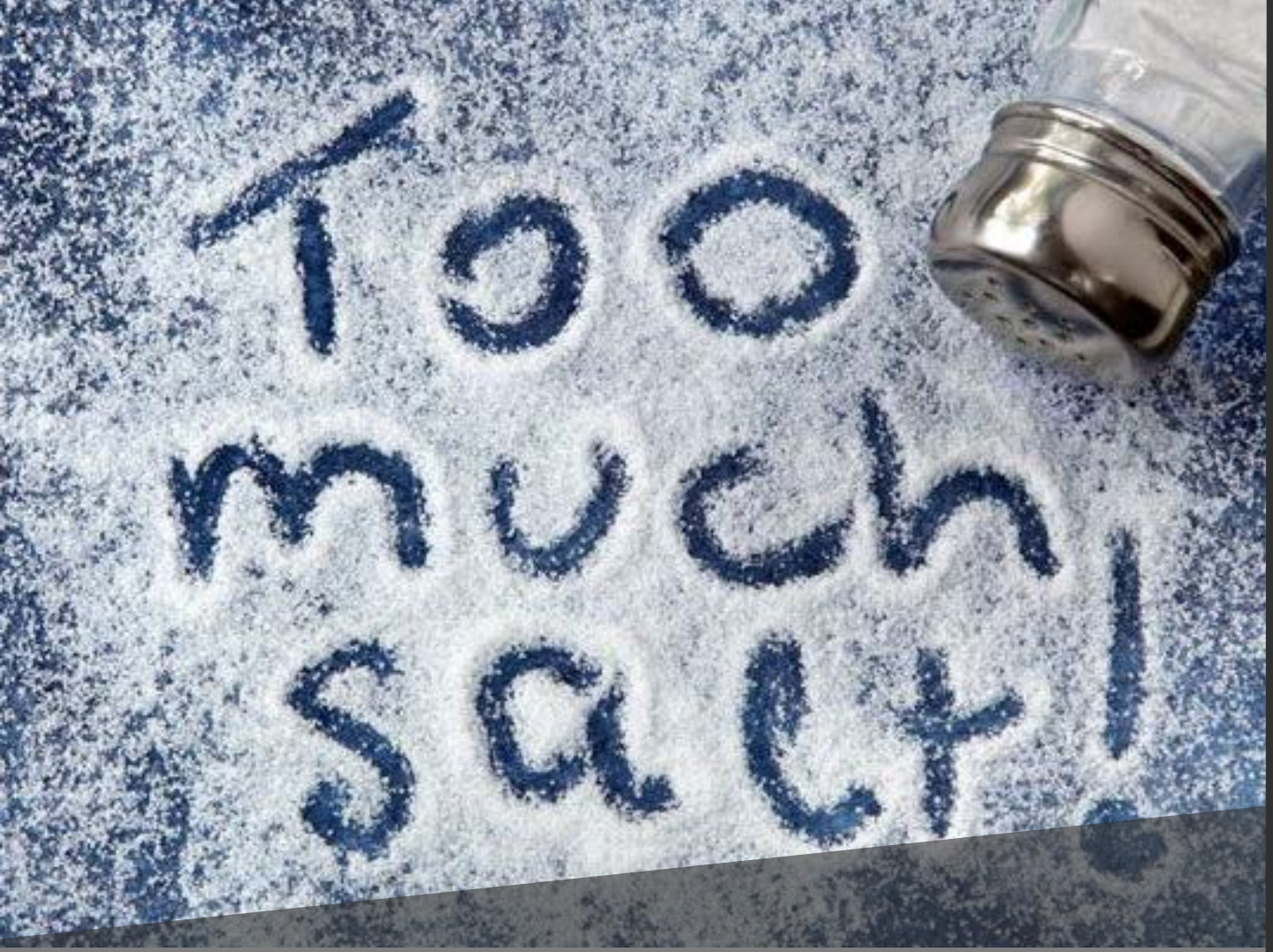
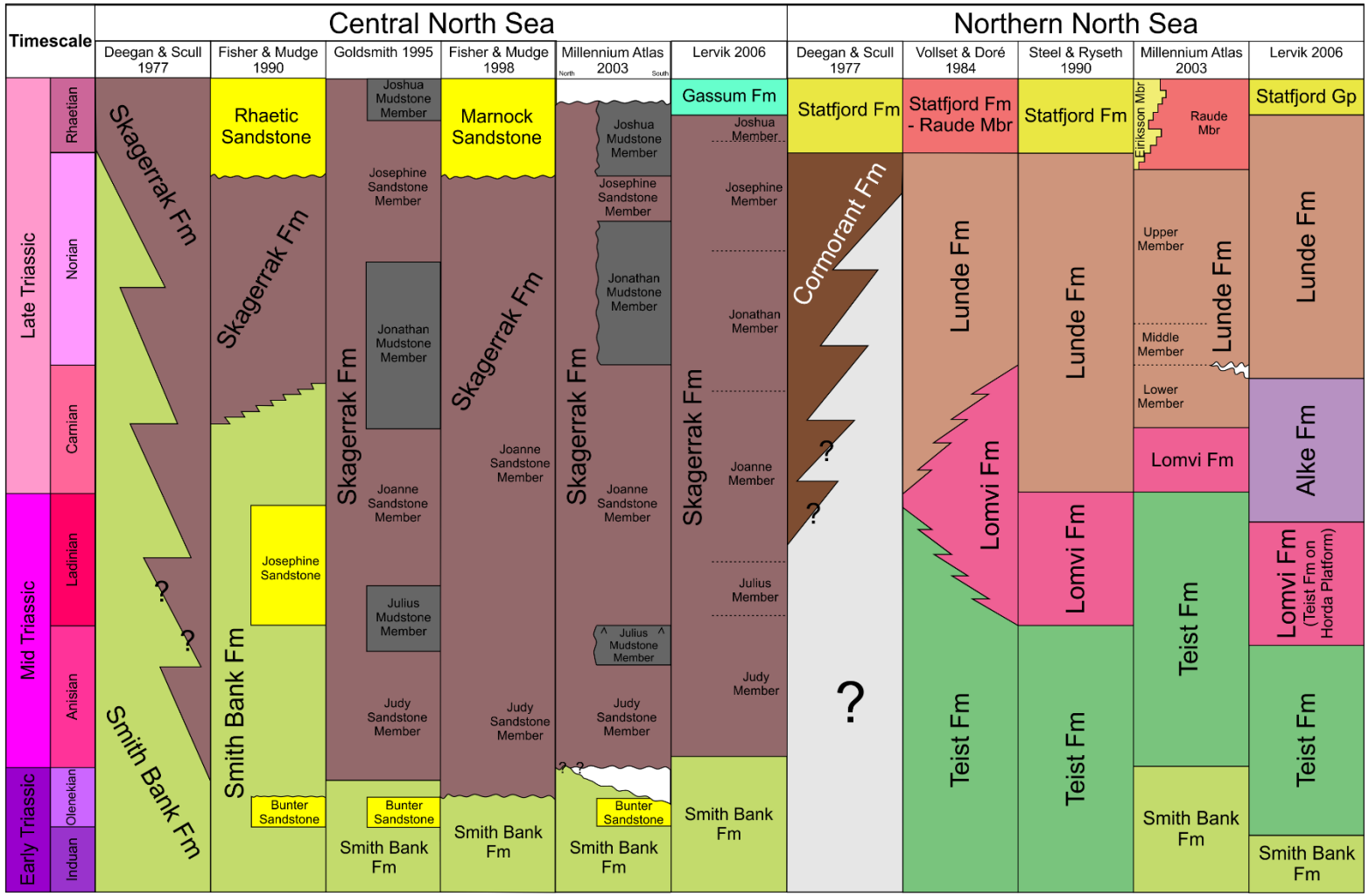


The Hegre Group – a complex stratigraphic interval: Example from the Greater Sleipner Area

