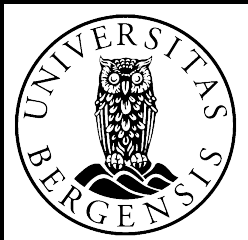


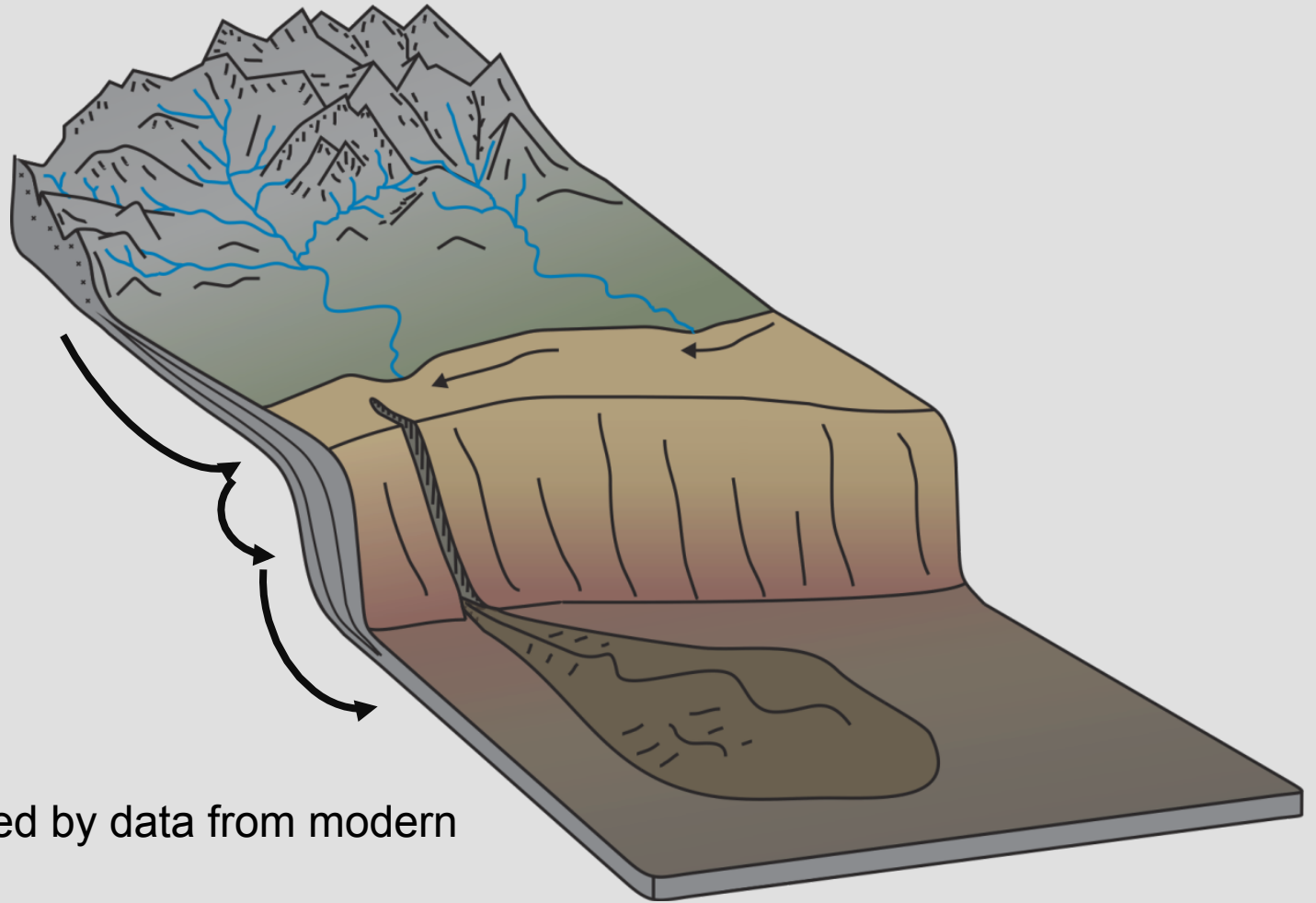
Use of source-to-sink concepts to provide insight to the stratigraphic record

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The source-to-sink concept

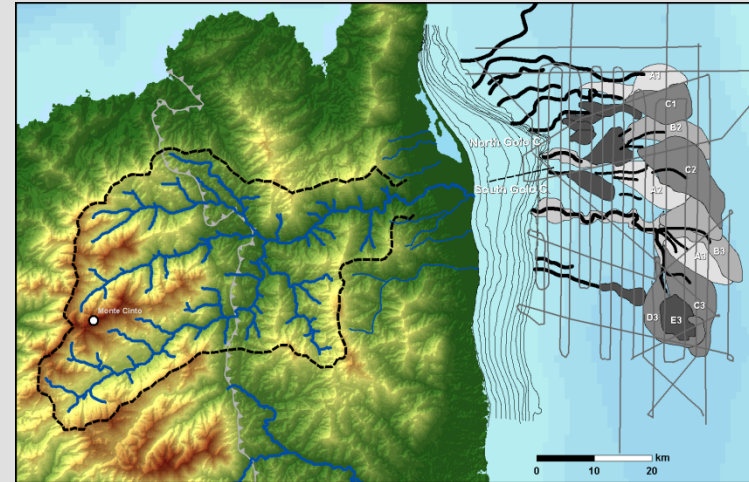


- Intermediate to long timescales
- Ancient systems are incomplete outside subsiding basin
- Missing gaps are filled by data from modern systems
- Segments are genetically related and first-order characteristics should be time independent
- Requires simplicity

Outline

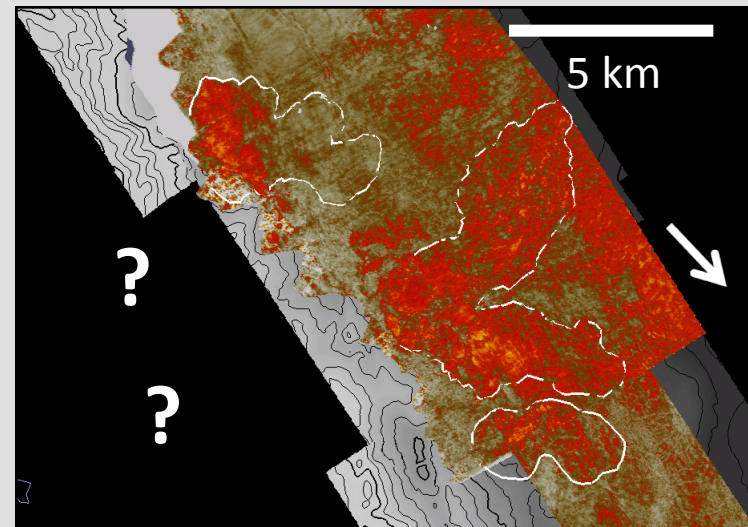
Quaternary Golo system

- 10^3 year resolution
- All segments preserved
- Sediment budget, link between onshore and offshore stratigraphy

