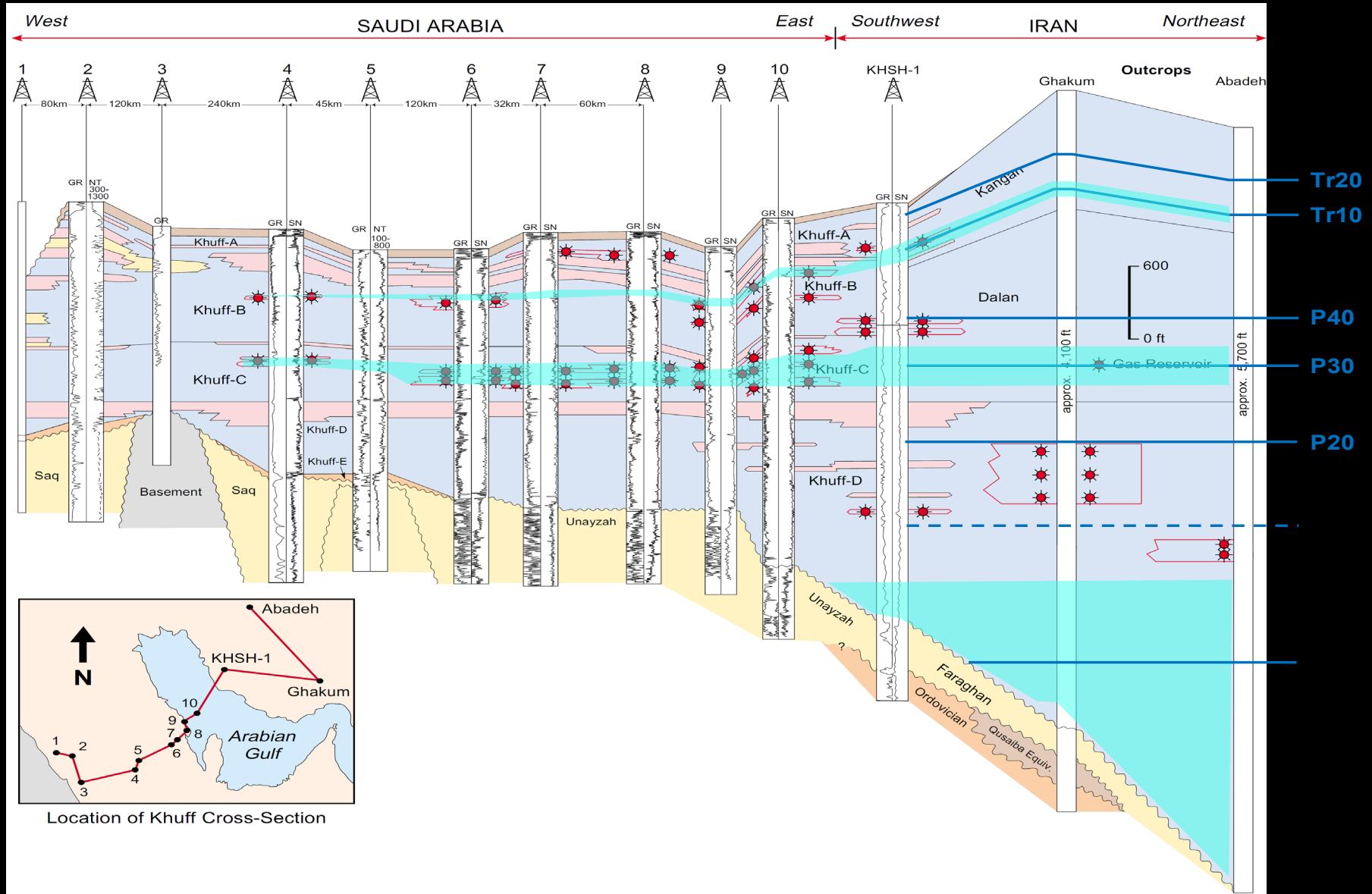
Chronostratigraphic Charts in Practice: Triassic, Arabian Plate



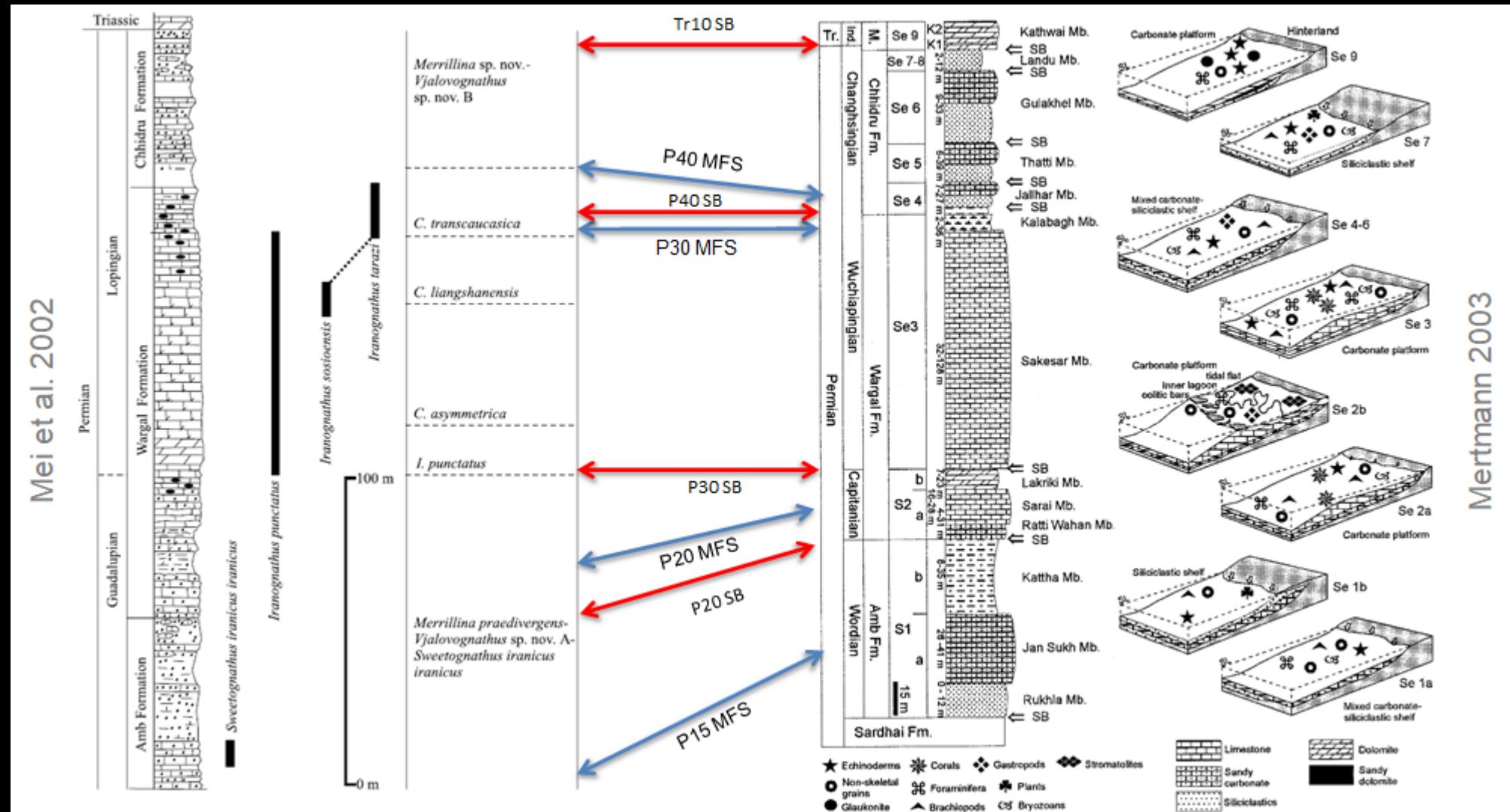
The Cyclicity of the Permian Stratigraphy of Arabia