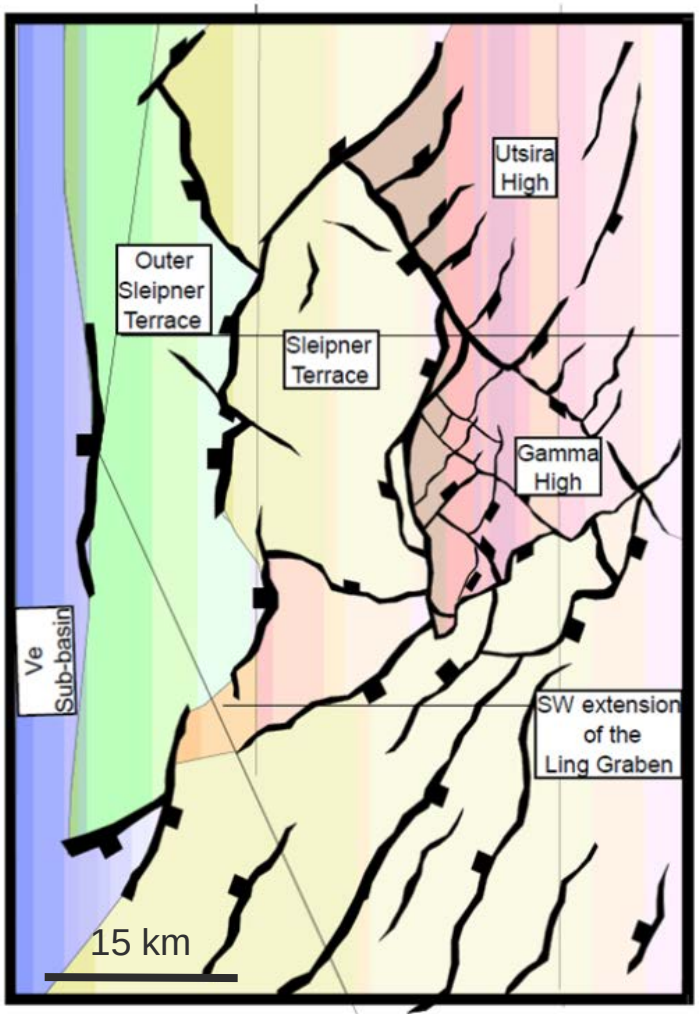
Anna Kulikova, Andreas Rittersbacher, Silvan Hoth, James Elgenes, Signe Ottesen and Annika Therese Ulfsdotter Heggheim

20 June 20

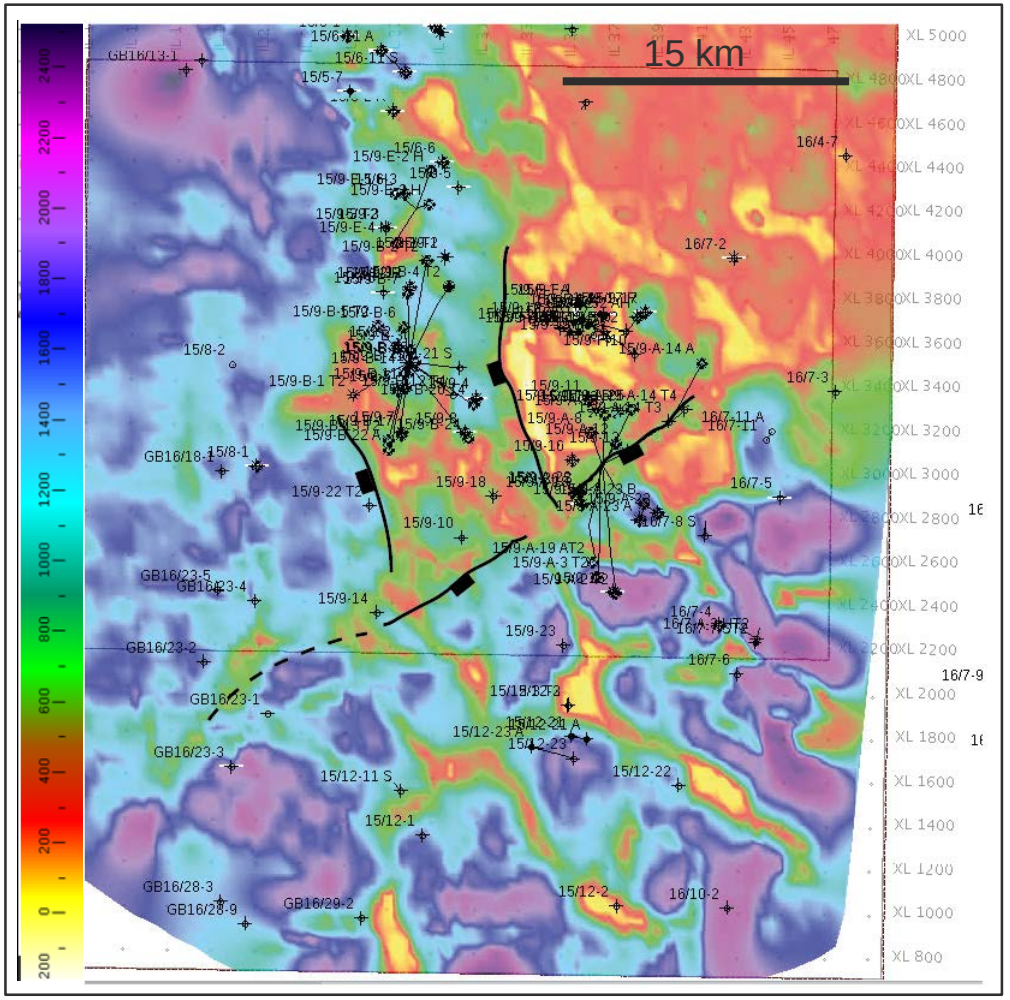
Stratigraphy challenge



Salt tectonics



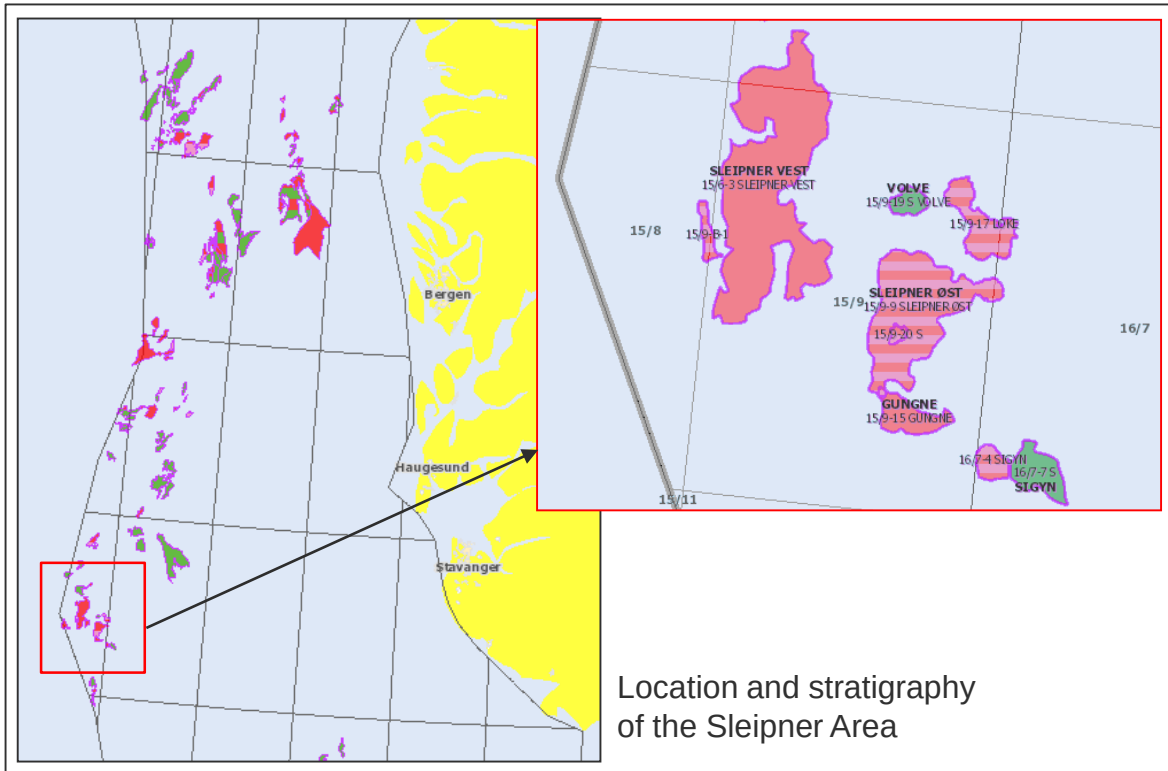
Permian fault blocks (Signe Ottesen, 2001)



