The influence of allogenic controls on facies variability within two basins: the Triassic Sherwood Sandstone Group of Central and Northern England

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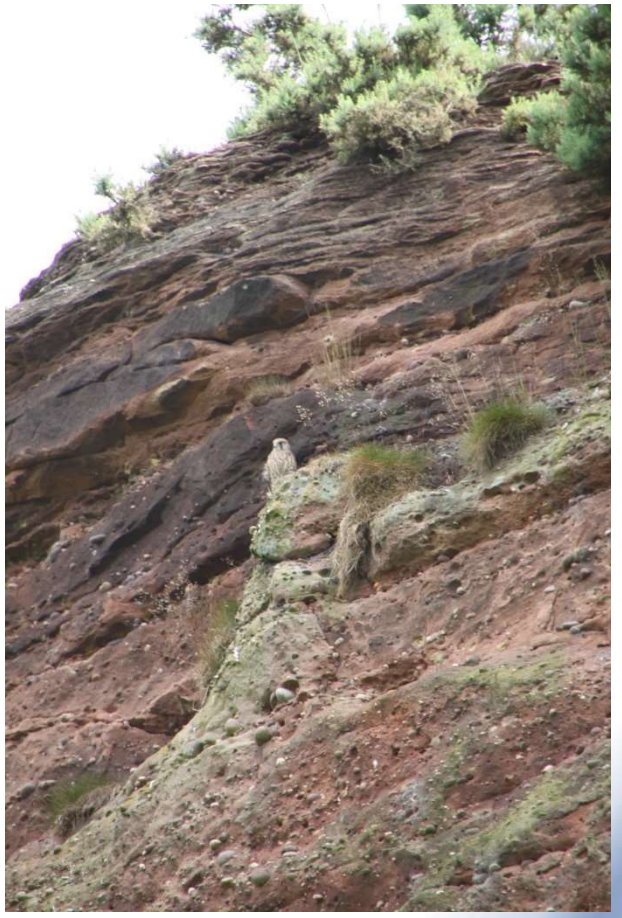
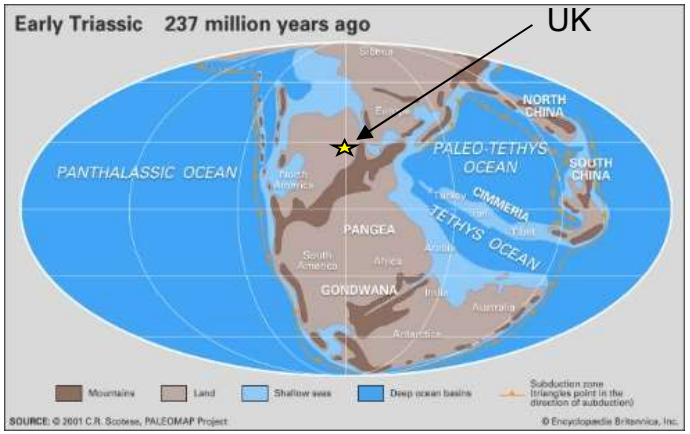
Introduction

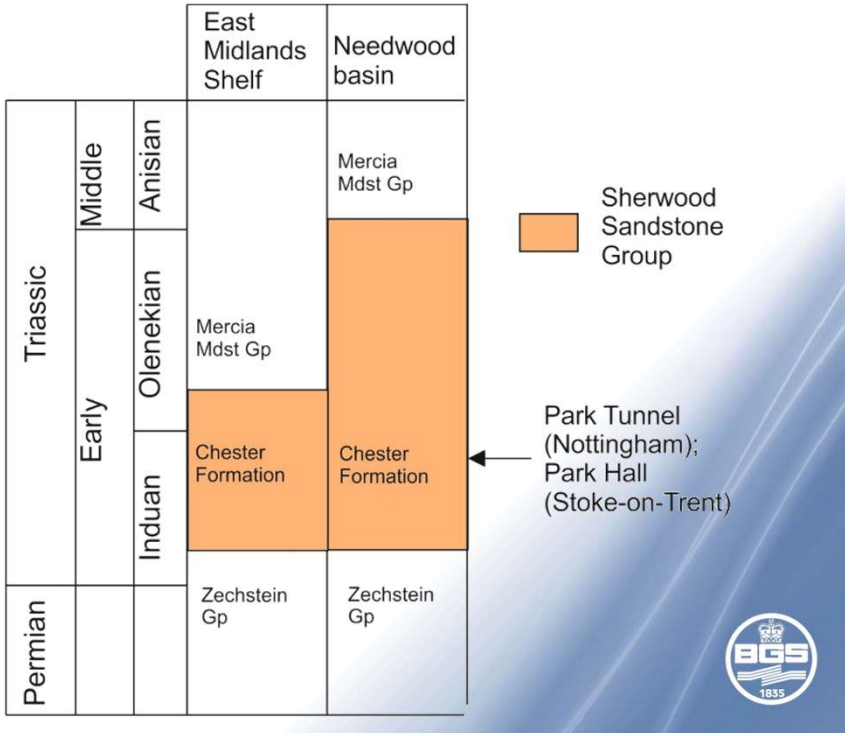
- *Why study the Sherwood Sandstone Group?*
  - *Hydrocarbon reservoirs*
  - *Major aquifer*
  - *Industrial legacy (contamination)*
- *Why do we care about allogenic controls on facies variability?*
  - *Facies prediction away from data points*
  - *Systems bigger than single depositional basins*



