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Scours: Occurrence, Measurement, and Importance in Deep Water and Shallow Water Depositional Systems*

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Abstract

Scouring at the base of channels and at channel mouths may play a significant role in enhancing vertical connectivity of reservoirs. Assuming accurate depth conversion, scours measured in both East Breaks Upper Fan (Quaternary) and Iron River Valleys (Cretaceous) are comparable in scale, with a typical weighted average of 10 to 15 m scour depth. Experimental datasets show development of scours under jet-generated turbulence, comparable in relative scale to East Breaks and Iron River seismically-defined scours.

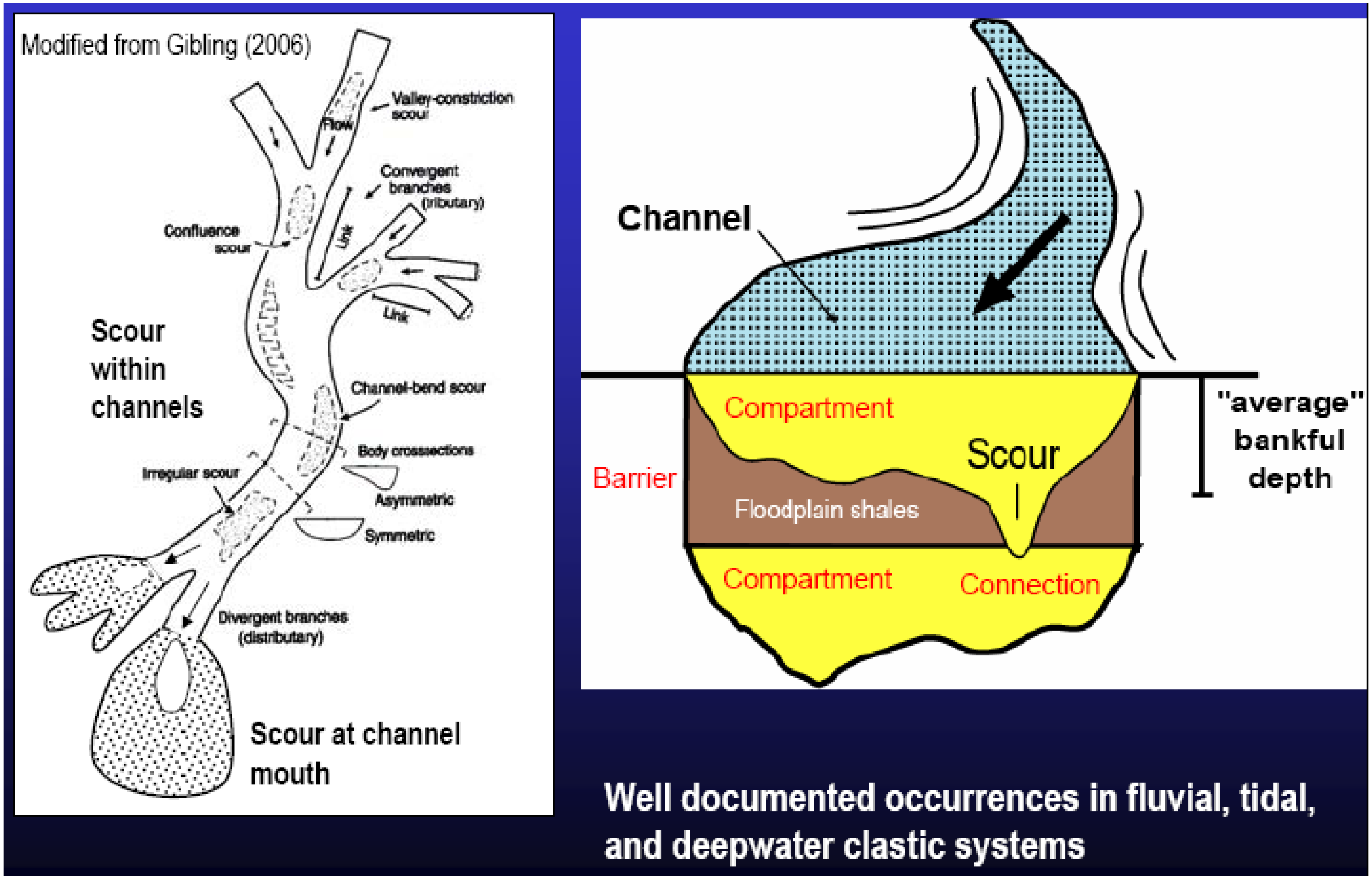
Factors considered as possible controls on scour occurrence, depth, and spacing are slope gradient, substrate lithology; and planform geometry (e.g., bends, constrictions). Results indicate that neither gradient nor substrate lithology appears to greatly influence scour depth or location in the datasets analyzed.