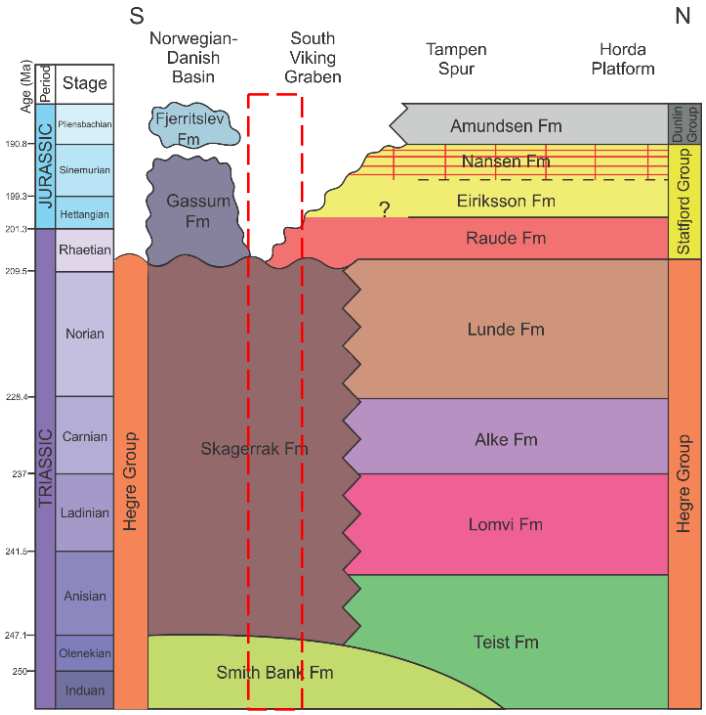
Top Zechstein -Top Sleipner Fm thickness map

Objectives of the study

- Enhance the understanding of the deposition of a Triassic reservoir in the Sleipner Area
- Enhance the decision making for potential Triassic exploration projects

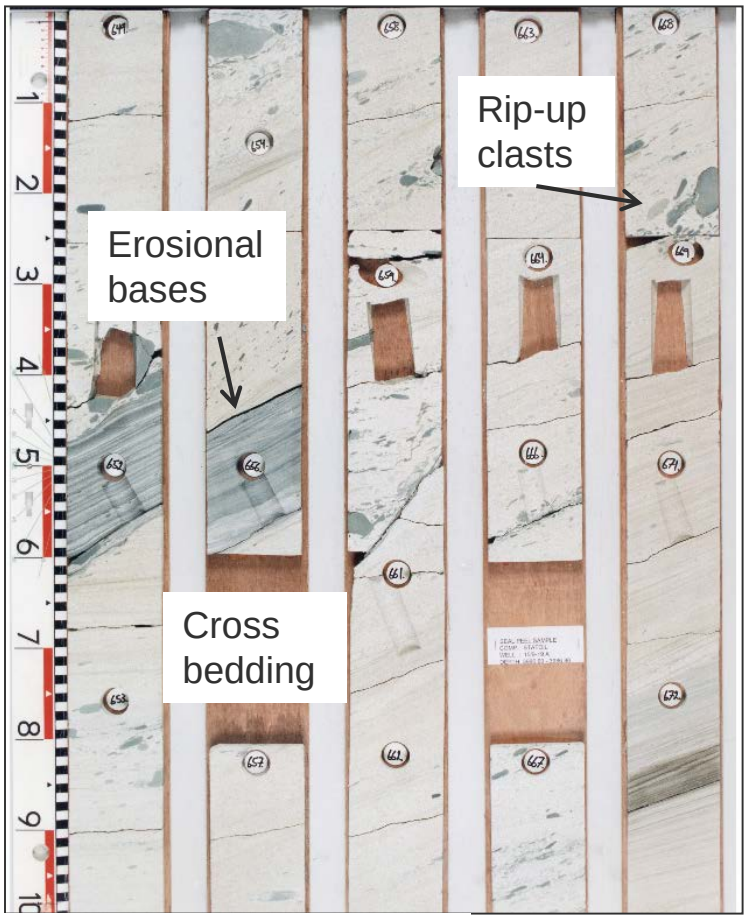


Location and stratigraphy of the Sleipner Area



Facies from core: Proximal-medial part of a fluvial system

Amalgamated channel fill deposits and paleosols

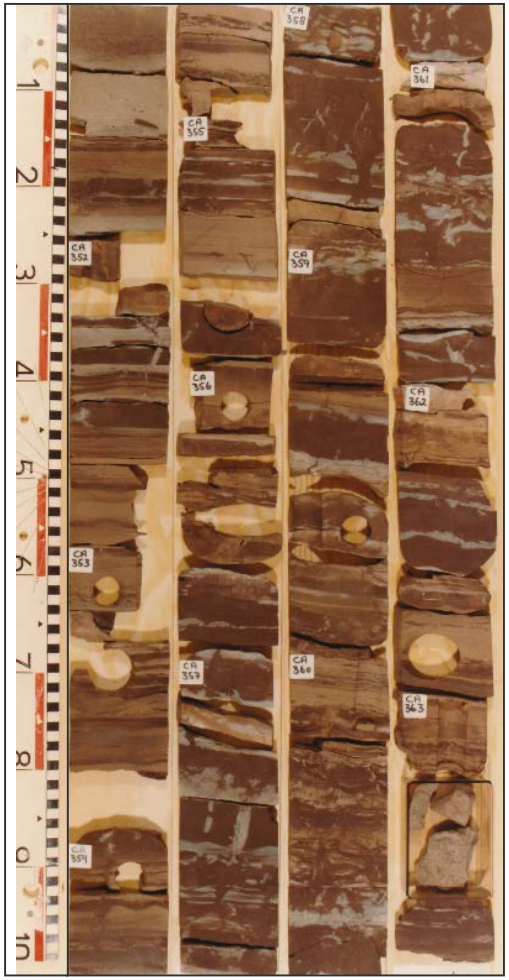


Channel fill deposits

Paleosols with caliche

Facies from core: Distal alluvial plain

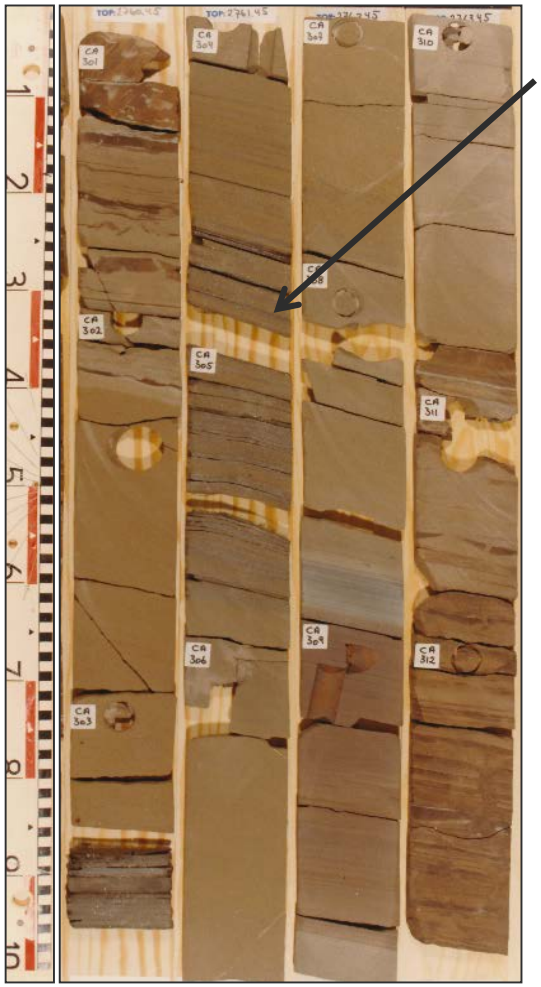
Alluvial plain / ephemeral lake



- Wave ripple & horizontal lamination
- Roots, burrows
- Mudcracks and rip-up clasts
- Quiet setting

