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Architecture and tectonic framework of the Triassic rift basin in East Greenland

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Abstract

The Triassic rift basin along the East Greenland margin is represented by NE-SW trending basins and highs segmented by NW—SE trending transfer zones. The coarse-grained sediments along the eastern side of Jameson Land are shown to be hosted in half-graben structures belonging to the Carlsberg Fjord Basin that is bounded by NW-dipping normal faults mapped and described after fieldwork in the Klitdal area in Liverpool Land. New aeromagnetic and electromagnetic data together with new drill cores allow the re-interpretation of available seismic lines showing the continuation of the Triassic rift basin toward the SW where it is buried under the Upper Triassic post-rift sediments and the Jurassic successions of the Jameson Land Basin. The N—S trending Liverpool Land, interpreted as the boundary block of the Triassic basin represents a structural high inherited from the Late Carboniferous tectonics and faulted during the Triassic rifting. The Carlsberg Fjord Basin and the Klitdal Fault System in Jameson Land could represent the analogues of the Helgeland Basin in the Norwegian offshore that is bounded by the Ylvingen Fault Zone and the Papa and West of Shetlands Basins that are bounded by the Spine Fault. The Triassic rift zone and transfer faults on both conjugate margins shows a straightforward correlation with the trends of the initial spreading line and fracture zones of the North-East Atlantic indicating a possible inheritance of the Triassic rifting.

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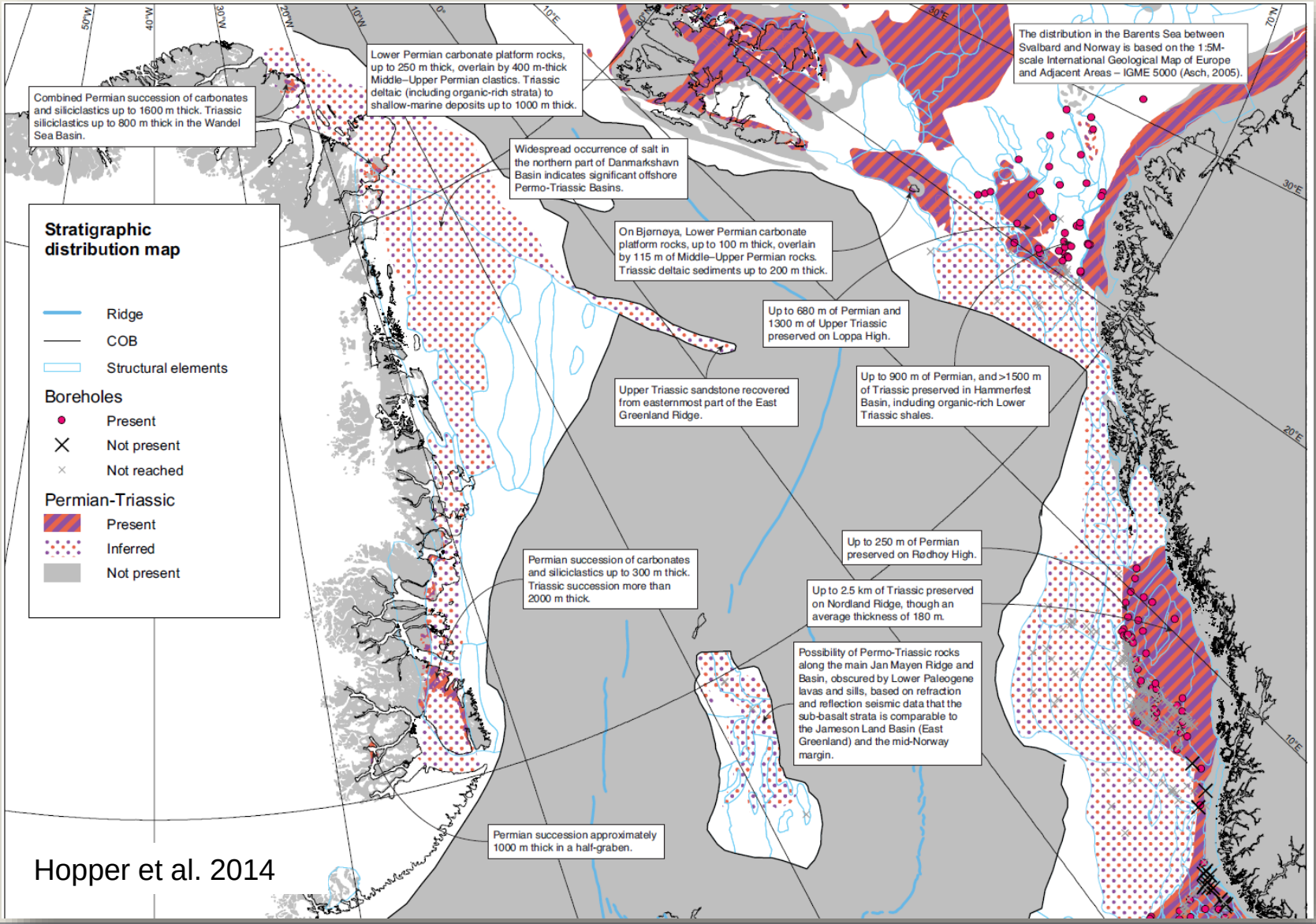
content

