

Rotliegend

Depositional Environments

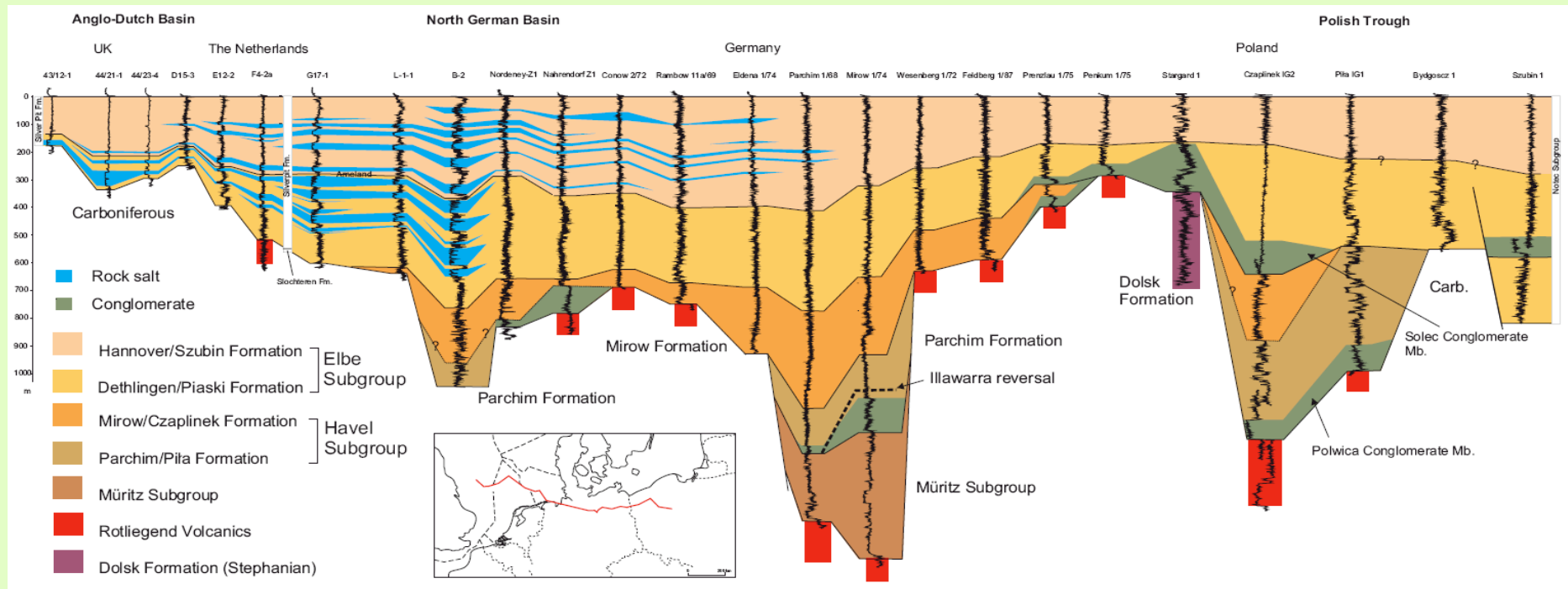
- an overview -

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Outline

- 1. Introduction**
- 2. Depositional evolution**
- 3. Control factors of sedimentation**
- 4. Lithofacies-Types, Cycles**

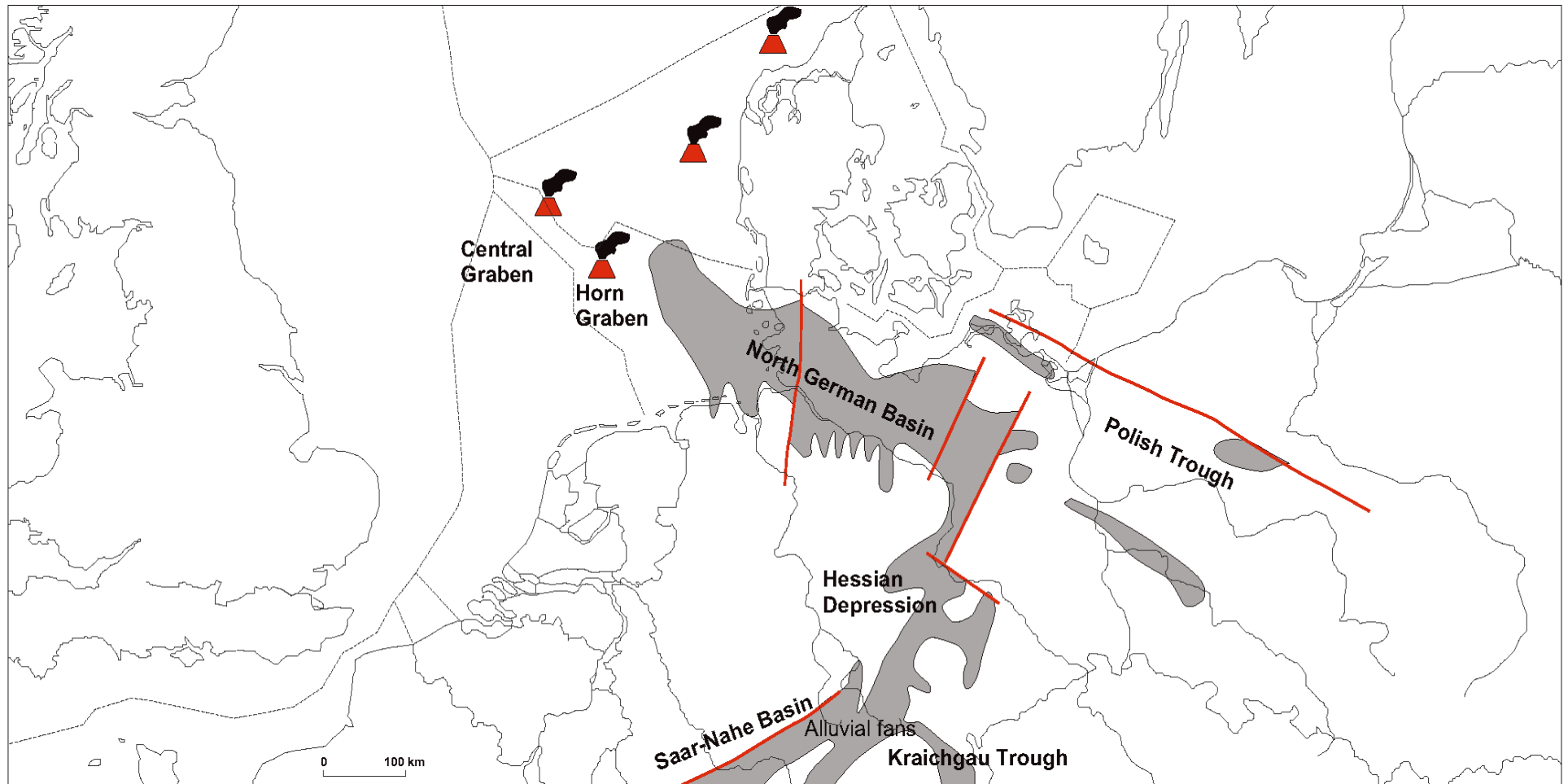
Rotliegend stratigraphic section CEBS W--E



Geluk (2005)

Rotliegend Paleogeography (oldest deposits)