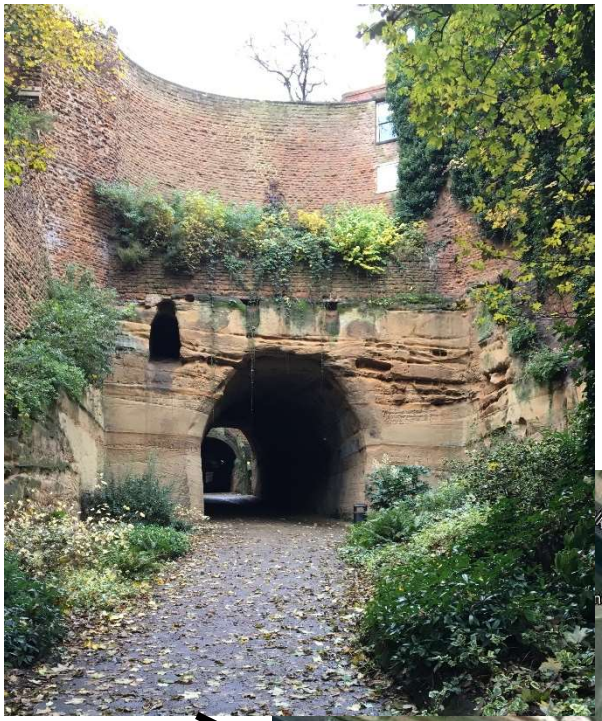
Basin overview

East Midlands 'Shelf' basin vs Needwood Basin

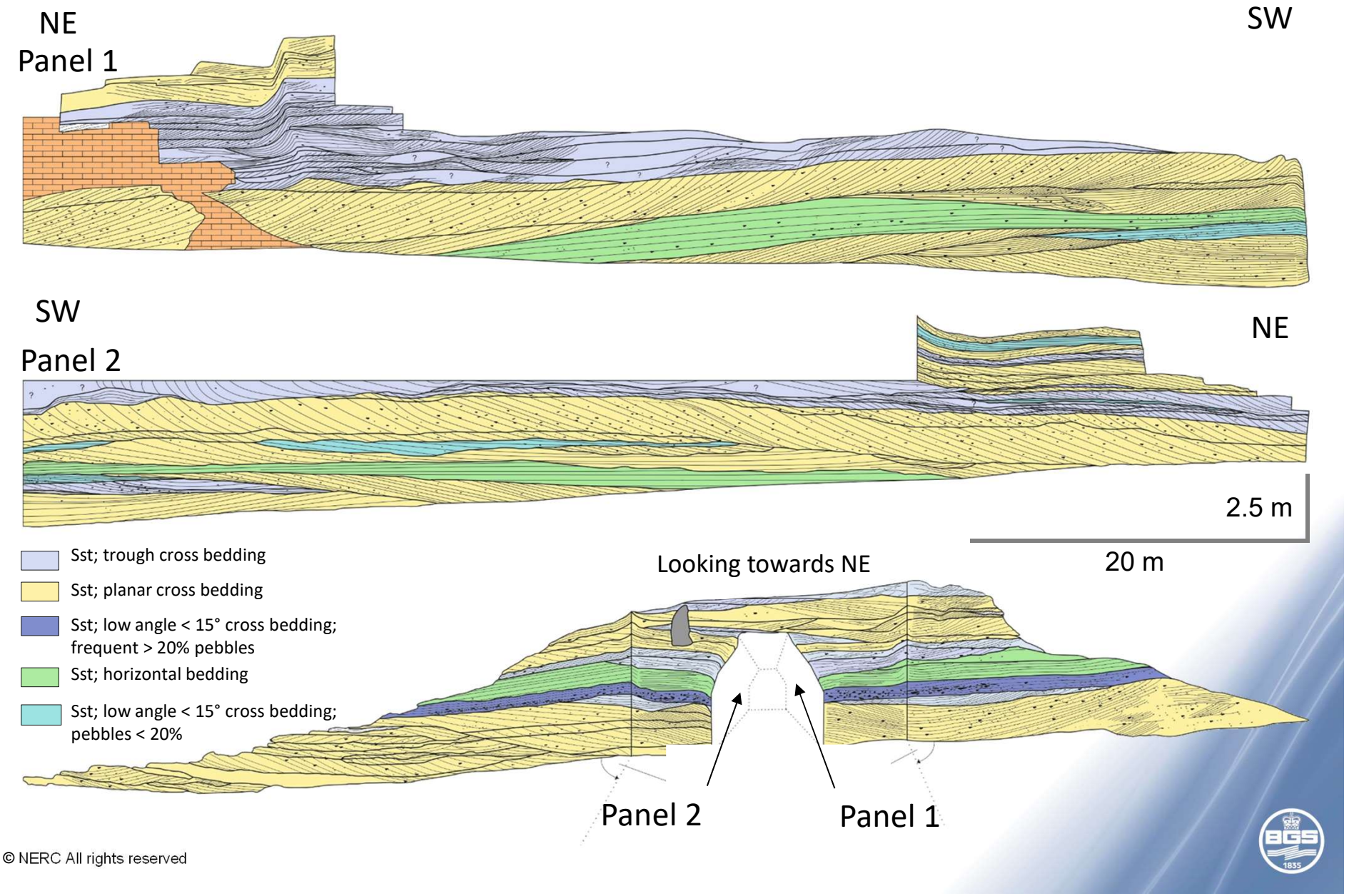