- Onshore/offshore East Greenland margin
- Tectonostratigraphy of the East Greenland margin
- Jameson Land Basin
- Stratigraphy
- Late Carboniferous rift
- Triassic Rift
- Conclusions

Onshore/offshore East Greenland

NAGTEC Stratigraphic distribution of Permian – Triassic



Hopper et al. 2014

Onshore/offshore East Greenland

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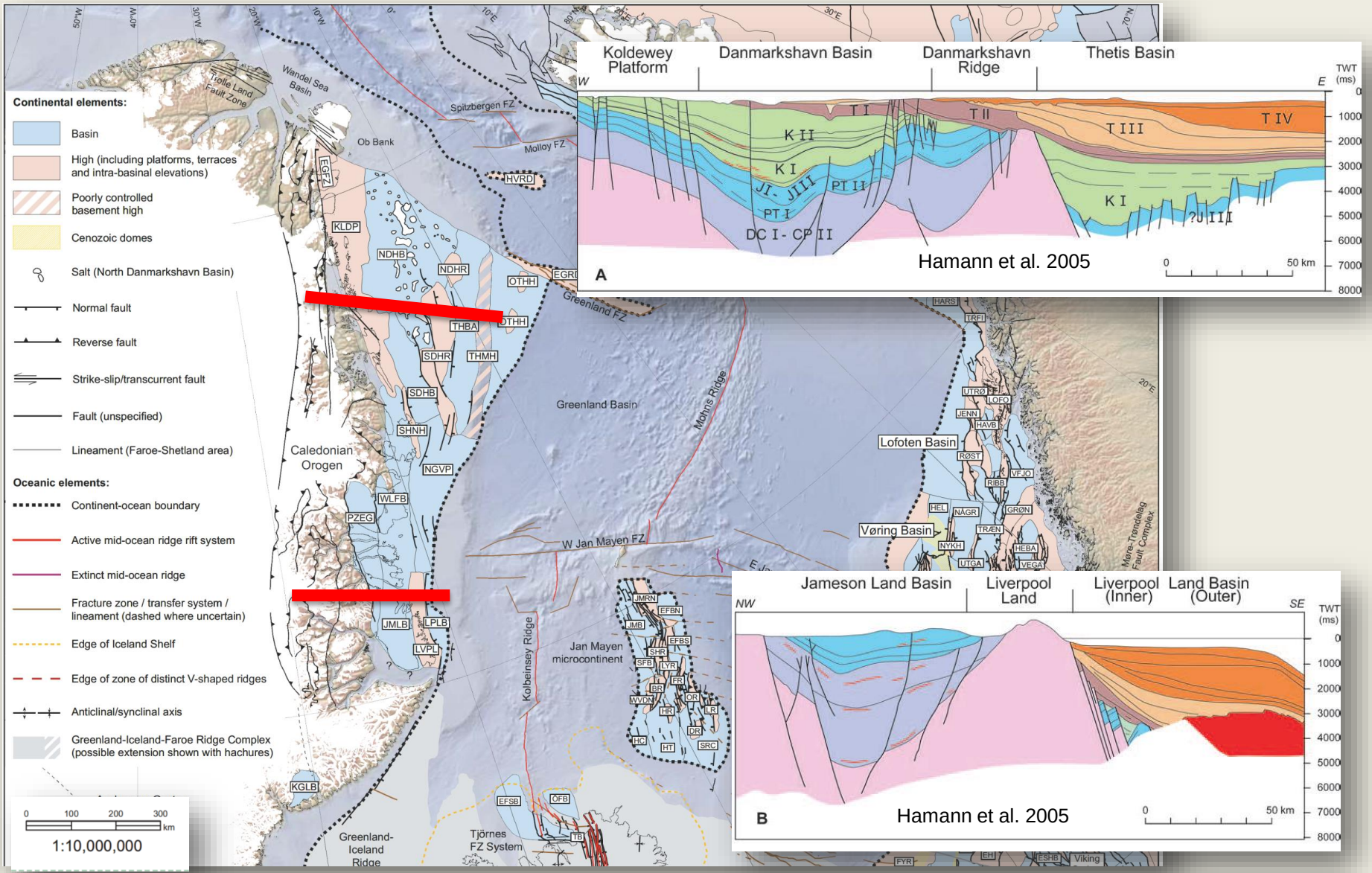
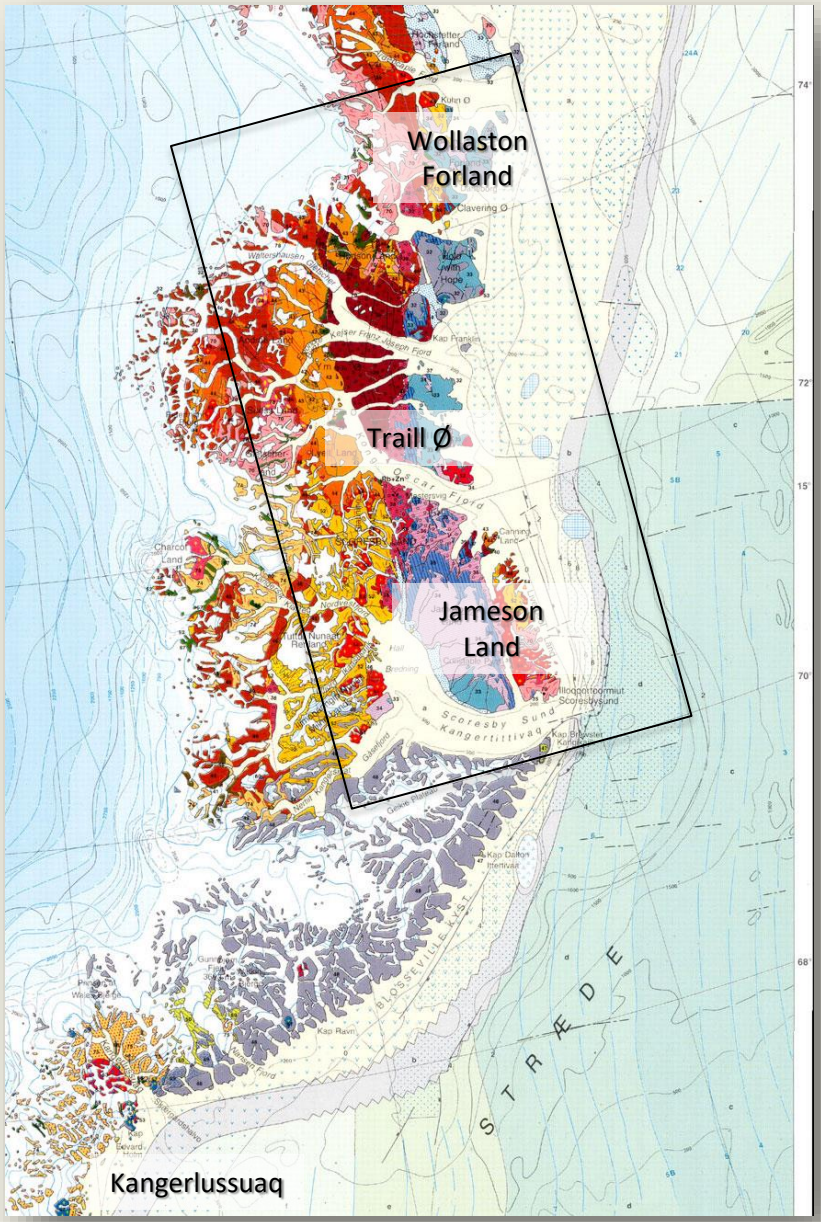
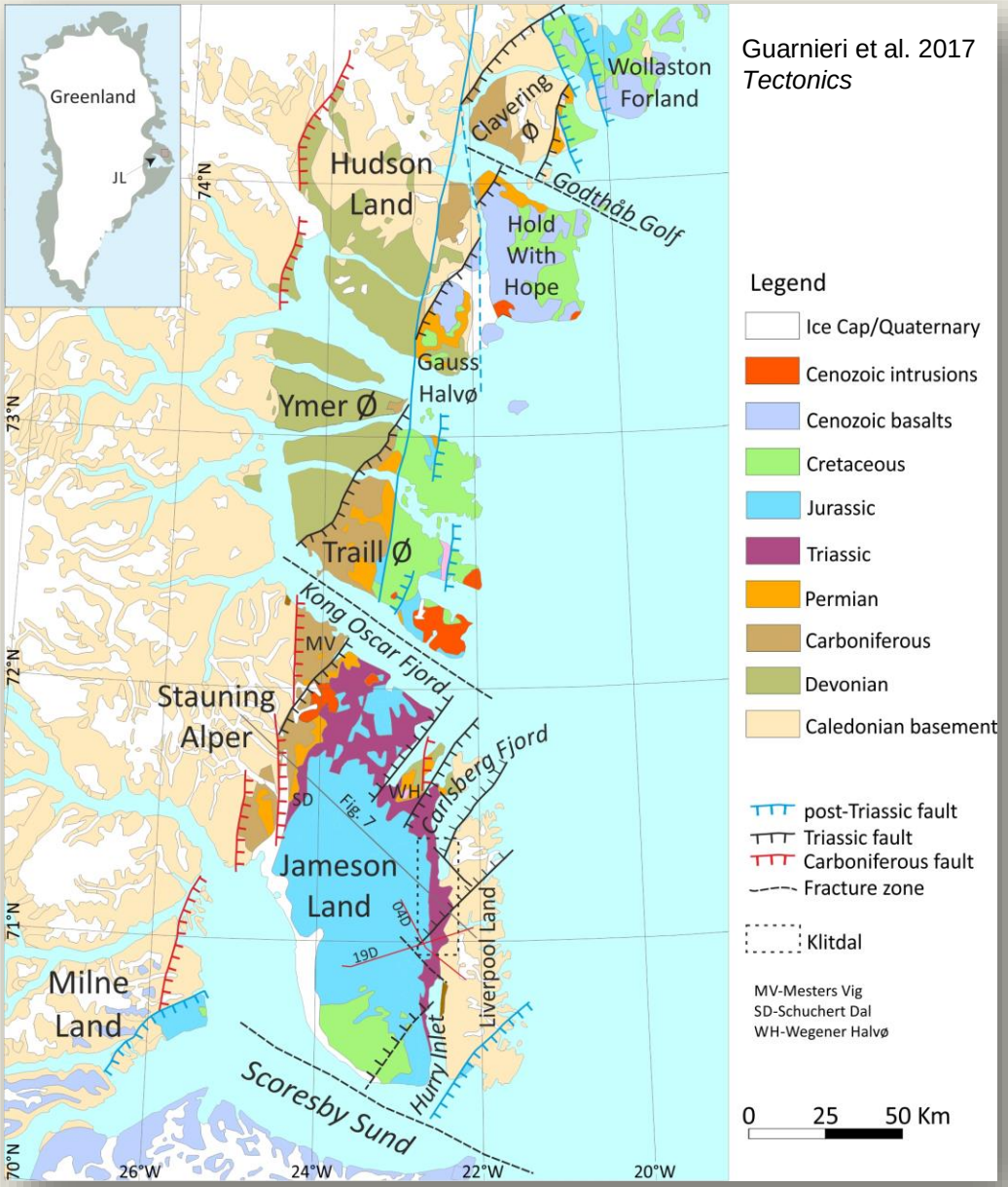
NAGTEC Structural map (Hopper et al. 2014)