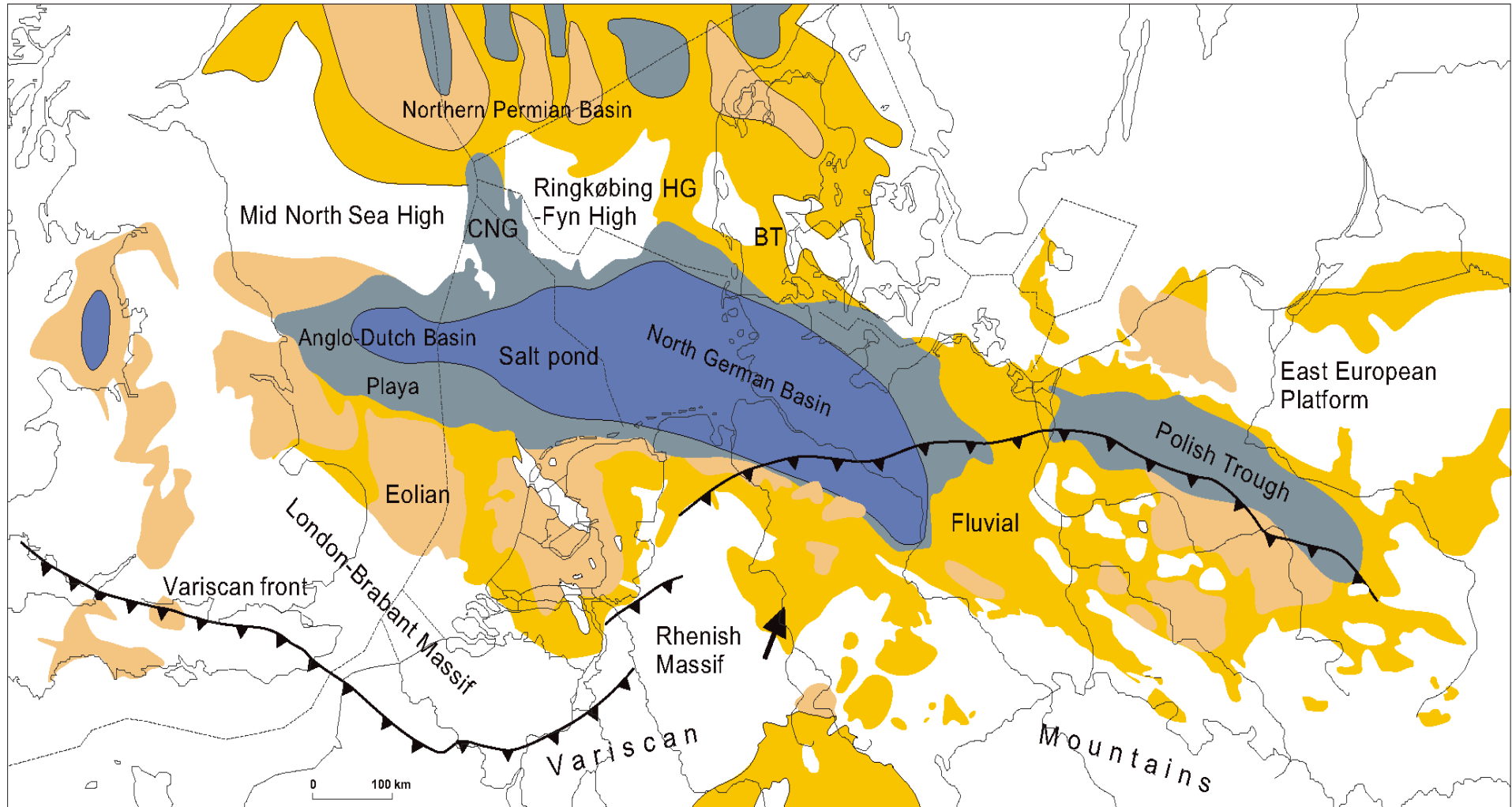
GELUK (2005)



Present-day distribution of the oldest part of the Rotliegend Sediments, the Mürz Subgroup (Mid Permian) and correlation units in Central Germany. The depositional facies include alluvial fans, fluvial, lacustrine and playa environments. Contemporaneous volcanism, indicated schematically, occurred in the Central, Horn and Oslo grabens. After Plein (1993, 1995) & Hoffmann et al. (1997)

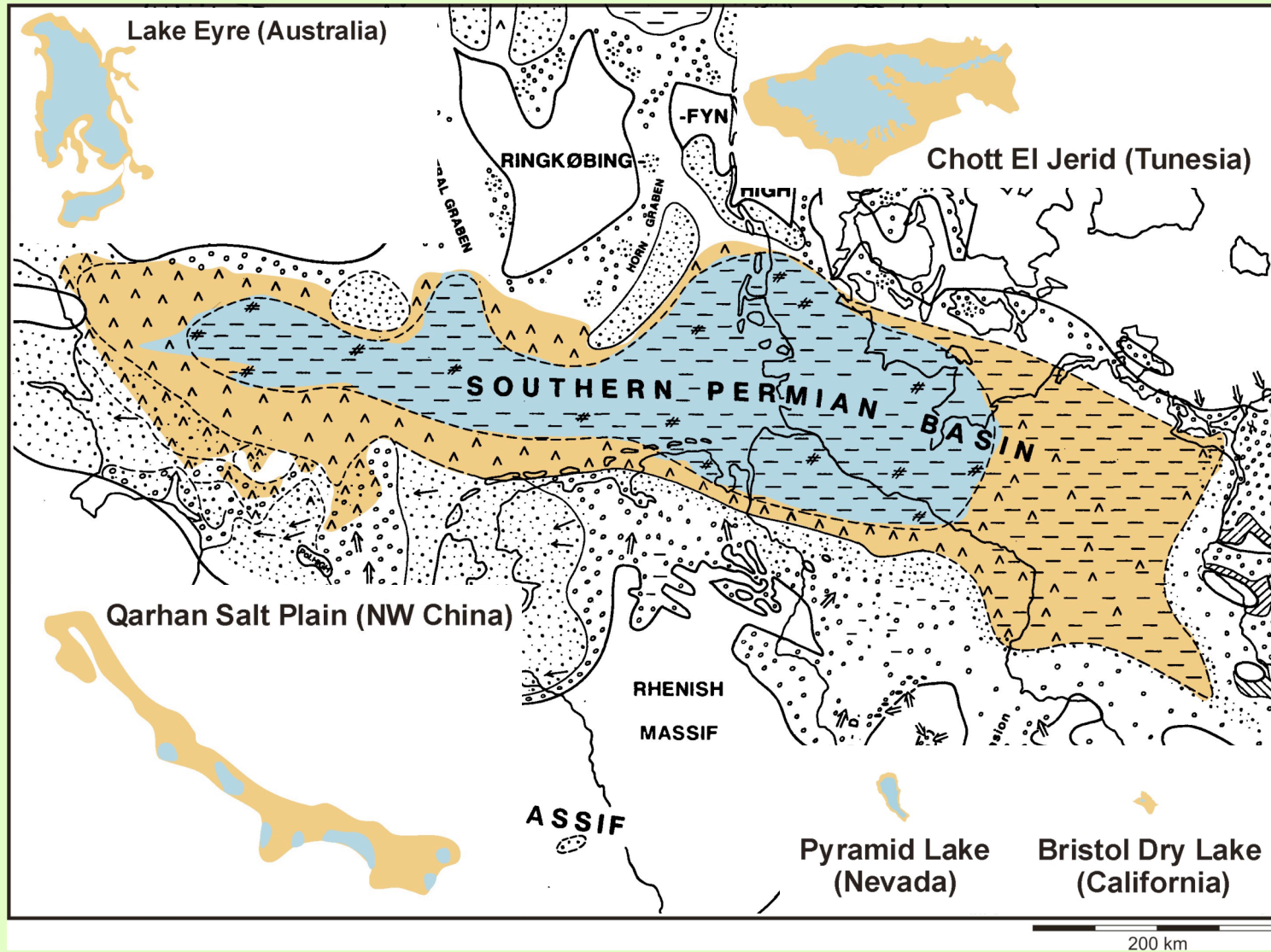
Rotliegend Paleogeography (Elbe Subgroup)