Similar to examples of Smith Bank in UK sector (McKie, 2014)

Terminal splay/ lake delta



- A lot of mica – ponding, low energy
- Parallel lamination
- Gradational boundaries
- Unconfined flow

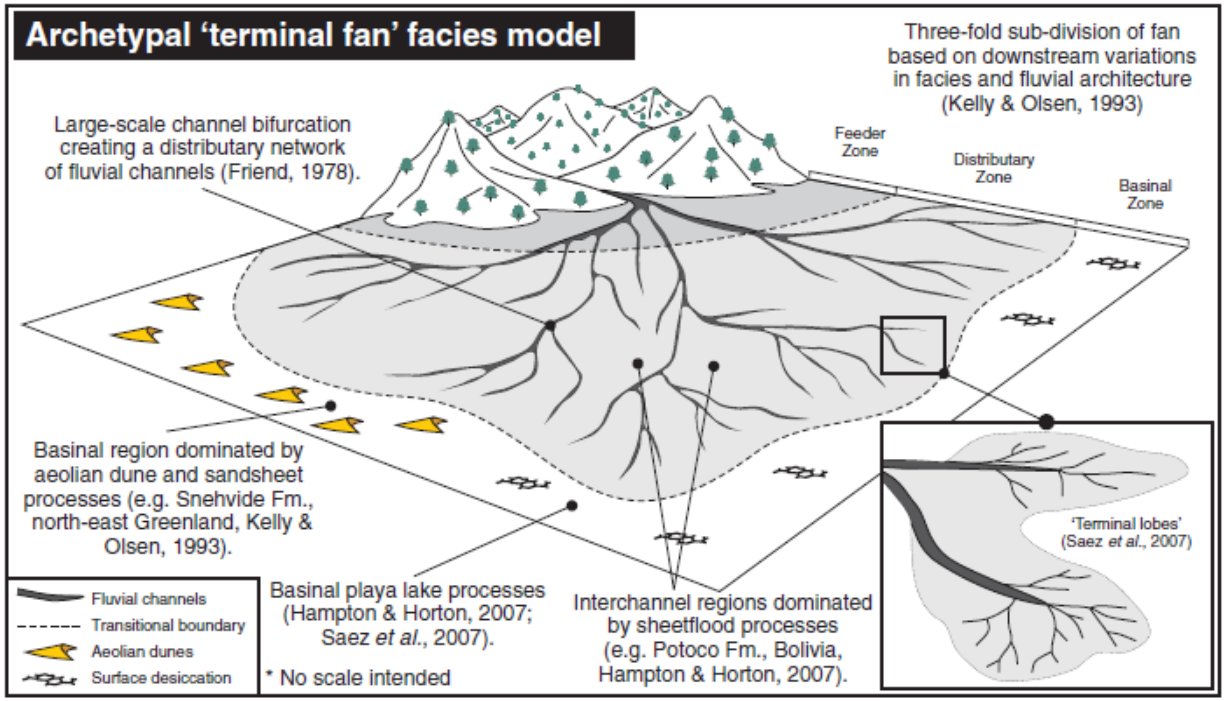
Facies model

Proximal to medial part of a fluvial system

- Channelized flow, maximum reworking
- Amalgamated sandstones, floodplain is reworked and transported downstream

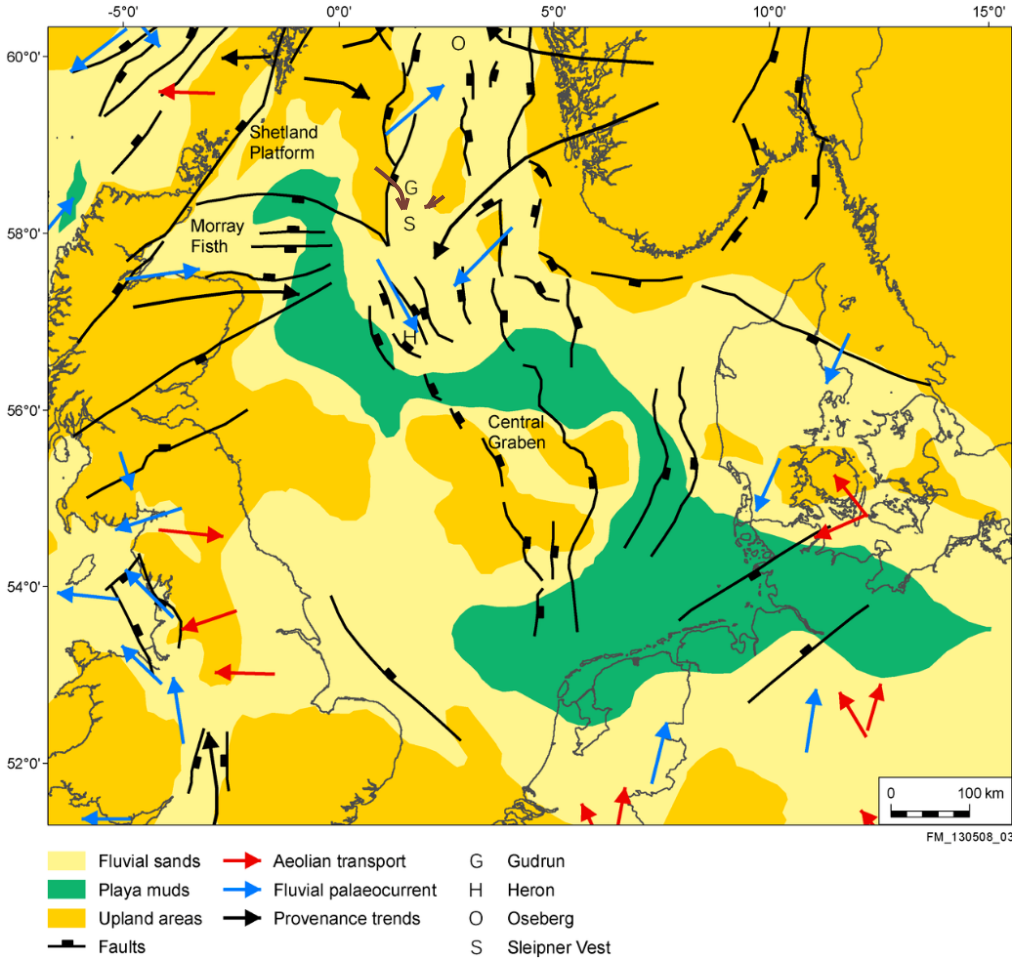
Distal dry alluvial plain, terminal splays, lakes

- Unconfined flows from terminal splays
- Standing bodies of water - ephemeral lakes / ponds
- Aeolian?