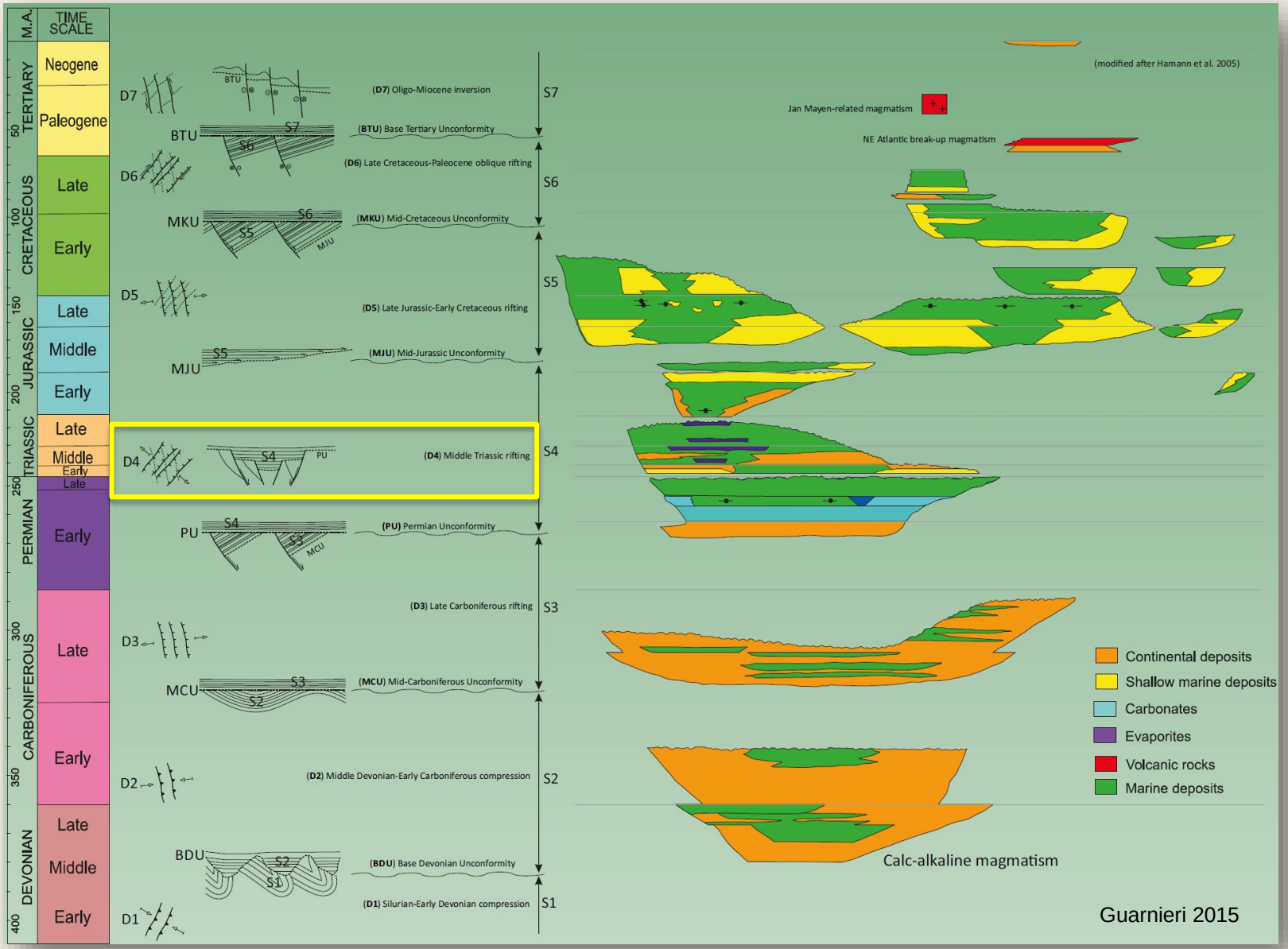


Onshore/offshore East Greenland