GELUK (2005)

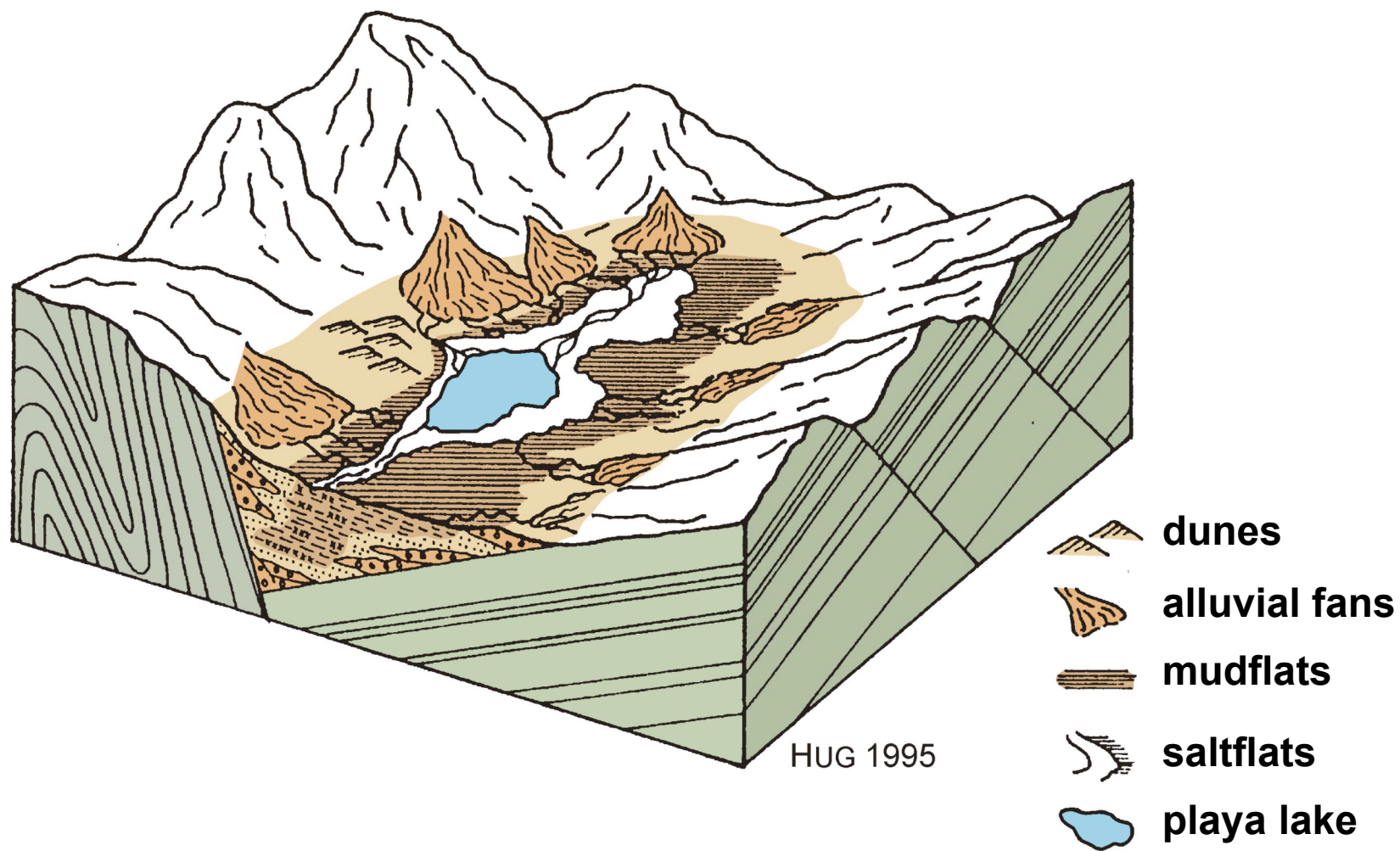


Facies and present-day distribution of the Elbe Subgroup of the Rotliegend Sediments. A large salt lake occupied the deepest parts of the Anglo-Dutch and North German Basins. CNG: Central North Sea Graben. After Sørensen & Martinsen (1987), Plein (1993, 1995), Hoffmann et al. (1997), Lokhorst (1998), Glennie et al. (2003).

Recent analogues for Late Rotliegend deposition?



The conventional Playa-Model



Recent surface analogues?