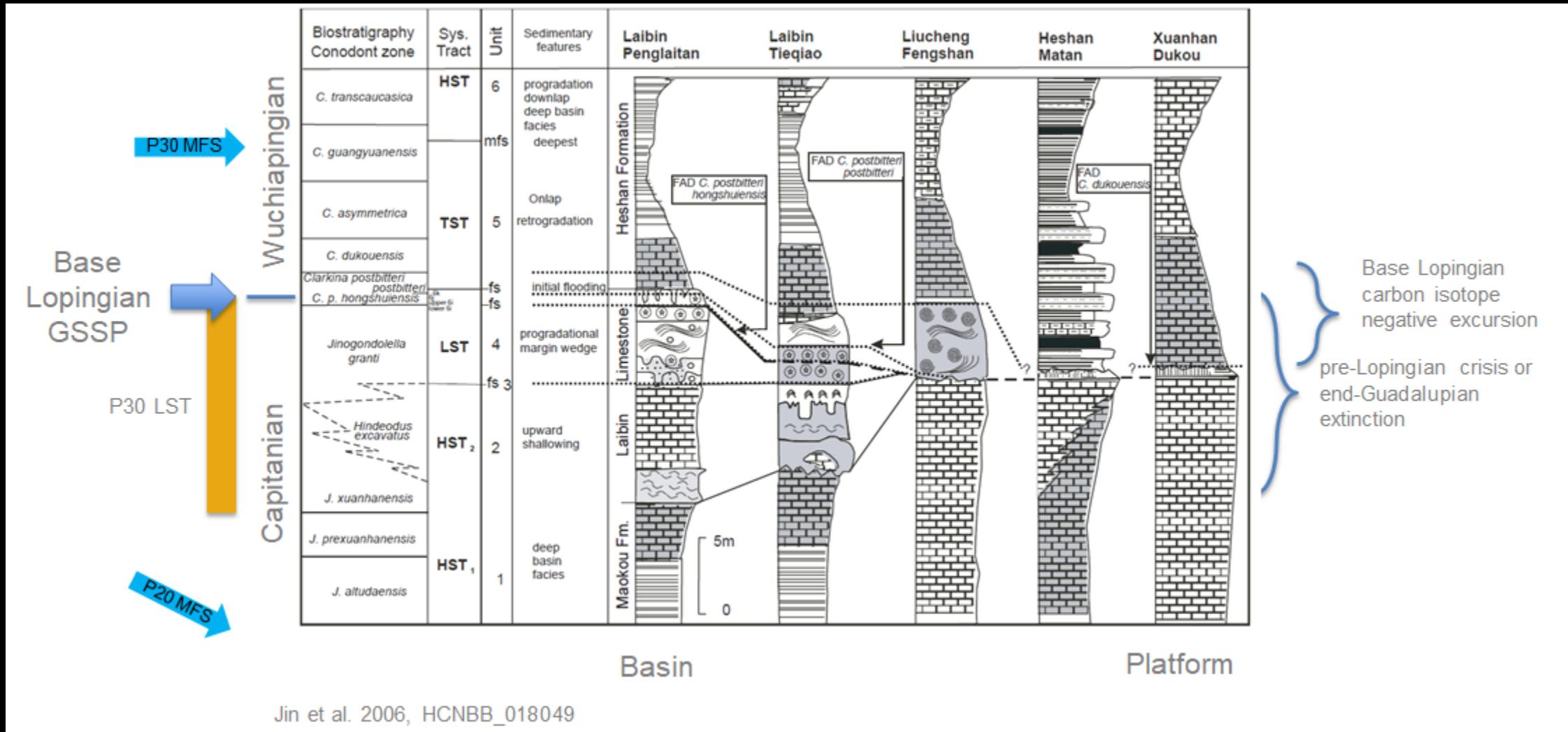
The Cyclicity of the Permian Stratigraphy of Arabia