Planform geometry (sharp turns in channel thalweg) appears to show a qualitative association with deep scouring in East Breaks (Quaternary) channels. In the Iron River (Cretaceous) heavy oil field, scour spacing shows a potential relationship with bankfull width, per the relationship derived from modern fluvial channels, though the reach length was restricted here.

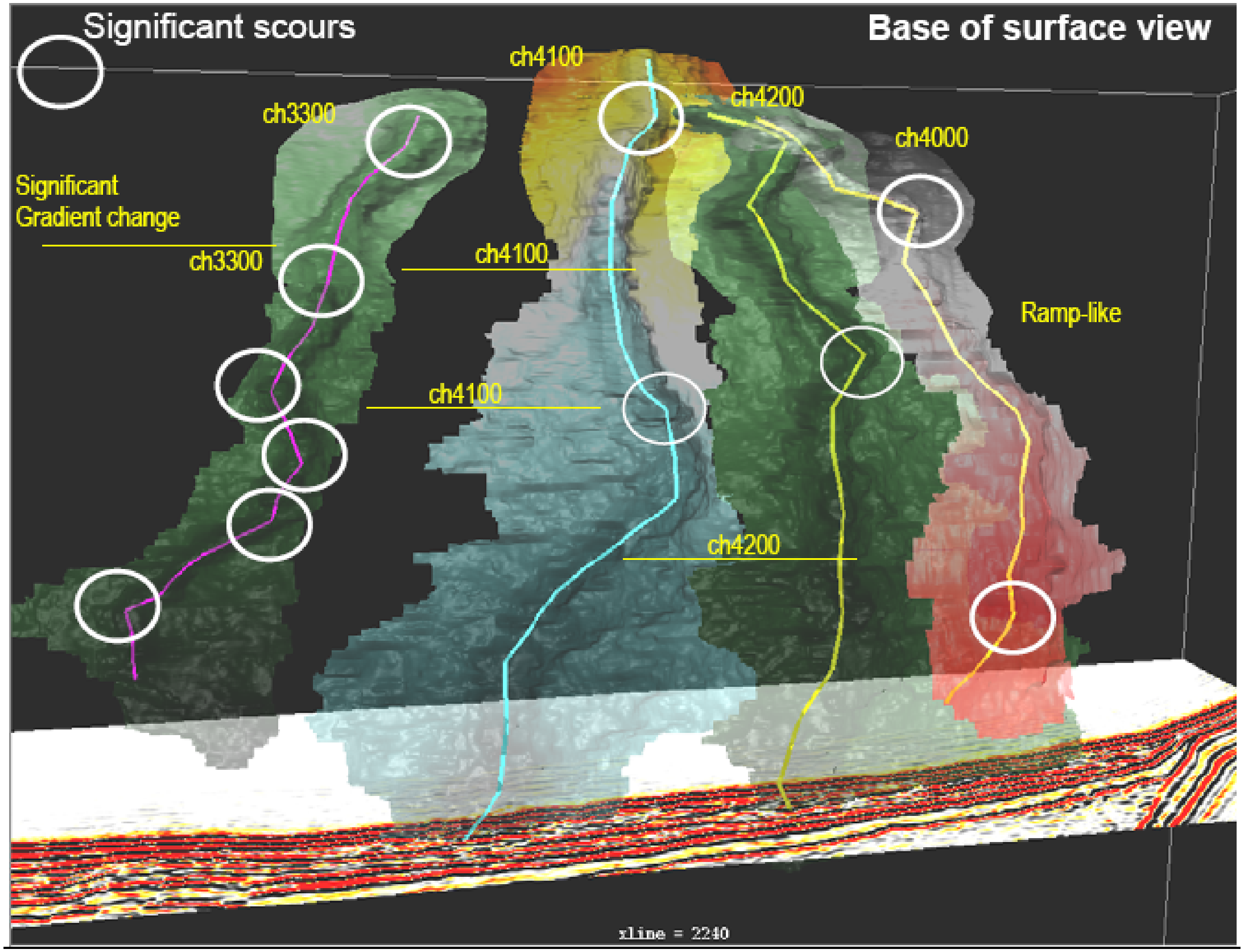
Among the potential implications from this study are that channel-base scour depths and locations are most influenced by changes in channel orientation in a deepwater system where sediment gravity flows are episodic. In a fluvial system where flows are interpreted to be more temporally continuous, scours and the jets that form them may become better established temporally, and the pool spacing relationship with bank full width (5-7x of Keller and Melhorn, 1978) may apply.