Caspi-Dardzha

Dry sandflats

Damp sandflats

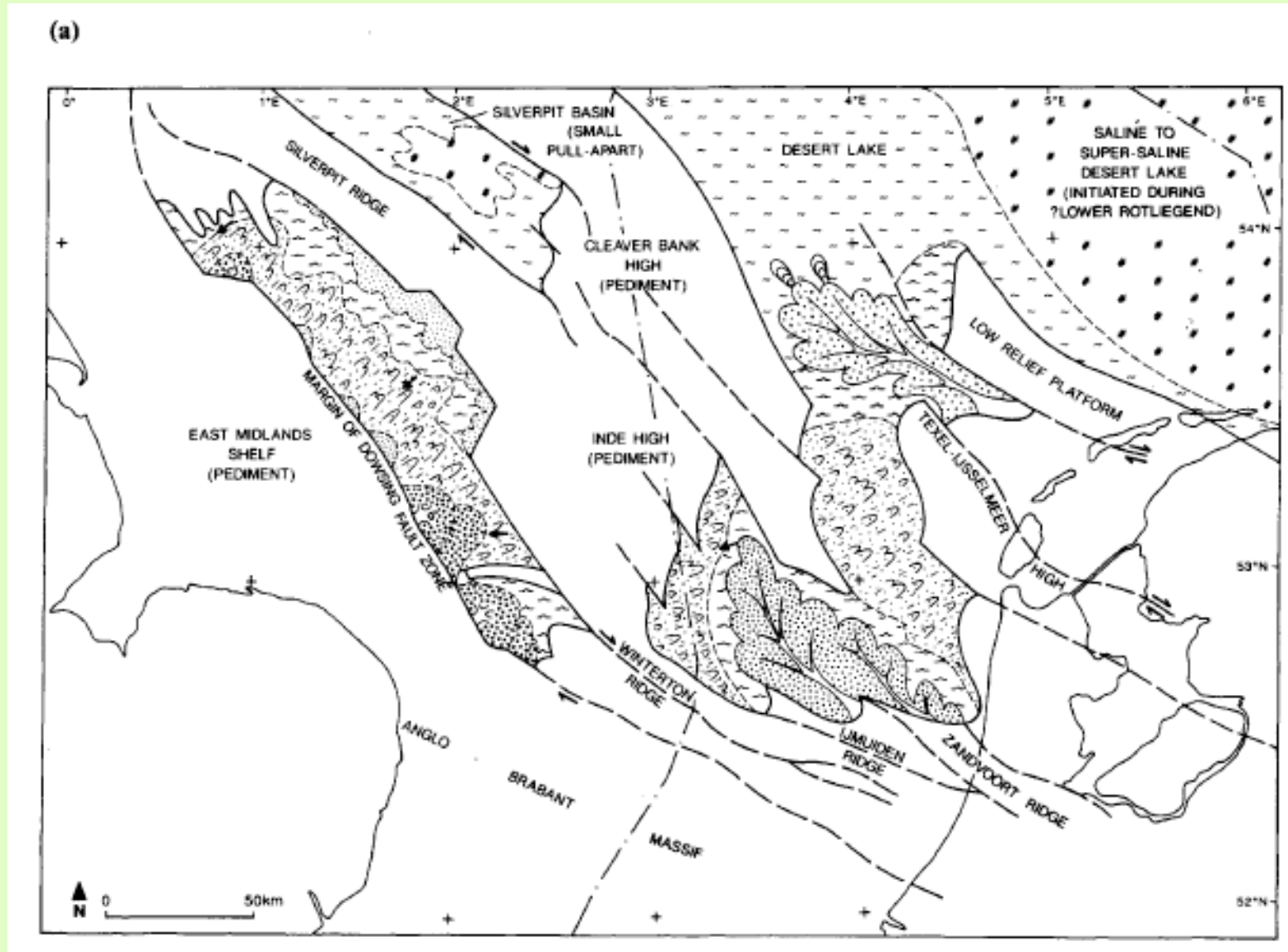
Evap. mudflats

Major aspects of Rotliegend deposition

1. Synsedimentary tectonics locate Early Rotliegend deposition
2. From semi-arid to more humid conditions during Late Rotliegend (onlapping) deposition
3. Climate controls supply *and accommodation*
4. Terminal lake setting, underfilled basin

Depositional “structure-controlled facies patterns”

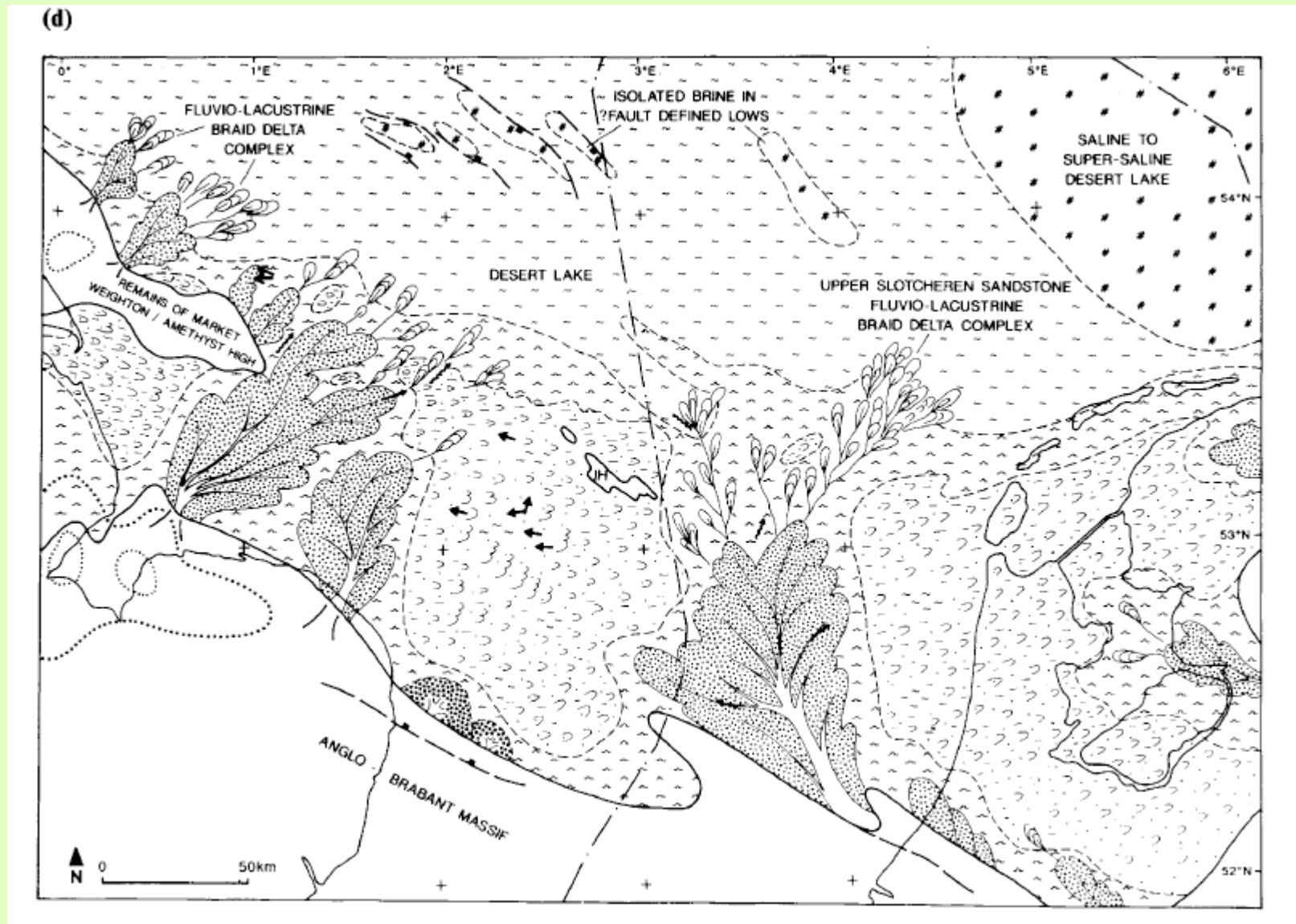
George & Berry 1997



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Depositional “supply-controlled facies patterns”

George & Berry 1997



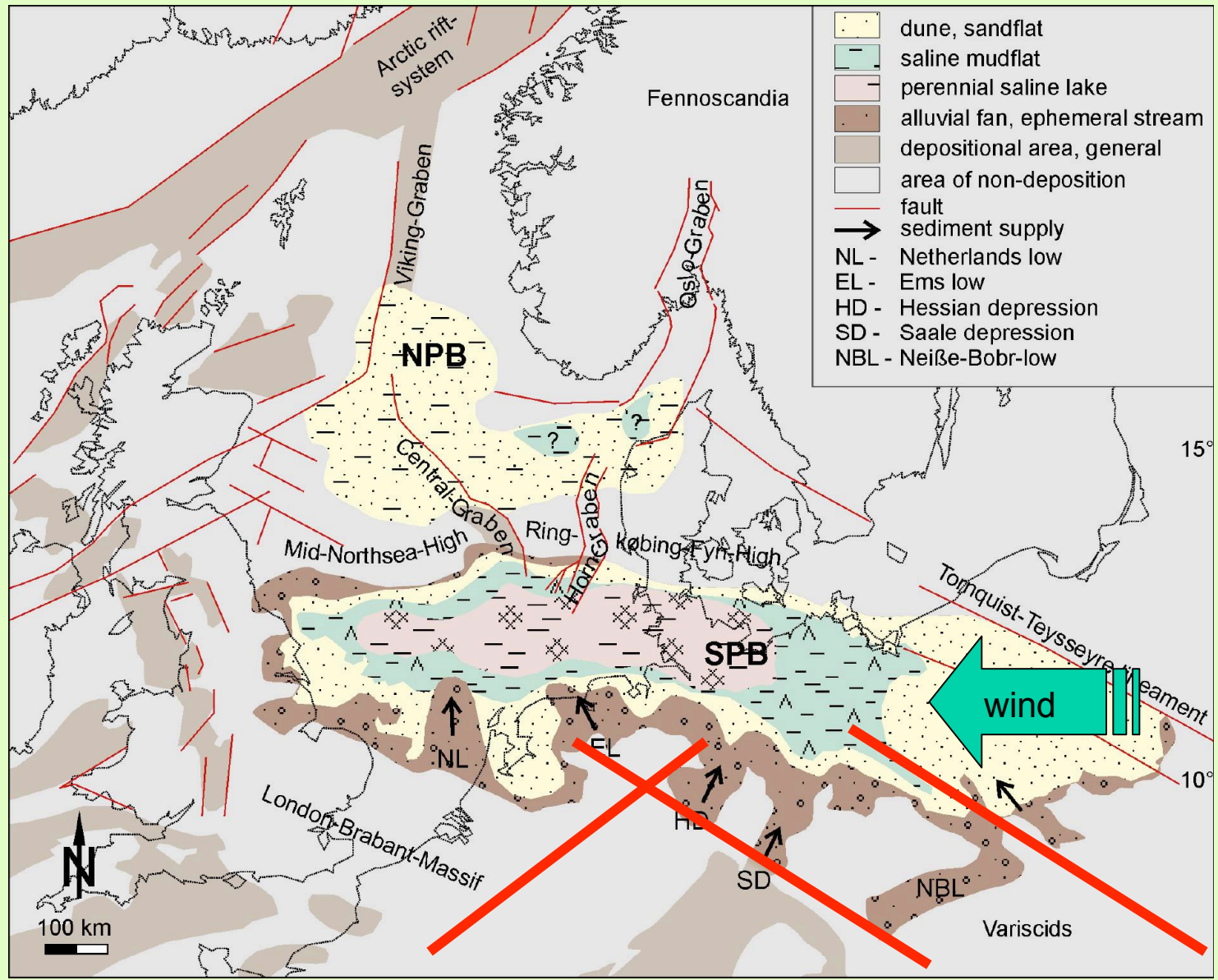
“Fifty years of petroleum exploration in the Netherlands after the Groningen discovery” Utrecht 2009