Are The Sequences Eustatic? Evidence From Pakistan



Are the Sequences Eustatic? Evidence from China



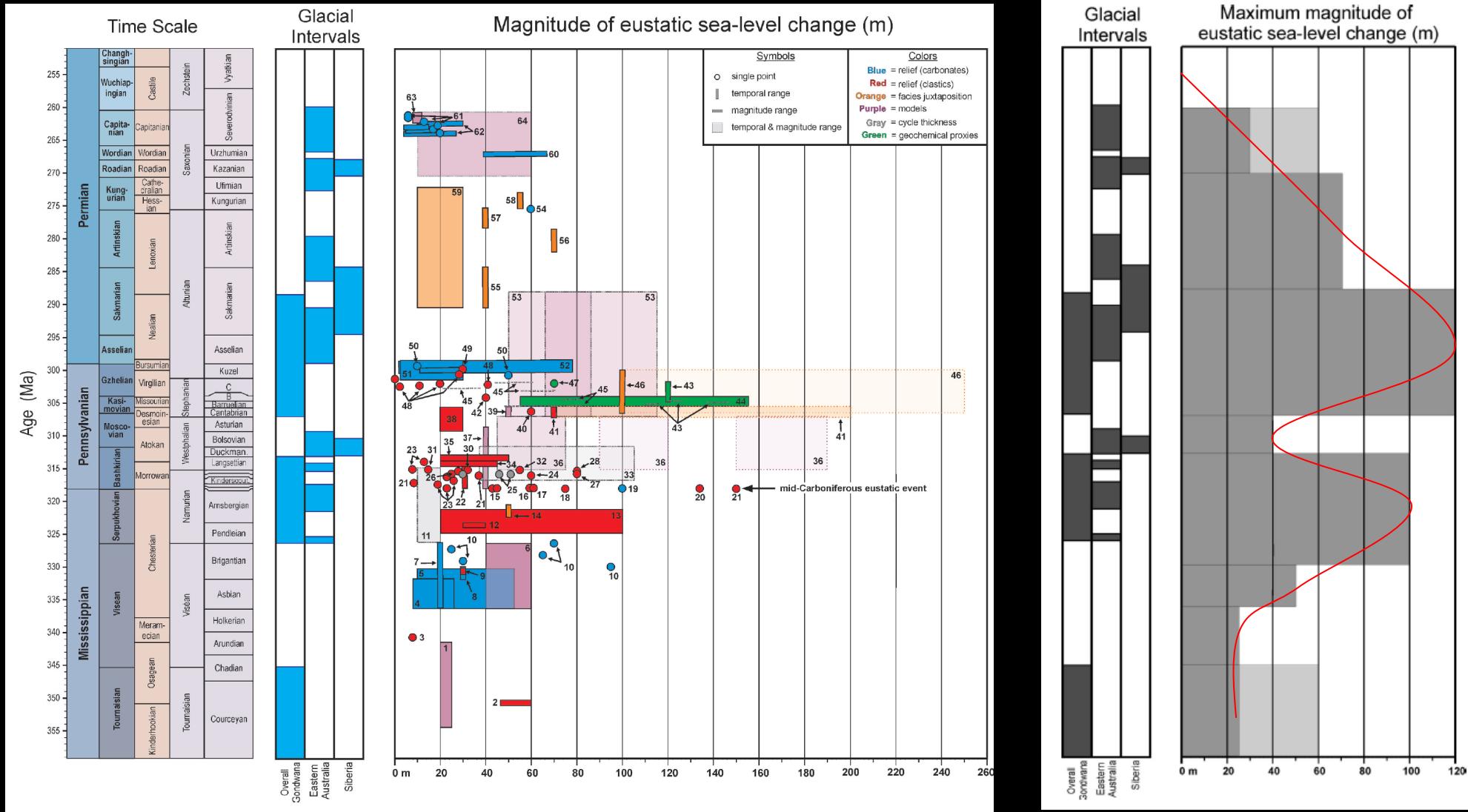
Building a Eustatic Curve

Symbols

- single point
- temporal range
- magnitude range
- temporal & magnitude range

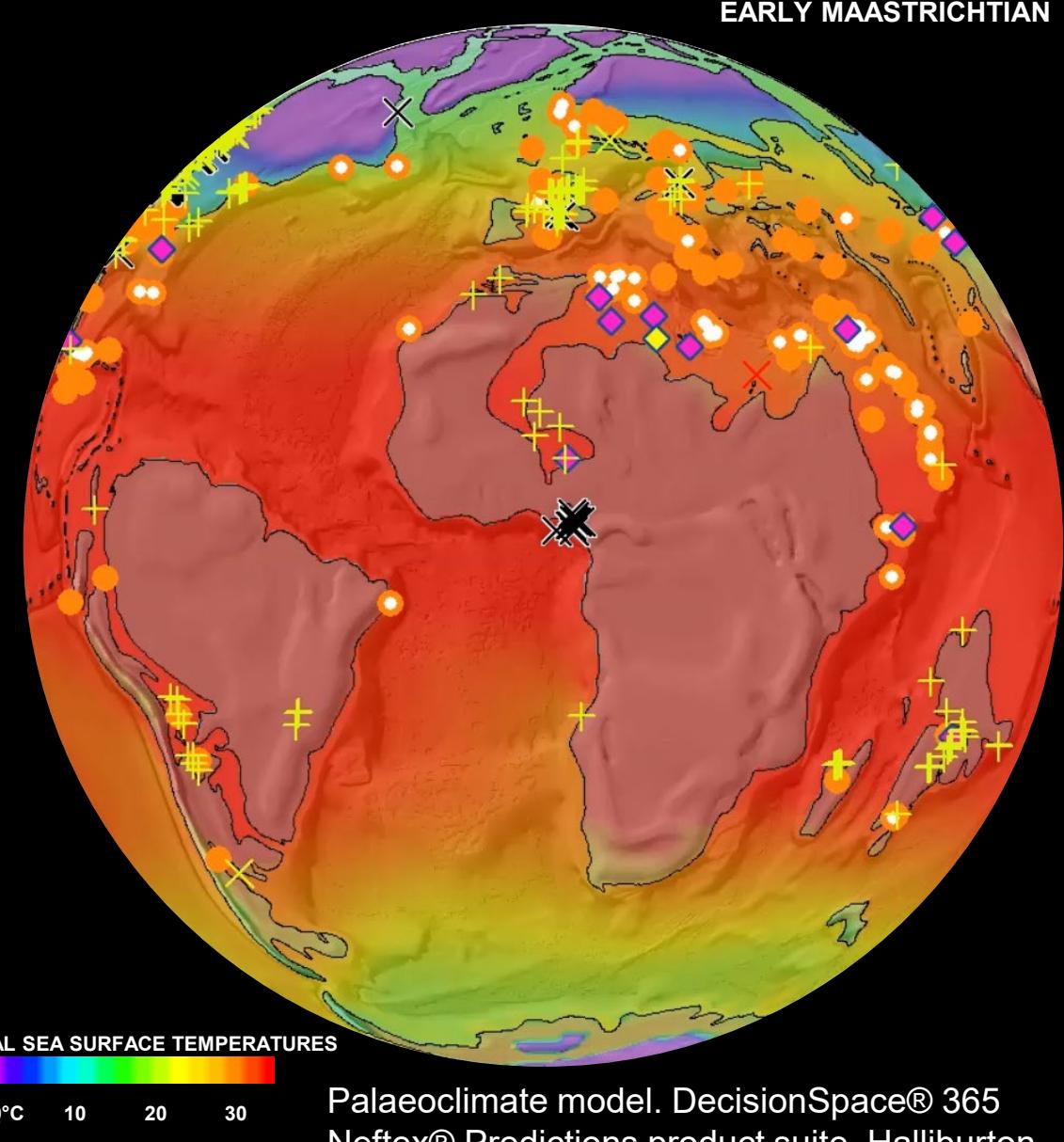
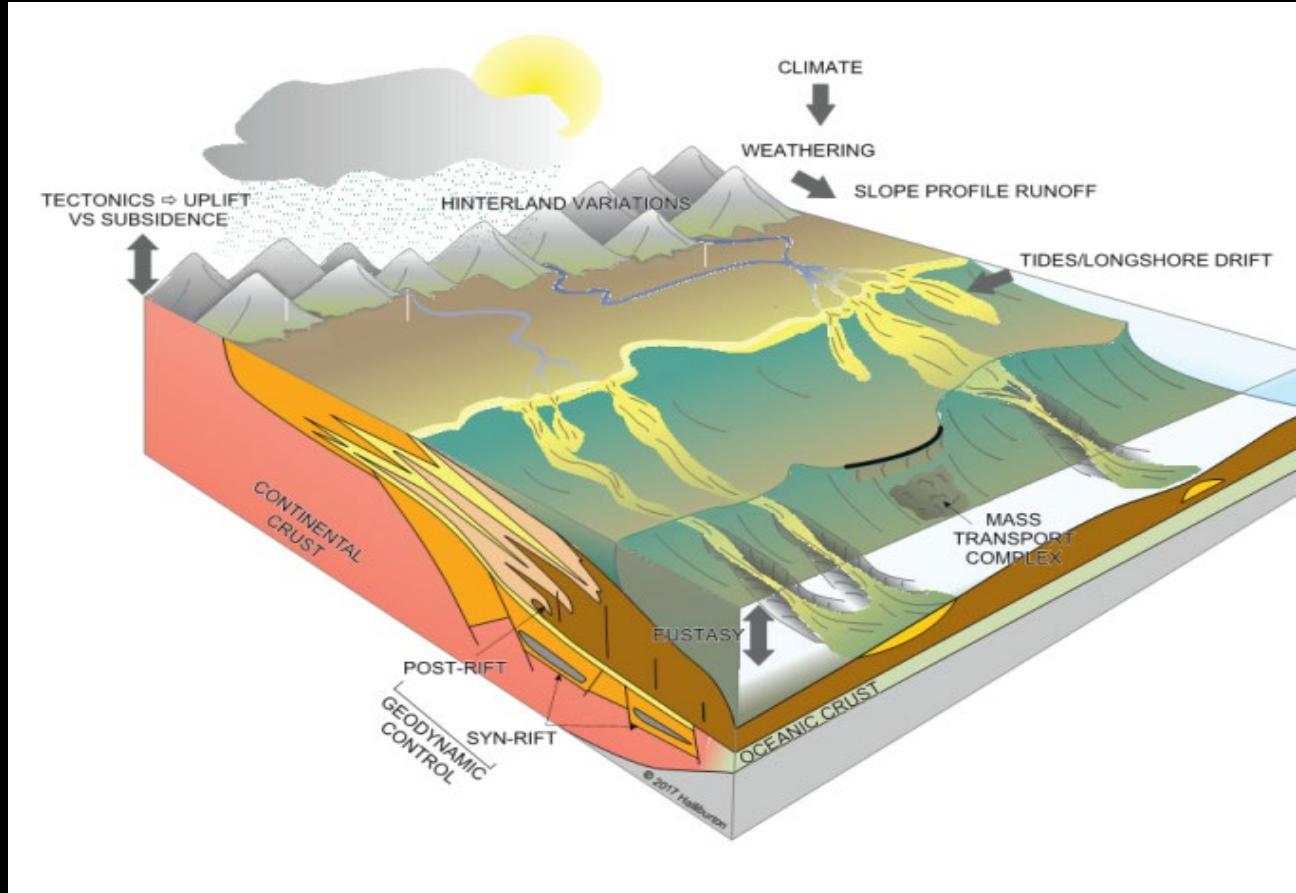
Colors

- Blue** = relief (carbonates)
- Red** = relief (clastics)
- Orange** = facies juxtaposition
- Purple** = models
- Gray** = cycle thickness
- Green** = geochemical proxies