Cain & Mountney, 2009

Transport direction



Likely towards East / Southeast

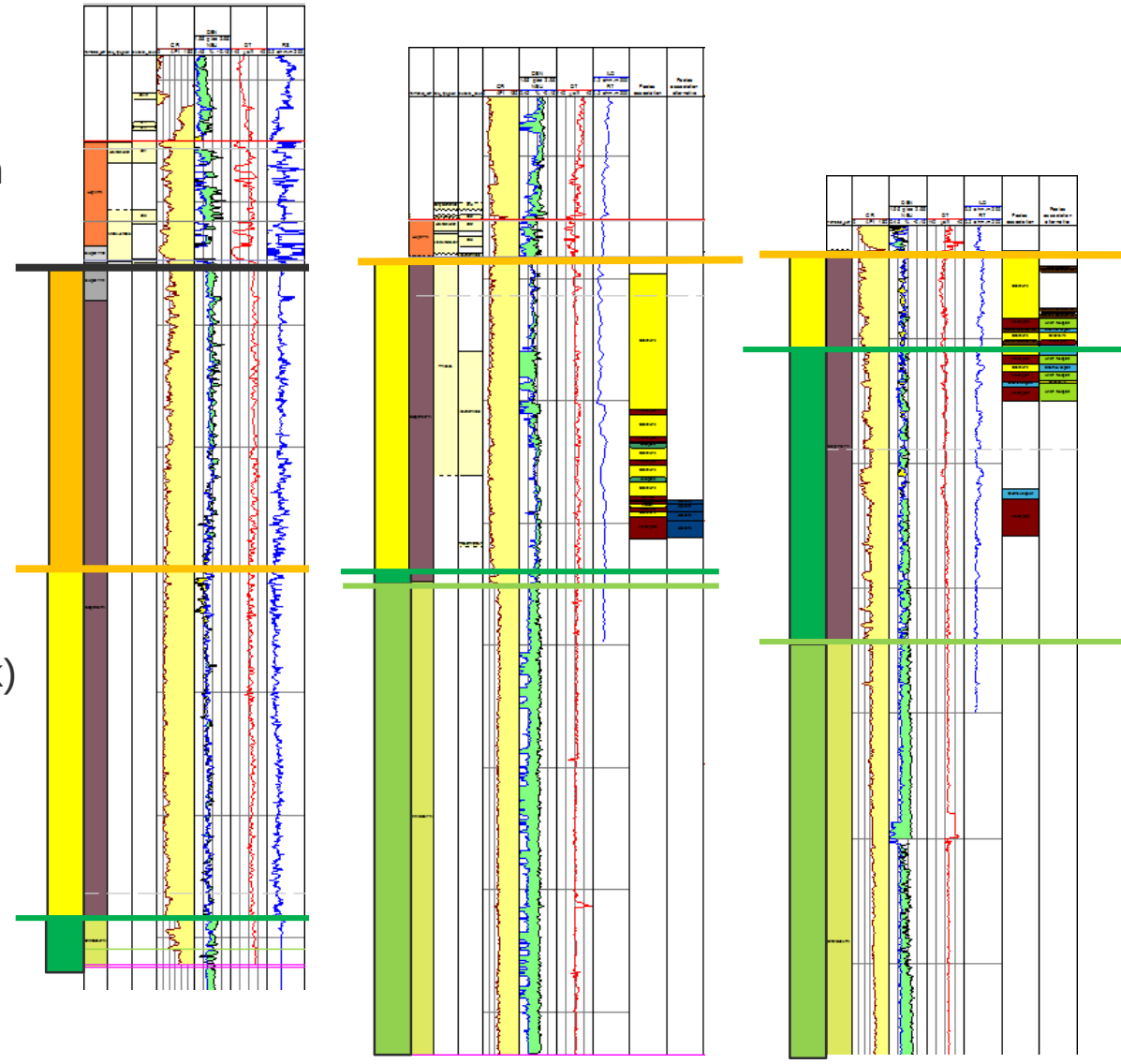
Possible source from the Utsira High

Paleogeography is taken from McKie (2012) Figure 19a. Sediment dispersal is taken from McKie and Williams (2009). Active faults are taken from the Millennium Atlas (2003)

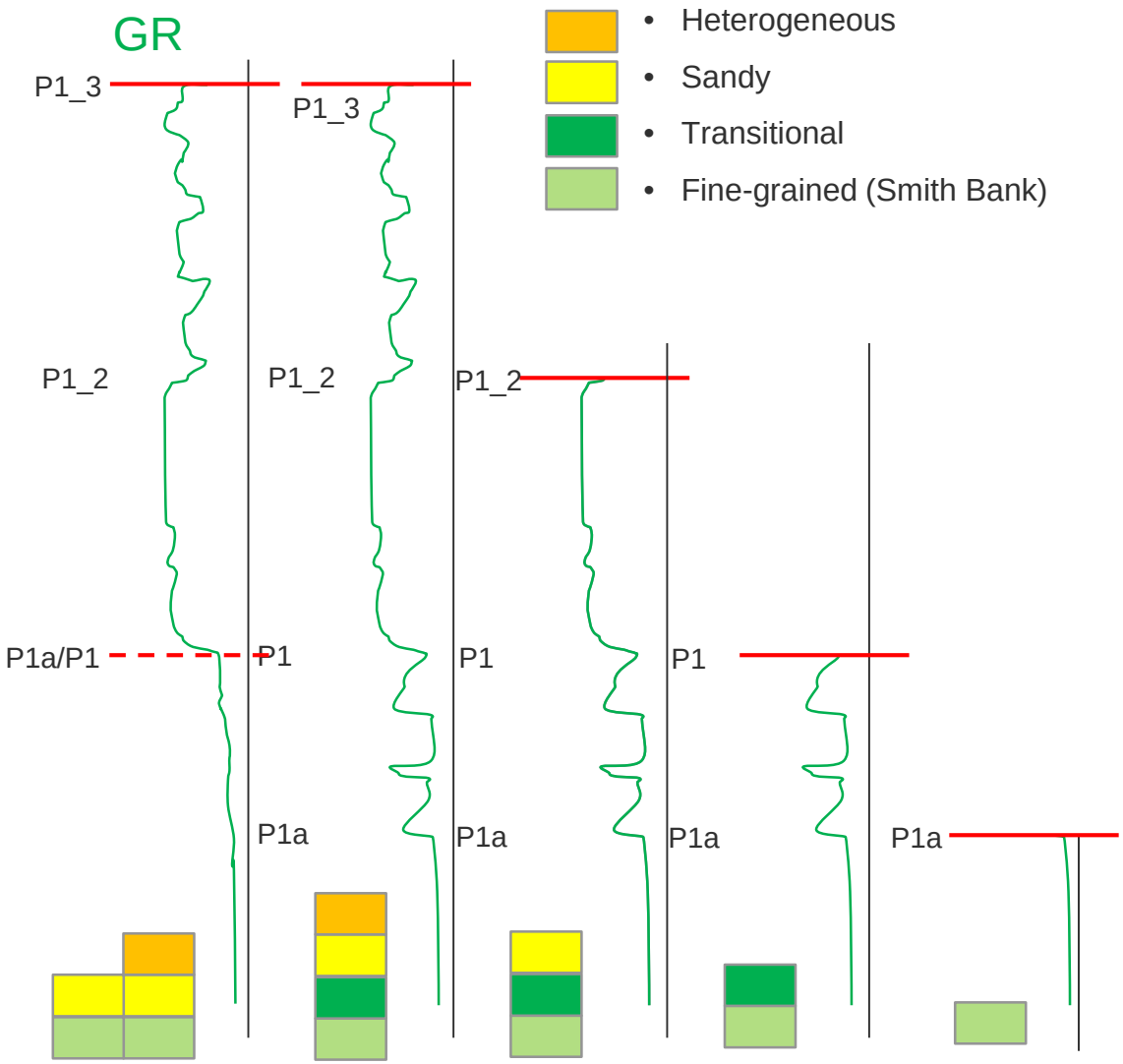
Intra Triassic lithological packages

- Lack of biostratigraphic data
- **Lithostratigraphic correlation**

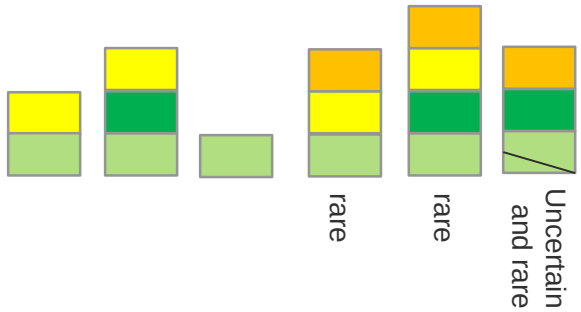
- Heterogeneous
- Sandy
- Transitional
- Fine-grained (Smith Bank)



Combinations that occur at Sleipner East

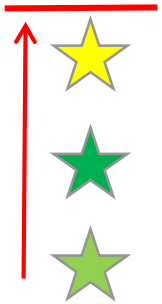


- Heterogeneous
- Sandy
- Transitional
- Fine-grained (Smith Bank)



- If succession of identified packages is depositional and correct:
  - Progradation of fluvial system has occurred
  - Erosion could be an important factor in preservation of sandstones of the upper packages
- As packages are similar and thick – the fluvial system covered a large area and was flowing without restrictions.