Sediment supply versus accommodation

1. Sediment supply

- supra-regional: aeolian clastics (quartz, fsp., mud)
- regional, local: alluvial / fluvial (often volcanic lithics)

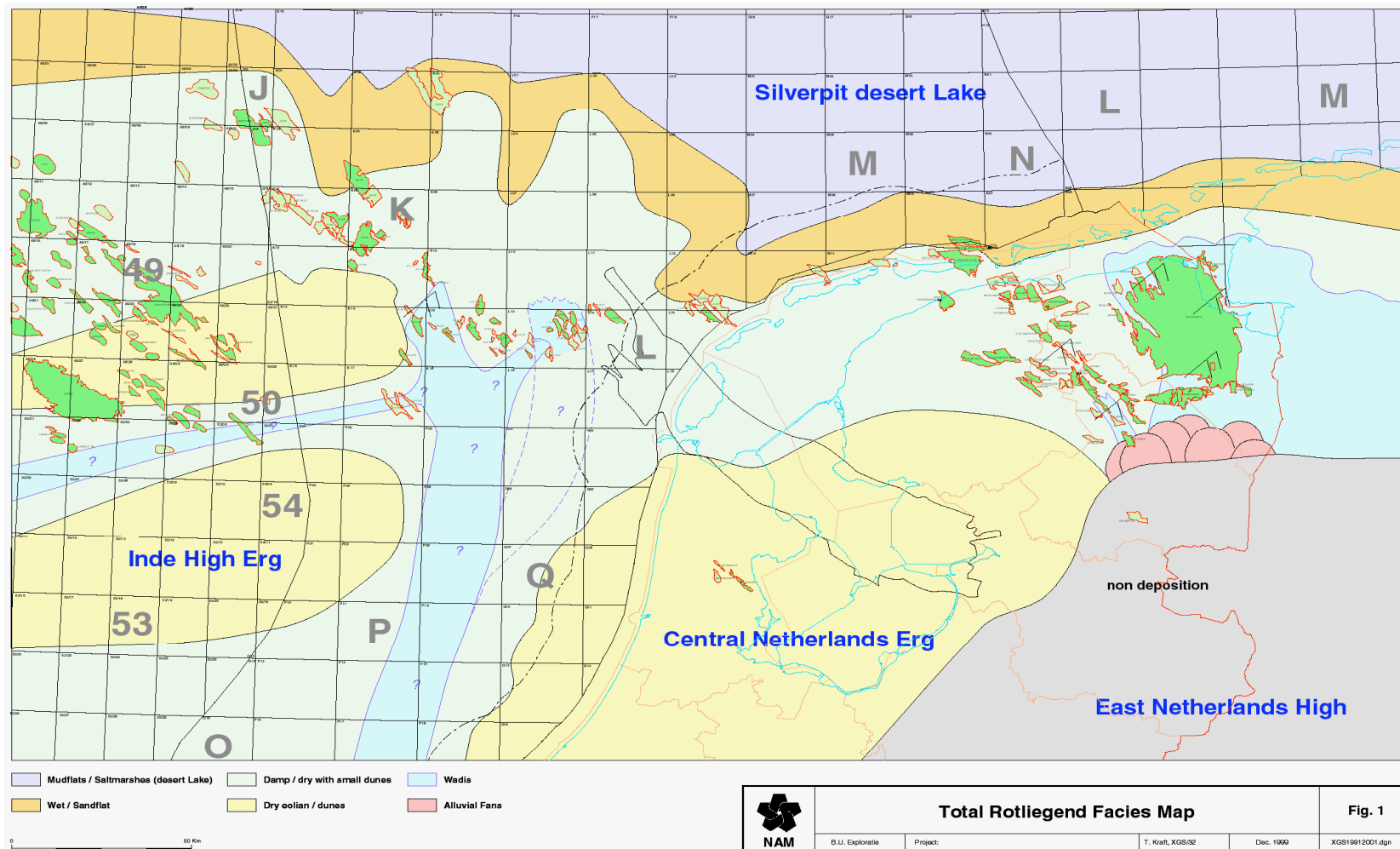
Rotliegend Fluvial sediment supply, aeolian reworking



Legler 2008

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Depositional “facies belts”



