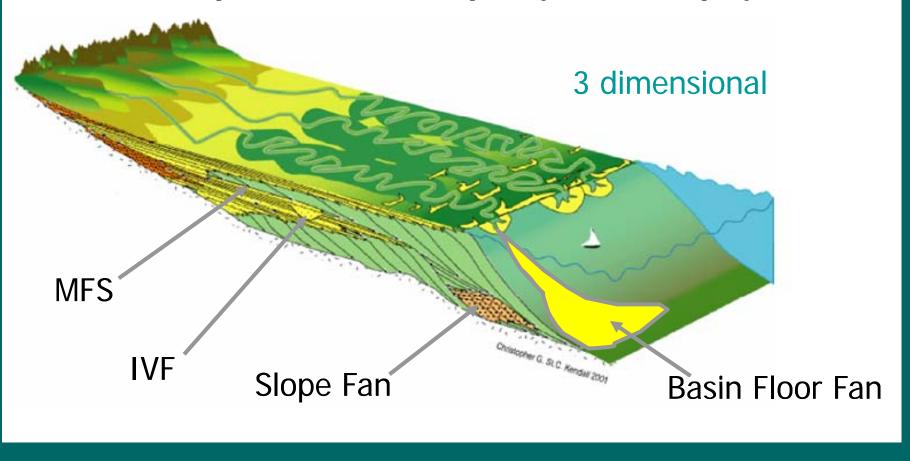
SEQUENCE STRATIGRAPHIC ANALYSIS

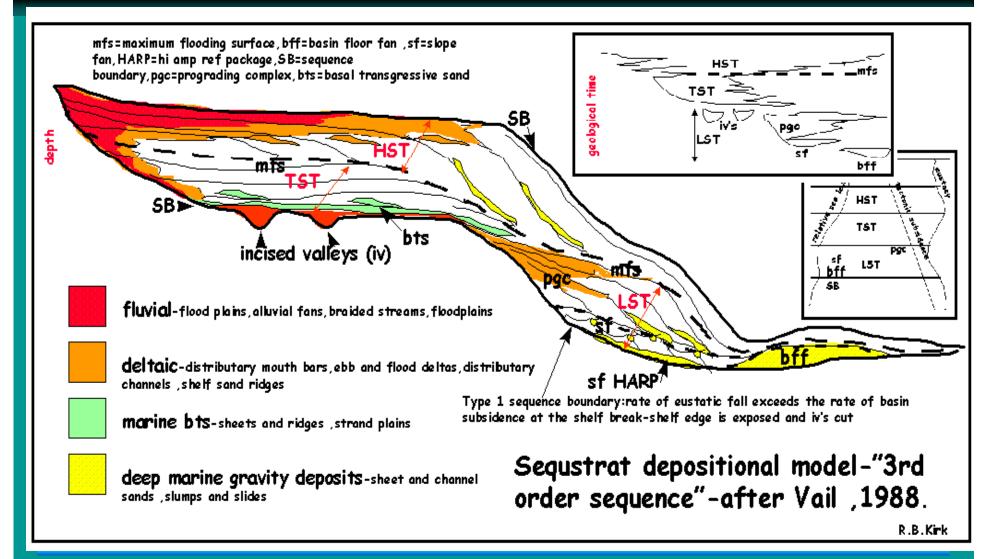
Robert Wong Hin Fatt, 2010 CCOP Workshop

A Simpler, More Useful Definition of Sequence Stratigraphy

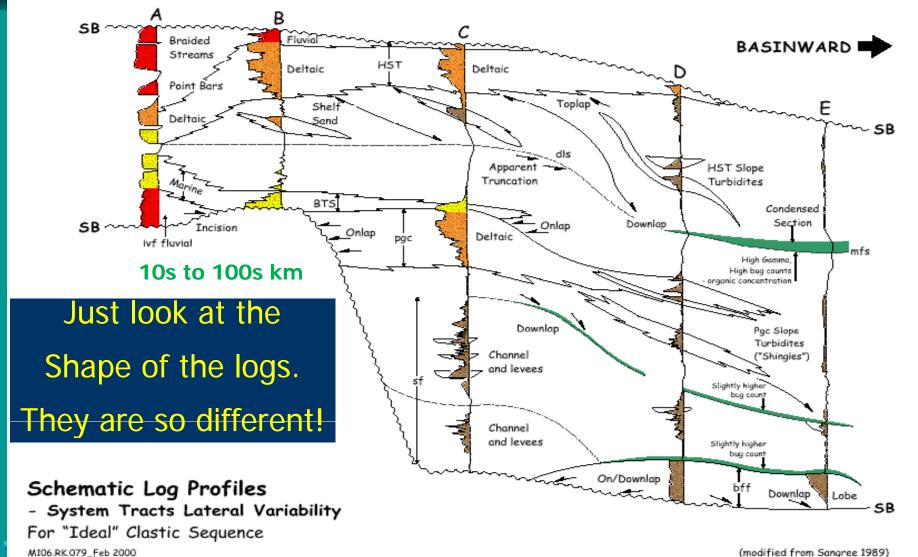
A method to impose the dimension of time on the relationships of rock units in space (area and depth)



Third order sequence described as Slug Model - 2 dimensional

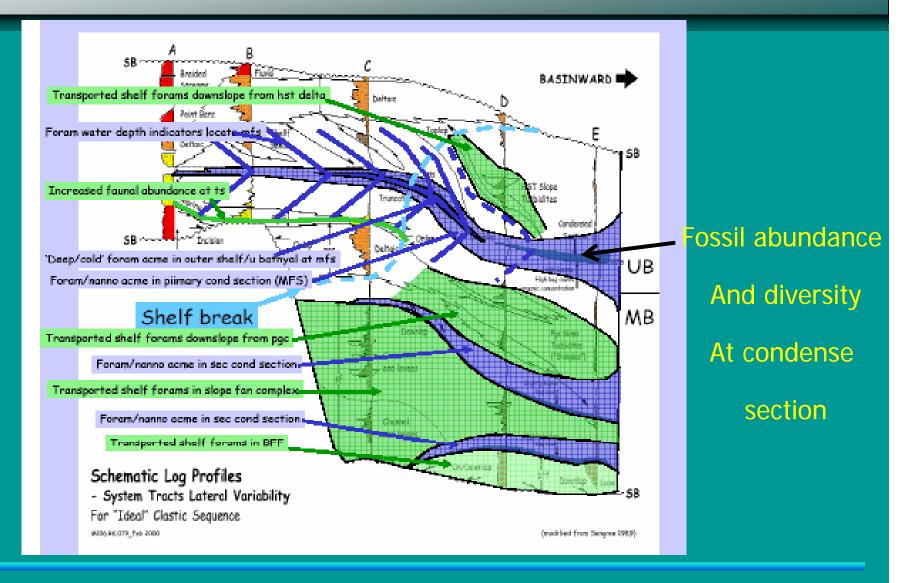


Slug Model illustrated by logs

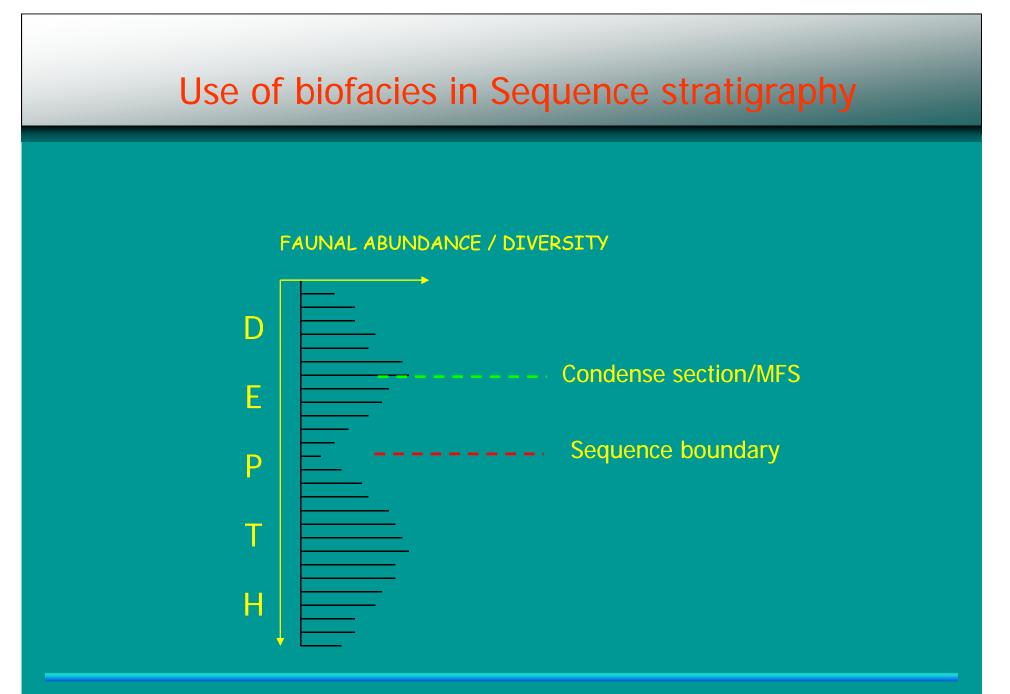


(modified from Sangree 1989)

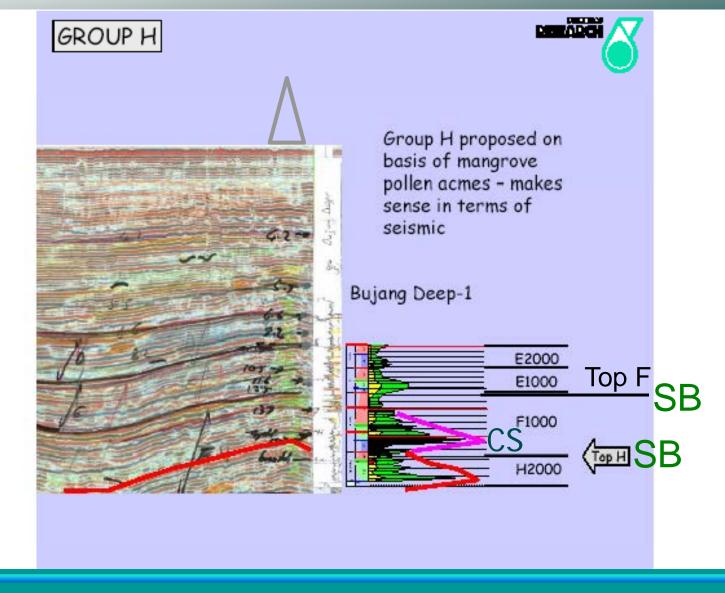
Sequence biostratrigraphy in a third-order sequence