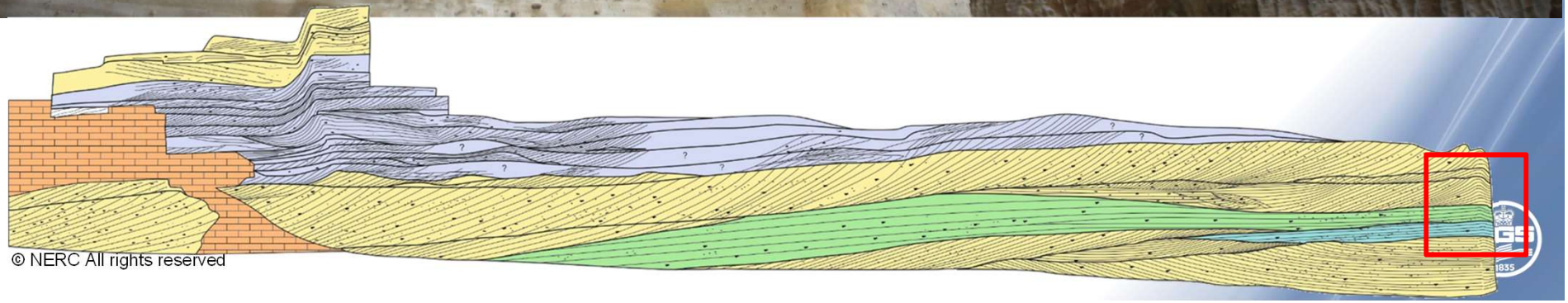


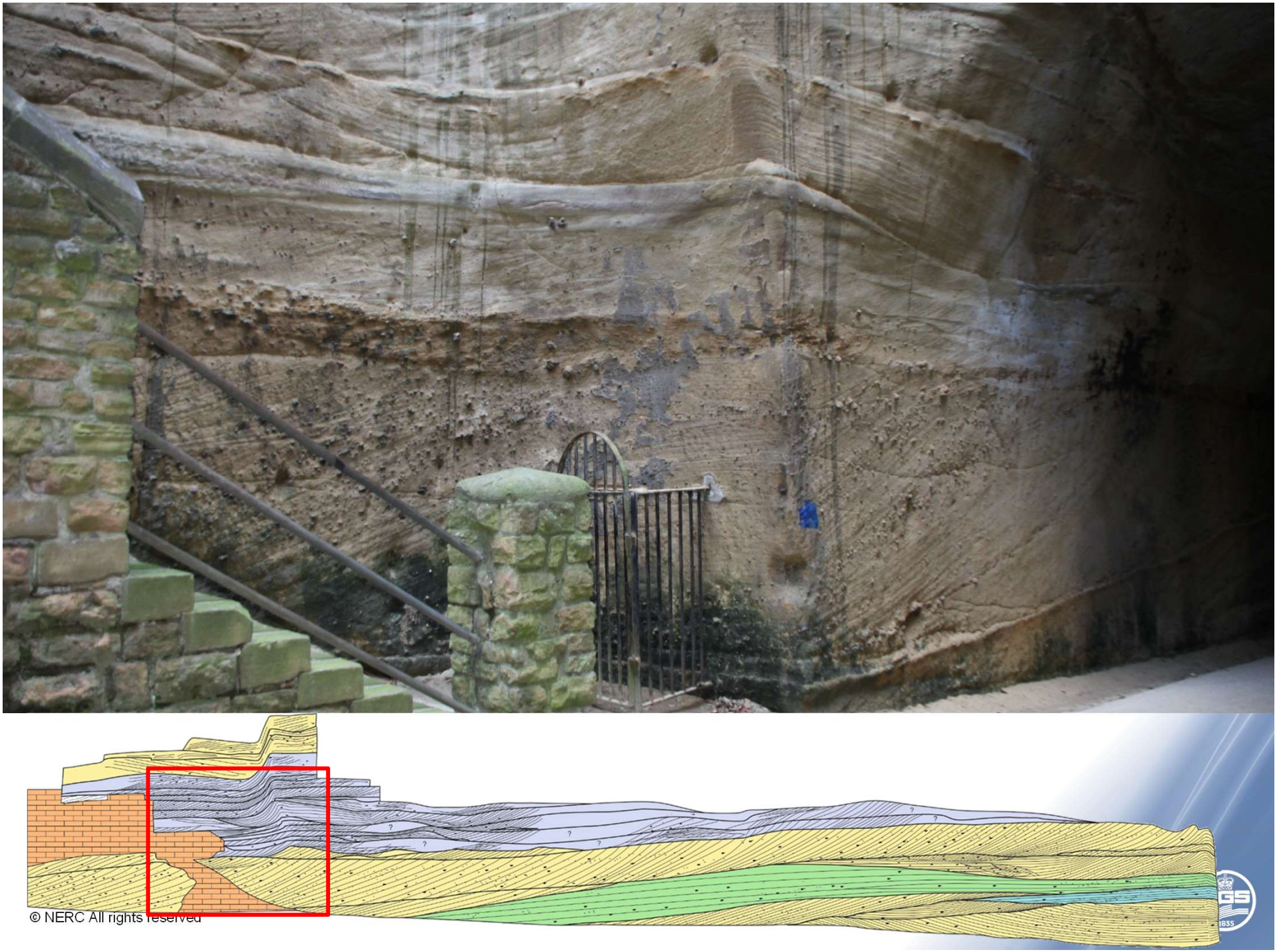
East Midlands Shelf

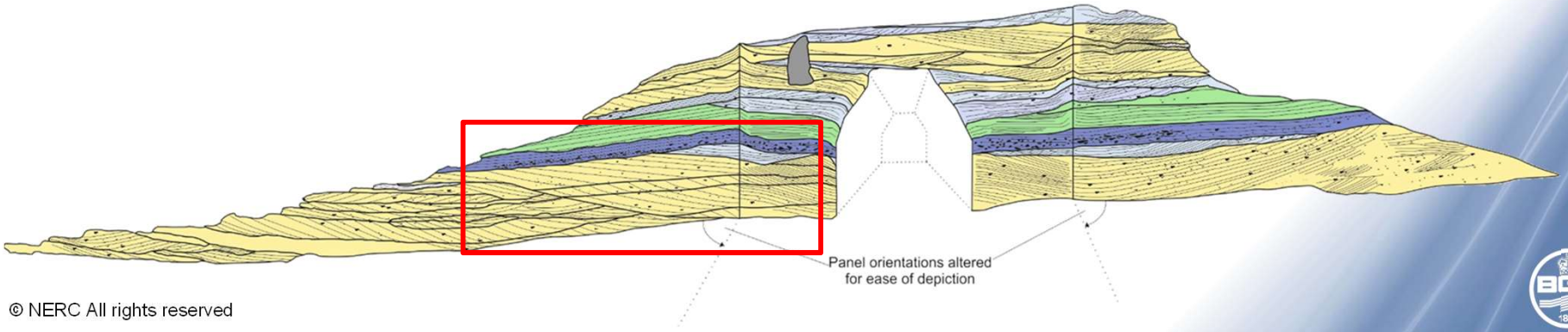