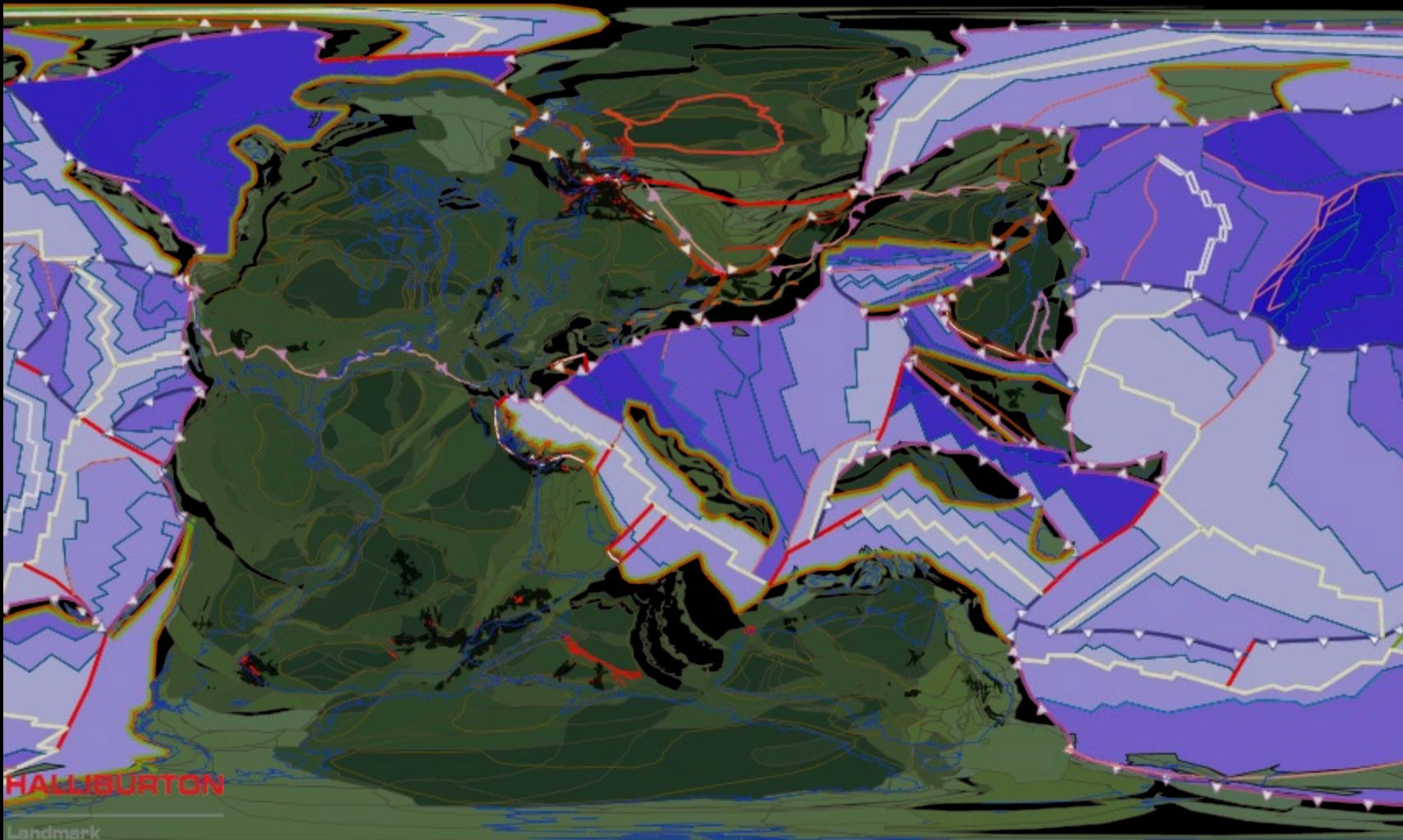


Rygel et al. 2008

Palaeoclimate and Source to Sink: Earth Systems Science

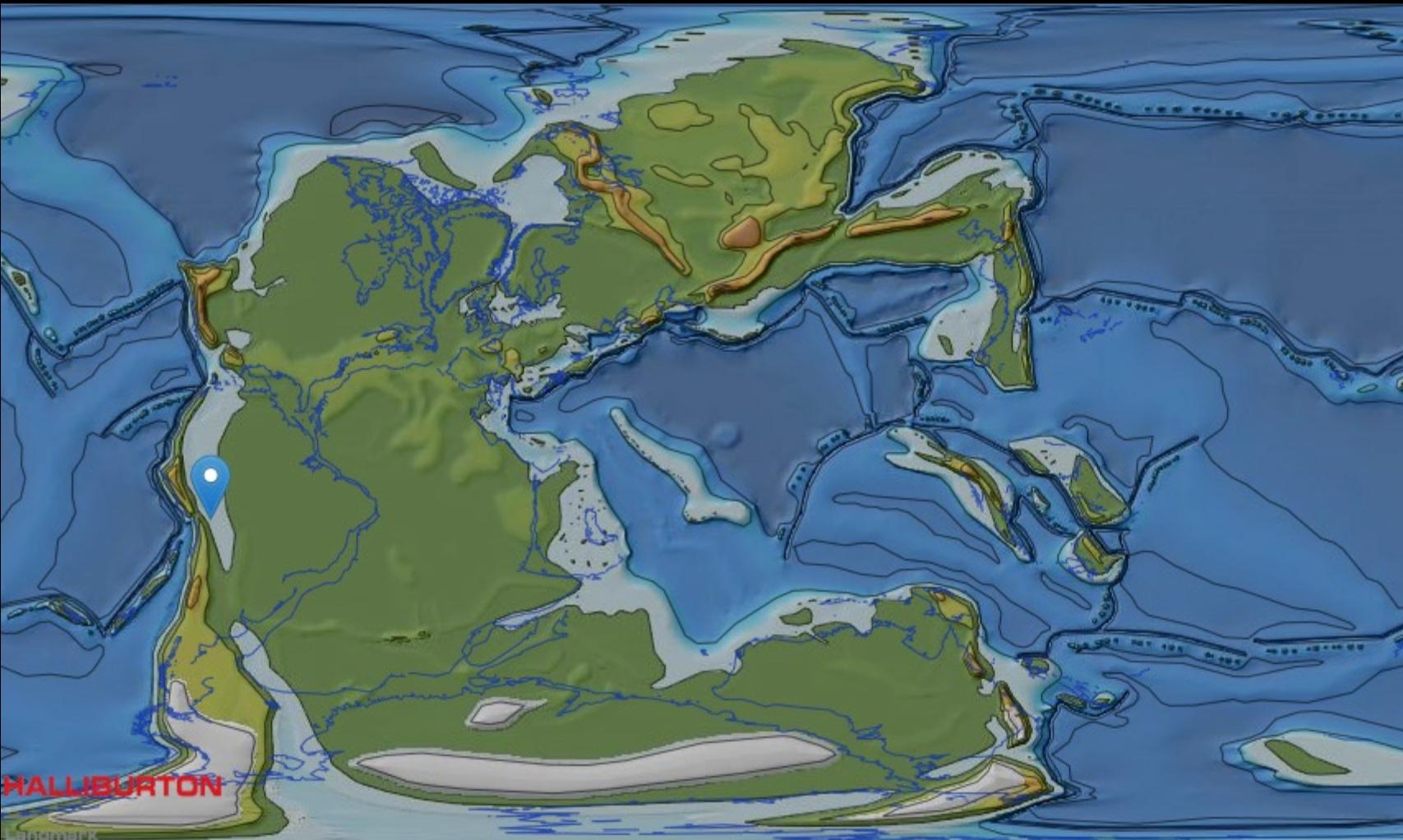


A Basis for the Bigger Picture



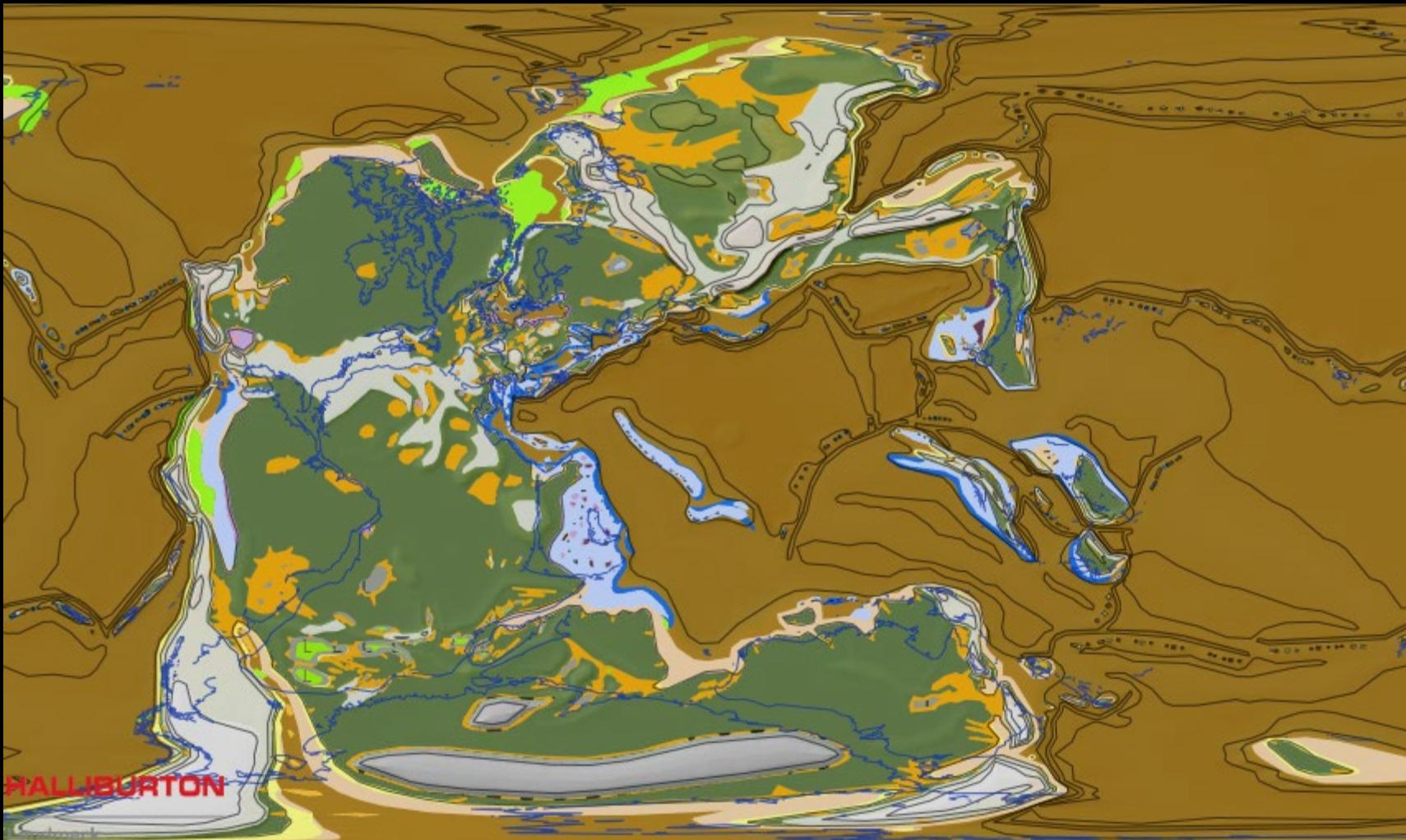
Changhsingian PDEM - Neftex® Predictions product suite, Halliburton