PRAM/PMU



Correlation of Biostrat., Well and Seismic Data



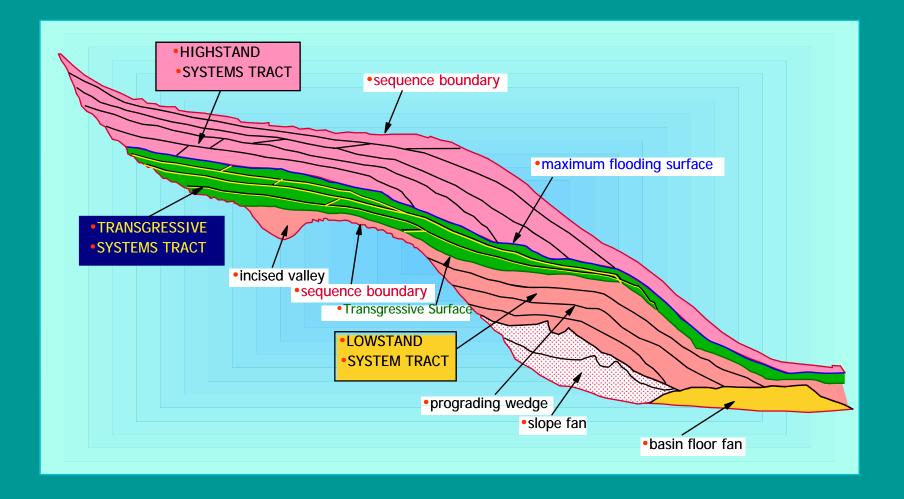
PRAM/PMU

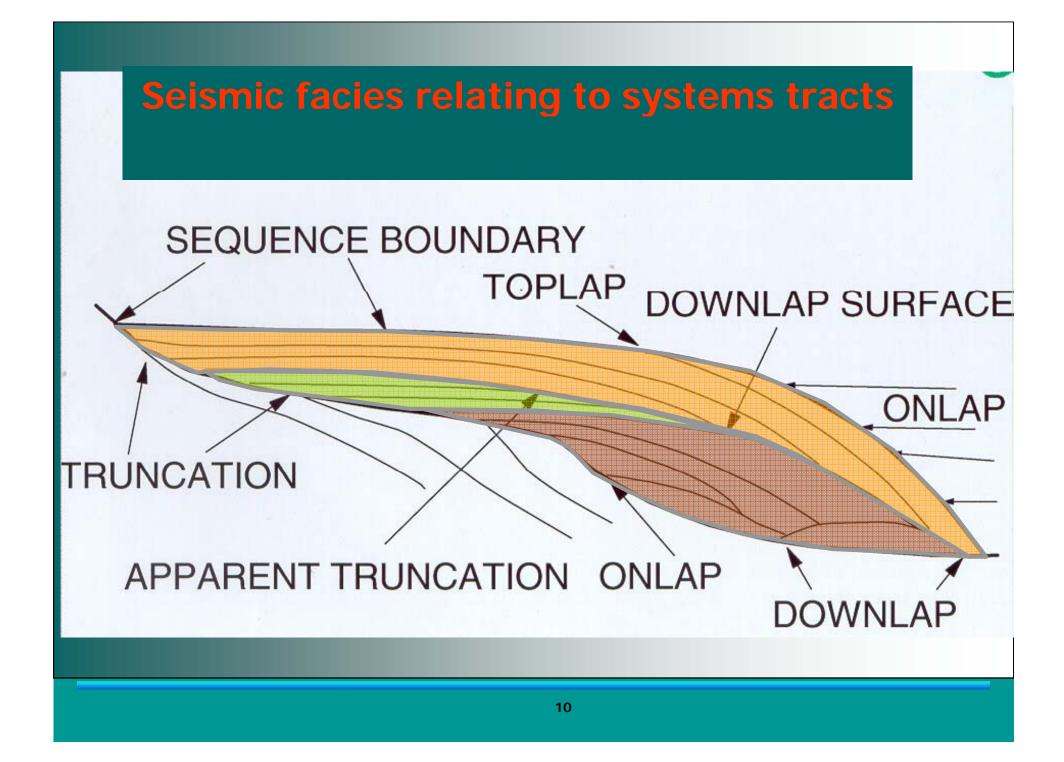


Seismic Facies Interpretation Within Sequence Stratigaphic Framework

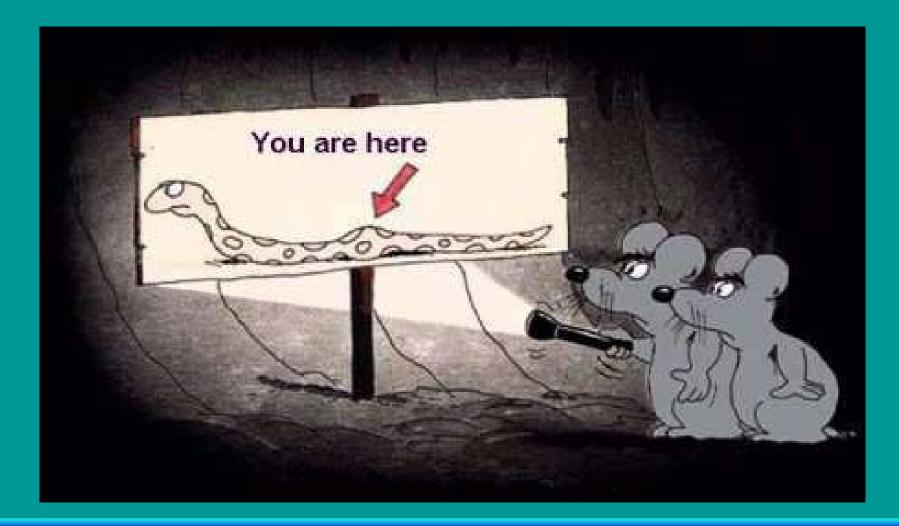
Robert Wong Hin Fatt, 2010

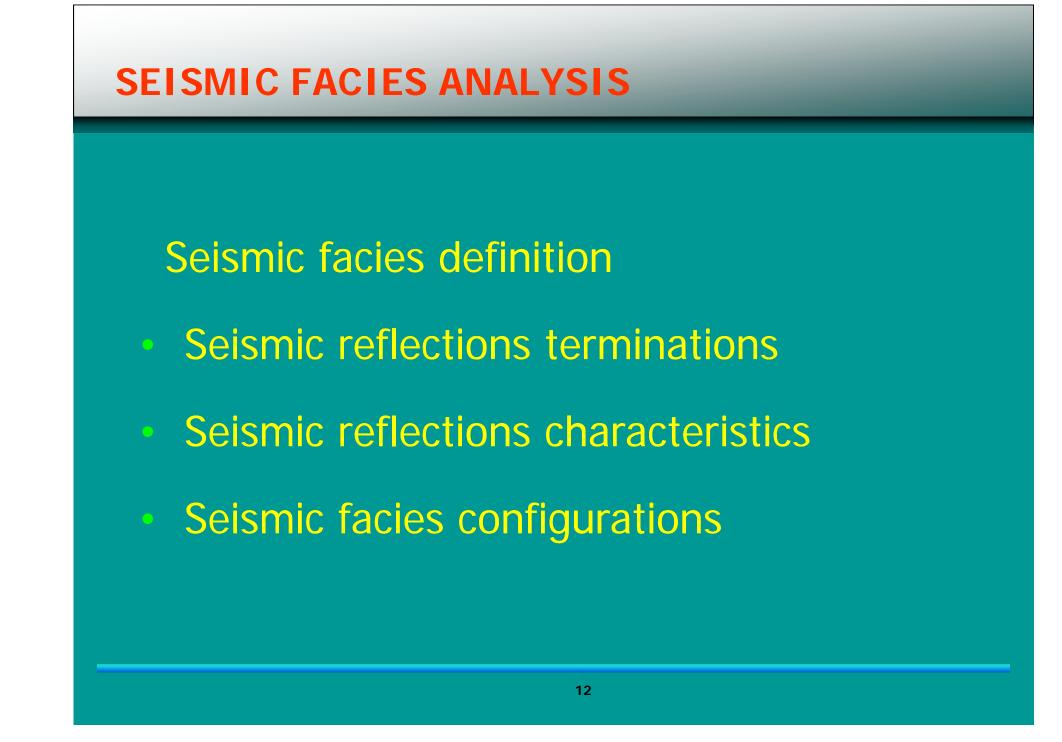
A third-order sequence model showing systems tracts





Remember! You must know where you are within the sequence stratigraphic framework.





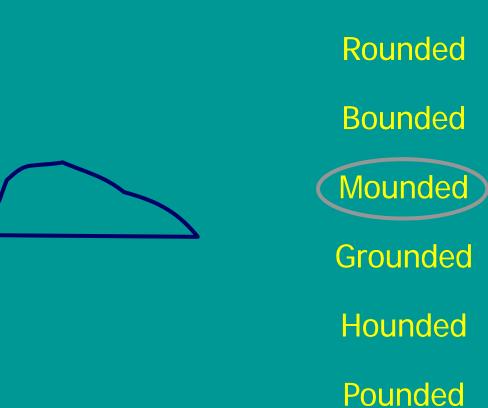
SEISMIC FACIES ANALYSIS

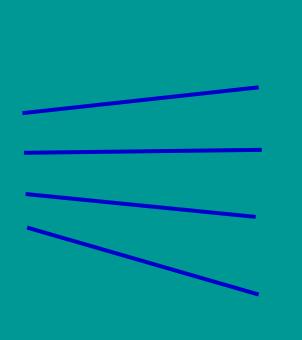
Definition: The description and geological interpretation of an association of seismic reflection parameters including:

- Amplitude
- Continuity
- Frequency
- Phase
- Geometric Configurations



Rounded Bounded Mounded Grounded Hounded Pounded

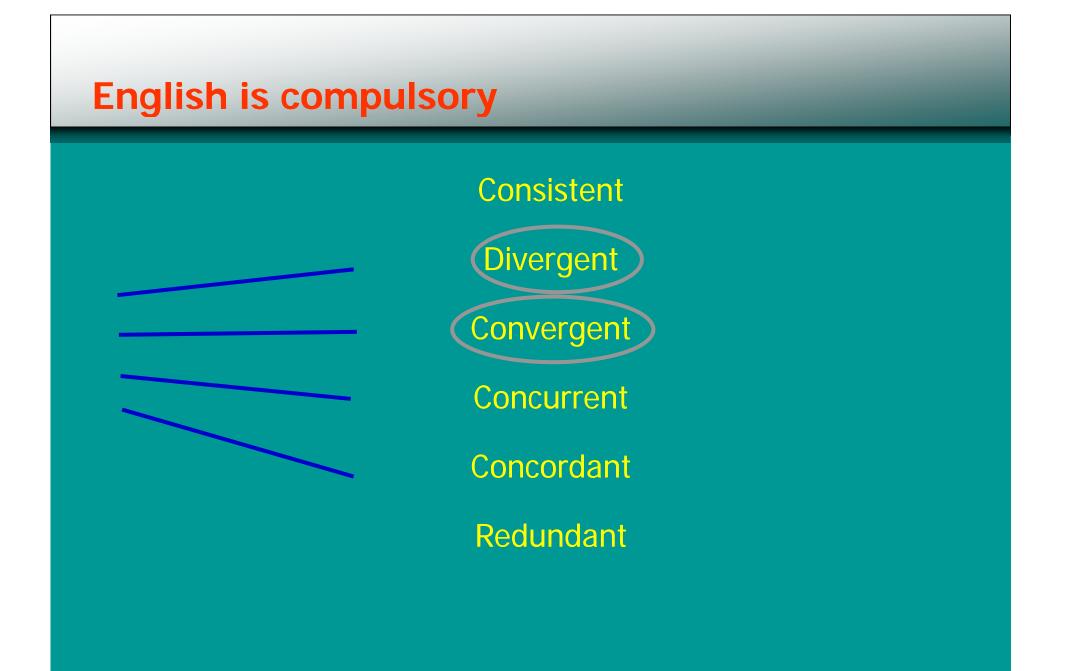




Consistent Divergent Convergent Concurrent

Concordant

Redundent





Sentimental

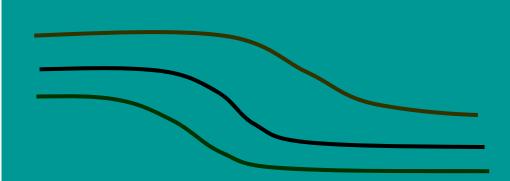
Cylindrical

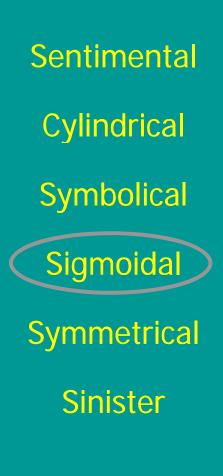
Symbolical

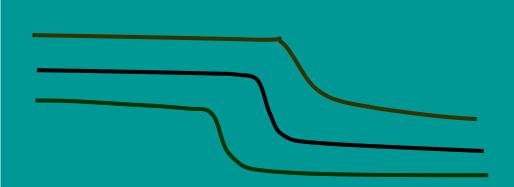
Sigmoidal

Symmetrical

Sinister







Oblong

Prolong

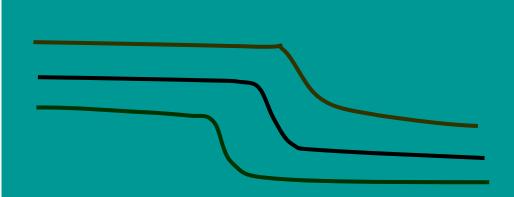
Along

Oblique

Obscure

Obese

Obvious



Oblong

Prolong

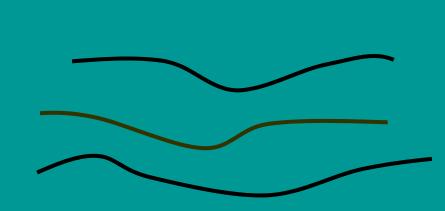
Along



Obscure

Obese

Obvious



Curvy

Hummocky

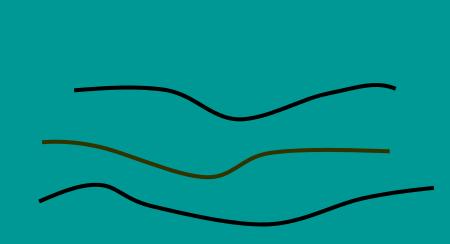
Wavy

Shaky

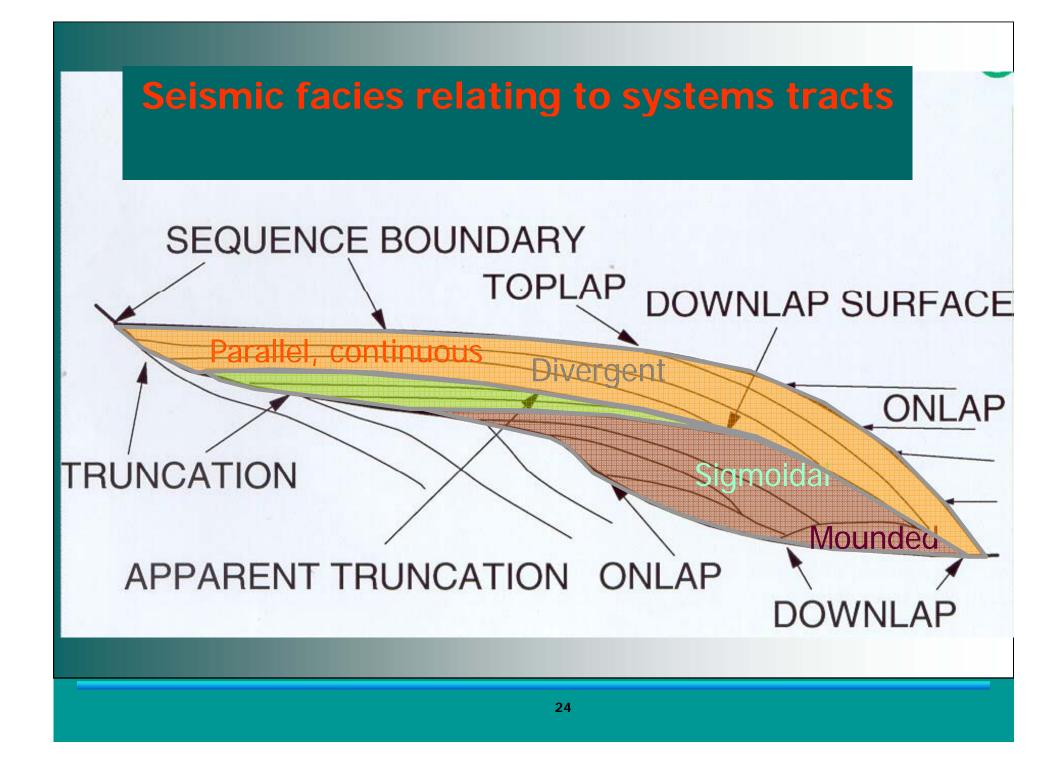
Funny

Tiny

wormy







SEISMIC FACIES ANALYSIS

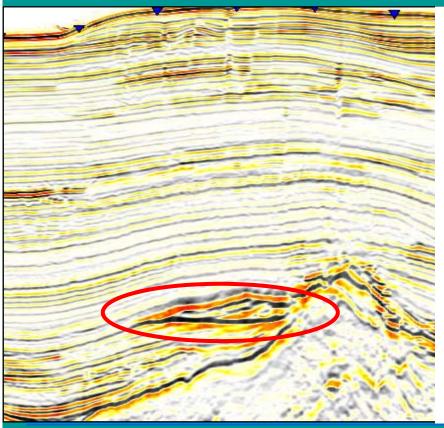
SEISMIC REFLECTION CHARACTERISTICS

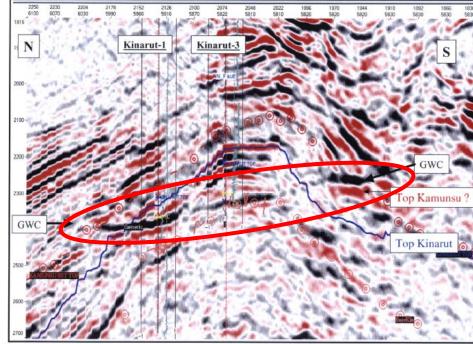
Feature	Geologic Interpretation
Amplitude	Vertical stratal discontinuity, bed spacing, fluid content
Continuity	Lateral stratal continuity, Depositional processes, geologic time line
Frequency	Bed thickness, fluid content
Phase Change	Fluid content, facies change
Geometry	Depositional environment
Flat Spot, Tilted Surface	Fluid Contact (GOC, GWC, OWC)