Park Tunnel, Nottingham city centre

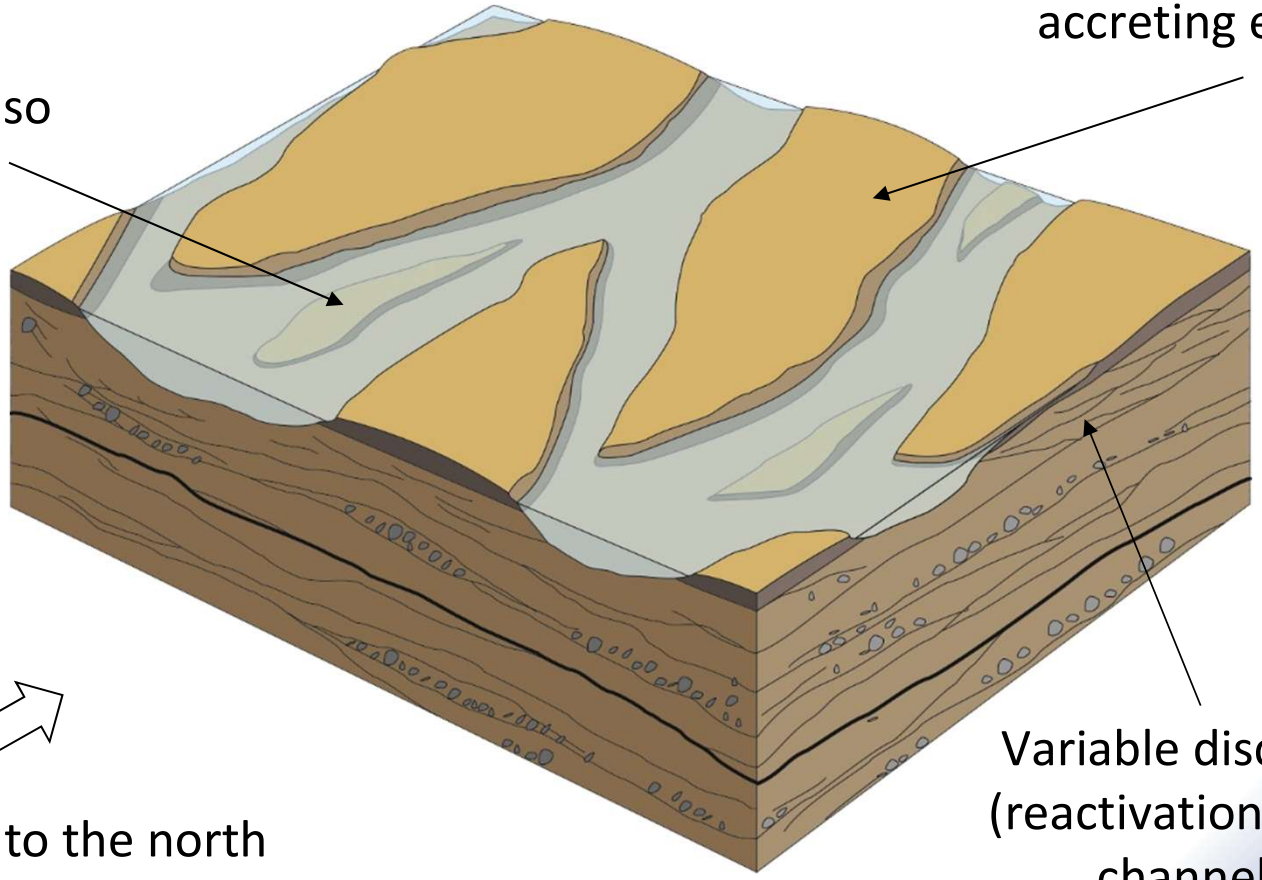








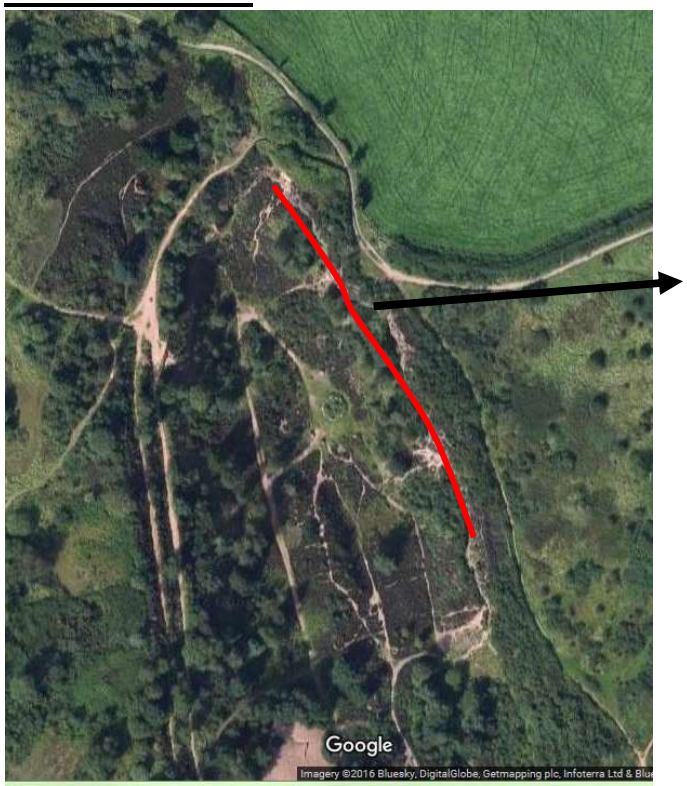
East Midlands Shelf