A Basis for the Bigger Picture



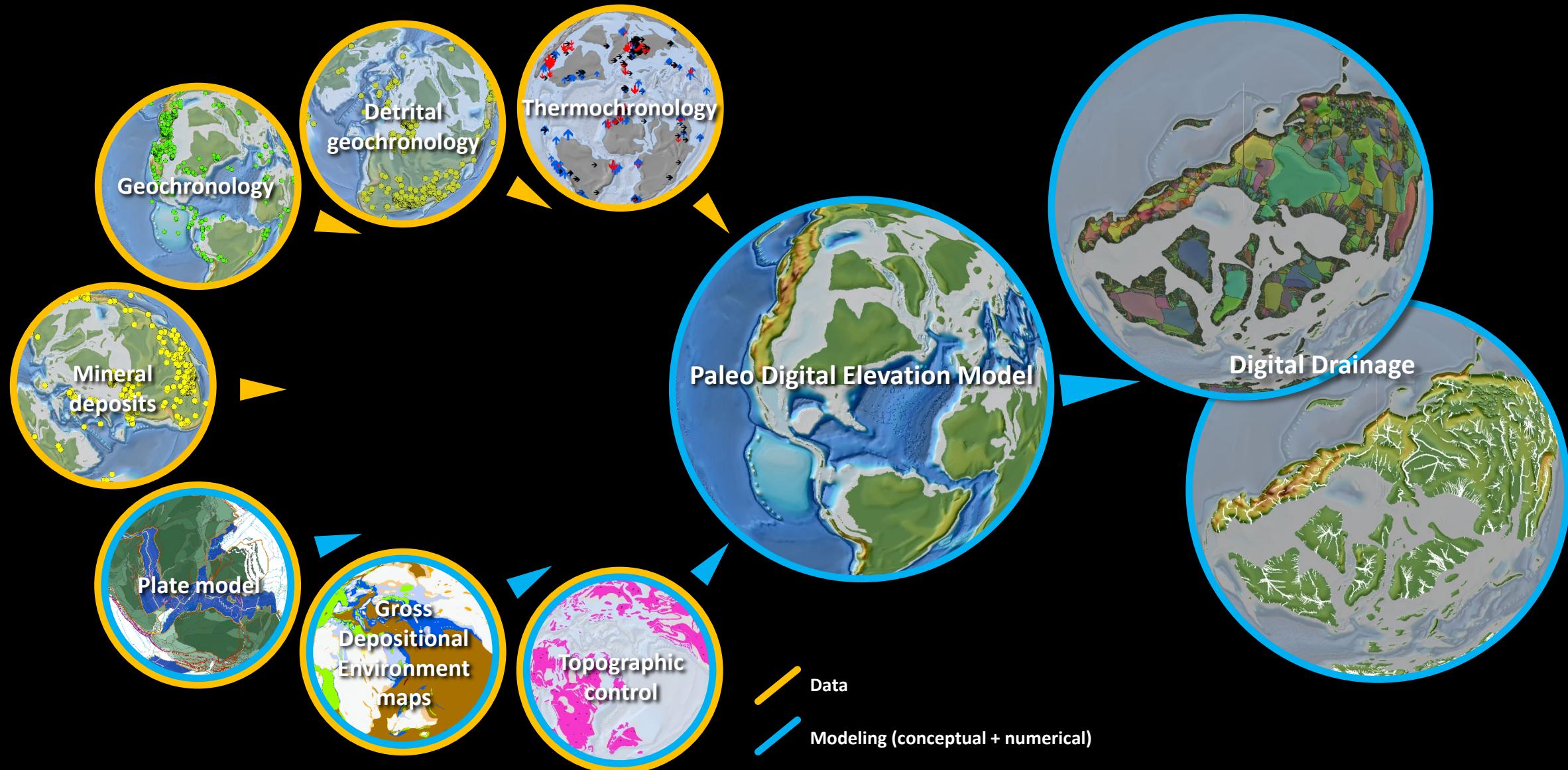
Changhsingian PDEM - Neftex® Predictions product suite, Halliburton