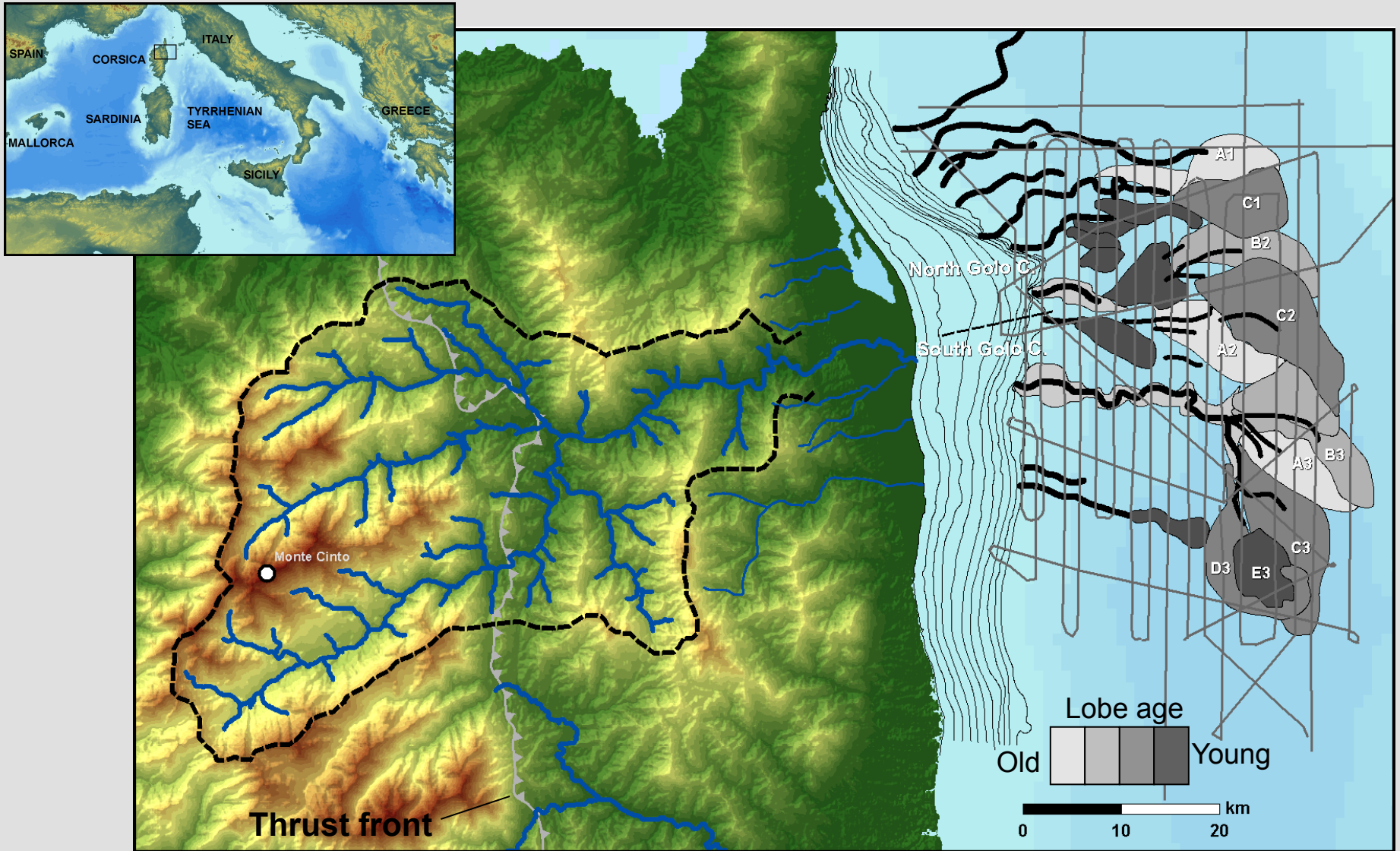


Late Cretaceous Møre systems

- 10^6 year resolution
- Only basin floor and lower slope preserved
- Paleo-drainage, sediment routing, stratigraphy



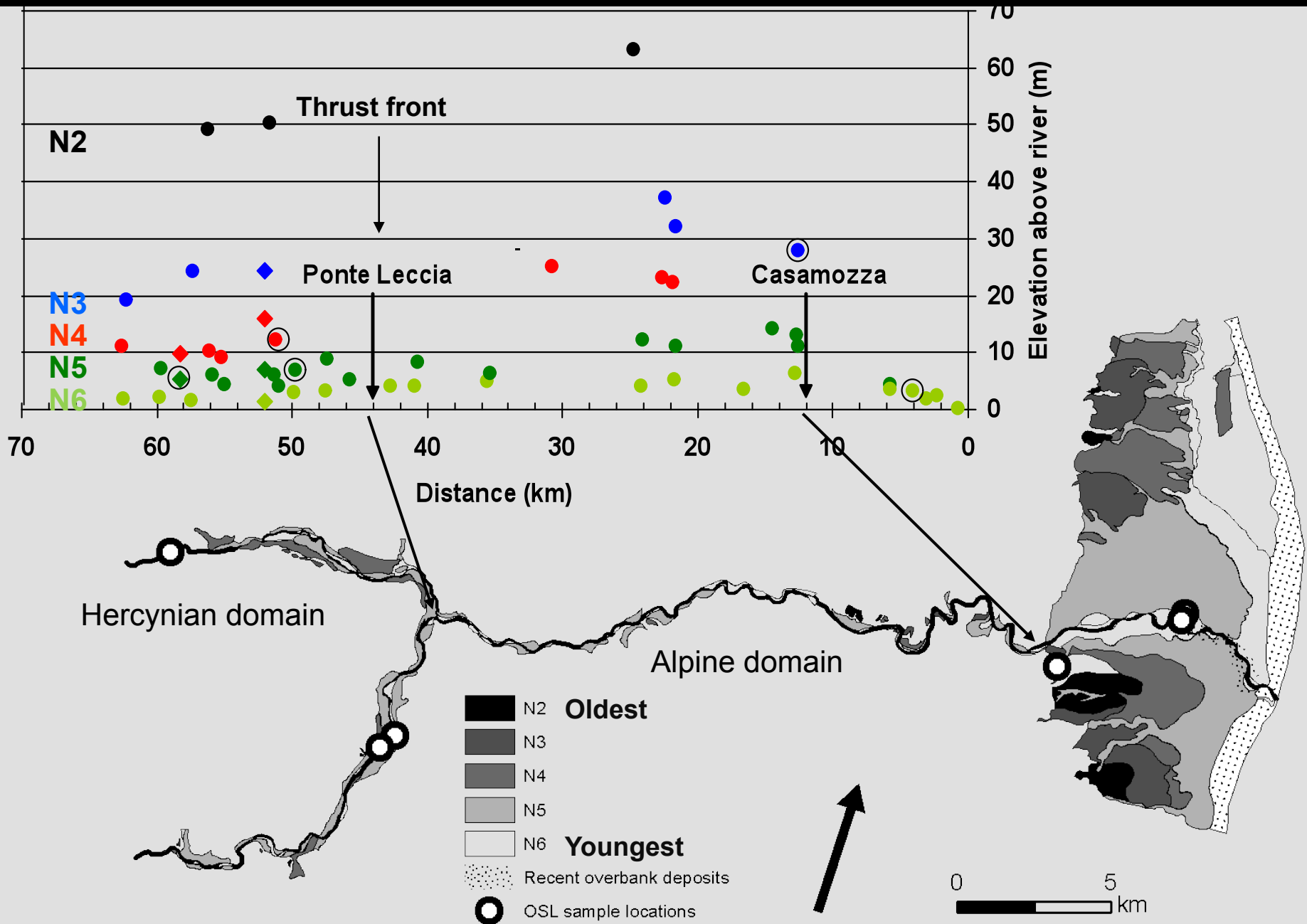
Golo stratigraphy - short time scale



Sømme et al. 2011

- When is sediment being deposited within the different segments?