Sediment supply versus accommodation

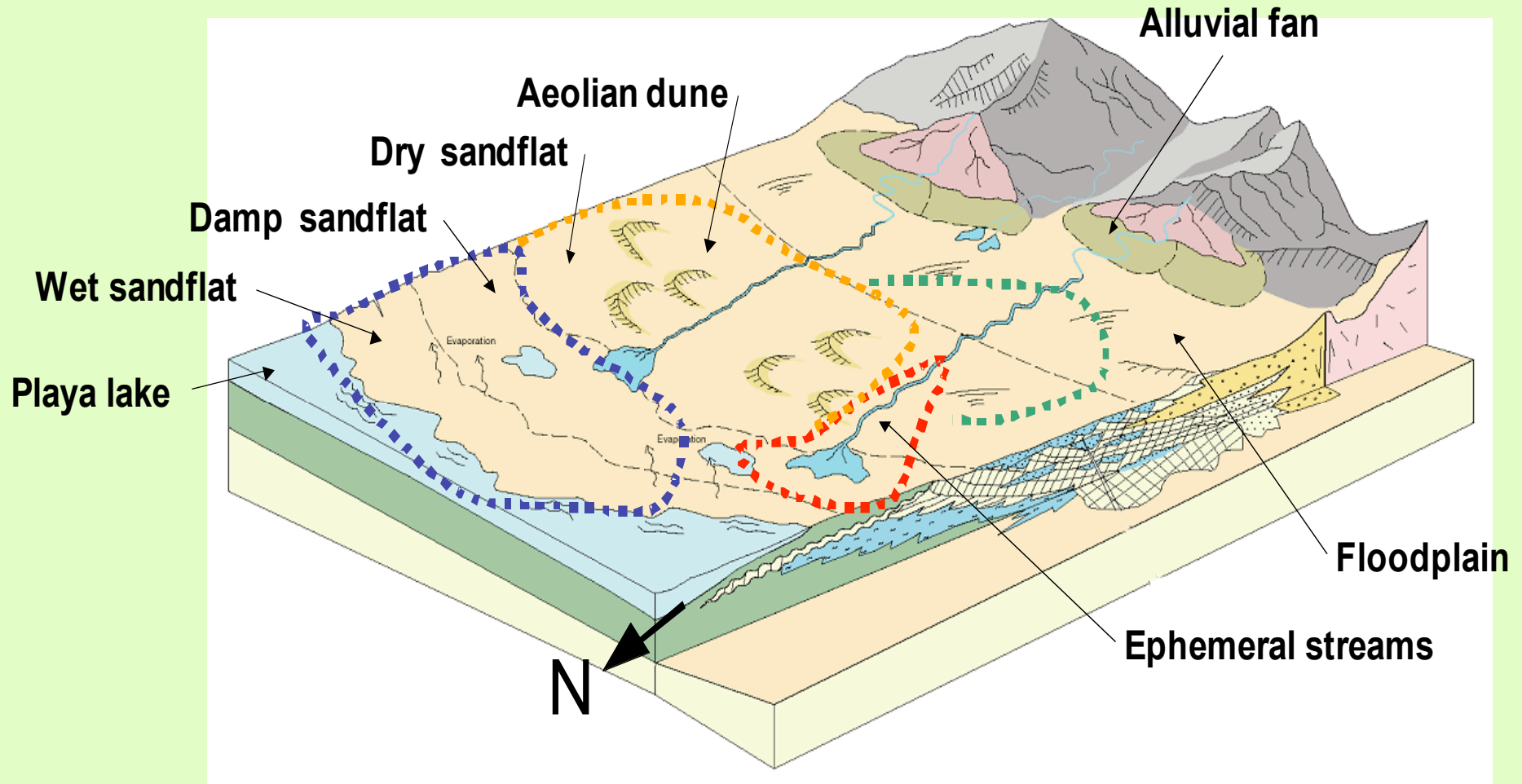
1. Sediment supply

- supra-regional: aeolian clastics (quartz, fsp., mud)
- regional, local: alluvial / fluvial (often volcanic lithics)

2. Accommodation and preservation of sediment

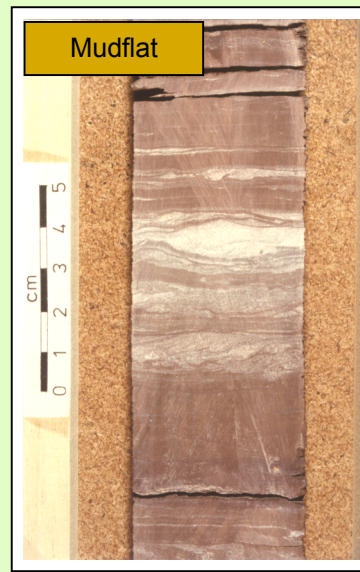
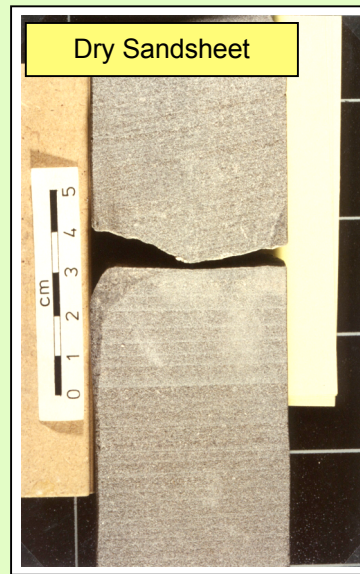
- basinal accommodation potential always in excess
- local preservation of sediment was highly variable, depending on groundwater position, salt efflorescences, deflation activity, flooding....

Rotliegend Depositional Environments



Rotliegend Modell Shell

Basic groups of Lithotypes & (Sub)-Environments



Solms/
Baunack
in Gaupp et
al. (2004)

Damp Aeolian Deposition



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Damp Aeolian Deposition



„patchy sand fabric“ in
Rotliegend muddy sands

Salt efflorescences and expansion polygons



Salar de Atacama / N-Chile

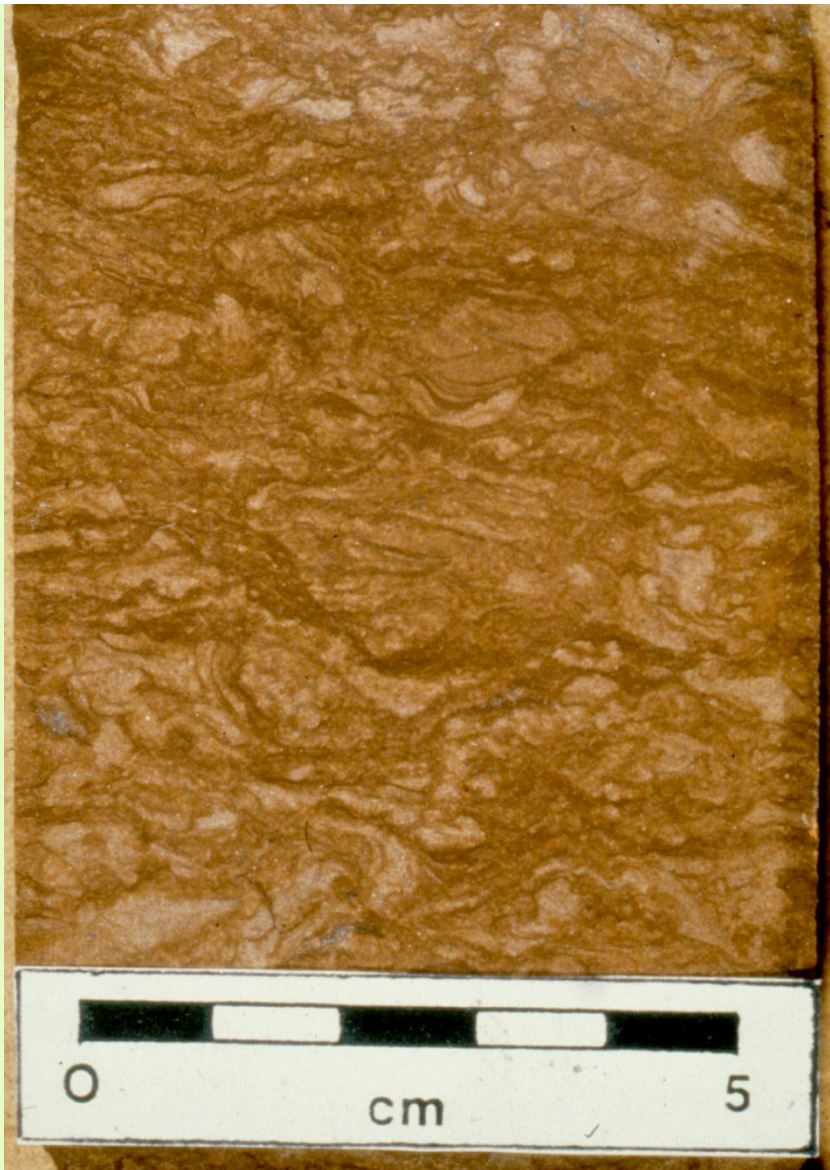
Salt efflorescences and expansion polygons