Obvious flat spot and tilted surface

Flat spot

Tilted surface

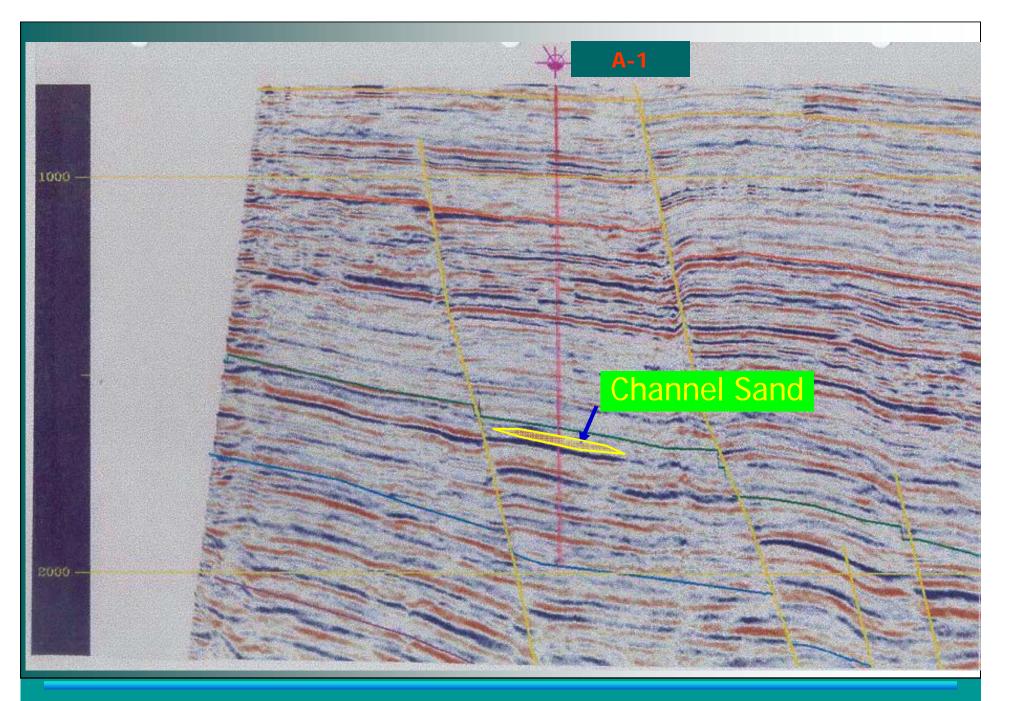


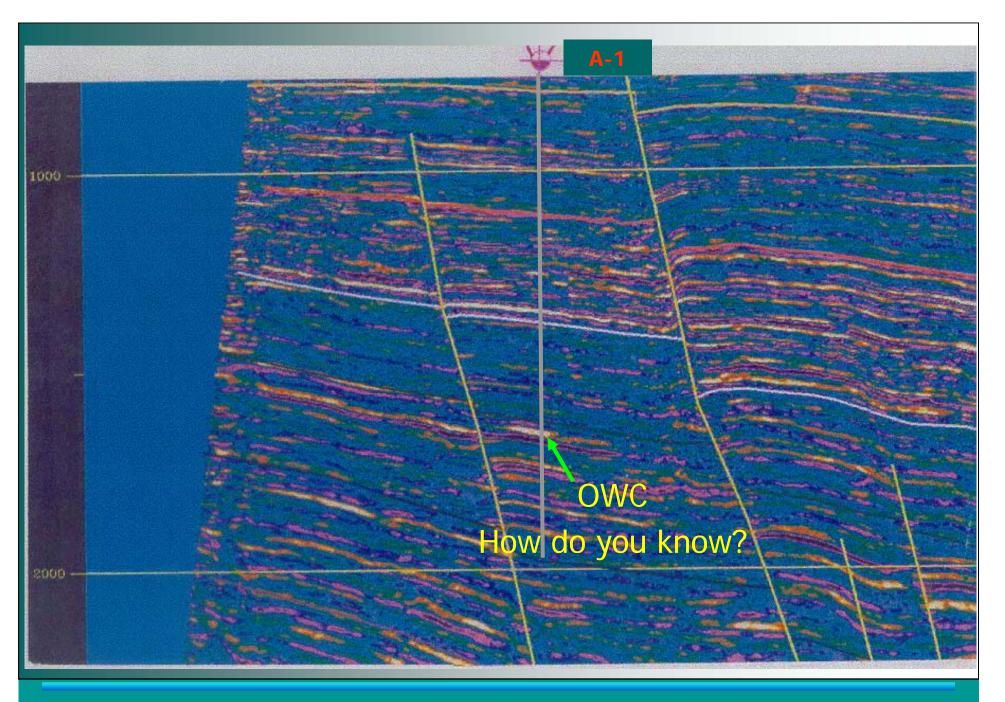


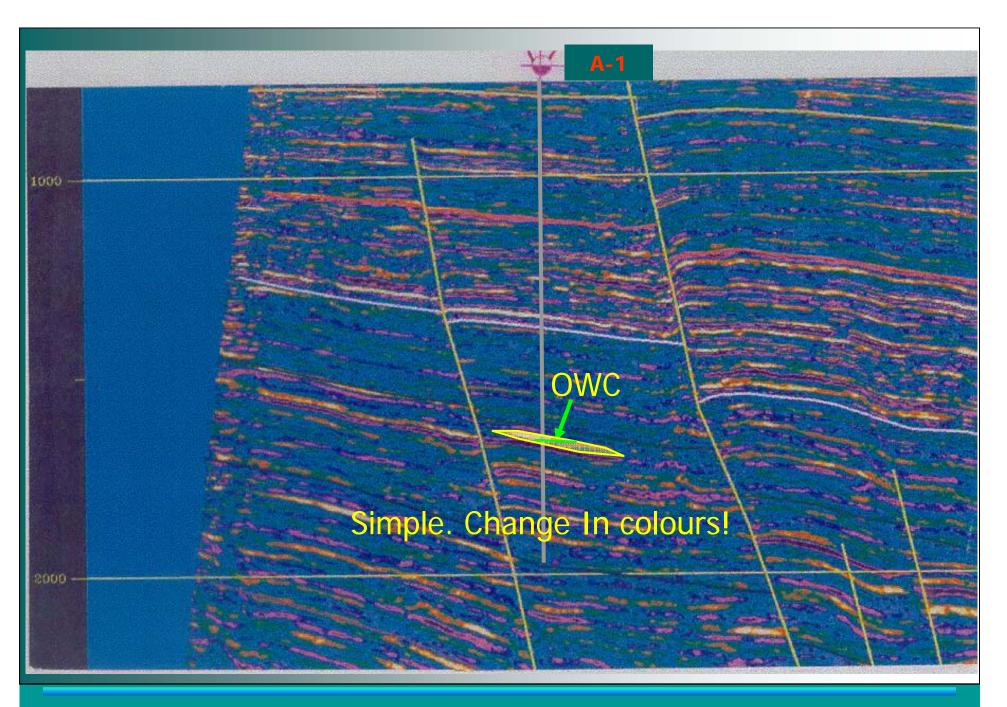
Kinarut-3, 1 horizons and markers

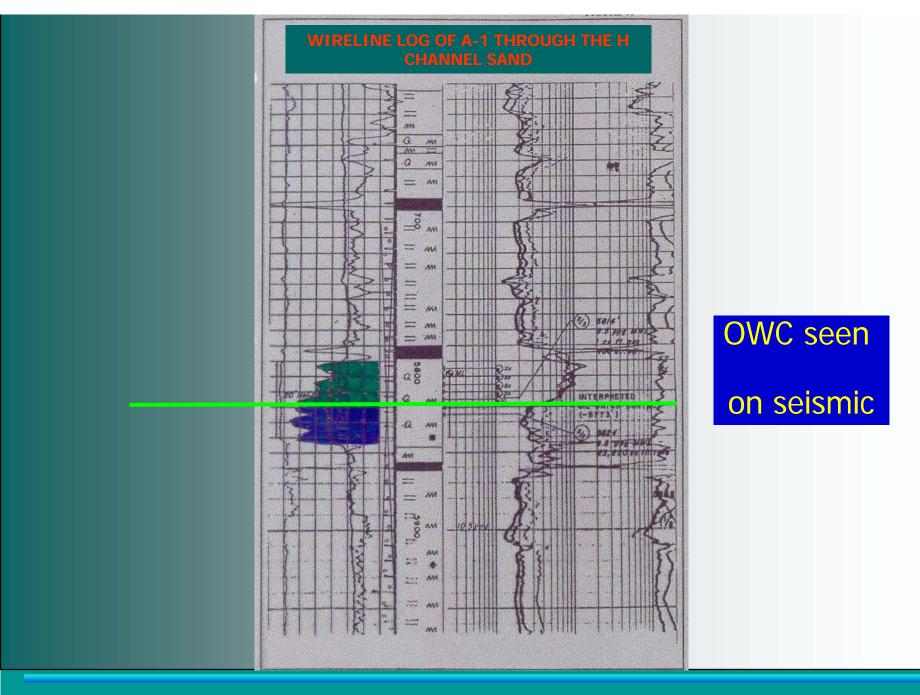
Figure 1.2.1.5







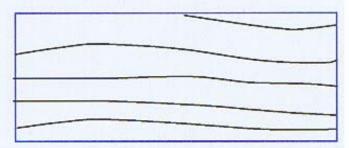




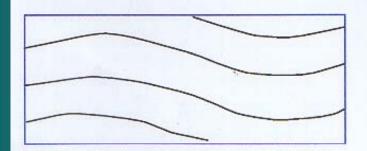
SEISMIC FACIES ANALYSIS INTERNAL CONFIGURATIONS

PARALLEL-EVEN

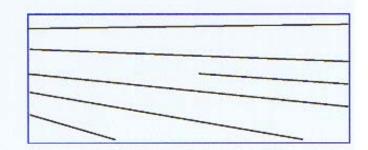
SUBPARALLEL

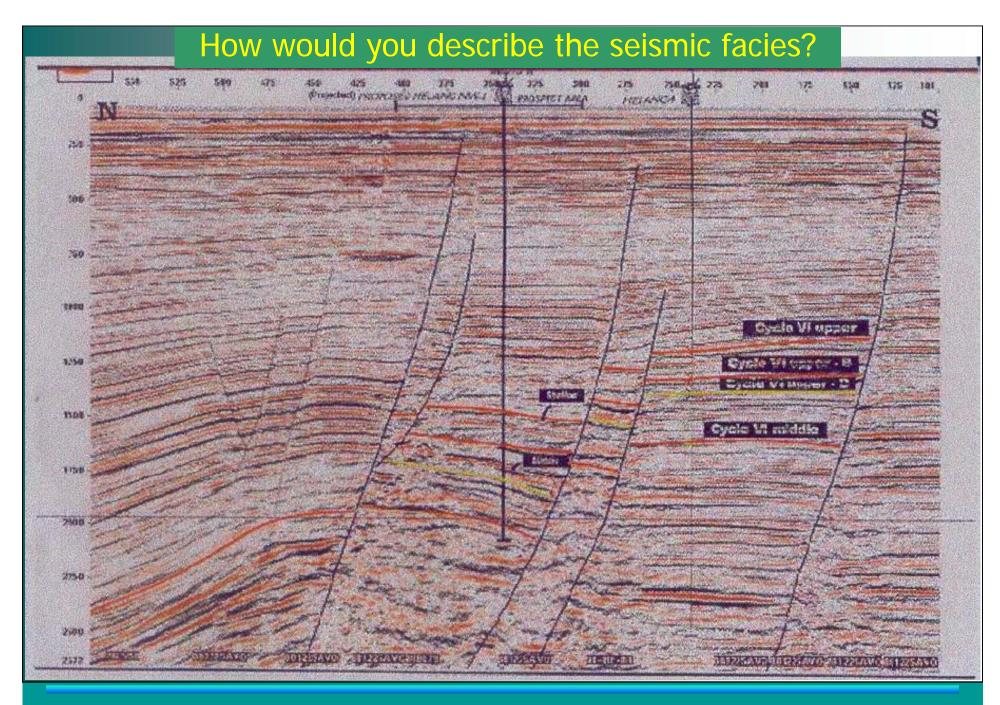


PARALLEL-WAVY



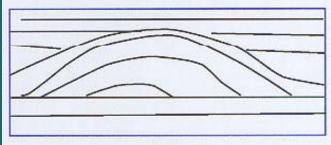
DIVERGENT



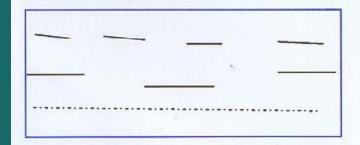


SEISMIC FACIES ANALYSIS INTERNAL CONFIGURATIONS

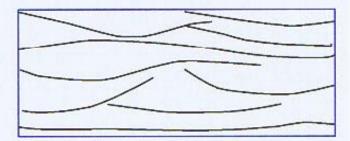
MOUNDED



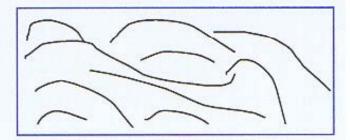
WEAK TO REFLECTION FREE

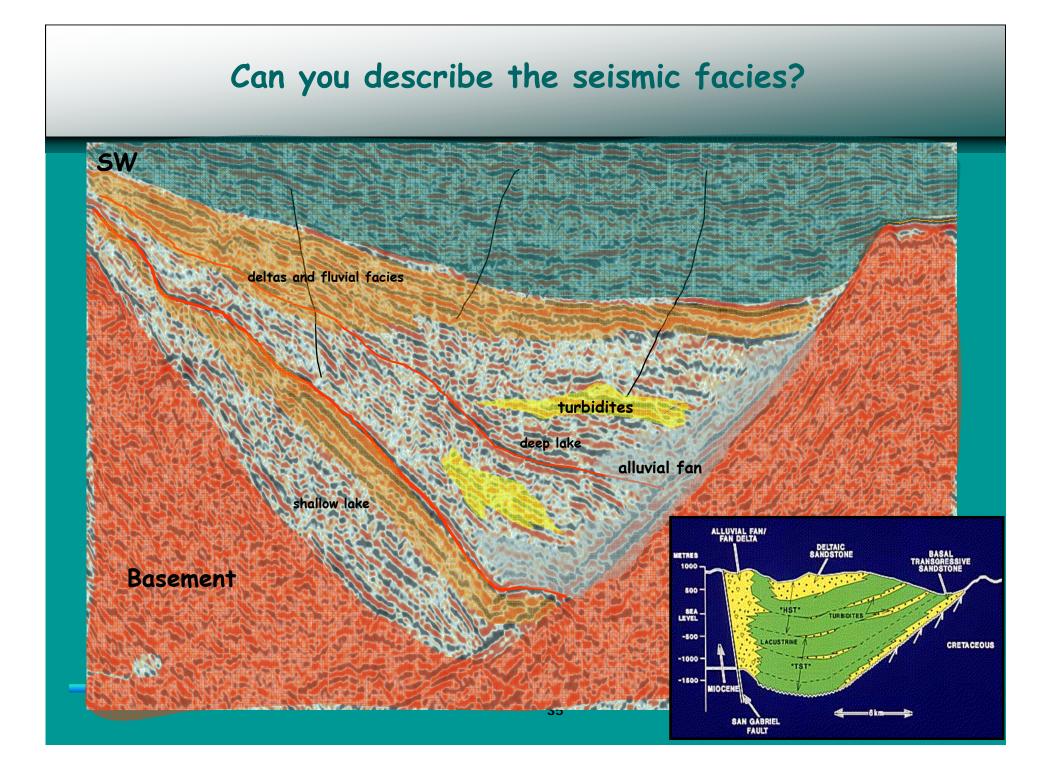


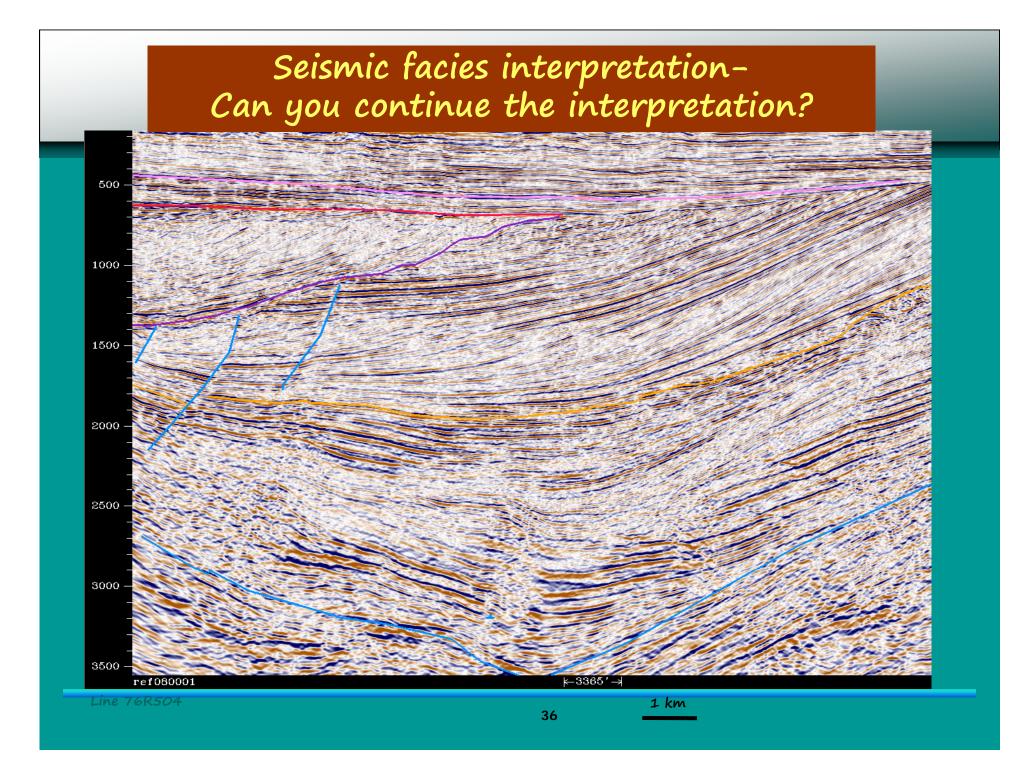




CHAOTIC

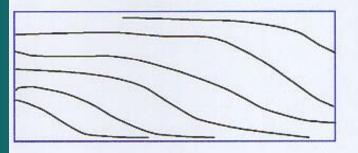




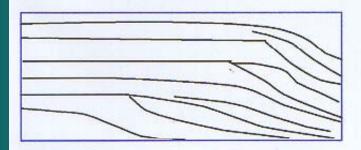


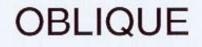