Alluvial terraces

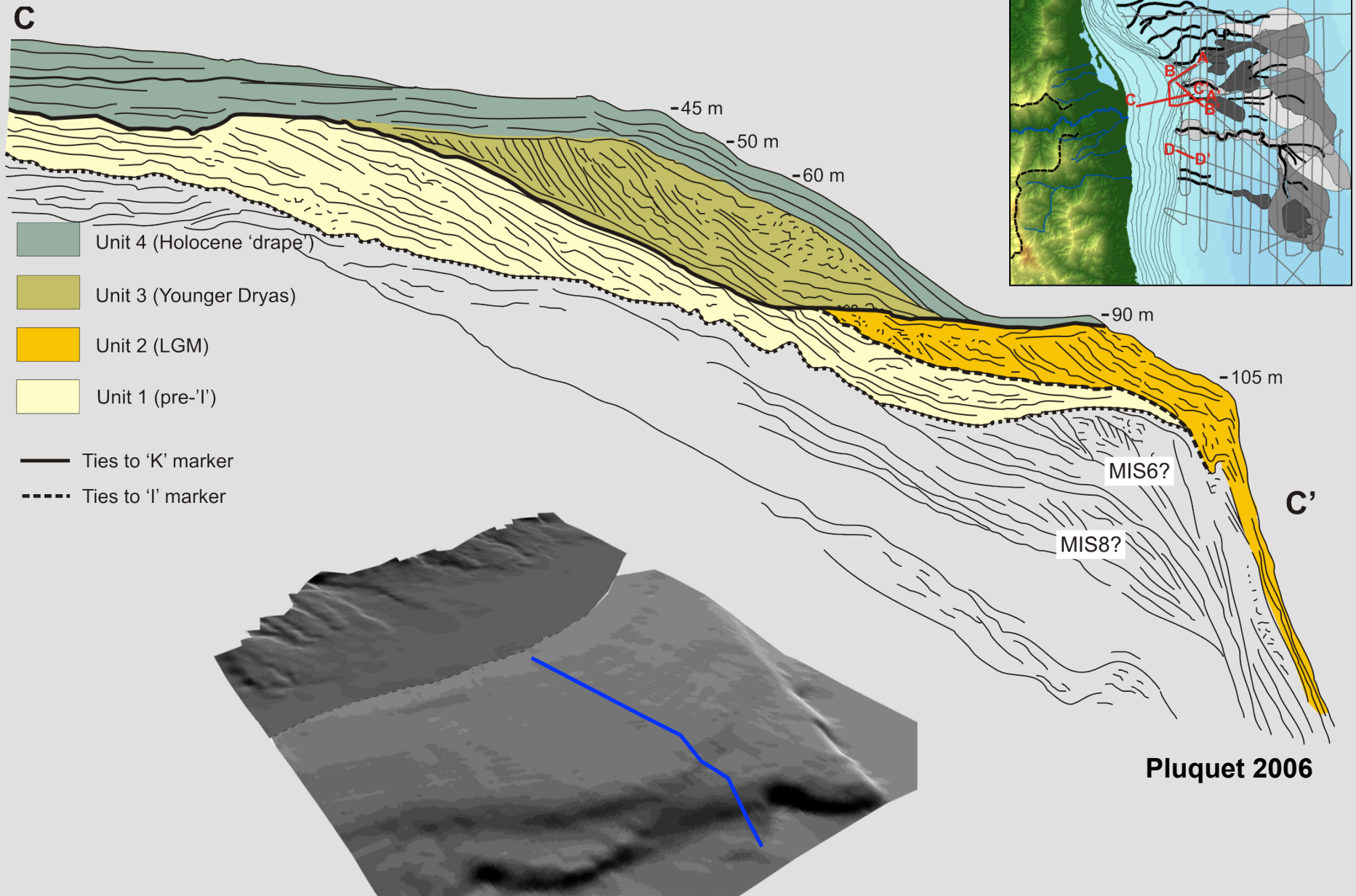


Alluvial terraces

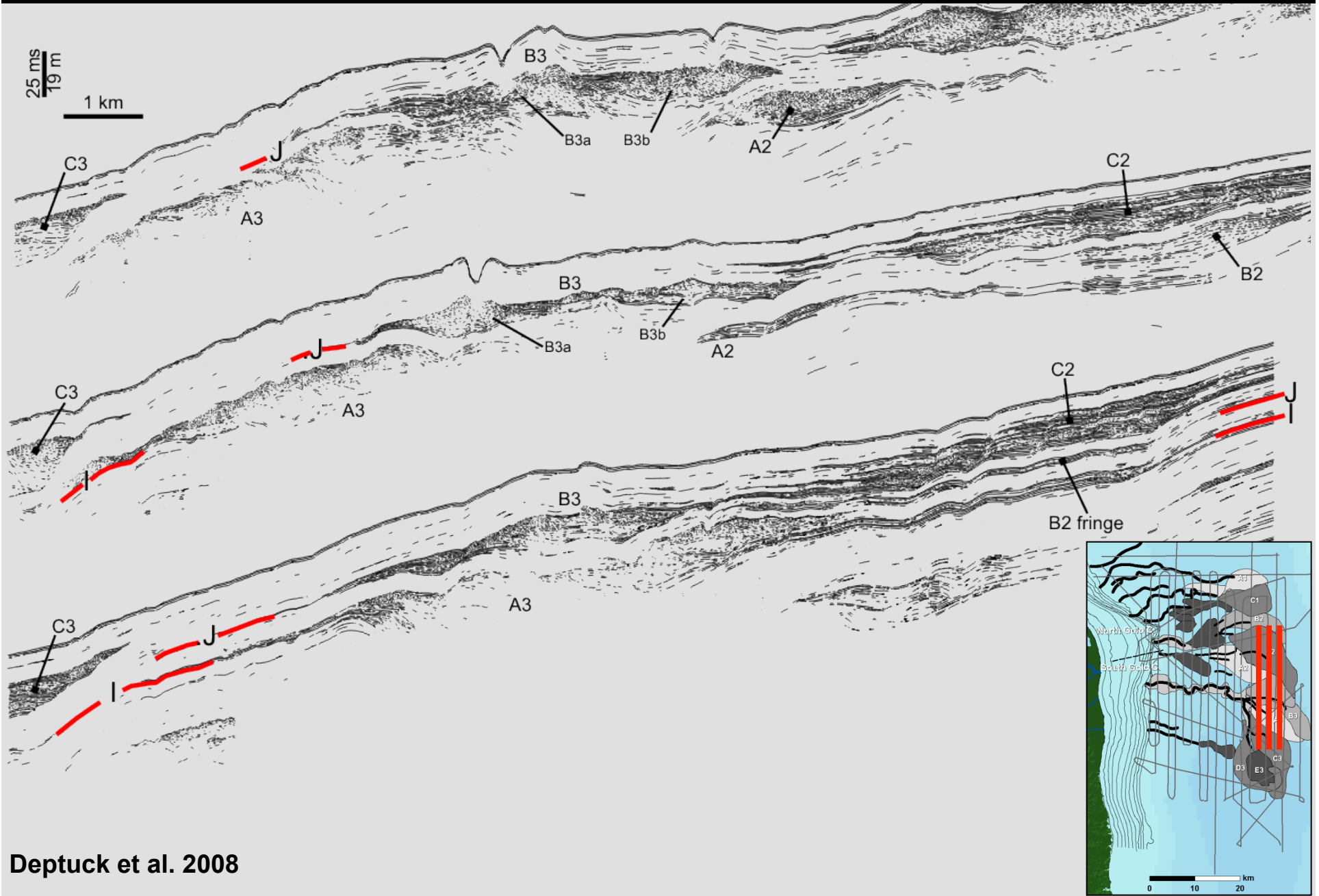


- Bedrock straths with alluvial cover
- Time equivalent with mass wasting from hill slopes