Salar de Atacama / N-Chile

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Wet evaporitic Sandflat



„patchy sand fabric“ in
Rotliegend muddy sands

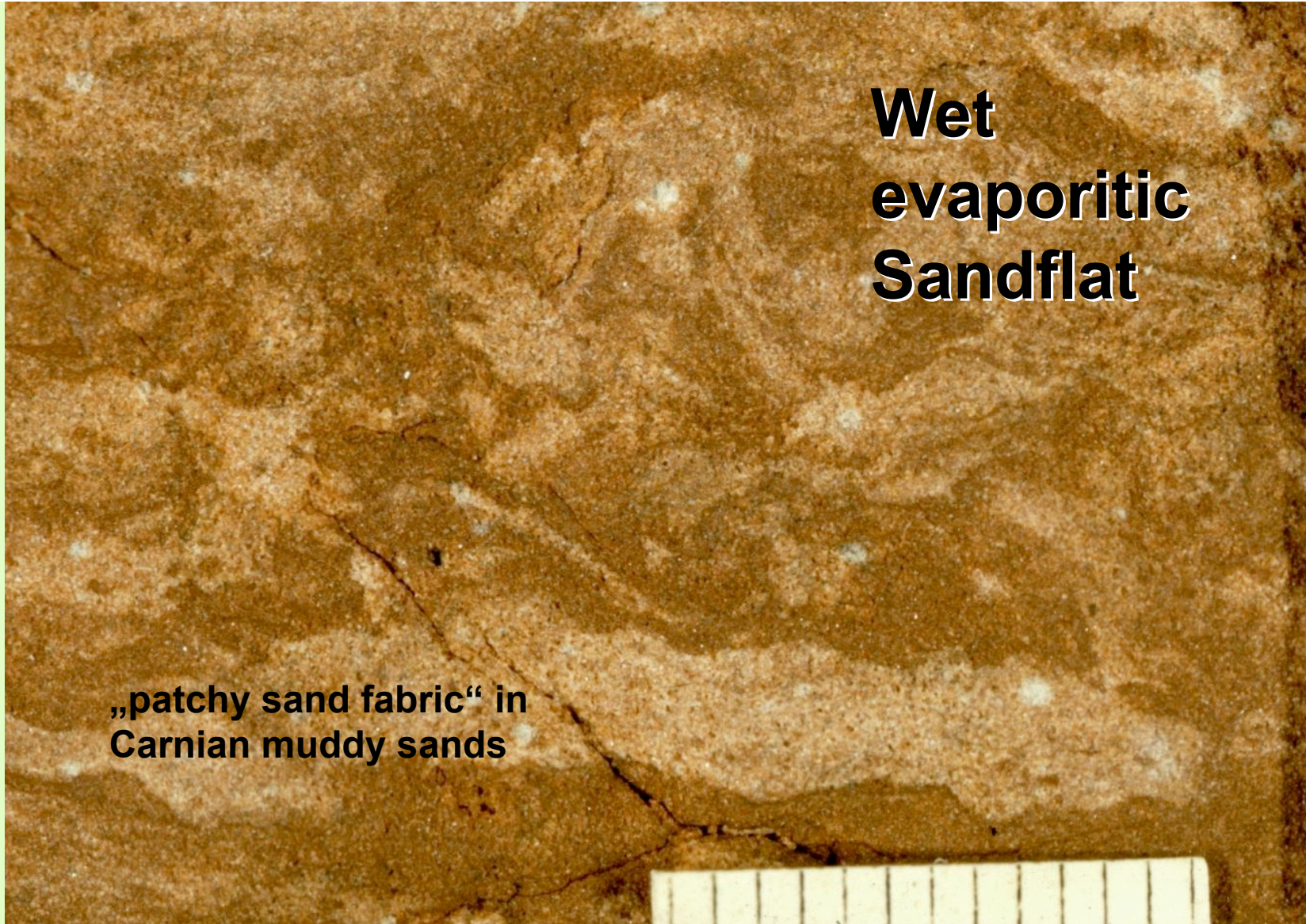


Wet evaporitic Sandflat

**„patchy sand fabric“ in
Rotliegend muddy sands**

Wet evaporitic Sandflat

**„patchy sand fabric“ in
Carnian muddy sands**



Interdune-Sediments, Sandflats, Mudflats

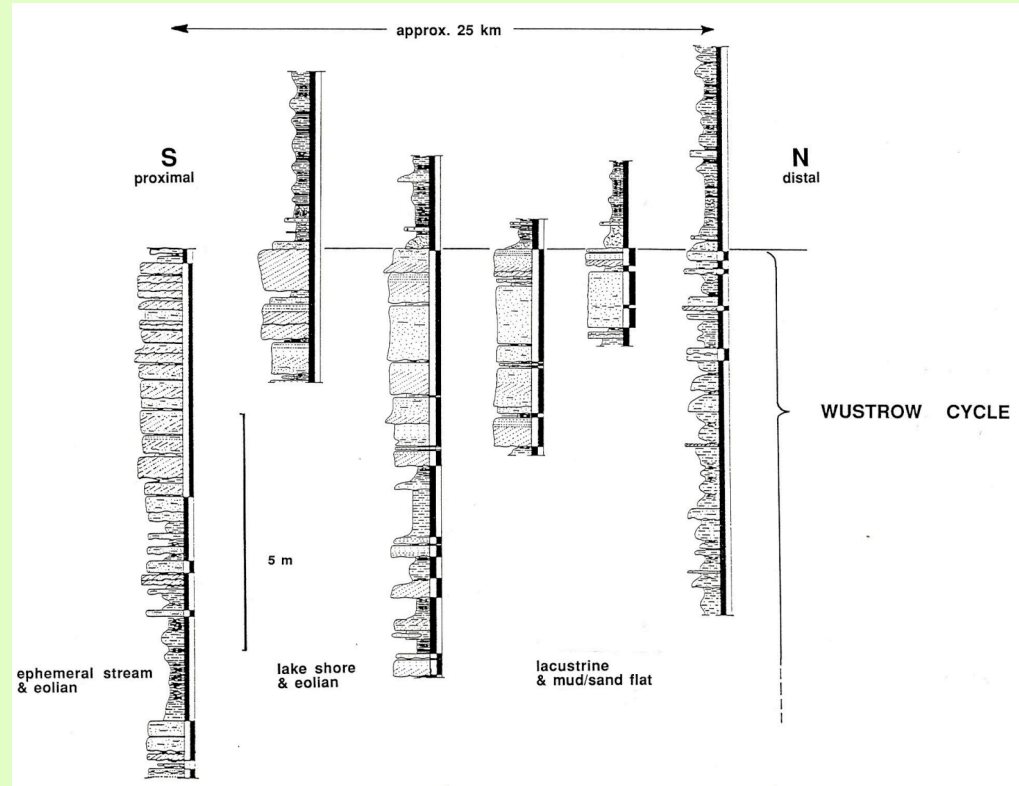
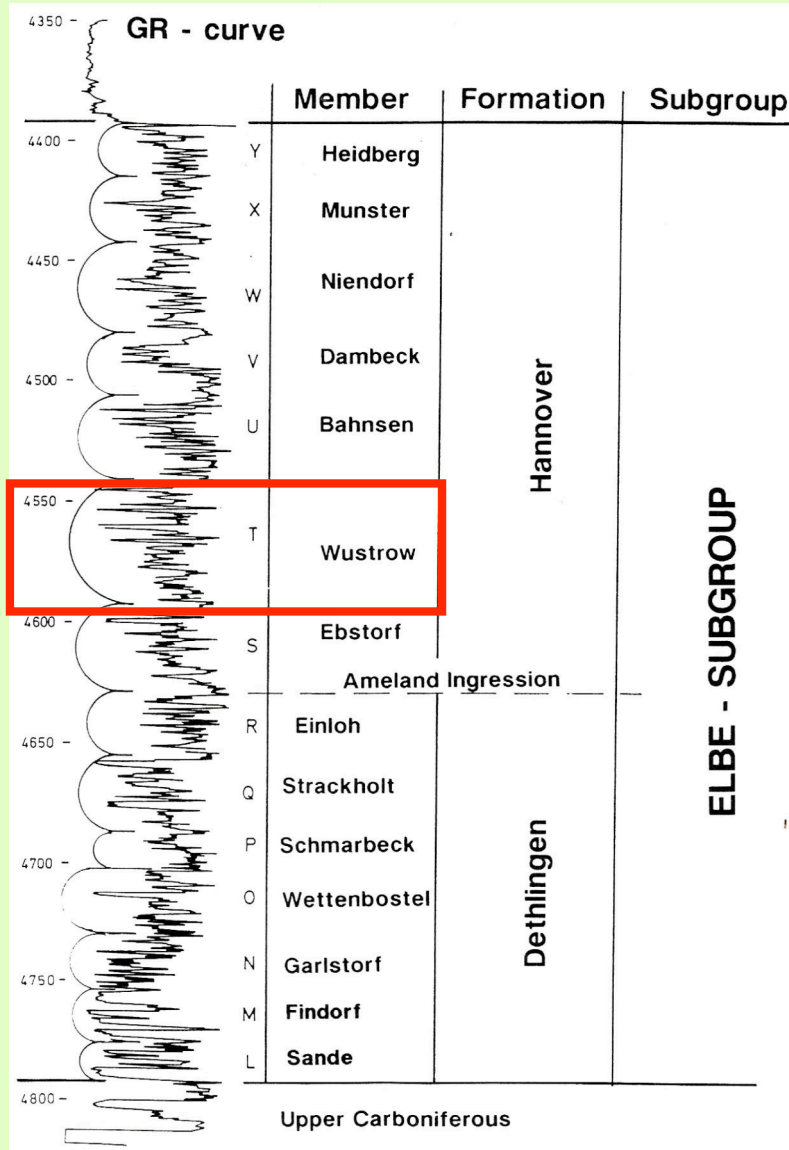
		DEPOSITIONAL CONDITIONS		
		DRY	DAMP	WET
SEDIMENTARY STRUCTURES/FEATURES	—	Wind ripples ⁺⁺		
	—	Eolian dune cross-strata ⁺⁺		
	—	Lag grain surfaces ⁺⁺		
	—	Deflation scours ⁺		
				Bioturbation structures ⁺
				Plant root structures ⁺
	—	Sand drift behind obstacles ⁺⁺		
			- Adhesion laminae ⁺⁺	
			- Microtopography ⁺⁺	
			- Rain-impact ripples ⁺⁺	
			— Brecciated laminae ⁺⁺	
			— Adhesion ripples ⁺⁺	
			- Adhesion warts ⁺⁺	
			— Evaporite structures ⁺	
			— Algal structures ⁺⁺	
			— Fenestral porosity ⁺	
			— Contorted structures ⁺	
			— Rill marks ⁺	
		— Wavy laminae ⁺⁺		
		- Wrinkle marks ⁺		
		— Channels ⁺⁺		
		— Small deltas ⁺⁺		
		— Water ripples ⁺⁺		
		- Subaqueous cross-strata ⁺⁺		
	Modern interdune deposits ⁺			
	Entrada interdune deposits ⁺			