SEISMIC FACIES ANALYSIS PROGRADING CLINOFORMS

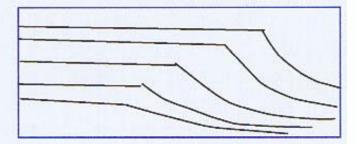
SIGMOID



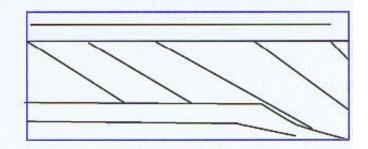
COMPLEX SIGMOID-OBLIQUE

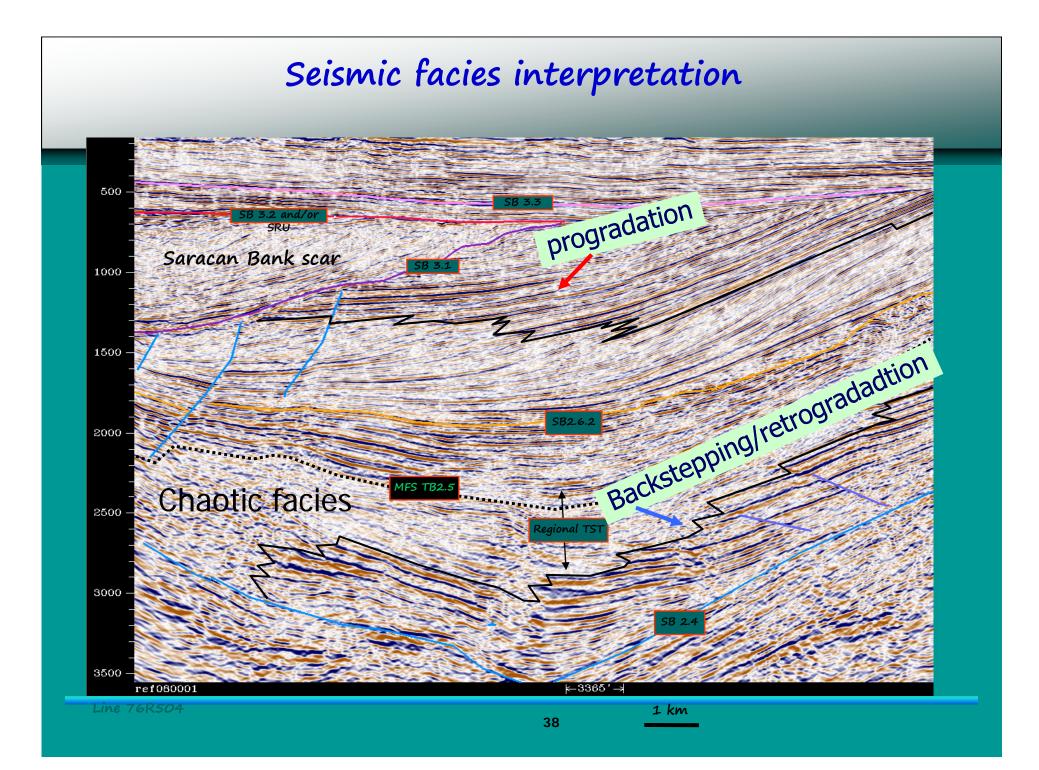




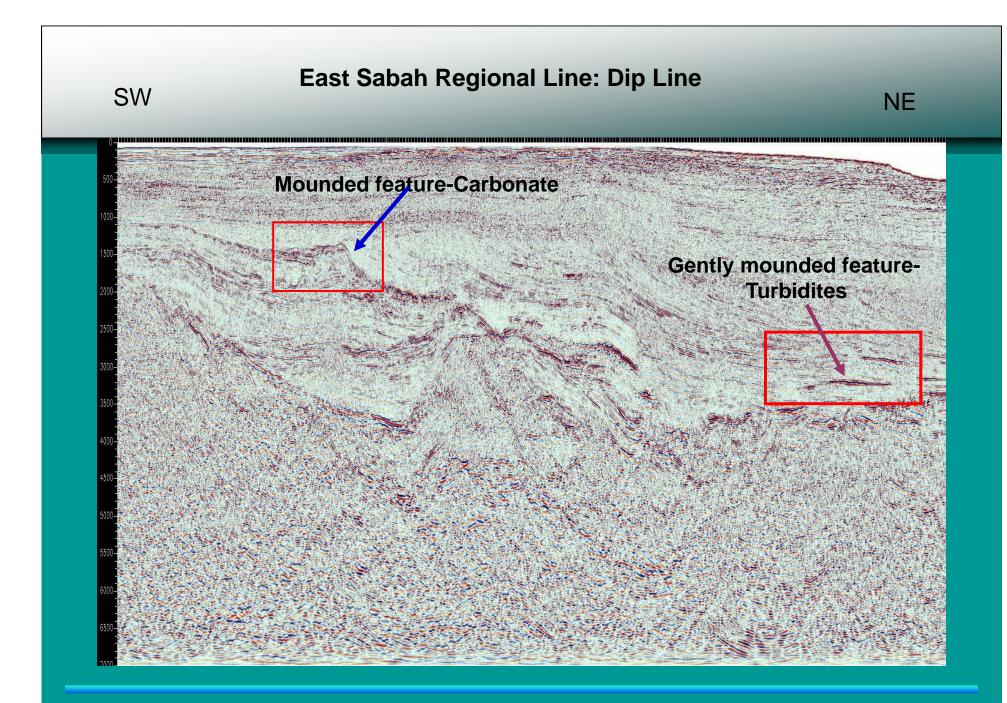


SHINGLED

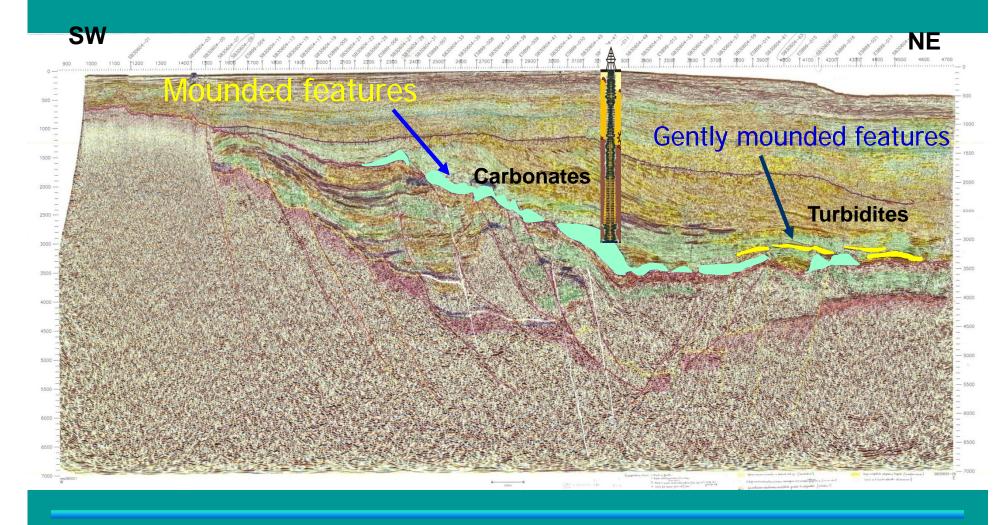




Uninterpreted seismic cross-section: East Sabah SW NE

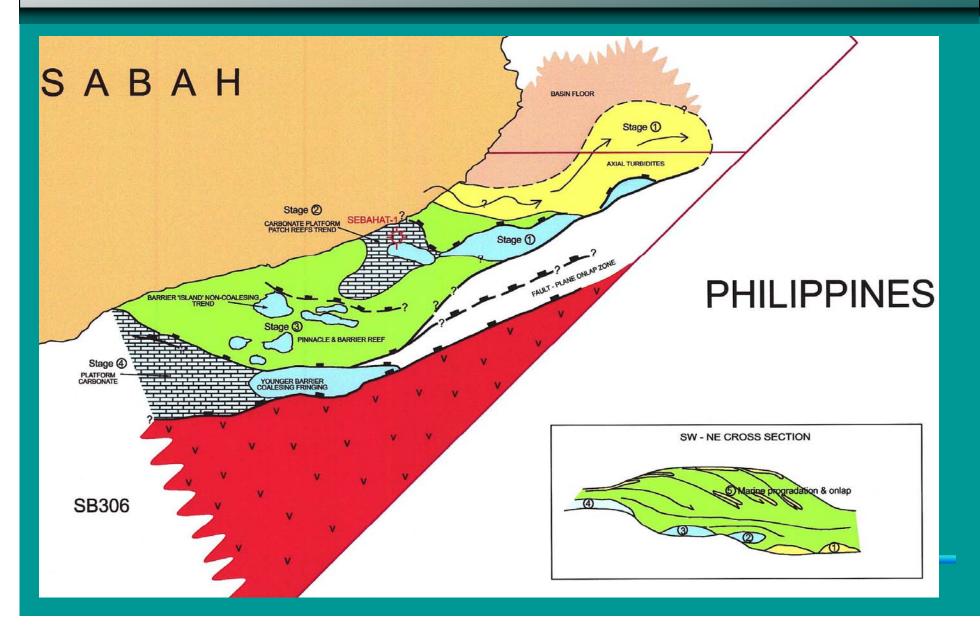


Seismic Sequence Stratigraphy

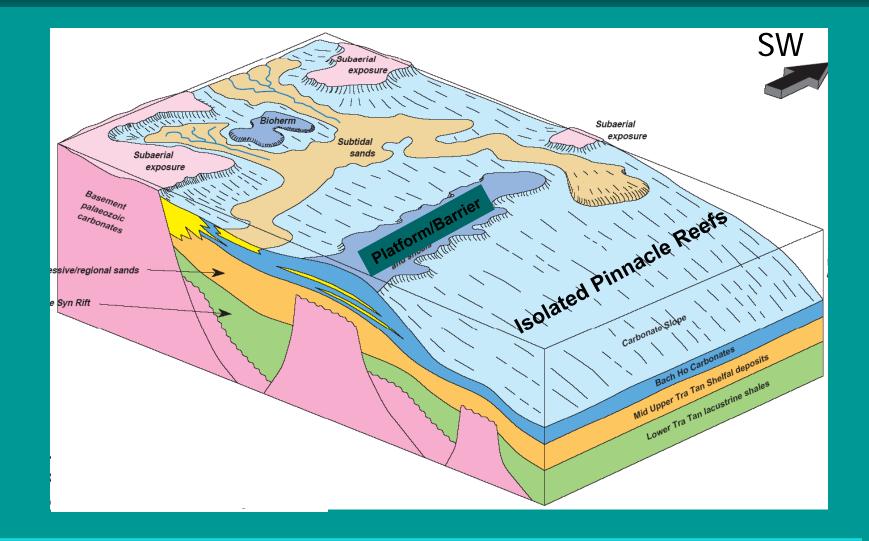


41

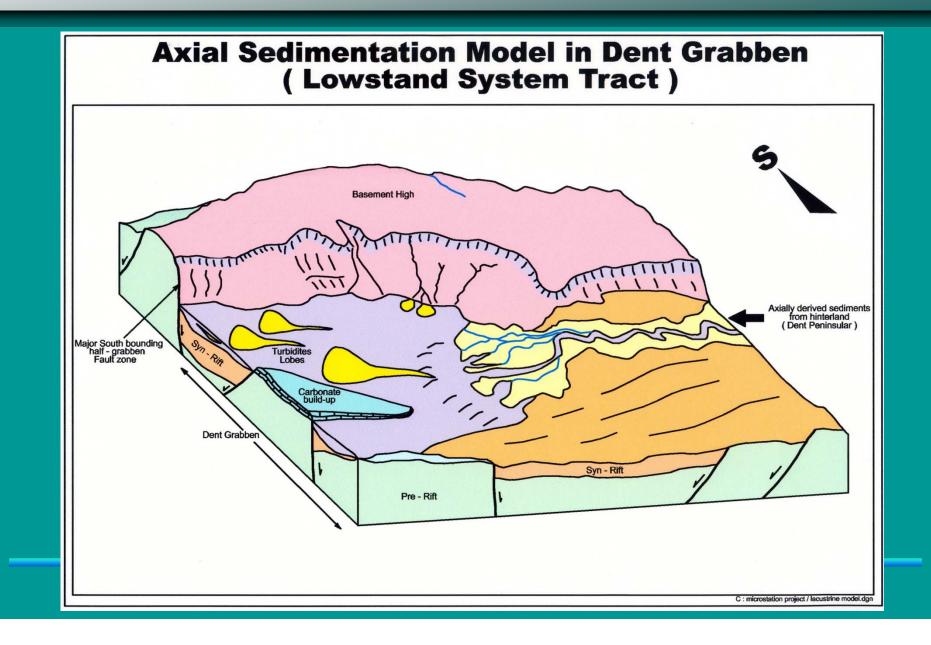
Seismic facies/paleofacies mapping

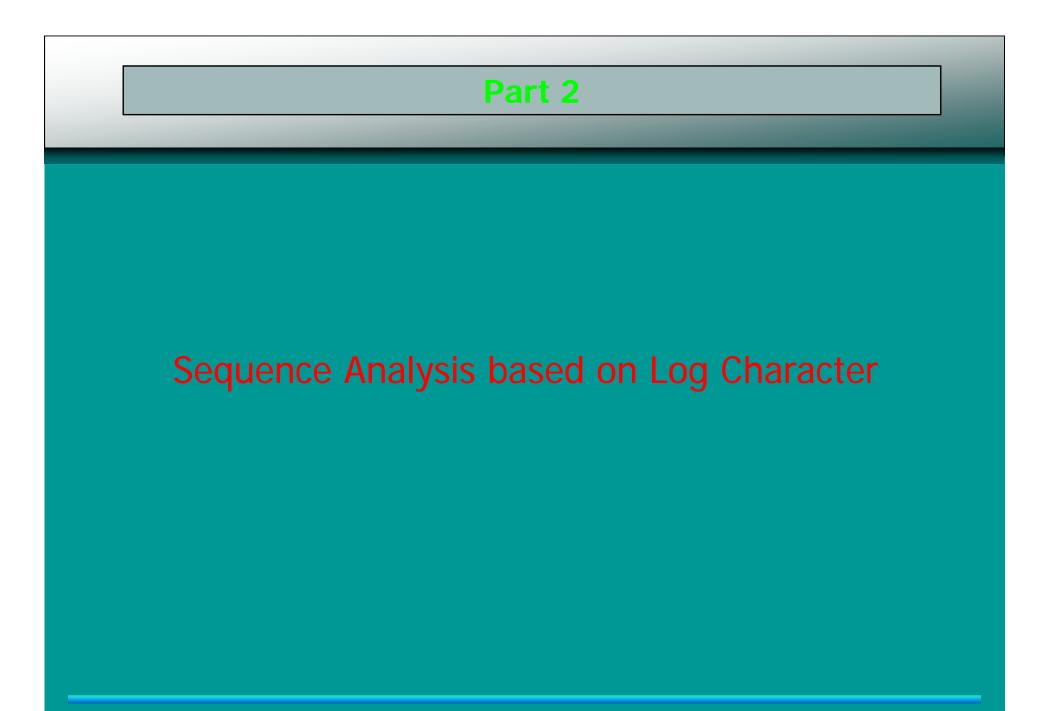


Reservoir Characterization - Carbonate Model

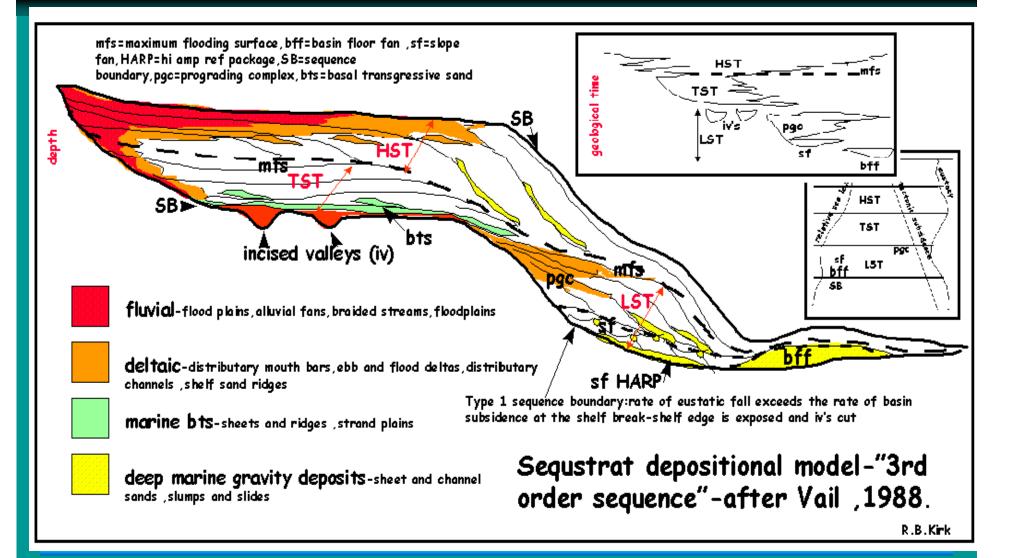


Reservoir Characterization - Turbidite Model



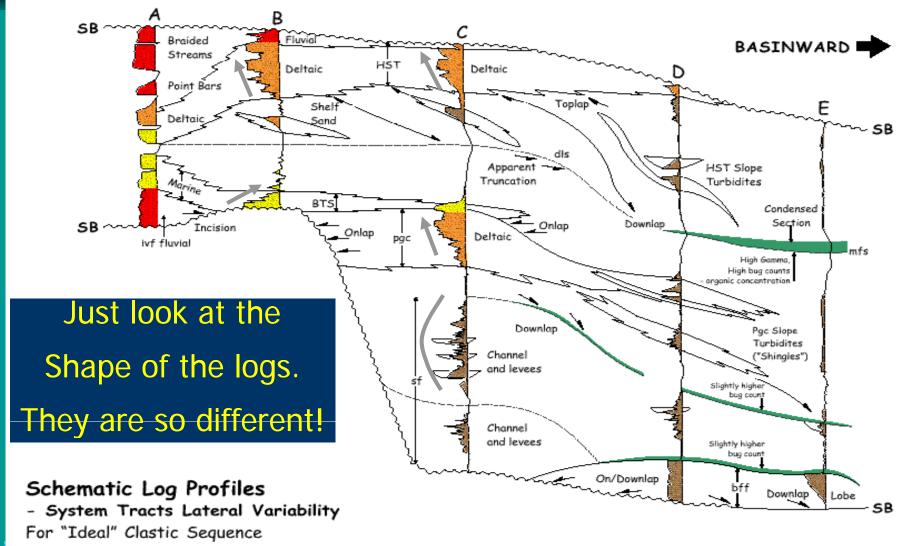


Third order sequence described as Slug Model



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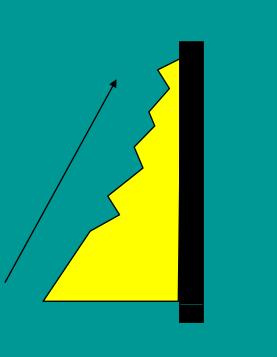
Slug Model illustrated by logs-Indicating Vertical and Horizontal Variability



M106.RK.079_Feb 2000

(modified from Sangree 1989)