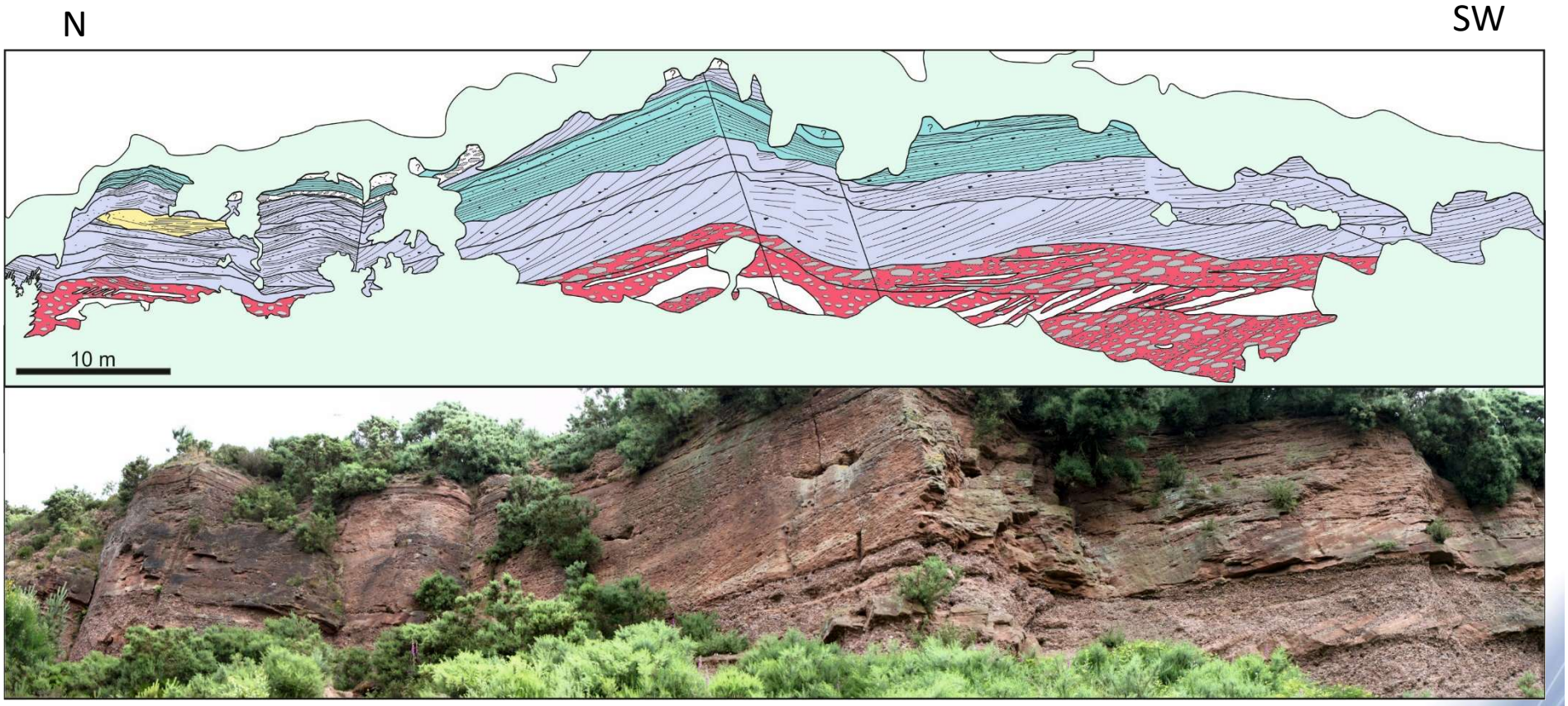
Needwood Basin

Park Hall, Stoke-on-Trent

80 m

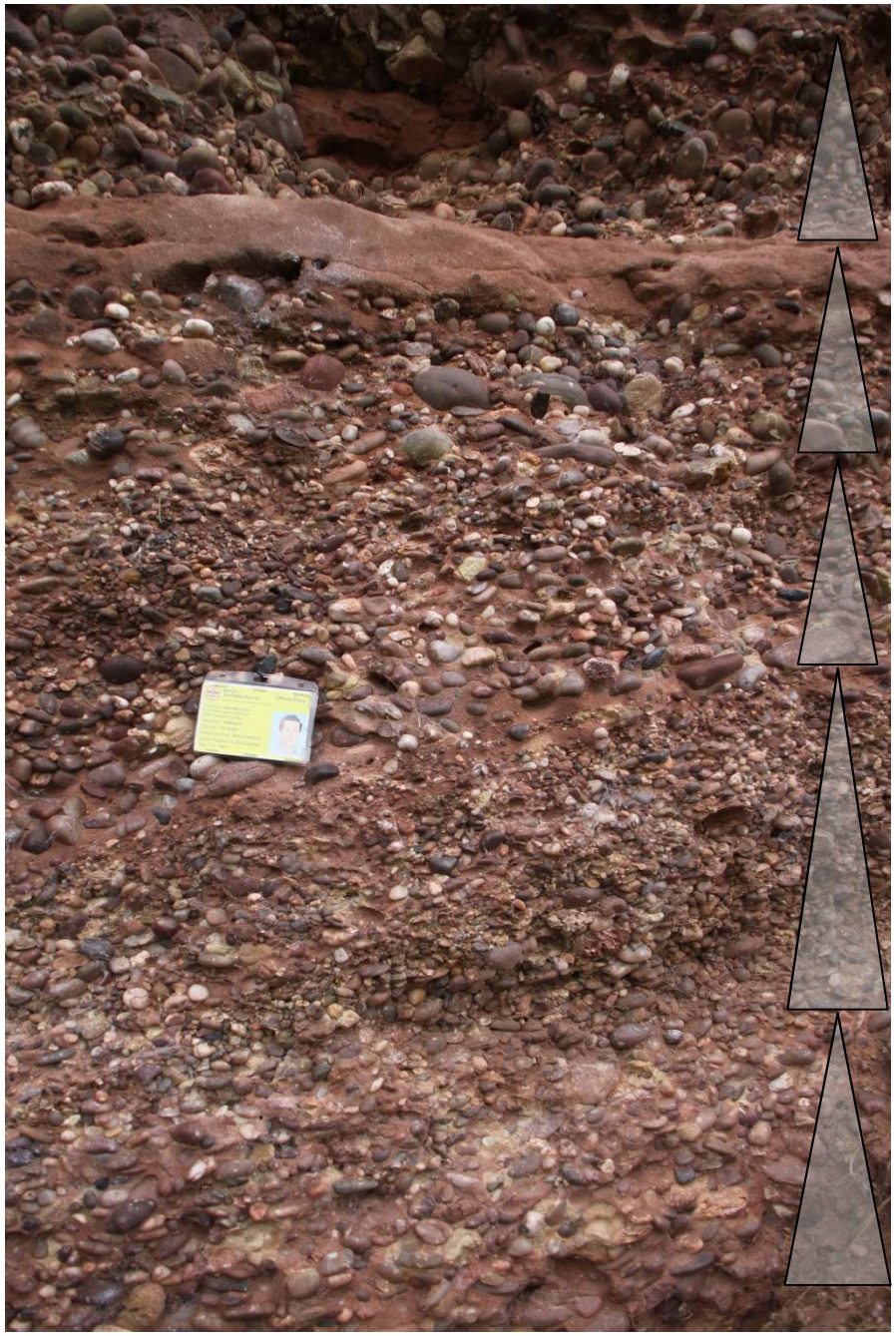


Needwood Basin