Scours create discrete, subseismic connections between reservoir compartments which must be included when constructing geologic models to simulate and match production histories.

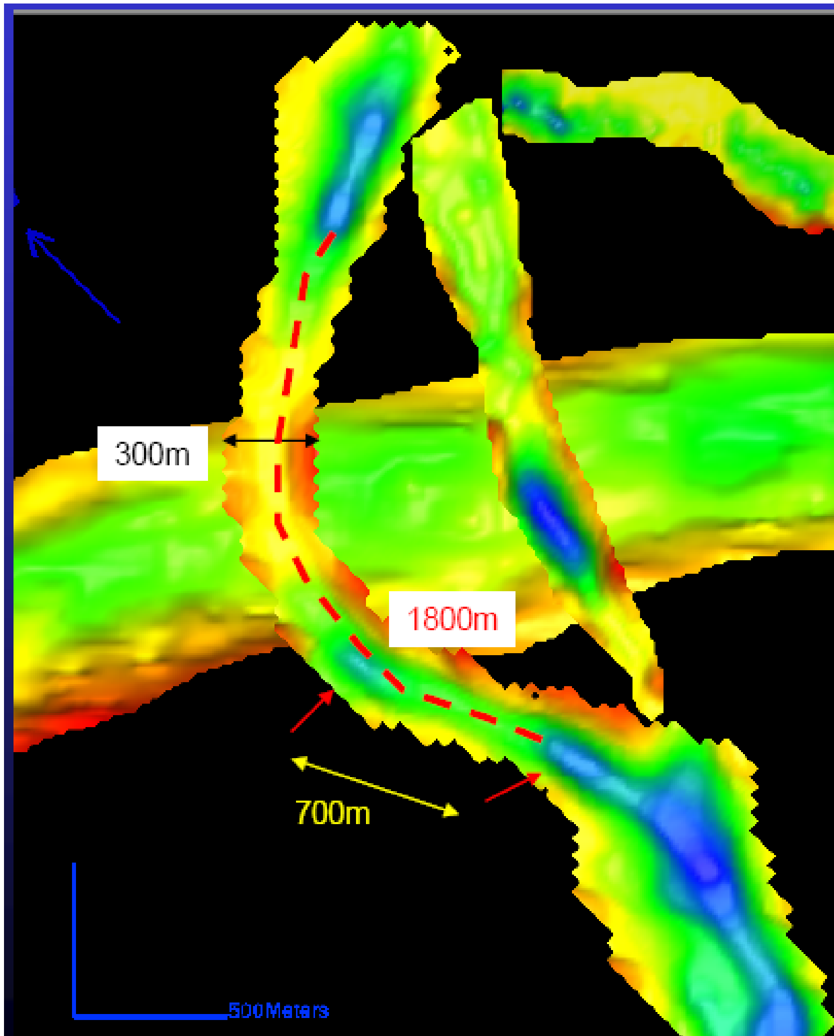
Selected Figures



Where scours form.