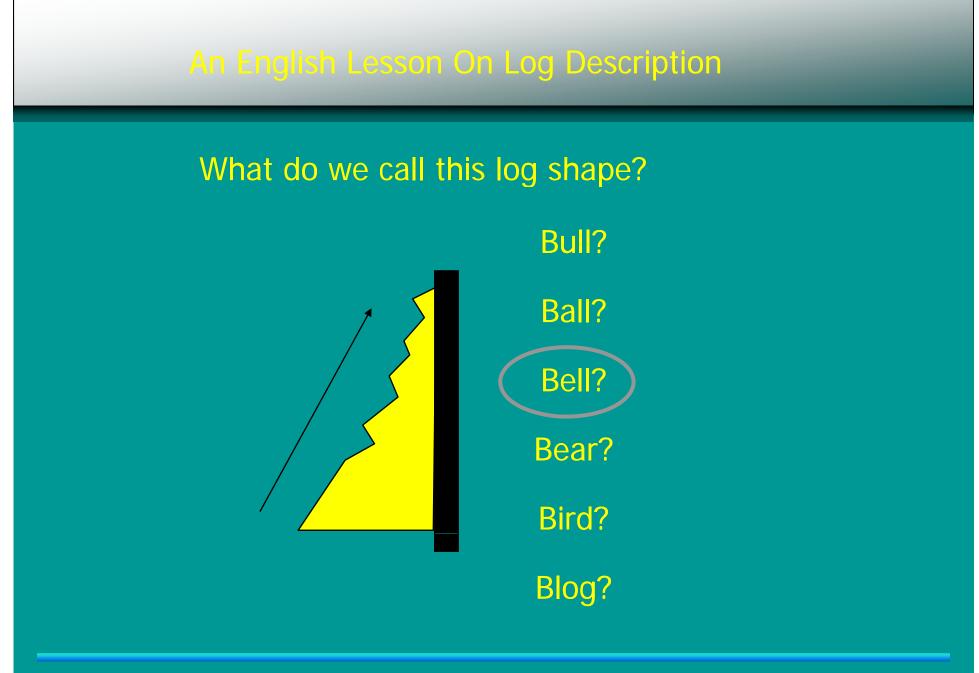
What do we call this log shape?



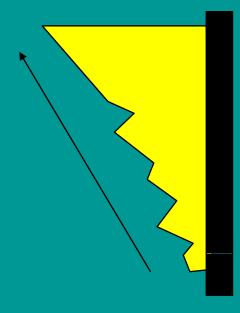
Bull? Ball? Bell? Bear?

Bird?

Blog?

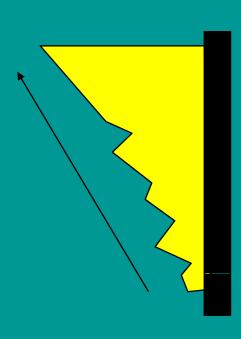


What do we call this log shape?



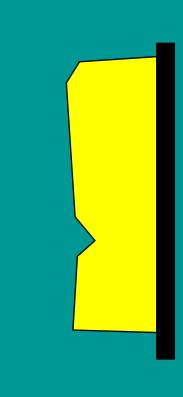
Flurry? / Funny? / Funnel? / Funky? / Fuzzy? / Furry? /

What do we call this log shape?





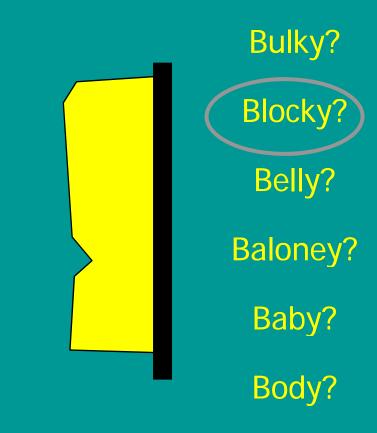
What do we call this log shape?



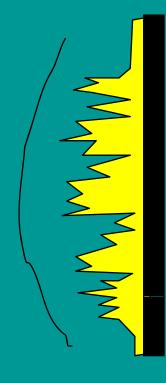
Bulky? Blocky? Belly? Baloney? Baby? Body?







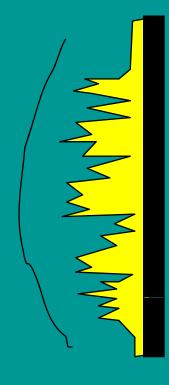
What do we call this log shape?



Ecstatic? Eccentric? Eclectic? Erratic? Eustatic?

Electric?

What do we call this log shape?

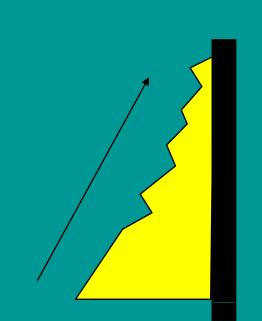


Ecstatic? Eccentric? Eclectic? Erratic?

Eustatic?

Electric?

Inferred Depositional Environment From Logs

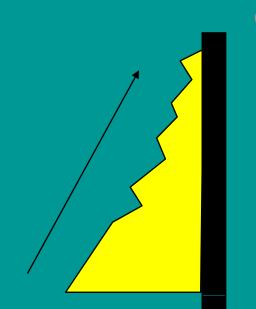


Fluvial/Braided Stream? Meandering Channel Sands/Barrier Bars? **Overbank/Levee/Crevasse Splay? River Mouth Bar/Beach Sands?** Shallow Marine Sands/Deltaic Sands? **Deep Marine Sands/Basin Floor Sands?** Levee Channel Complex/Slope Fans?

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Inferred Depositional Environment From Logs

Fluvial/Braided Stream?



Meandering Channel Sands/Barrier Bars?

Overbank/Levee/Crevasse Splay?

River Mouth Bar/Beach Sands?

Shallow Marine Sands/Deltaic Sands?

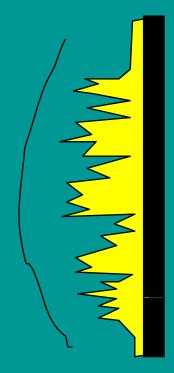
Deep Marine Sands/Basin Floor Sands?

Levee Channel Complex/Slope Fans?

MMMMM

Fluvial/Braided Stream? Meandering Channel Sands/Barrier Bars? Overbank/Levee/Crevasse Splay? **River Mouth Bar/Beach Sands?** Shallow Marine Sands/Deltaic Sands? **Deep Marine Sands/Basin Floor Sands?** Levee Channel Complex/Slope Fans?

Fluvial/Braided Stream?



Meandering Channel Sands/Barrier Bars?

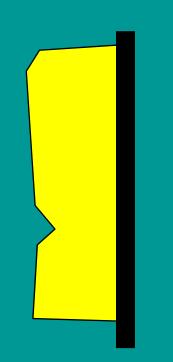
Overbank/Levee/Crevasse Splay?>

River Mouth Bar/Beach Sands?

Shallow Marine Sands/Deltaic Sands?

Deep Marine Sands/Basin Floor Sands?

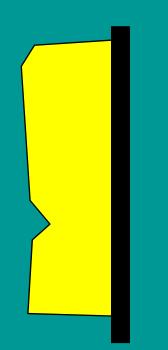
Levee Channel Complex/Slope Fans?



Fluvial/Braided Stream? Meandering Channel Sands/Barrier Bars? **Overbank/Levee/Crevasse Splay? River Mouth Bar/Beach Sands?** Shallow Marine Sands/Deltaic Sands? **Deep Marine Sands/Basin Floor Sands?** Levee Channel Complex/Slope Fans?

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Fluvial/Braided Stream?



Meandering Channel Sands/Barrier Bars?

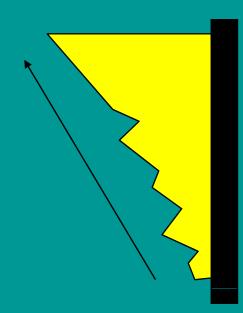
Overbank/Levee/Crevasse Splay?

River Mouth Bar/Beach Sands?

Shallow Marine Sands/Deltaic Sands?

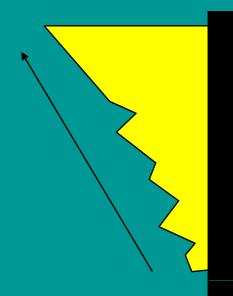
Deep Marine Sands/Basin Floor Sands?

Levee Channel Complex/Slope Fans?



Fluvial/Braided Stream? Meandering Channel Sands/Barrier Bars? Overbank/Levee/Crevasse Splay? **River Mouth Bar/Beach Sands?** Shallow Marine Sands/Deltaic Sands? **Deep Marine Sands/Basin Floor Sands?** Levee Channel Complex/Slope Fans?

Fluvial/Braided Stream?



Meandering Channel Sands/Barrier Bars?

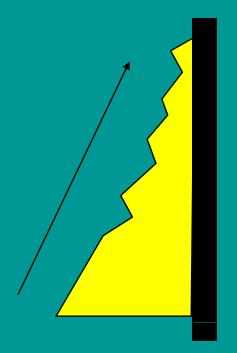
Overbank/Levee/Crevasse Splay?

River Mouth Bar/Beach Sands?

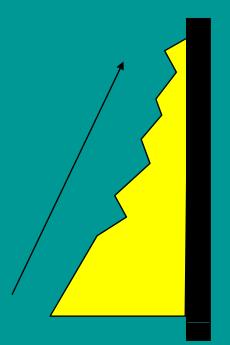
Shallow Marine Sands/Deltaic Sands?

Deep Marine Sands/Basin Floor Sands?

Levee Channel Complex/Slope Fans?



Coarsening upward? Fining upward? Shallowing Upward? Deepening Upward? No Or Little Change?



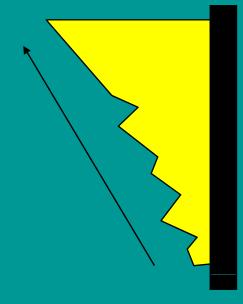
Coarsening upward?

Fining upward?

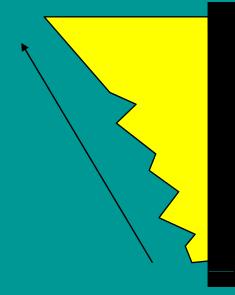
Shallowing Upward?

Deepening Upward?

No Or Little Change?



Coarsening upward? Fining upward? Shallowing Upward? Deepening Upward? No Or Little Change?





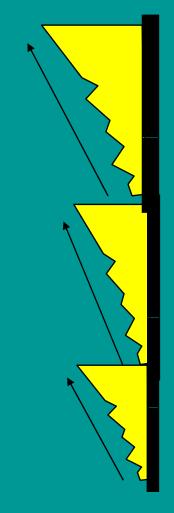
Fining upward?

Shallowing Upward?

Deepening Upward?

No Or Little Change?

Overall coarsening upward? Overall fining upward? Overall shallowing upward? Overall deepening upward? Overall little or no change?



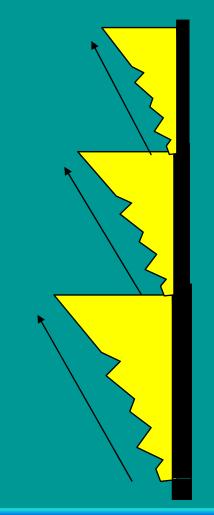
Overall coarsening upward?

Overall fining upward?

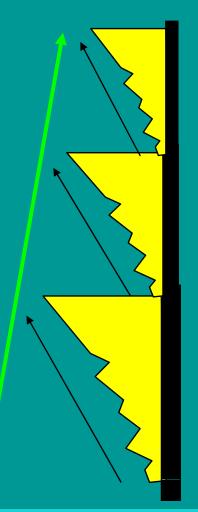
Overall shallowing upward?

Overall deepening upward?

Overall little or no change?



Overall coarsening upward? Overall fining upward? Overall shallowing upward? Overall deepening upward? Overall little or no change?



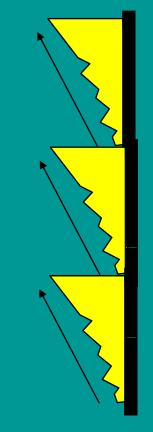
Overall coarsening upward?

Overall fining upward?

Overall shallowing upward?

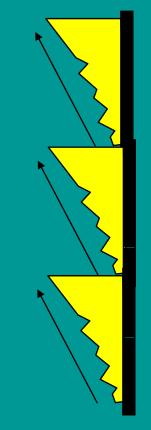
Overall deepening upward?

Overall little or no change?



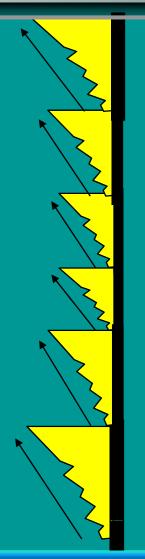
Overall coarsening upward? Overall fining upward? Overall shallowing upward? Overall deepening upward? Overall little or no change?

The Log Can Tell You A Story From Bottom to Top



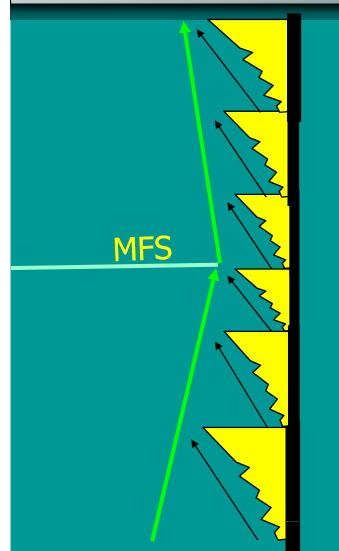
Overall coarsening upward? Overall fining upward? Overall shallowing upward? Overall deepening upward? Overall little or no change?