Marine deltas



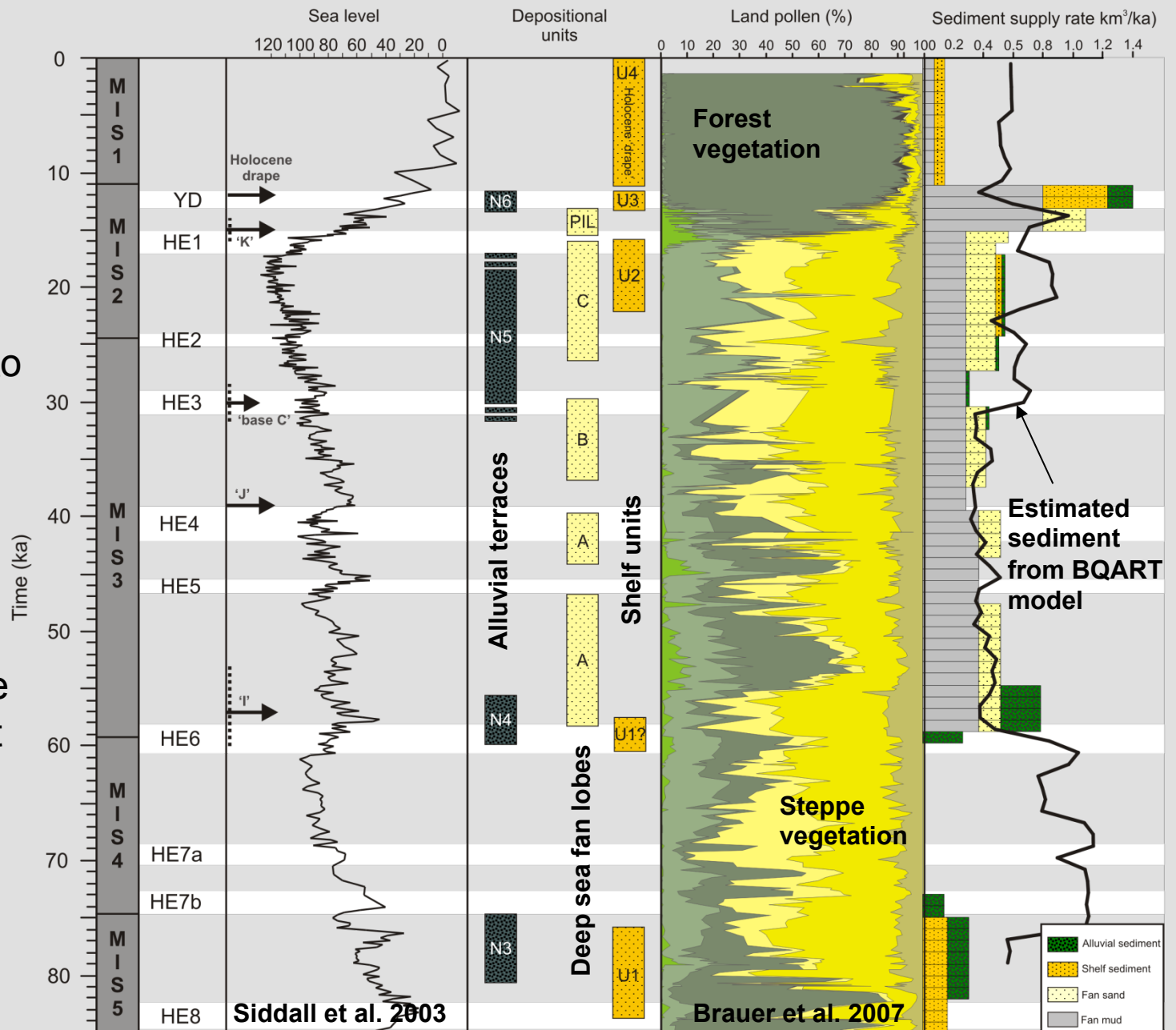
Deep-marine fans



Deptuck et al. 2008

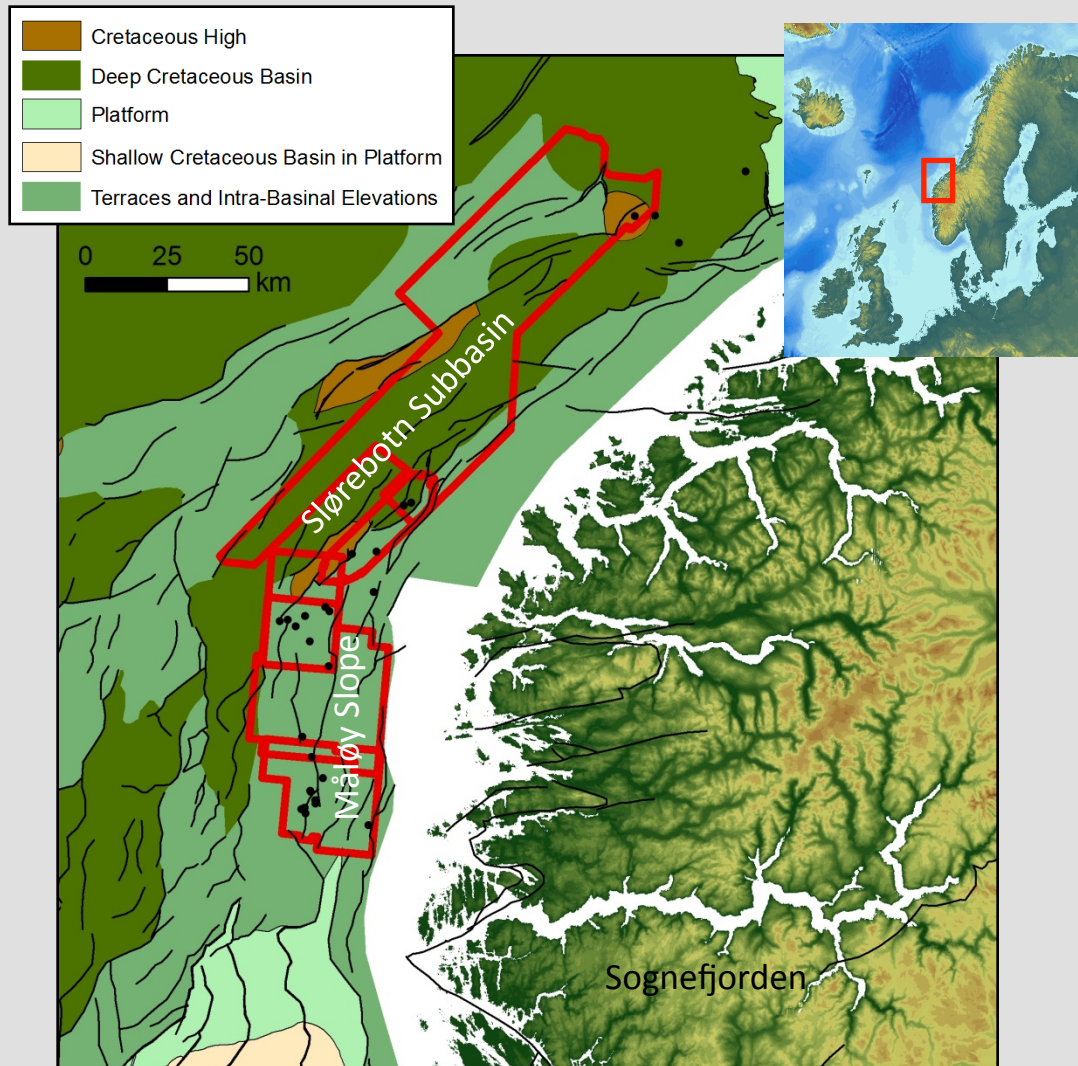
Stratigraphic link between segments

- Deposition in each segment is controlled by local thresholds – hard to fit into *one* model
- Supply estimates from the BQART model (Syvitski & Milliman, 2007) are in good agreement with calculated volumes



Sømme et al. 2011

Møre stratigraphy - long time scale

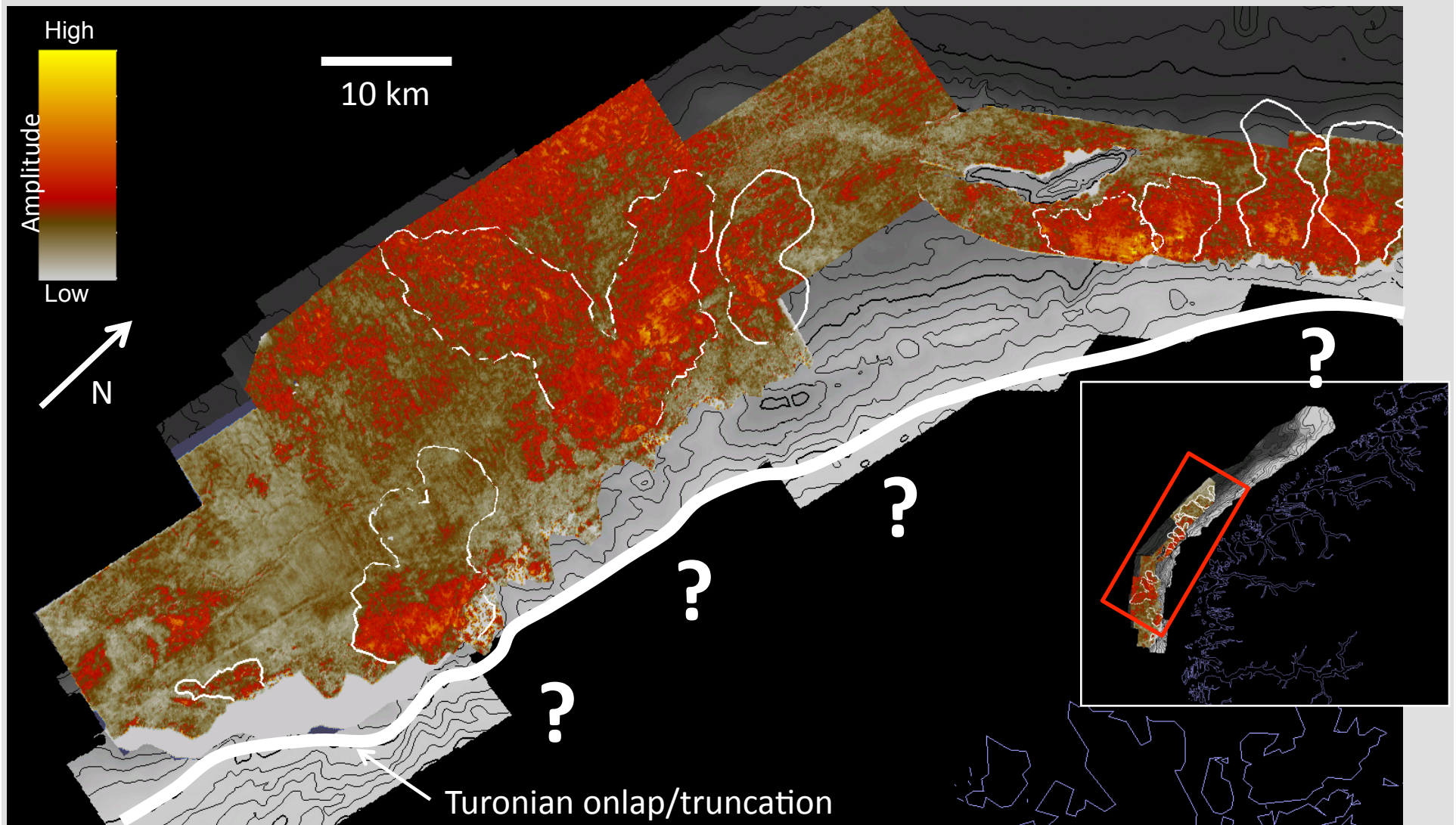


AGE		West	East
		(Basin Axis)	(Basin Margin)
Upper Cretaceous	Shetland Gp	Maastrichtian	
		Campanian	Jorsalfare Fm
		Santonian	Kyrre Fm
	Coniacian		
	Turonian	L	Trygvason Fm
		M	
E			
Cenomanian		Blodøks Fm	
			Svarte Fm