Distribution of sedimentary structures within the deposits of interdunes of different depositional conditions.
Collinson (1986)

Rotliegend depositional cycles

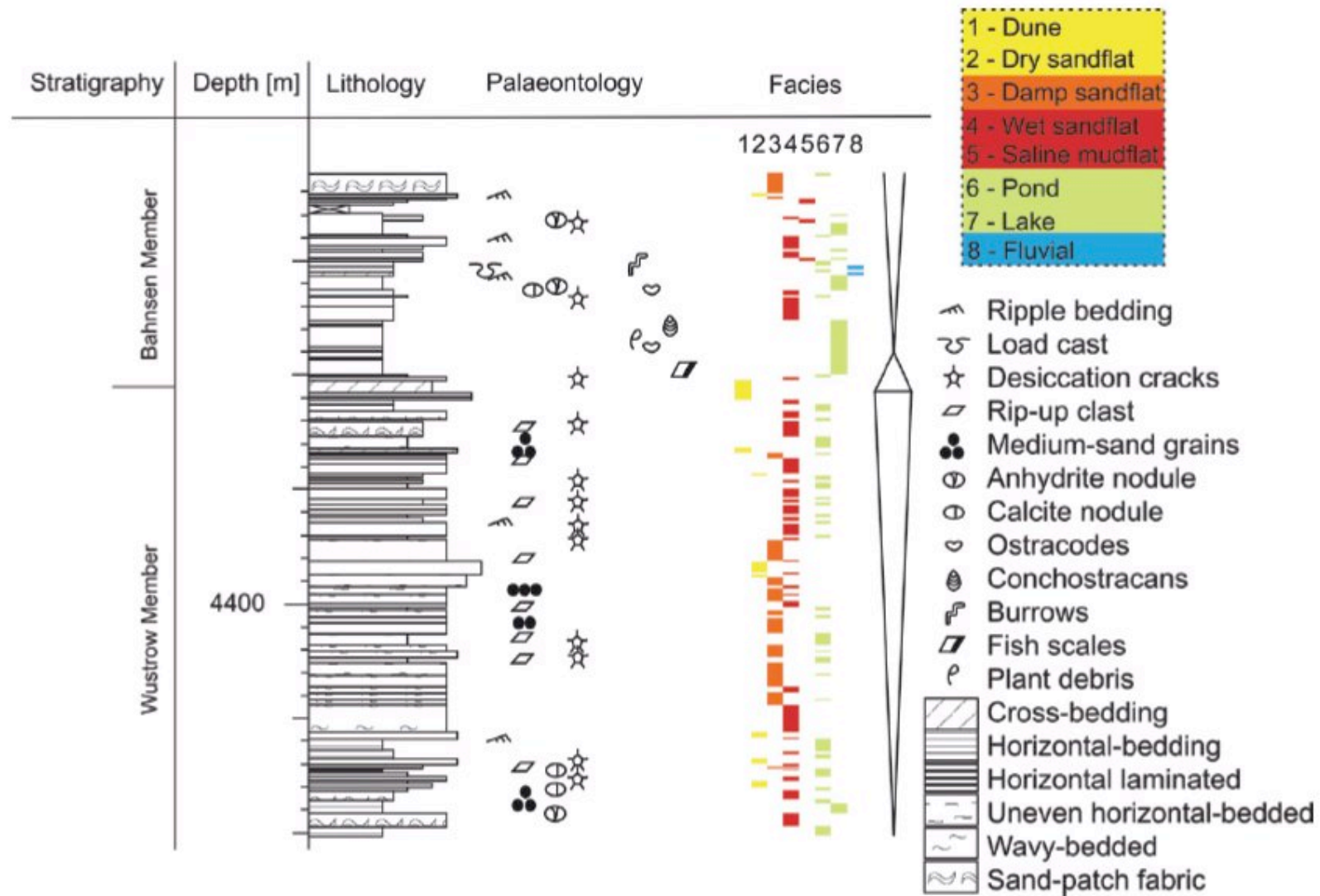
Gast (1989) Plein (1995)

Gaupp (1990)



Wustrow cycle Sedimentology

Rotliegend depositional cycles



Legler & Schneider (2008)

An aerial photograph showing a vast, flat landscape, likely a salt flat or a large body of water, with a horizon line. The sky is filled with large, white, fluffy clouds. In the distance, a small, dark structure is visible on the horizon. The overall scene is bright and expansive.

Thank you for your attention

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