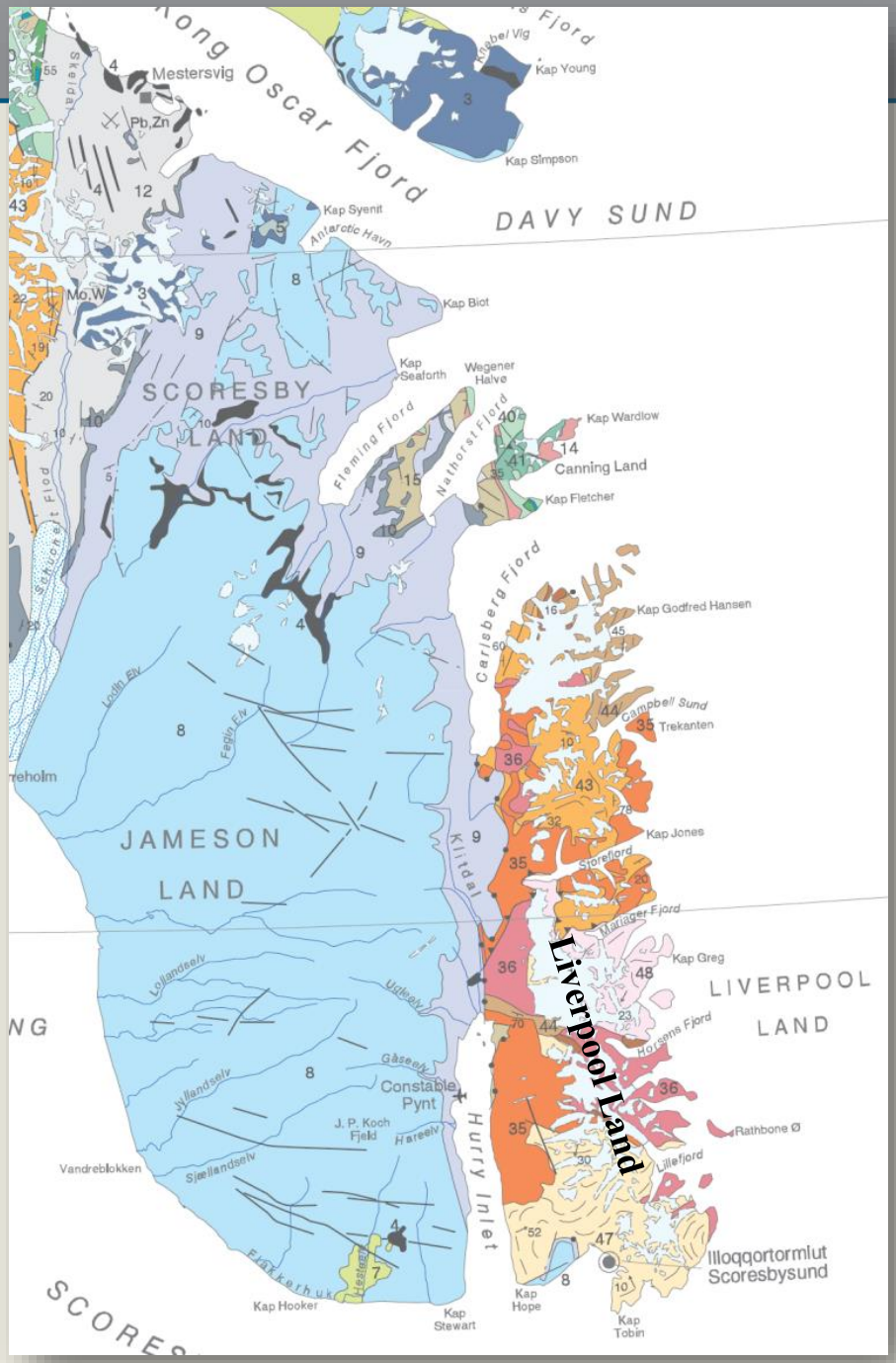


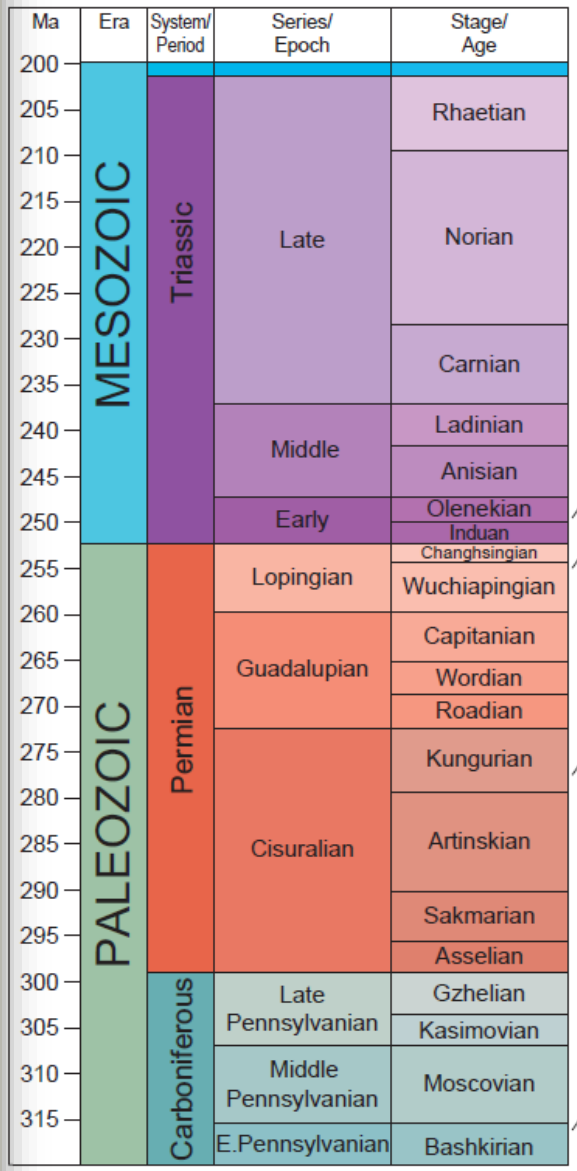