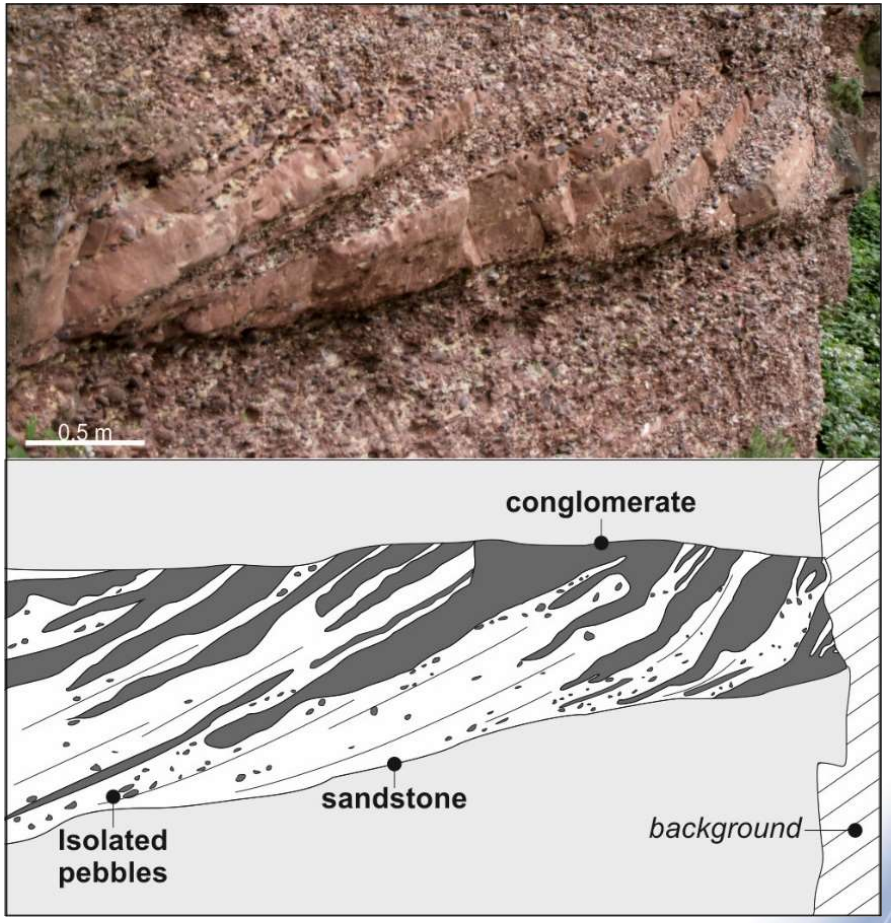


Heterolithic succession dominated by variably sized barforms (described by Steel & Thompson, 1983)