The Log Can Tell You A Story From Bottom to Top



How is Max. Flooding Surface defined? Can you mark the MFS?

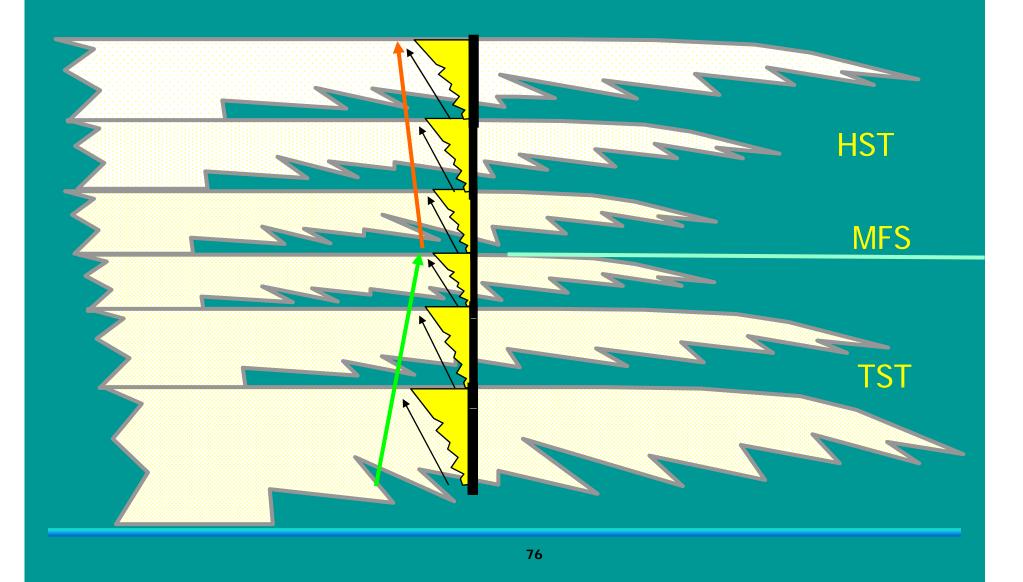
The Log Can Tell You A Story From Bottom to Top

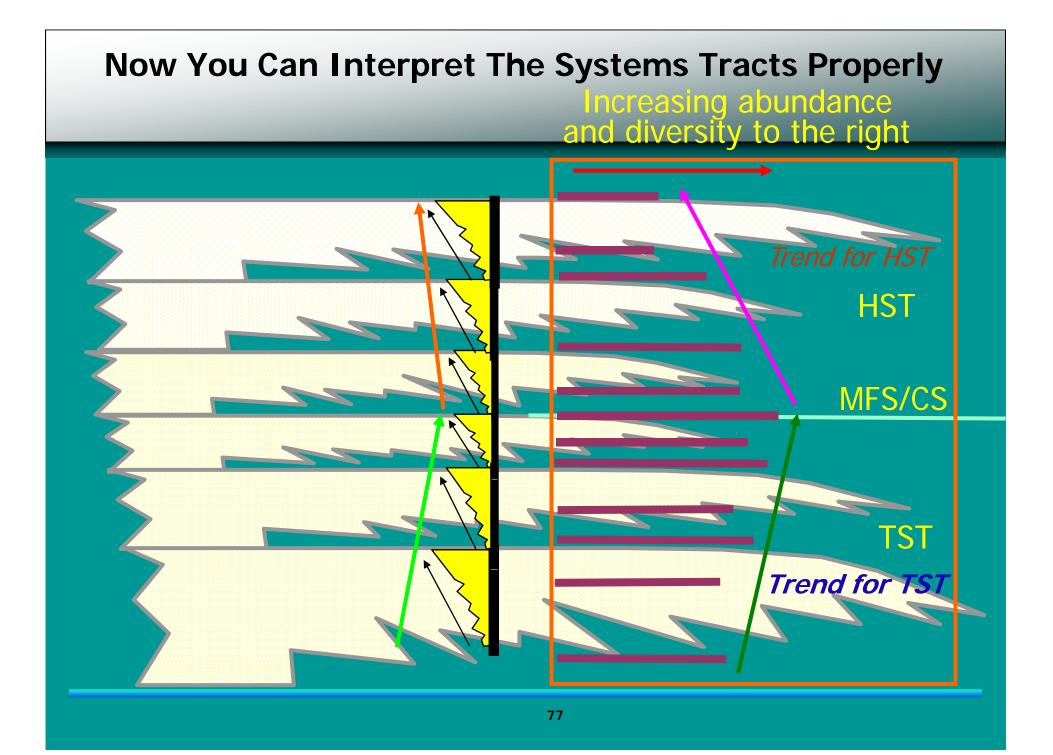


Bravo!

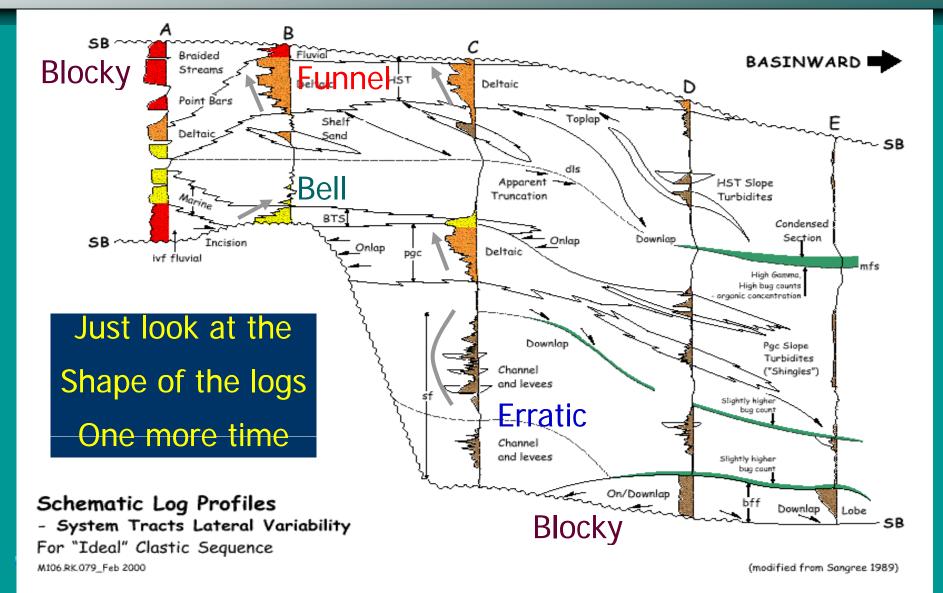
You got it right!

Now You Can Interpret The Systems Tracts

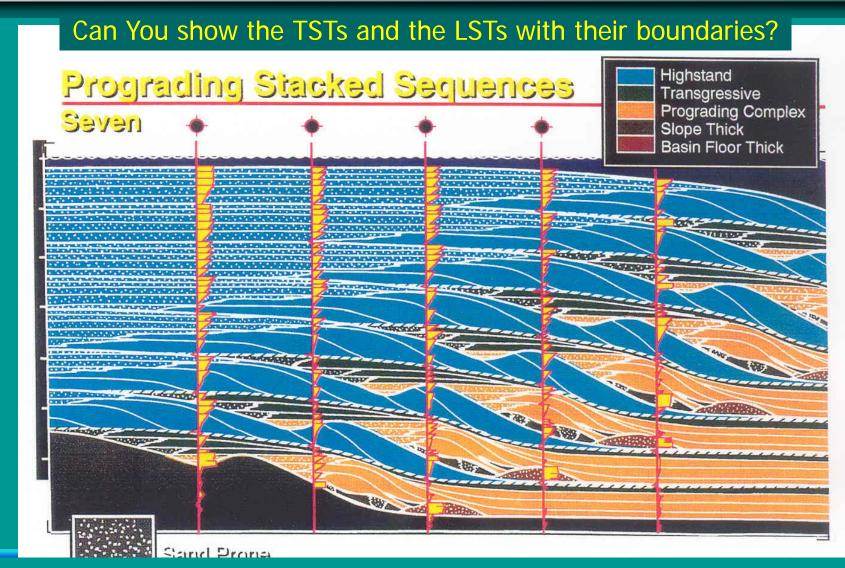




Slug Model illustrated by logs-Indicating Vertical and Horizontal Variability

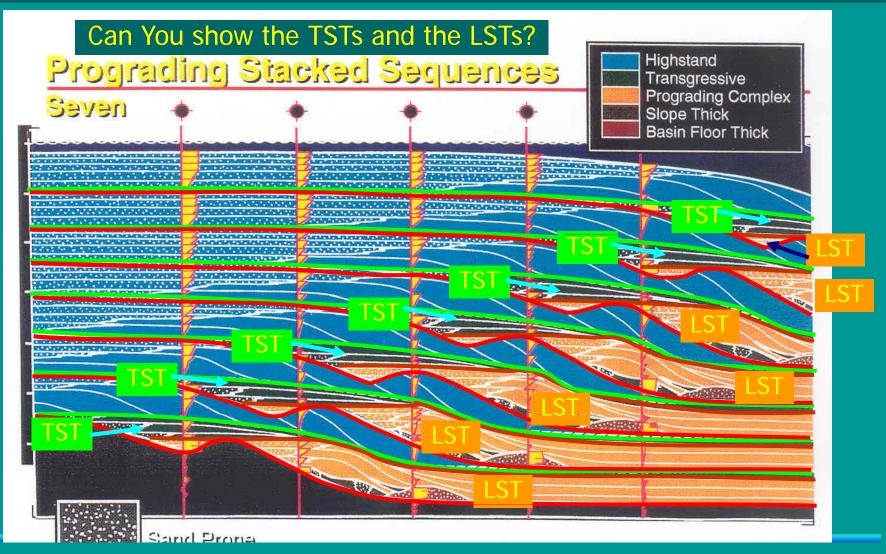


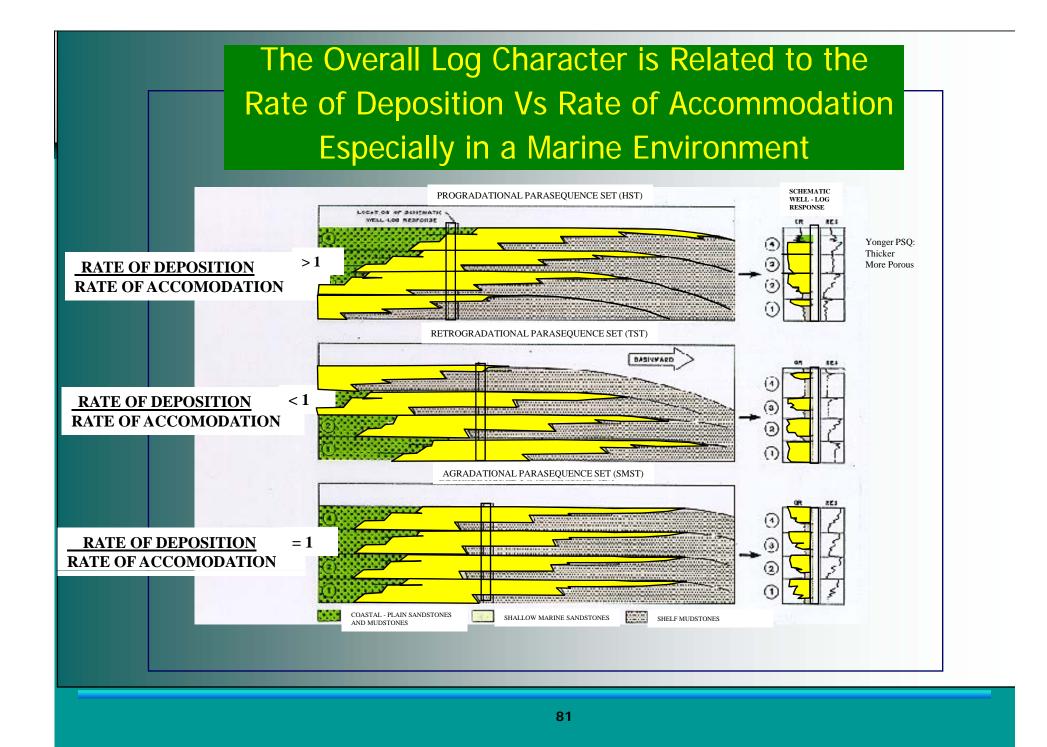
Log Pattern For Overall Prograding Sequences



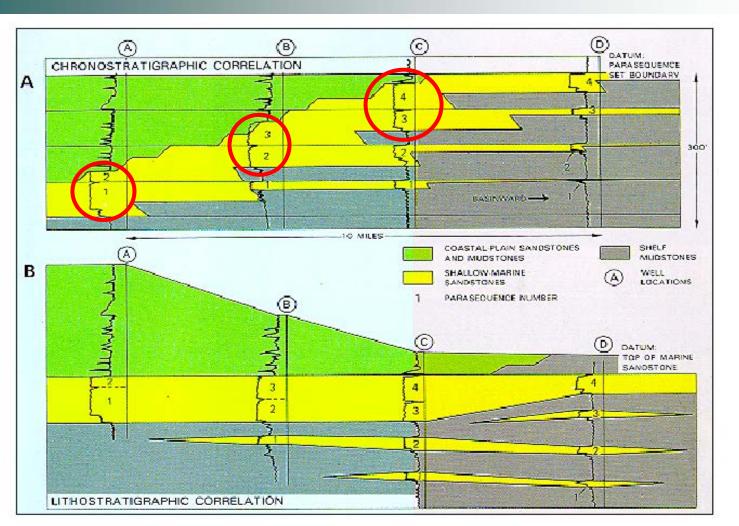
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Log Pattern For Overall Prograding Sequences