A Basis for the Bigger Picture

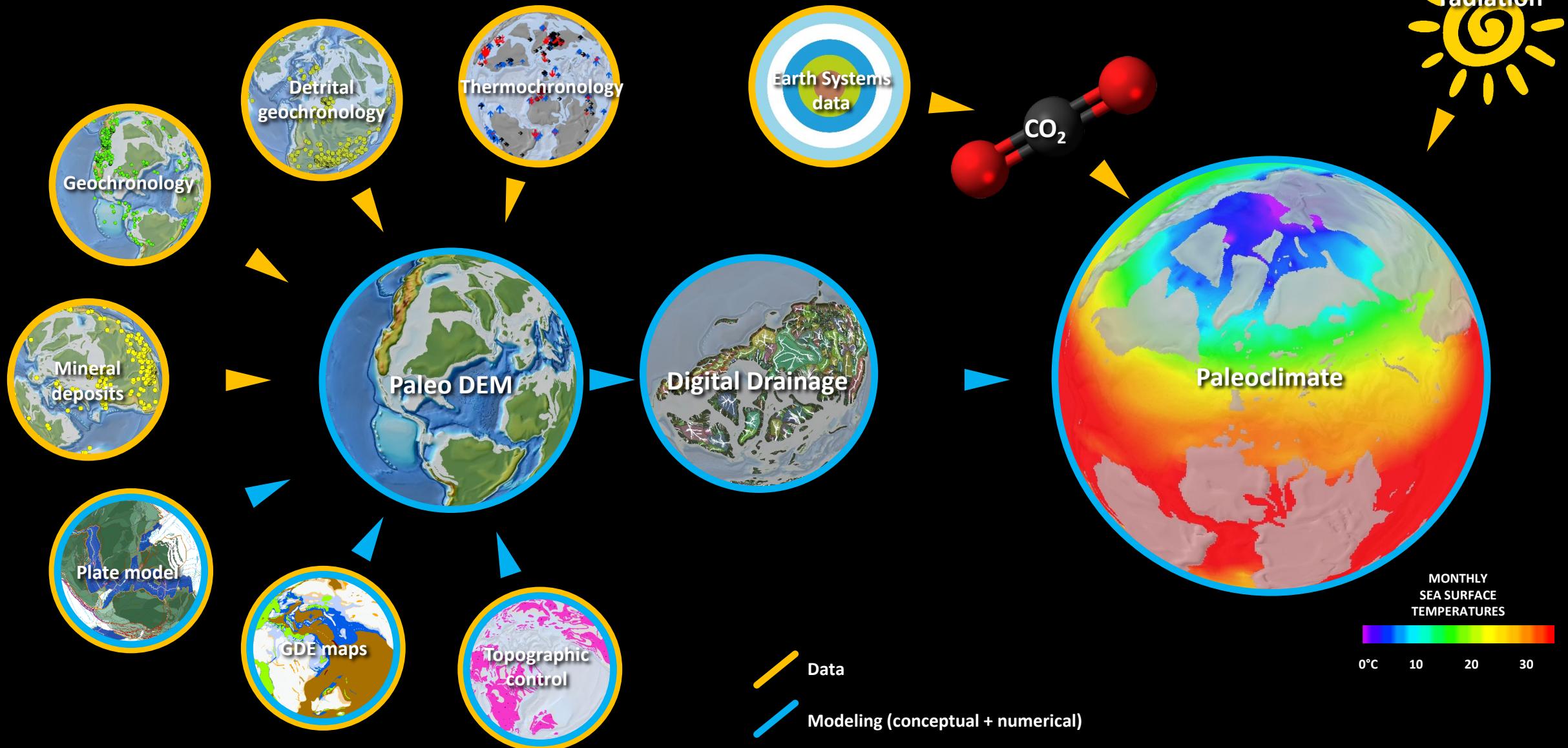


Changhsingian Palinspastic GDE - Neftex® Predictions product suite, Halliburton

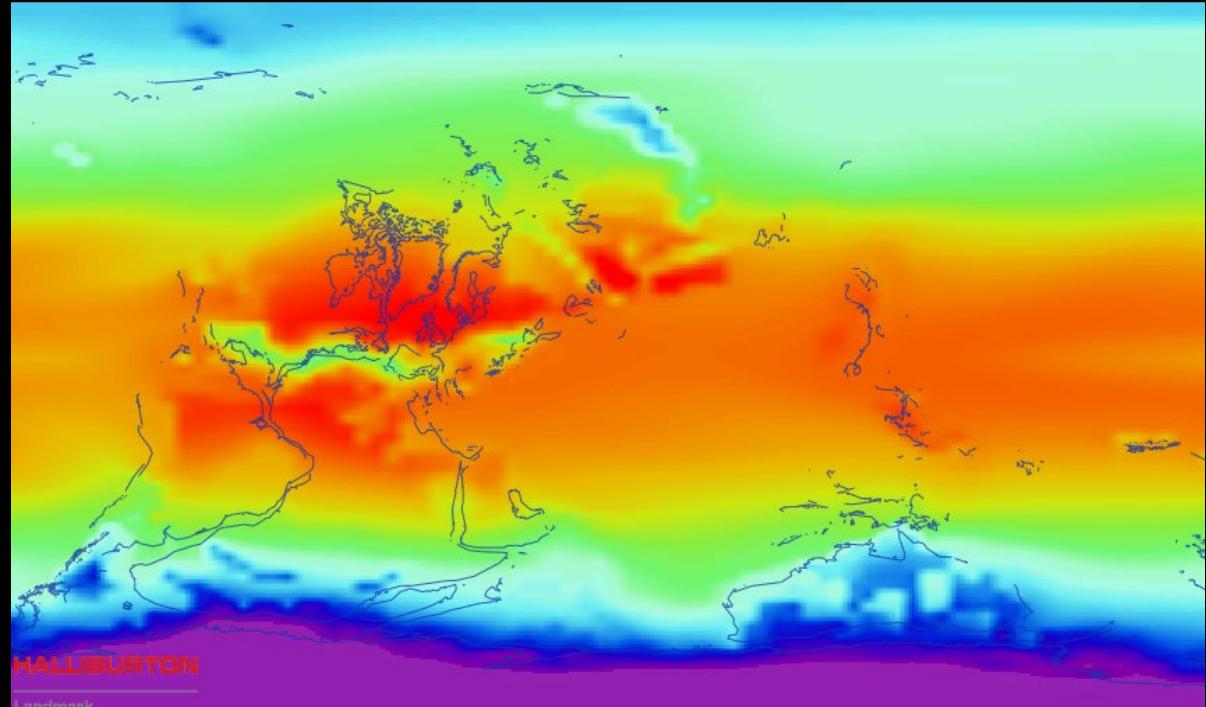
Holistic Earth System modelling – models supported by data



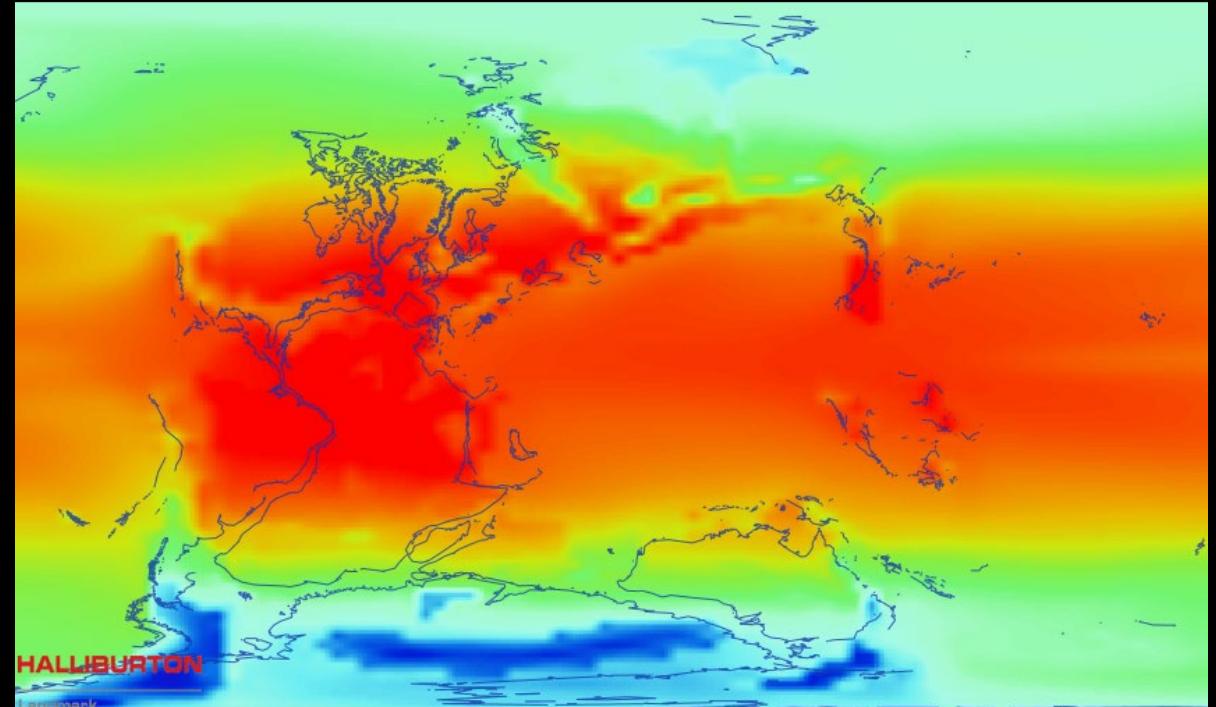
Holistic Earth System modelling – Models supported by data