Modified from Jackson et al. 2008

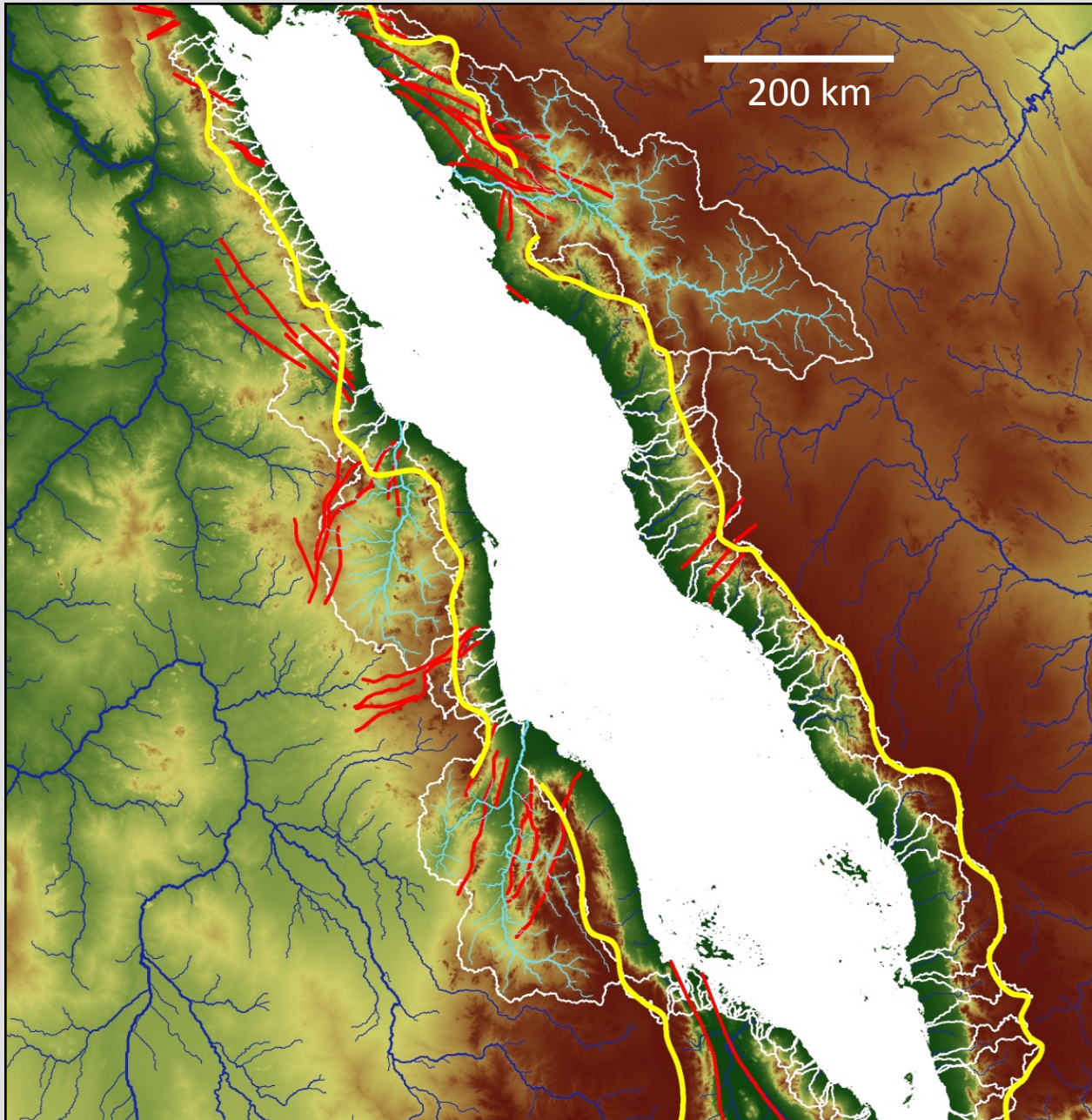
- Late Cretaceous (Turonian), Northern North Sea
- Same scale as the Quaternary Golo system

Turonian fans



- A total of 12 fan complexes have been mapped (12-298 km²)
- Fan spacing: 6-28 km

Generations of structures and topography

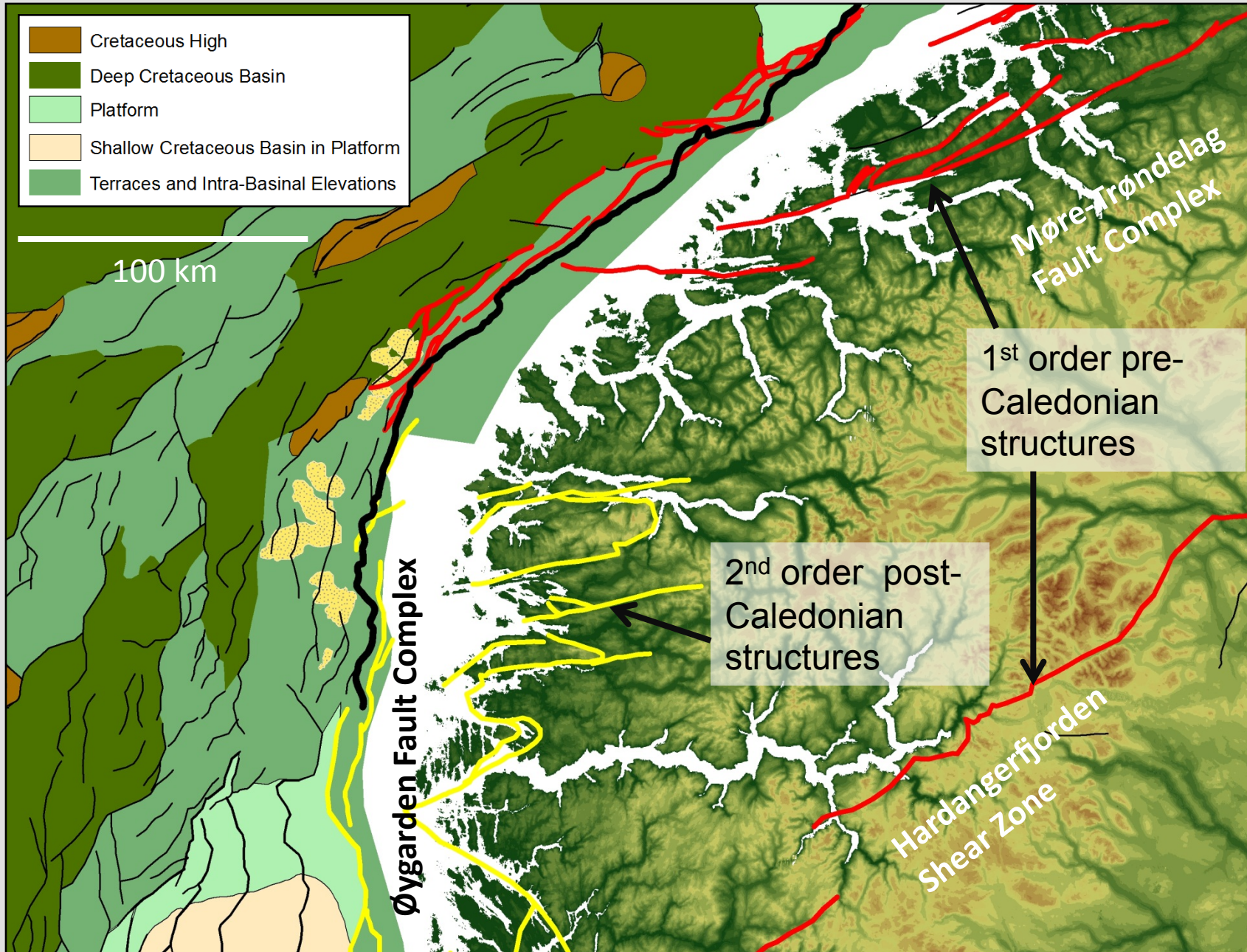


1st order: landscape and drainage controlled by “old” fault- and suture zones - regional