Accommodation vs Sediment supply



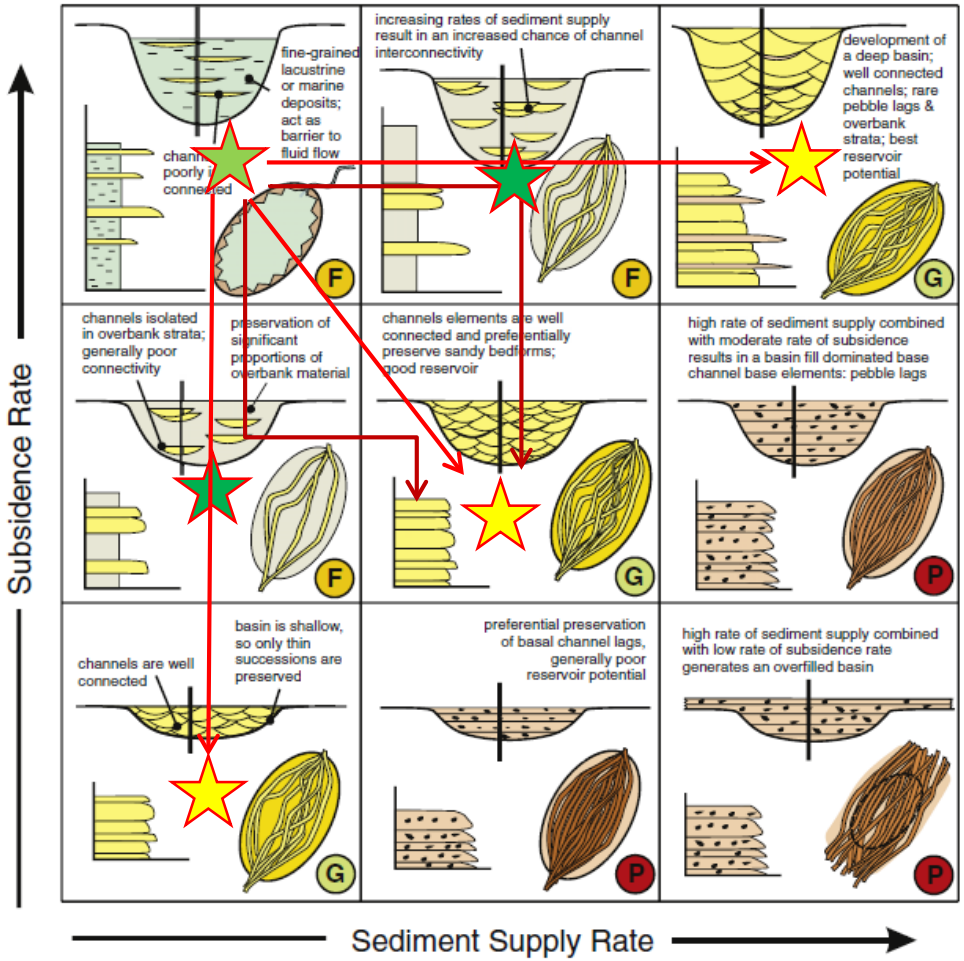
Sandy amalagmated package

Transitional package

Fine grained package

- Progradation of the fluvial system
- Decrease in subsidence rate or increase in sediment supply or a combination of both

- NOTE that lateral change in facies could occur due to proximal to distal variations



Banham & Mountney, 2013

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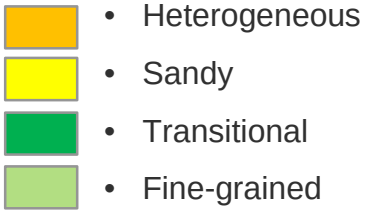
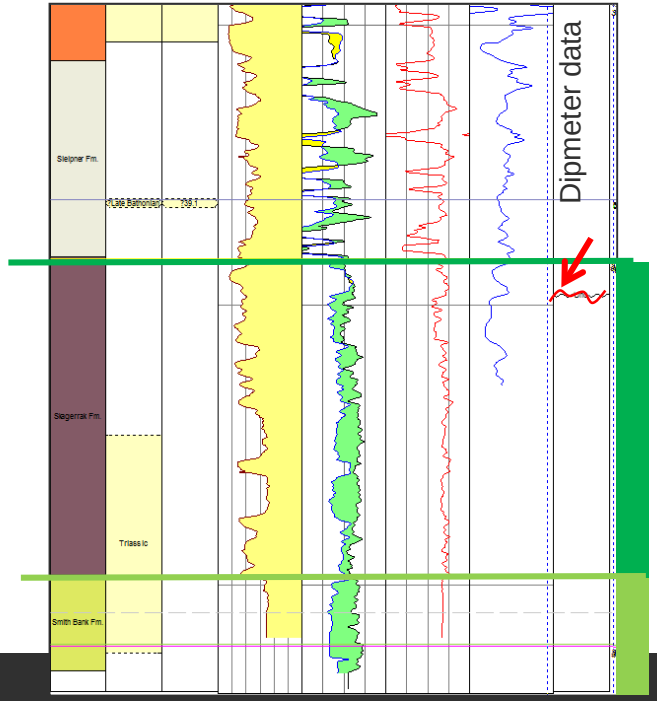
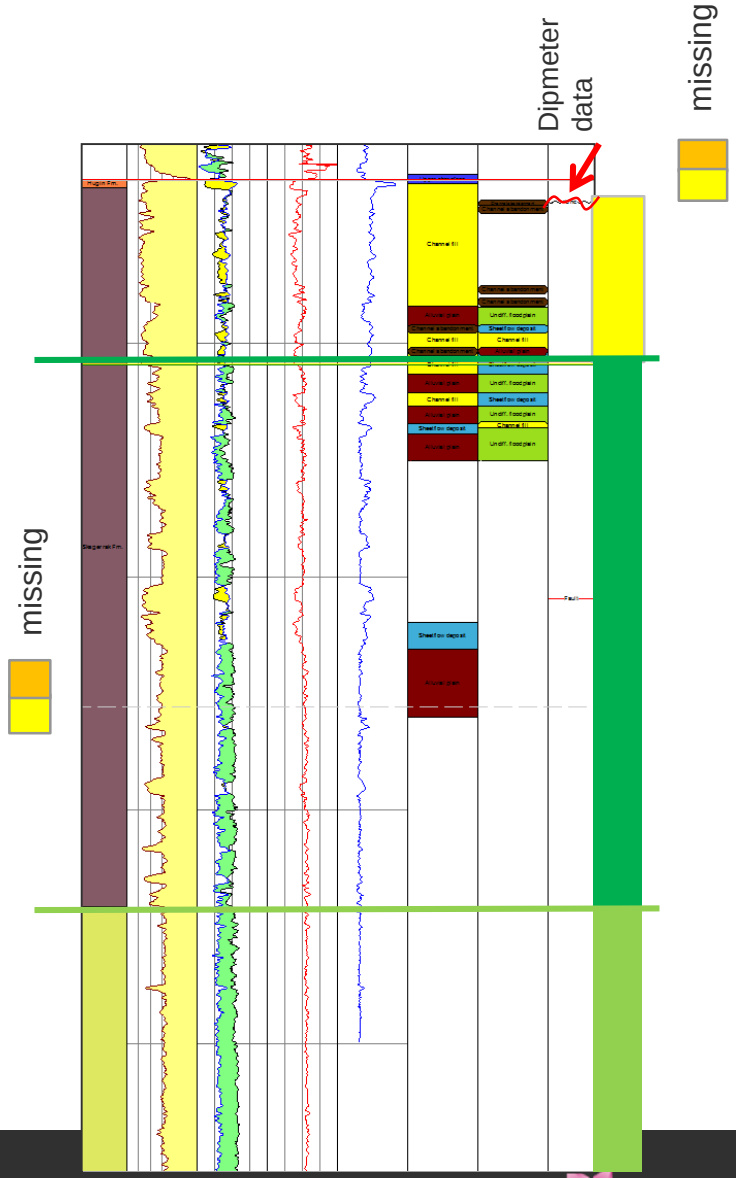
Evidence of erosion at the top of Triassic succession