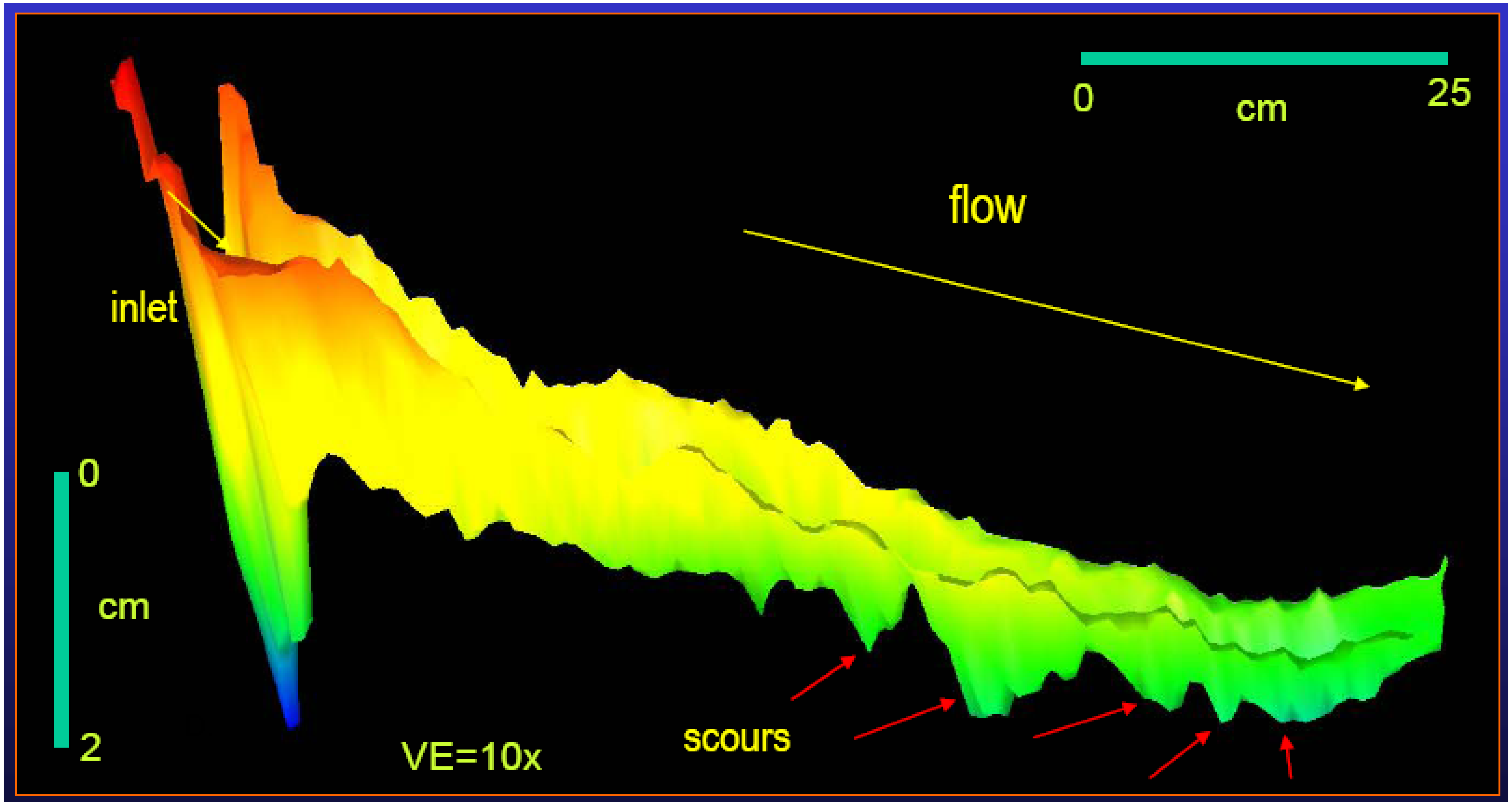
East Breaks fan channels, Quaternary, GOM, with deep scours pinpointed.



Channel Characteristics of Keller and Melhorn (1978)

Keller and Melhorn (1978)	
Range of pool to pool spacing	4.9 to 7.00
Range of sinuosity	1.01 to 2.40
Range of Channel widths	3.66 to 29.28
Range of Channel Slope	0.0010 to 0.0089
Bed material	bedrock to alluvial
Stream Types	Intermittent to Perennial
N	251

Iron River (Cretaceous) fluvial channels, Alberta, Canada. For the valley where data allowed measurement of the scour-to-scour spacing, it is 700 to 1800m and the valley width is 300m.



Physical tank experiments: Analysis of the data indicates that channel depth variations are somewhat analogous with natural stream systems in that deep scours are present along the thalweg with depths more than twice the average channel depth. (The large depression created near the inlet; it is an artificial feature.)

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