Outputs: Air Temperature

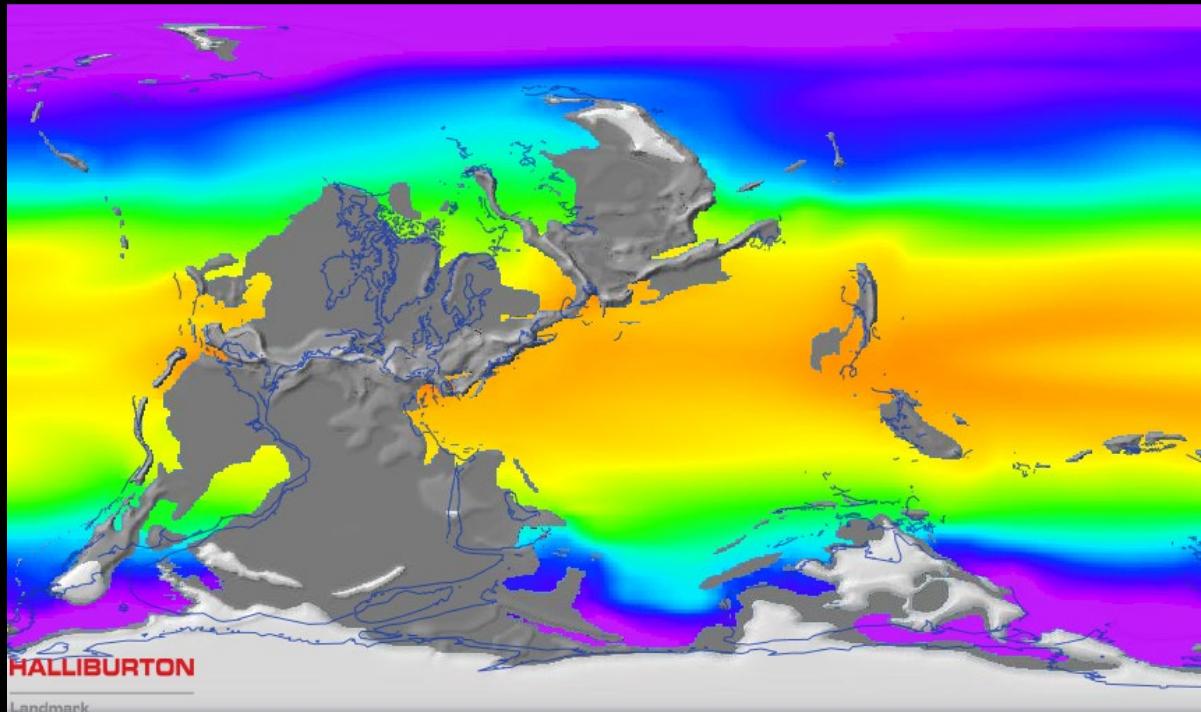


Sakmariyan

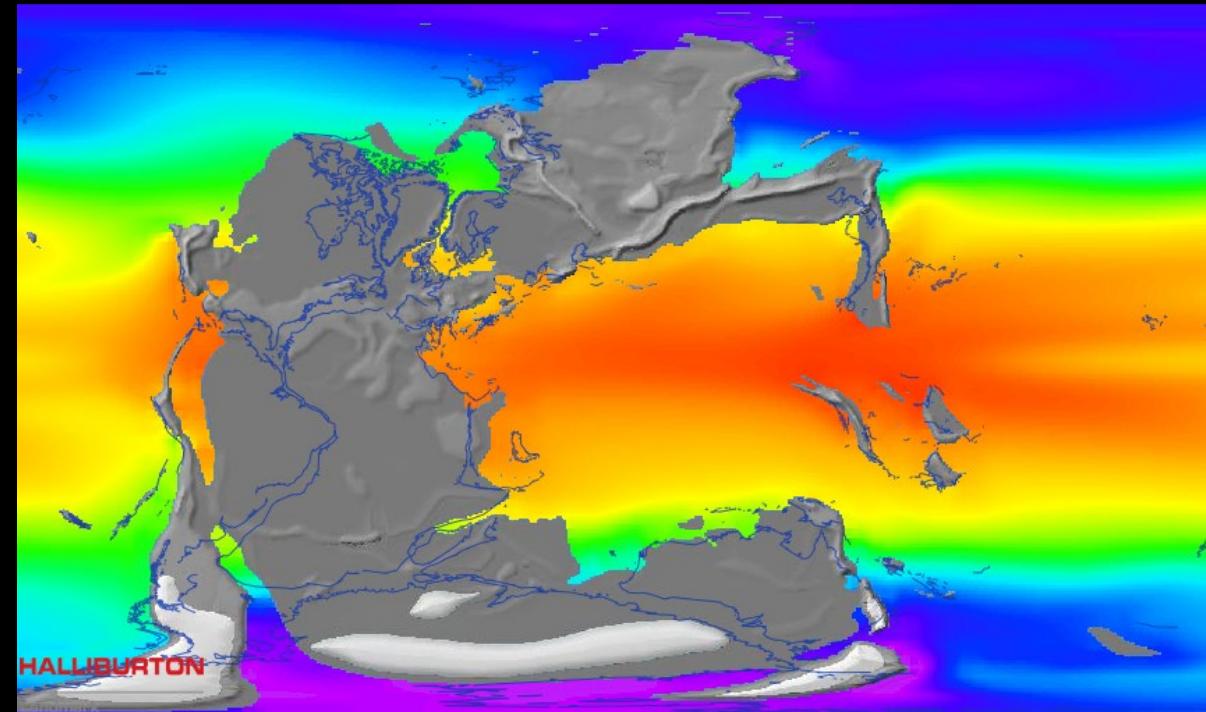


Changhsingian

Outputs: Sea-Surface Temperature

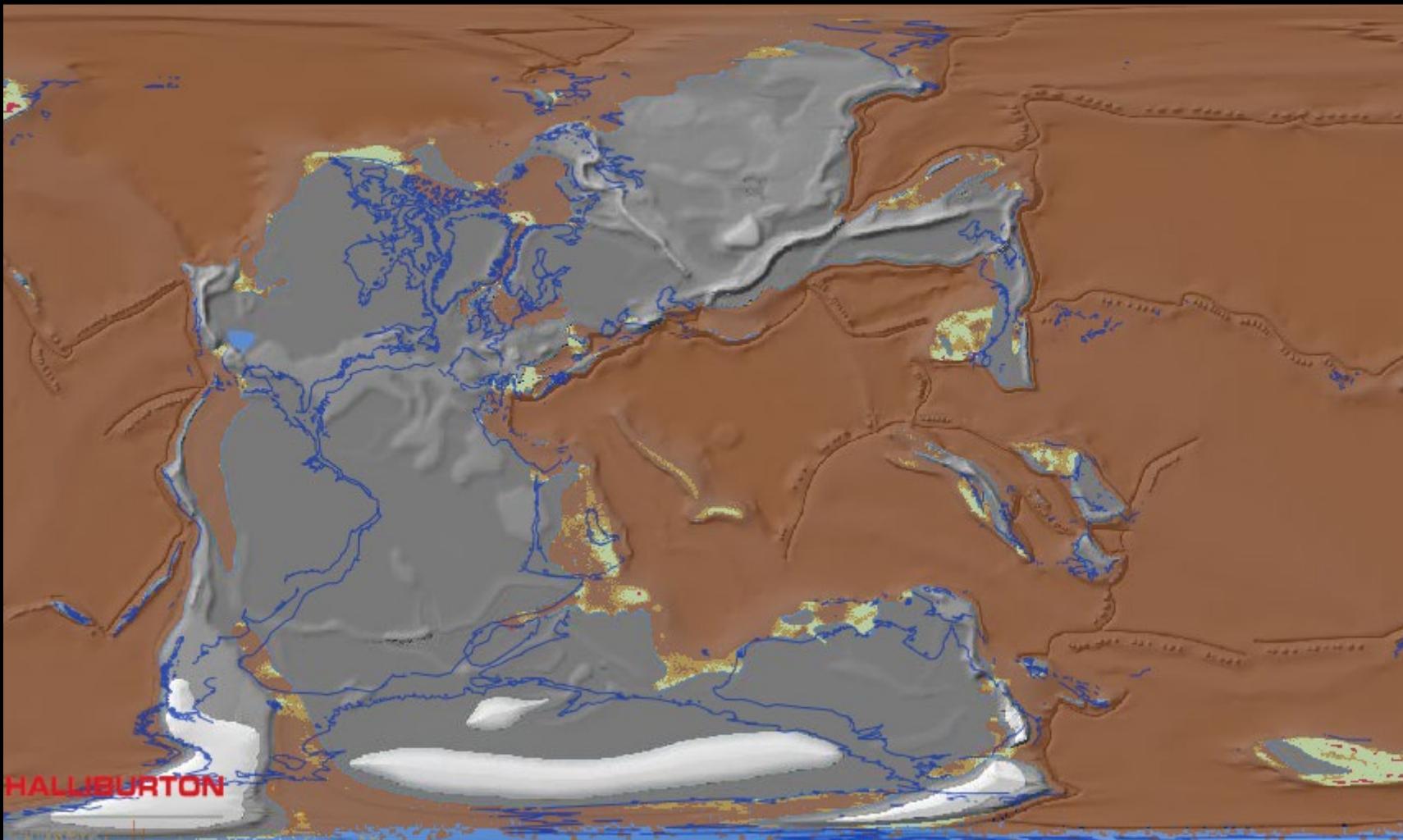


Sakmarian



Changhsingian

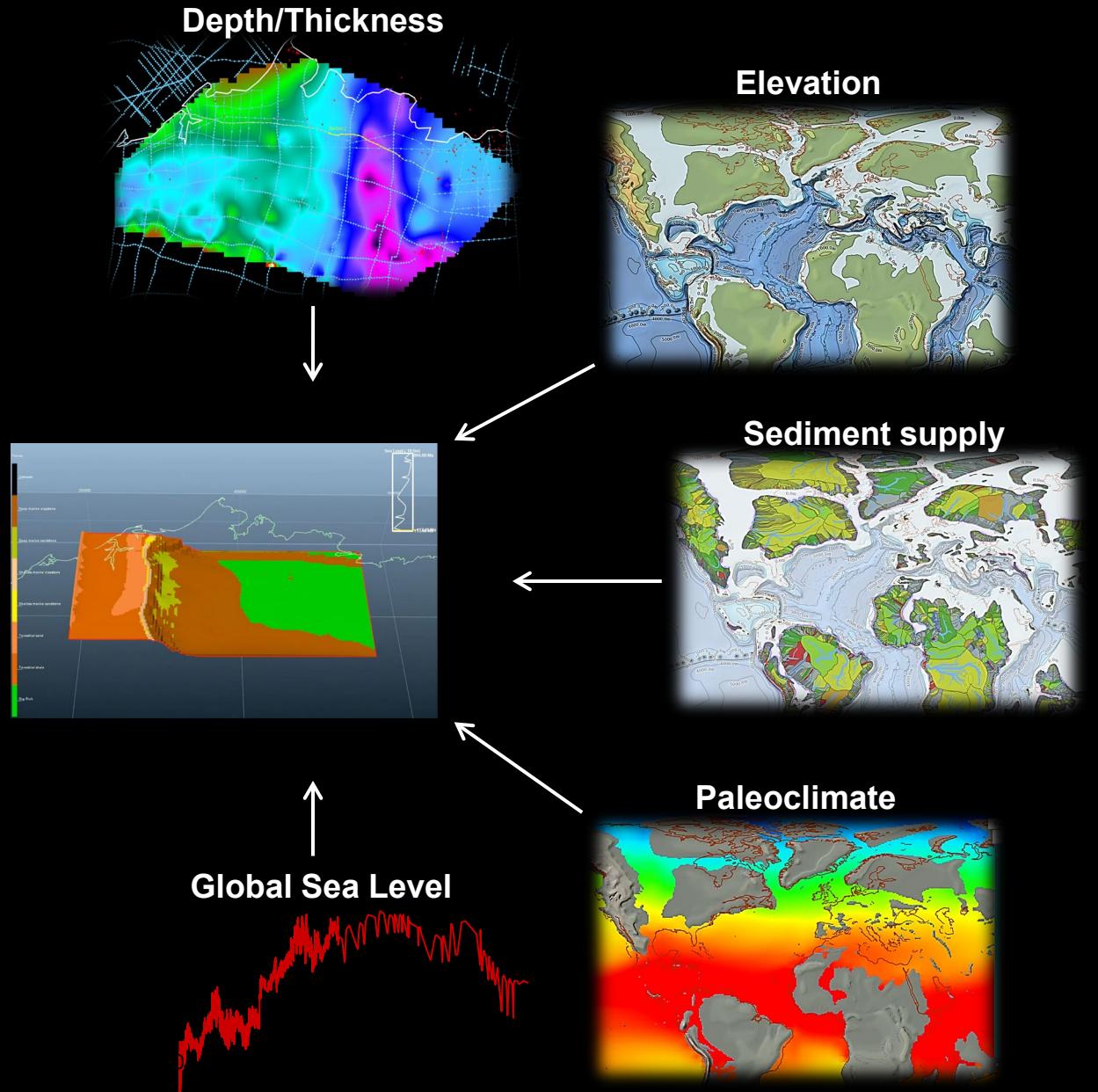
Bringing ESS to Bear: Tidal Current Strength Modelling



Changhsingian

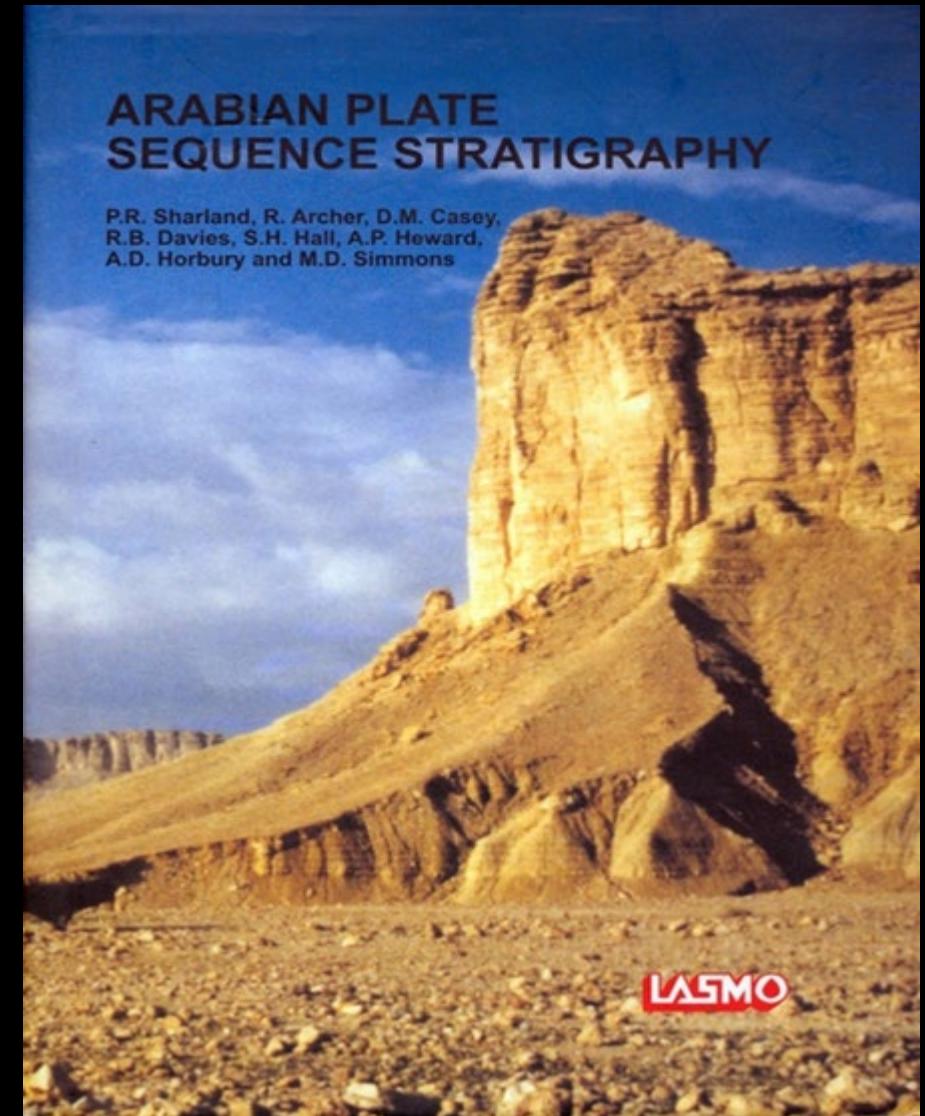
Bringing It All Together: Forward Stratigraphic Modelling

- Forward stratigraphic models are physics-based, numerical simulators capable of modelling entire sedimentary systems
- Require information on different geological forcings



Summary

- Prediction or extrapolation between data is a fundamental aspect of geoscience – no matter if to academic or commercial ends
- A number of geological techniques assist in this regional geology assessment:
 - Biostratigraphically Constrained Sequence Stratigraphy
 - Geodynamics
 - Palaeoclimate/Source to Sink – Earth Systems Science
- Forward stratigraphic modelling is a powerful computational technique for modelling geology at a regional scale
- *Challenge for the Subcommission on Permian Stratigraphy – Creation of a definitive Permian eustatic curve?*
- Thanks to Halliburton and Neftex colleagues past and present and to Mike and Lucia for the invitation



THANK YOU

The image is a high-contrast, black-and-white graphic. It features a dense, abstract arrangement of text elements. The most prominent words are 'THANK YOU', 'ANSWERS', 'QUESTIONS', 'HALLIBURTON', and 'Q&A'. These words are repeated multiple times in different sizes and shades of gray, creating a textured, overlapping effect. The overall composition is organic and non-linear, with no single focal point.