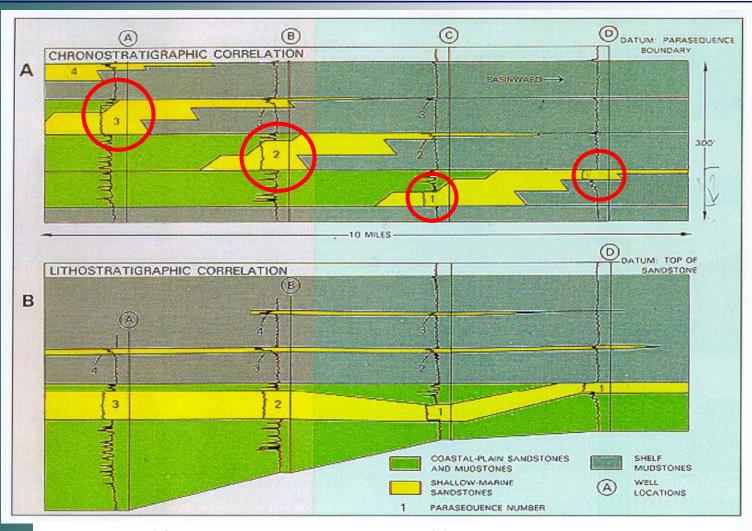


If you mis-correlate the sands in HST, it might still be OK

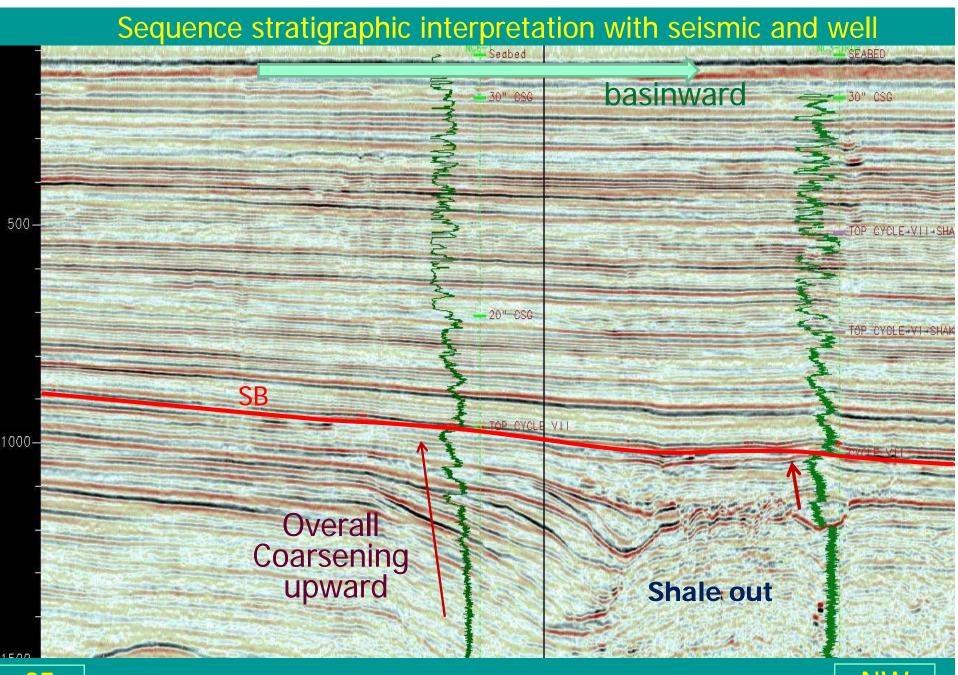


Comparison of (A) chronostratigraphic correlation and (B) lithostratigraphic correlation styles: progradational parasequence set.

But if you mis-correlate the sands in TST, it is not OK!



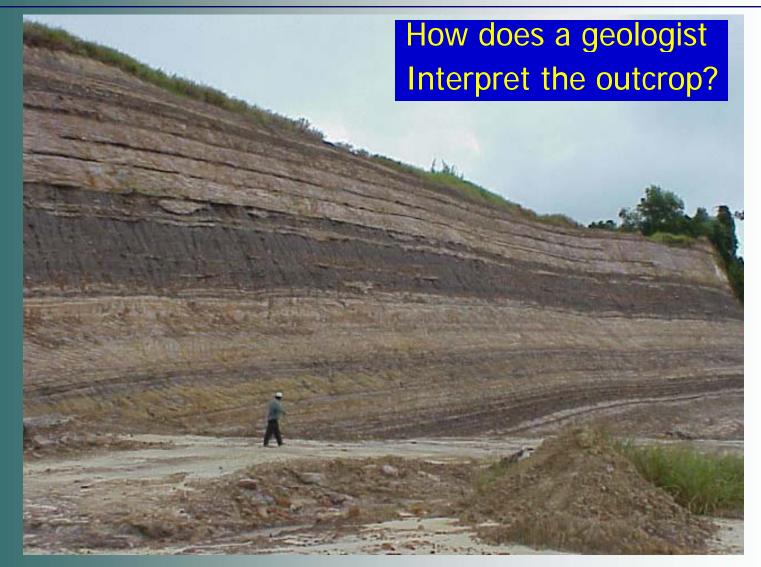
Comparison of (A) chronostratigraphic correlation and (B) lithostratigrapic correlation styles: retrogradational parasequence set



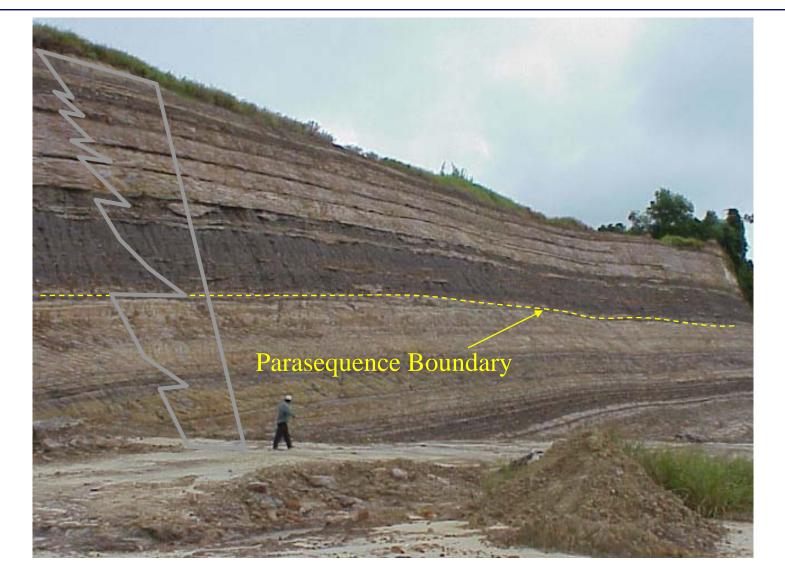
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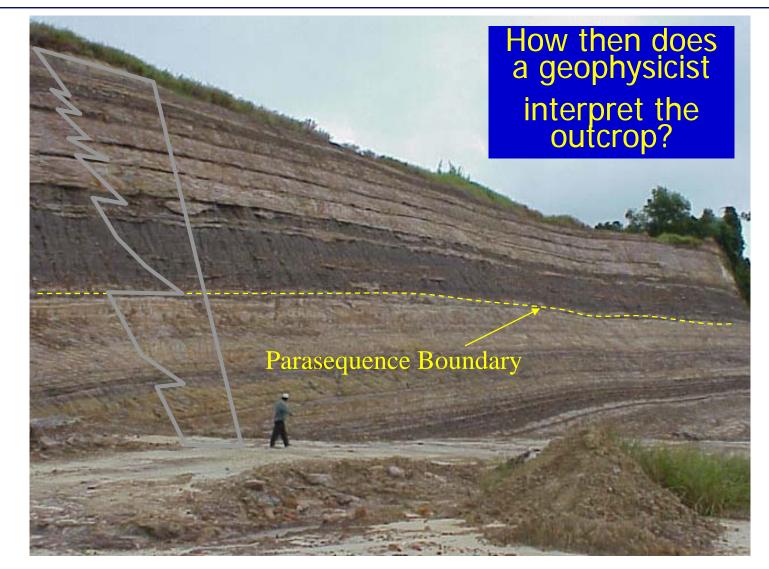
A Field Geologist Looking at Outcrop Scale



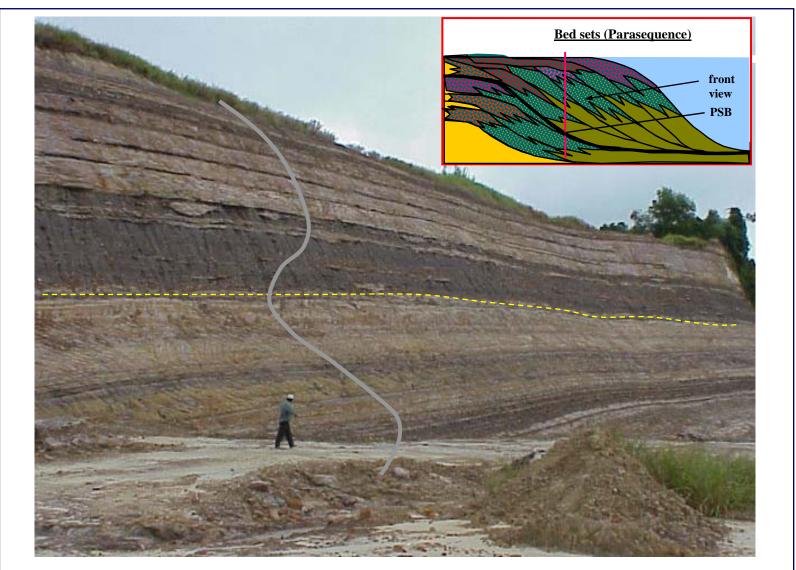
A Geologist integrates outcrop with log



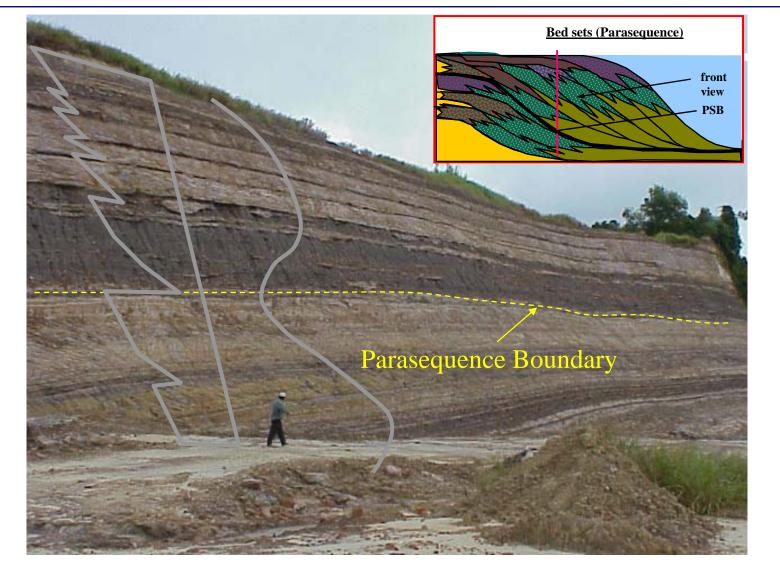
A Geologist integrates outcrop with log



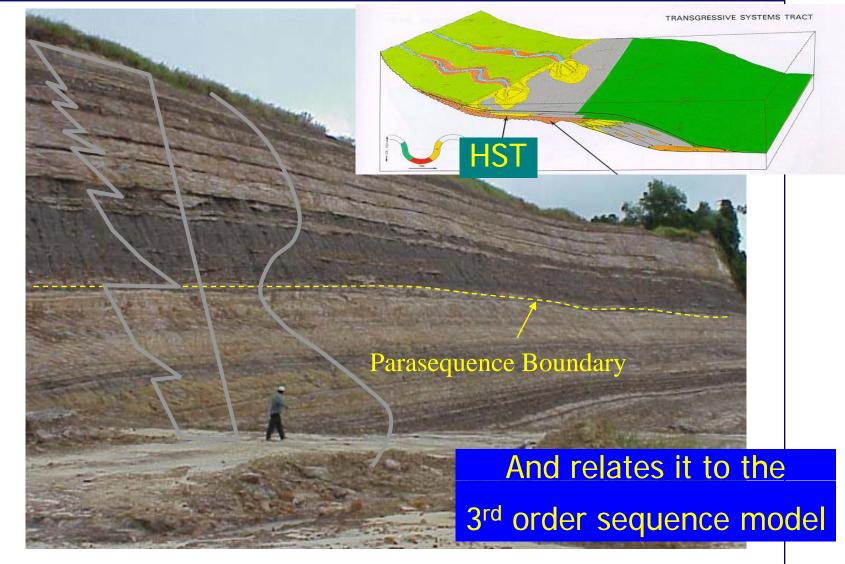
A Geophysicist Integrates Outcrop with Seismic



A Sequence Stratigrapher integrates outcrops, well and seismic



A Sequence Stratigrapher integrates outcrops, well and seismic



After you have done the sequence stratigraphic interpretation, you can just relax

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BALINGIAN STRATIGRAPHIC SCHEME