- Assuming that succession of lithological packages is depositional and correct
- Different uppermost packages are missing in a number of the wells
- Unconformities have been observed at the top Triassic from dipmeter data
- Unconformities are also observed on seismic data

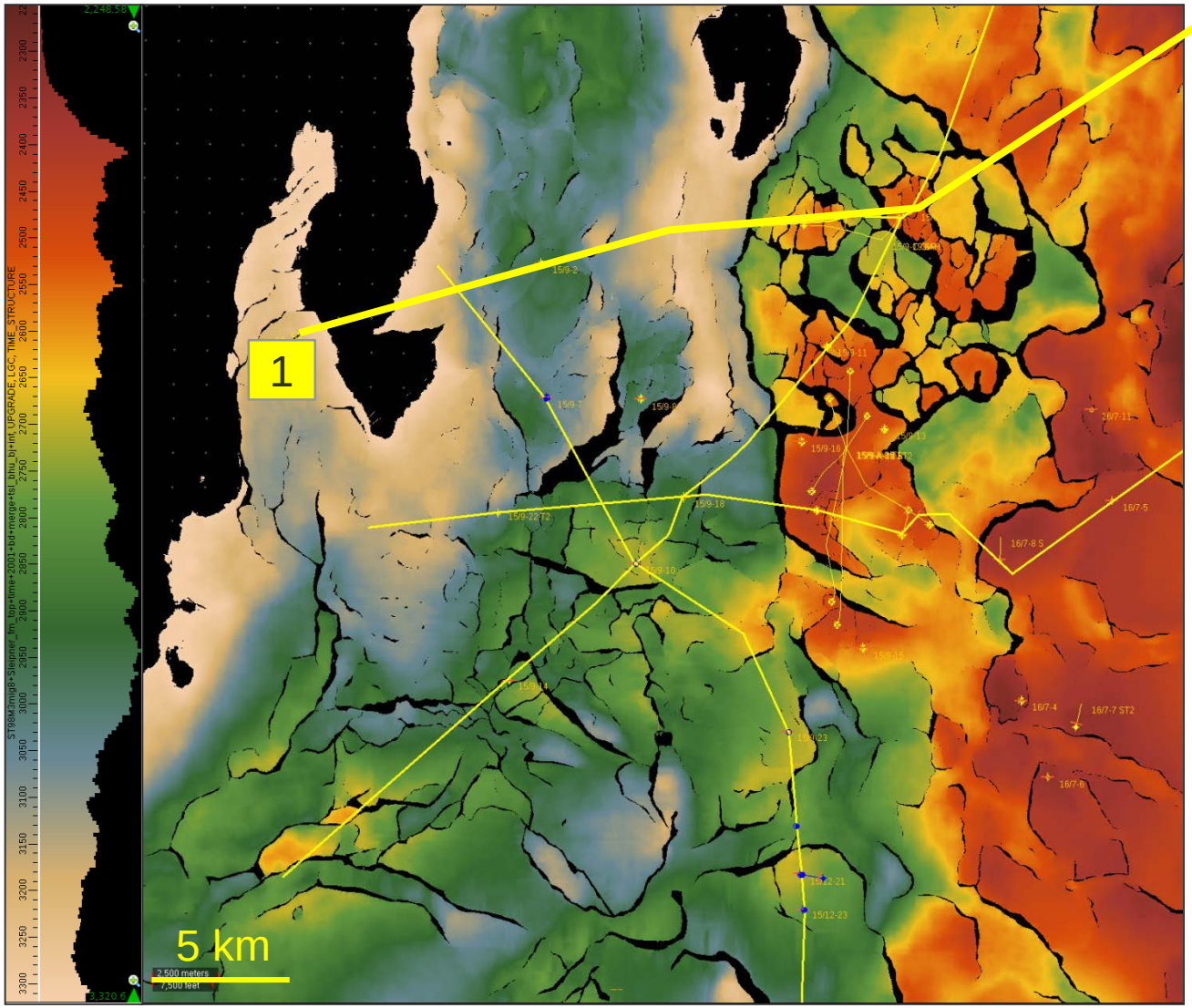


- Heterogeneous
- Sandy
- Transitional
- Fine-grained

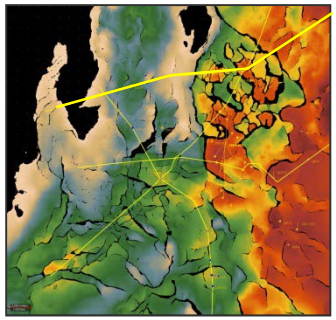




Correlation and seismic section lines



Well Correlation Line 1



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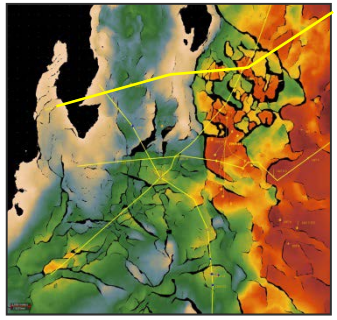
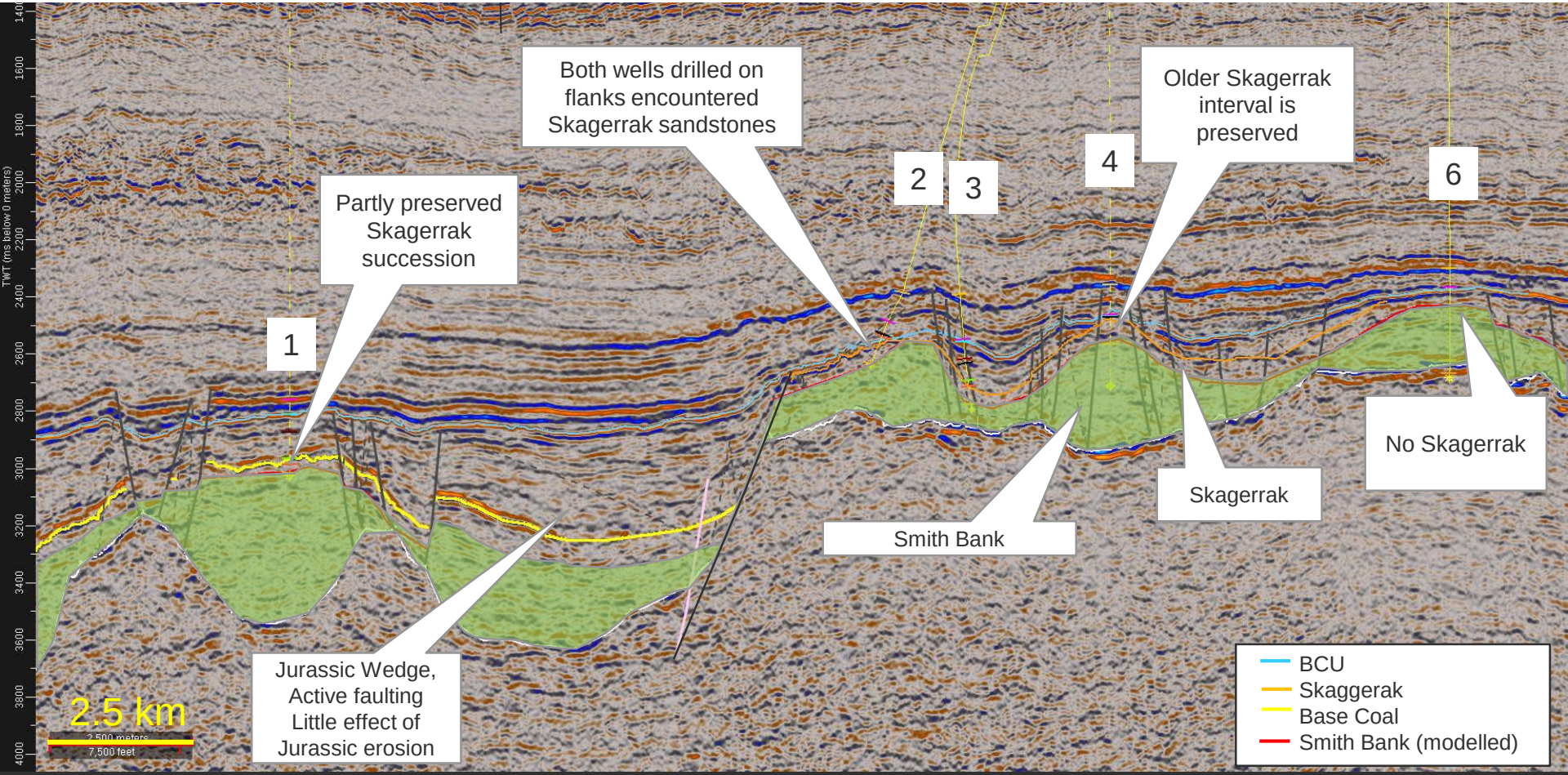
Seismic section Line 1