- Conglomerate (clast supported); planar cross bedding
- Sst; low angle < 15° cross bedding
- Sst; trough cross bedding
- Sst; planar cross bedding

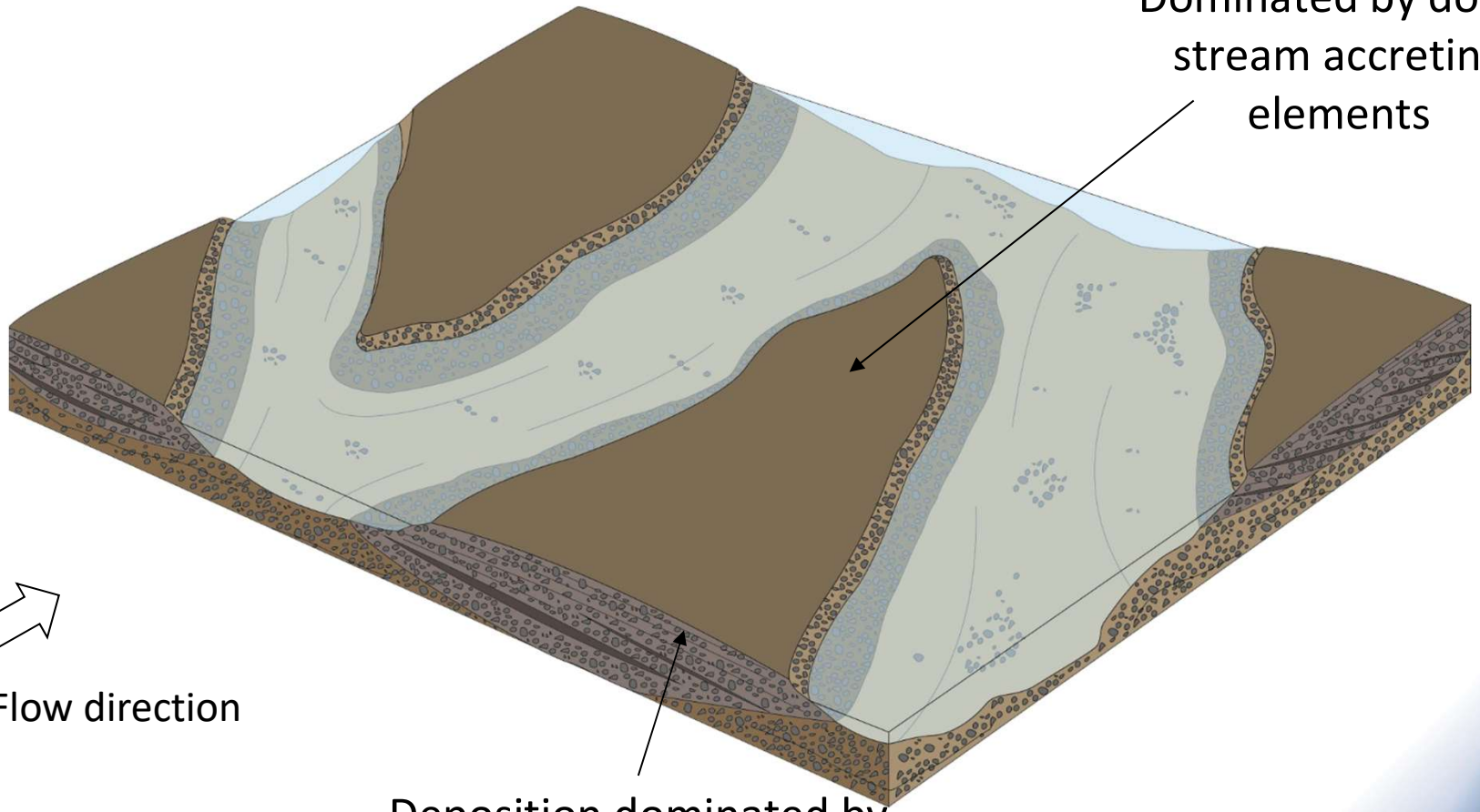


Example barforms

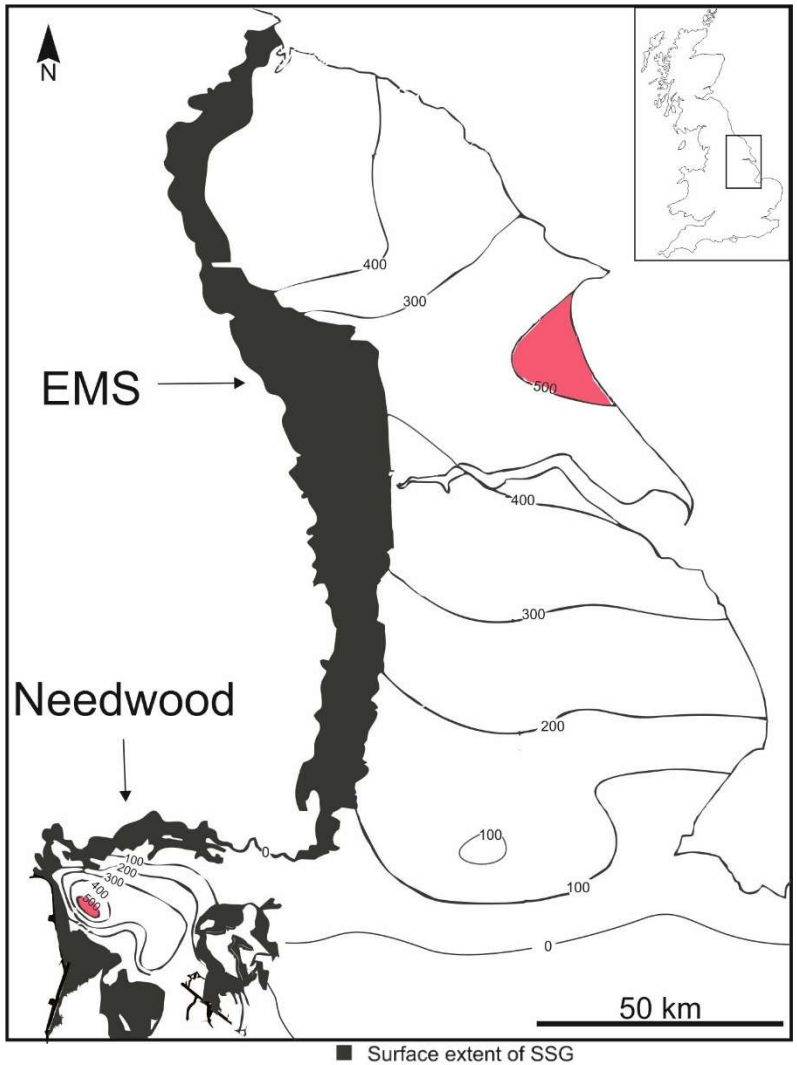


Variations in clast/matrix supported, abundant fining upward successions

Needwood Basin



Basin Comparison



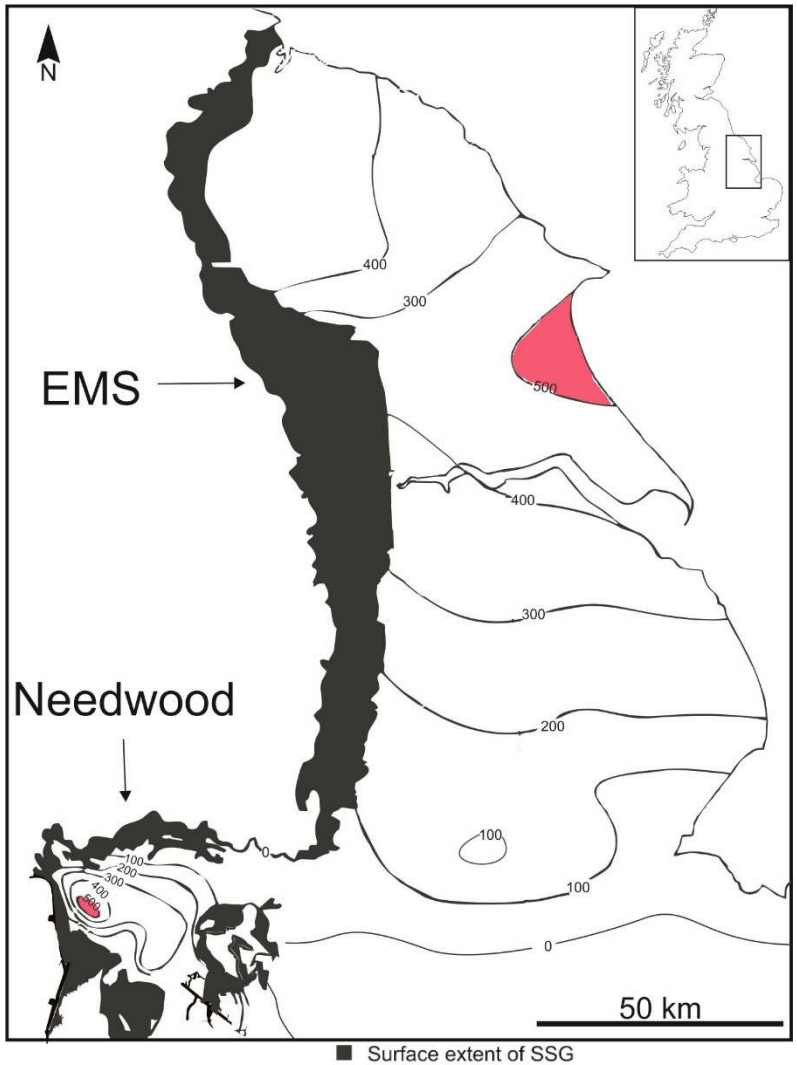
EMS:

- Gentle subsidence
- No fault controlled deposition
- Greater distance to depocentre

Needwood:

- High subsidence
- Syn-sedimentary faulting
- Shorter distance to depocentre

Basin Comparison



Needwood:

- Braided
- Downstream accreting
- Variations in discharge
- Heterolithic:
  - Conglomeratic and sandy facies
- Greater bed thickness
- Subsiding half graben
- Steeper basin gradient from fluvial source to depocentre

East Midlands Shelf:

- Braided
- Downstream accreting
- Variations in discharge
- Sand-dominated:
  - Sandy facies dominate
- Thinner beds
- Passive shelf edge area
- Gentle gradient to depocentre

Conclusion

How does the geometry of a basin effect the facies variability?

- The rapid basin subsidence is creating accommodation space for the preservation of coarser grained deposits, i.e. the conglomerates.

The allogenic controls of basin geometry/subsidence (i.e. basin tectonics) exert a large influence on sedimentary facies variability in the East Midlands Shelf and Needwood Basins.

References

Steel, R. J. and Thompson, D. B. 1983 Structures and textures in Triassic braided stream conglomerates ('Bunter' Pebble Beds) in the Sherwood Sandstone Group, North Staffordshire, England *Sedimentology*, **30** 314-376