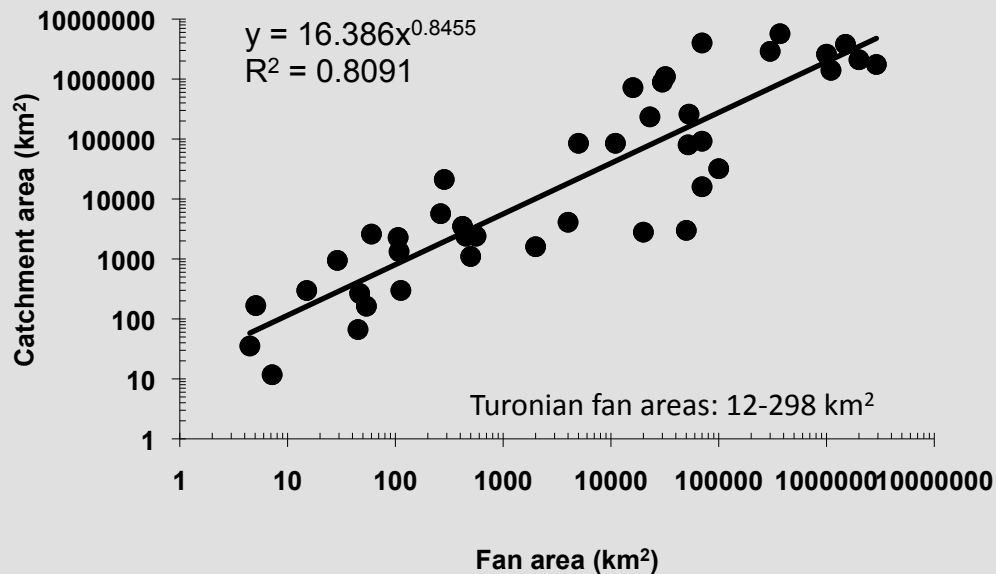
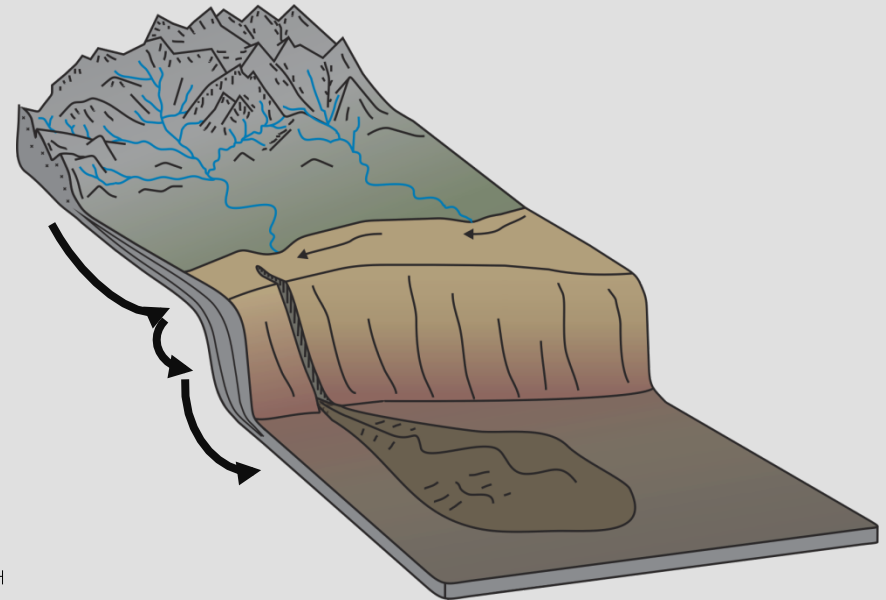
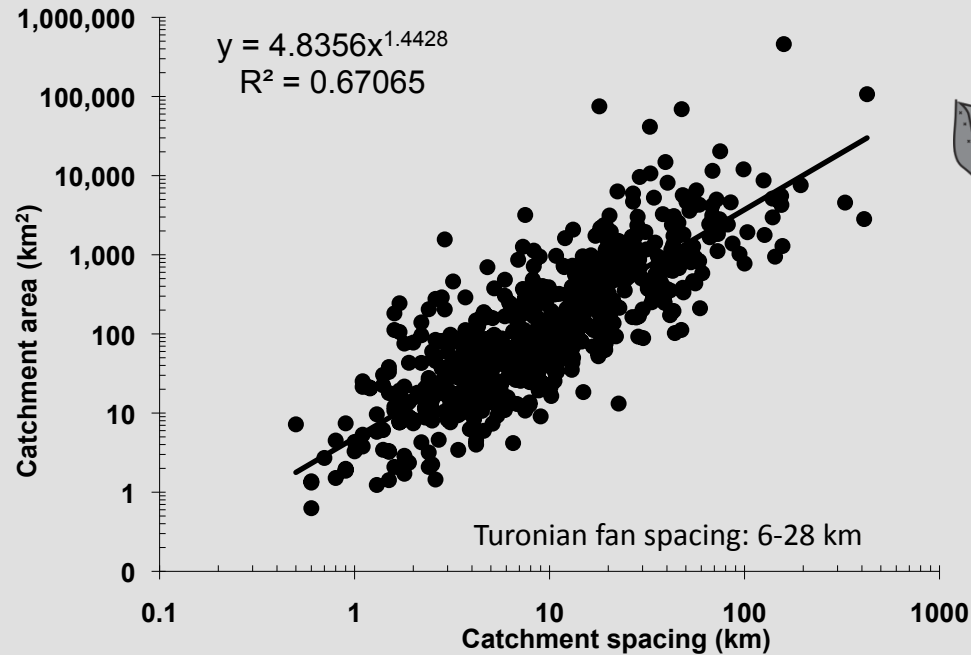
2nd order: landscape and drainage controlled by long-lived, semi-regional structures

3rd order: landscape and drainage controlled by relatively short-lived, local structures

Generations of structures and topography

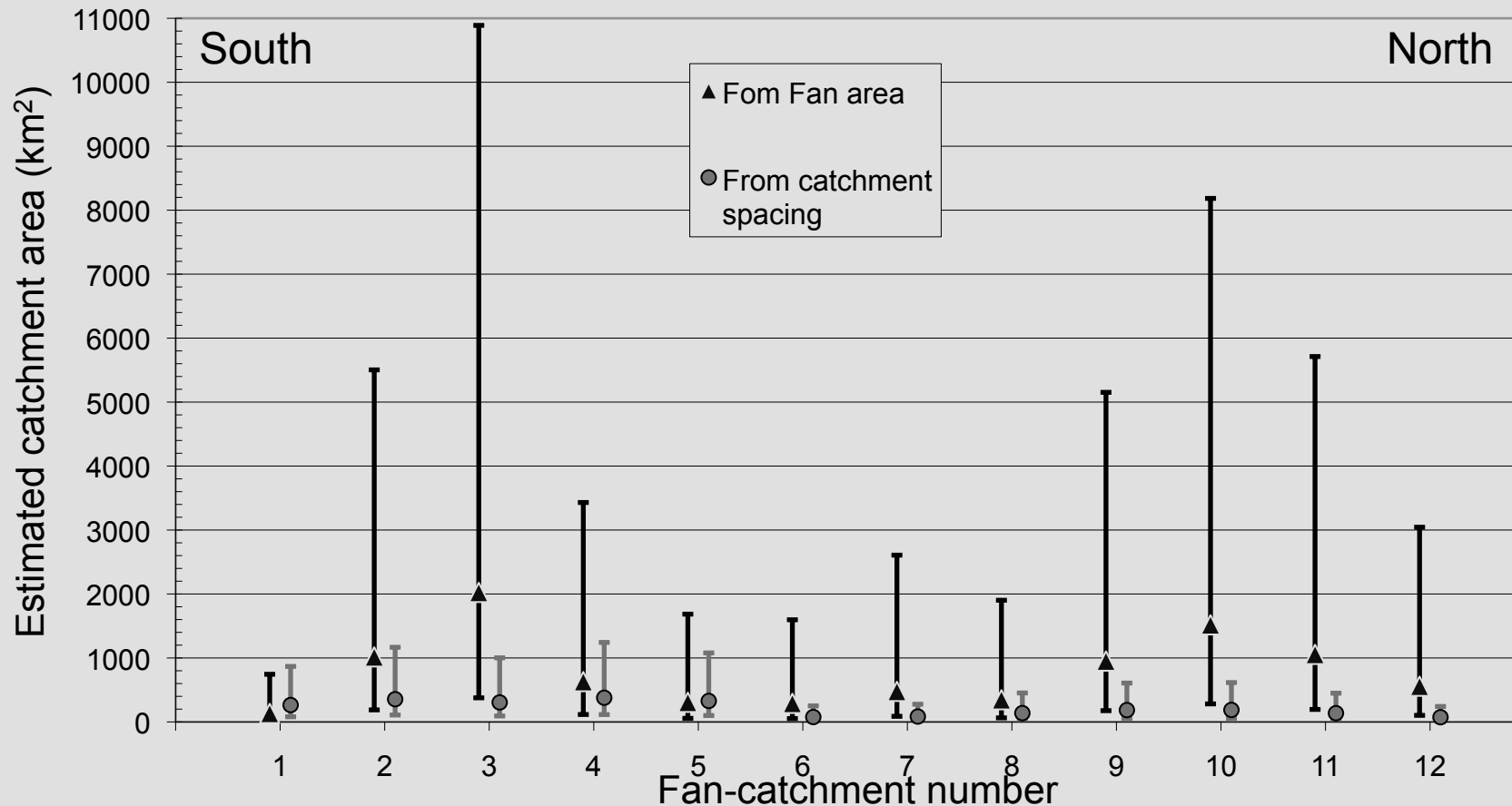


Constraining paleo drainage



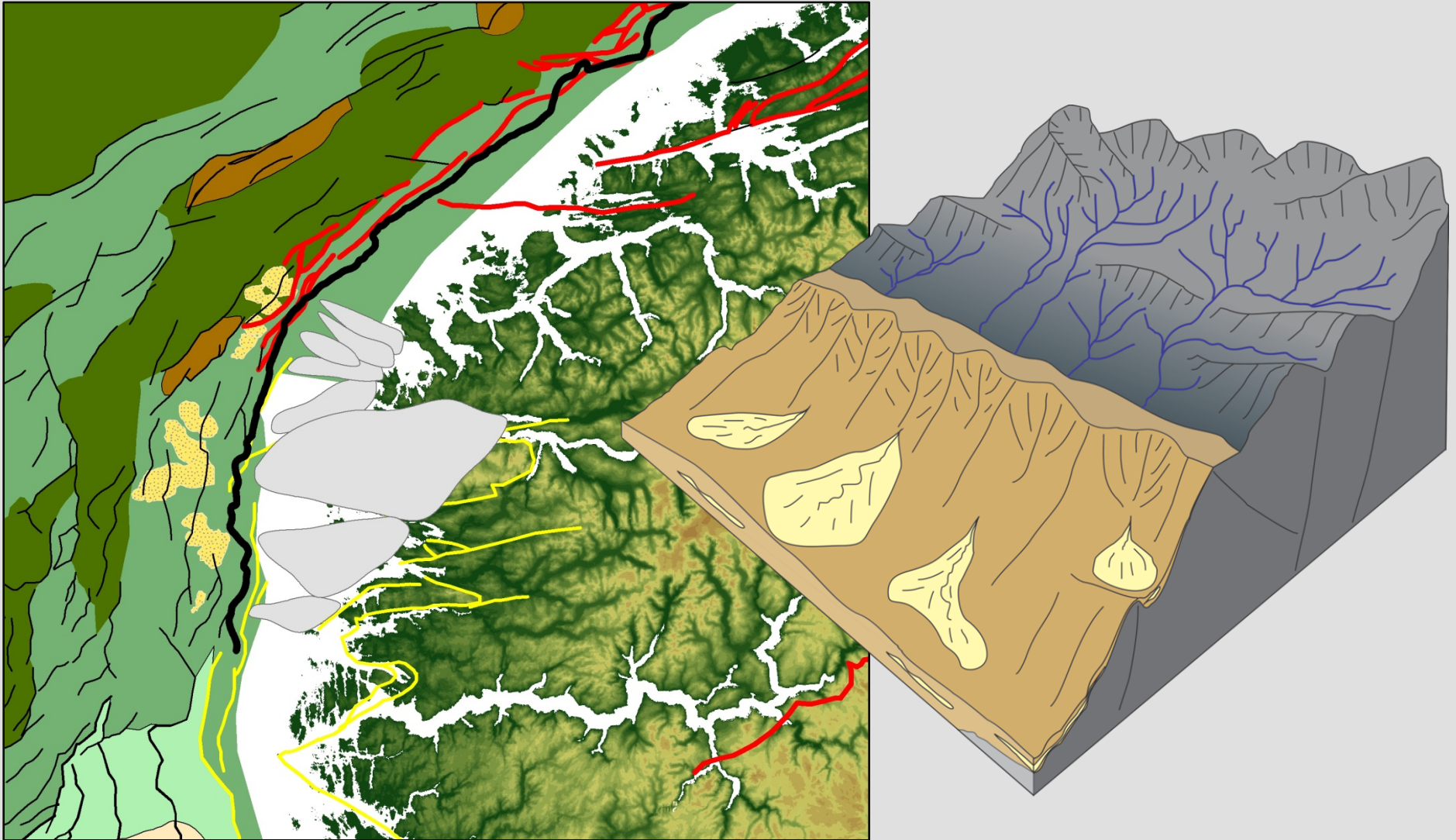
- Use relationships between catchment area, outlet spacing and extent of fan complexes from modern systems to constrain paleo-catchments
- Suggest paleo source areas of ~100 – 2000 km²