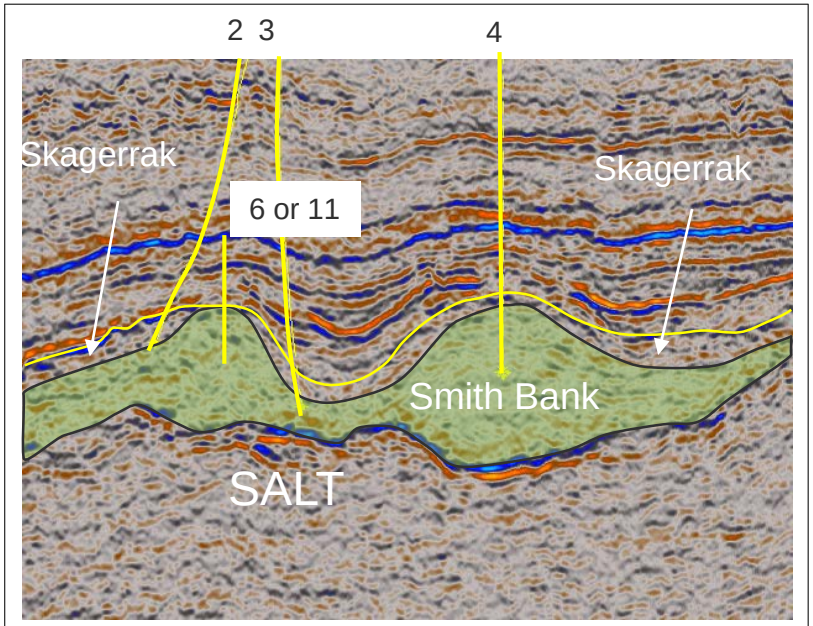
- Sandy Skagerrak package is missing on top of the mini-basins and present on the flanks
- Faulting played a role as well





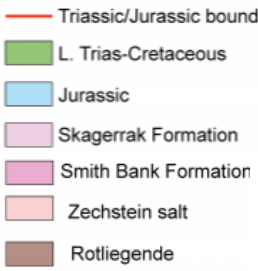
Salt sediment interaction model

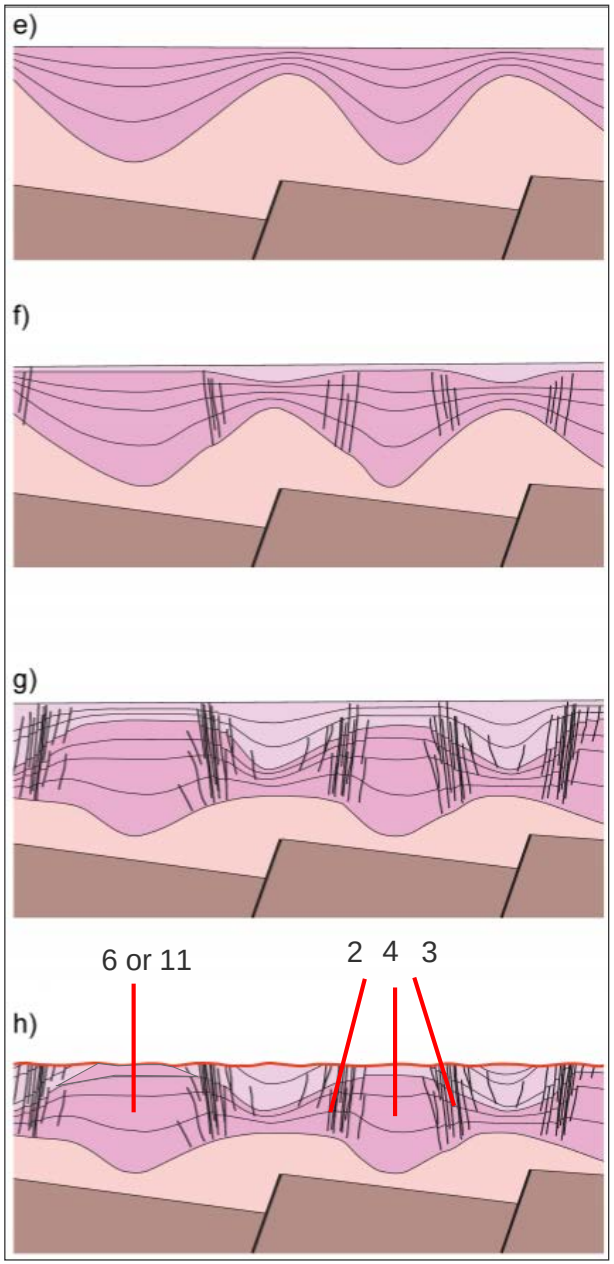
1. Smith Bank – increased thickness in salt mini-basins
2. Deposition of Skagerrak across the area with potential depocentres or differential preservation above salt crestal collapse structures
3. Aalenian unconformity (Jurassic erosion) – partly or fully removes Skagerrak sandstone package



Sleipner Field example

Model modified from McKie, 2014





Conclusions for the Sleipner Area

- Skagerrak fluvial system was active across the whole area and prograded towards SE during formation of crestal collapse structures
- Erosion removed parts of Skagerrak deposits from tops of the inverted salt mini-basins
- Skagerrak sandstone is mainly preserved on the flanks of the inverted salt mini-basins and in the depocentres between the mini-basins, and partly on the top of the mini-basins
- Salt - sediment interaction models by McKie (2012, 2014) allow for the well and seismic observations made in the Sleipner Area
- Correlation of lithostratigraphic packages in absence of biostratigraphic data seems to be plausible, but uncertainty on the chronostratigraphy remains
- Hegre Gp is complex stratigraphic interval affected by a **combination of fluvial system dynamics, salt movements and Jurassic erosion**

Statoil. The Power of Possible

Questions?

Presentation title

The Hegre Group – a complex stratigraphic interval: Example from the Greater Sleipner Area

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