Constraining paleo drainage



- **Independent** estimates of paleo catchments suggest ~100 to ~2000 km²
- Estimates overlap within the uncertainties of one standard deviation

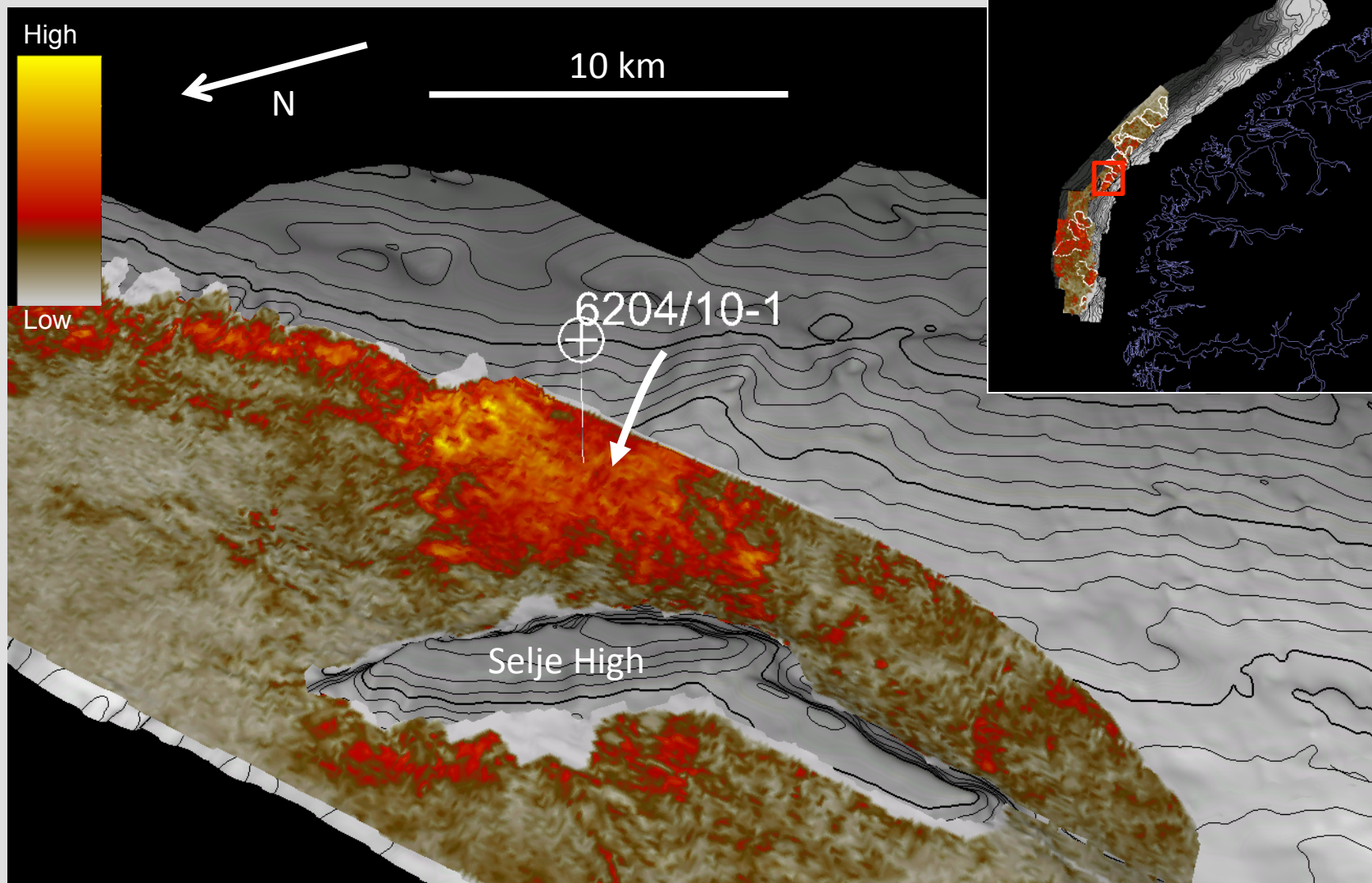
Depositional model



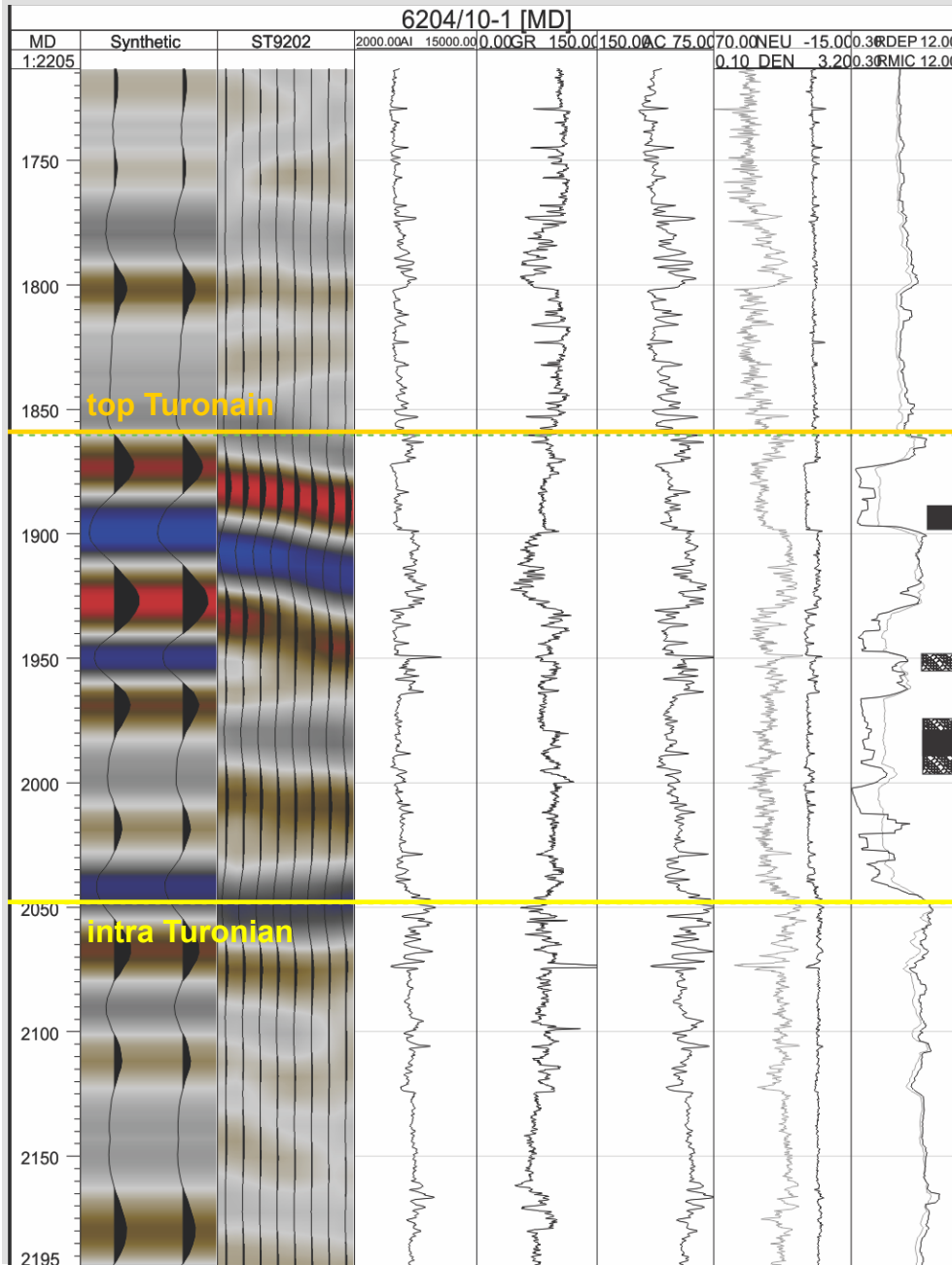
- Source constrained to local fault blocks
- Short transport routes

- Coarse and immature sediments
- Little internal filtering/buffering

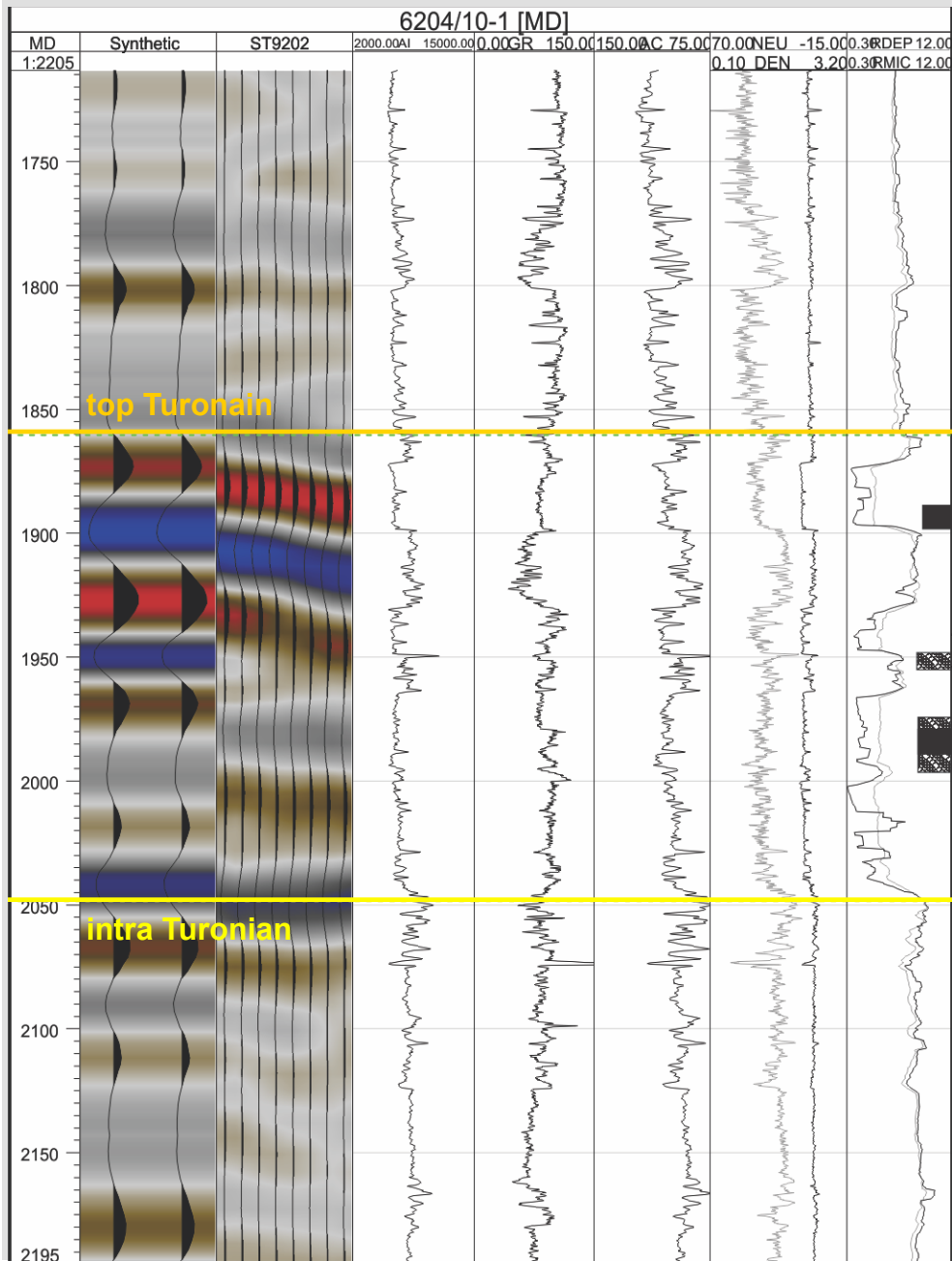
Fans architecture



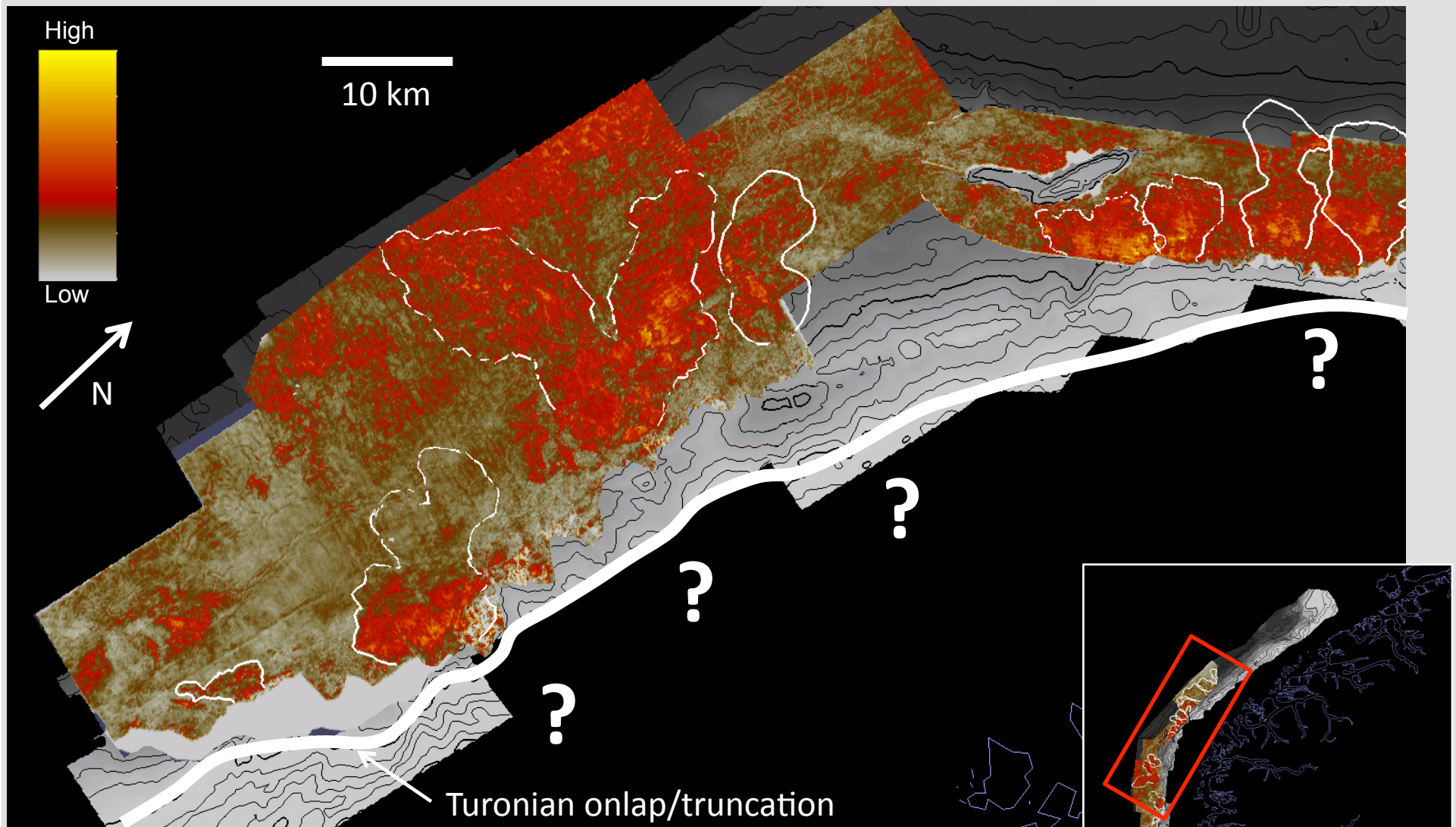
Lithology and stratigraphy



Lithology and stratigraphy



Implications for reservoirs



- Implications for intra fan and regional sandstone connectivity
- Implications for lithology and reservoir quality

Summary and conclusions

- The ultimate goal is a predictive tool that can constrain morphology and stratigraphy in ancient subsurface systems
- Model is populated with empirical data from modern systems
- Requires simplicity
- The Quaternary Golo system suggests that sediment storage in segments is linked to local thresholds
- We can estimate the morphological and sedimentological characteristics of the Late Cretaceous Møre systems based on modern data