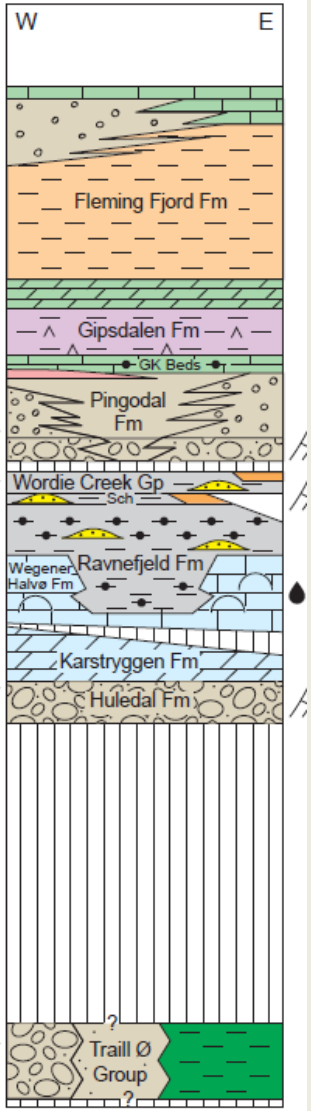
Tectonostratigraphy of East Greenland



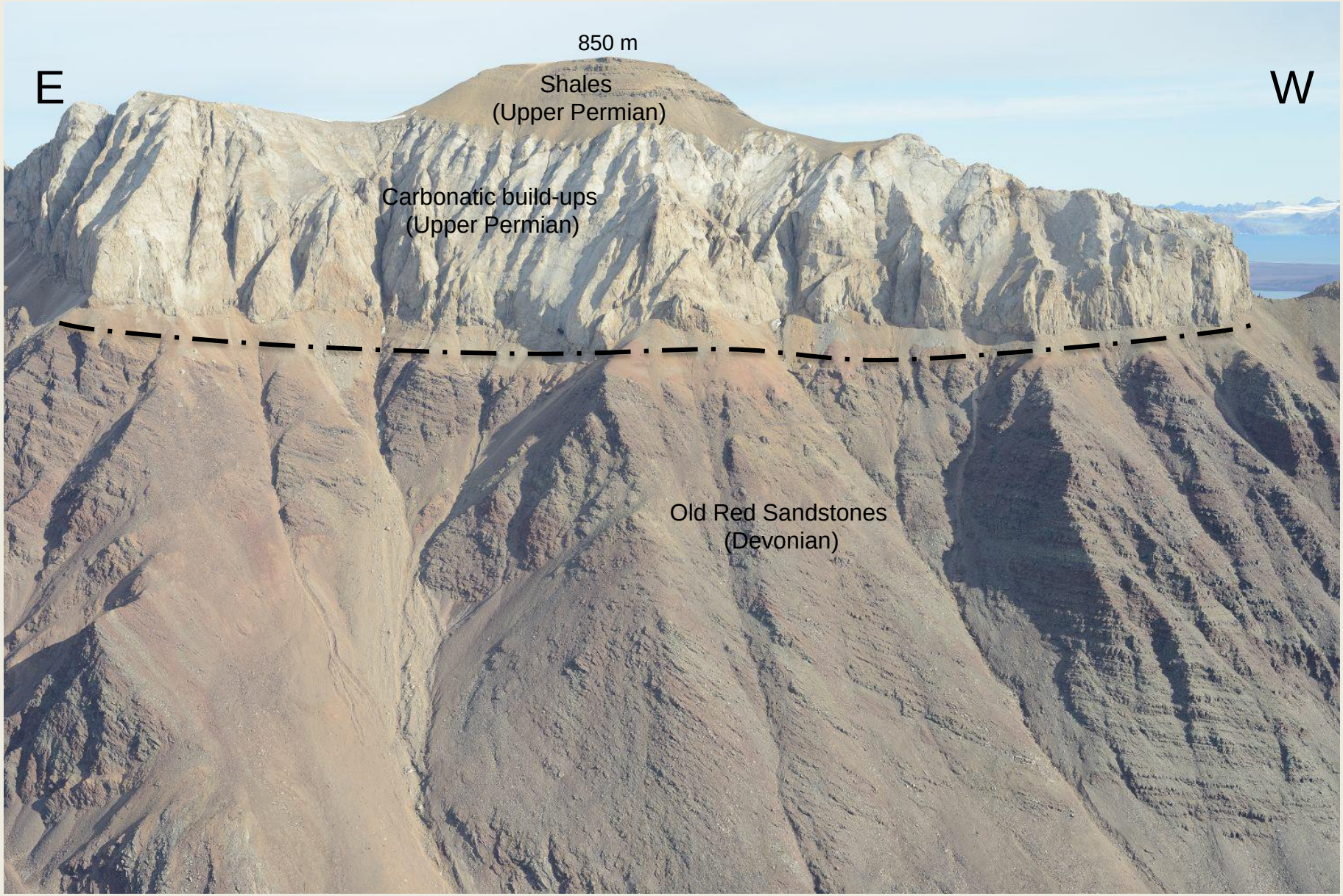
The Jameson Land Basin



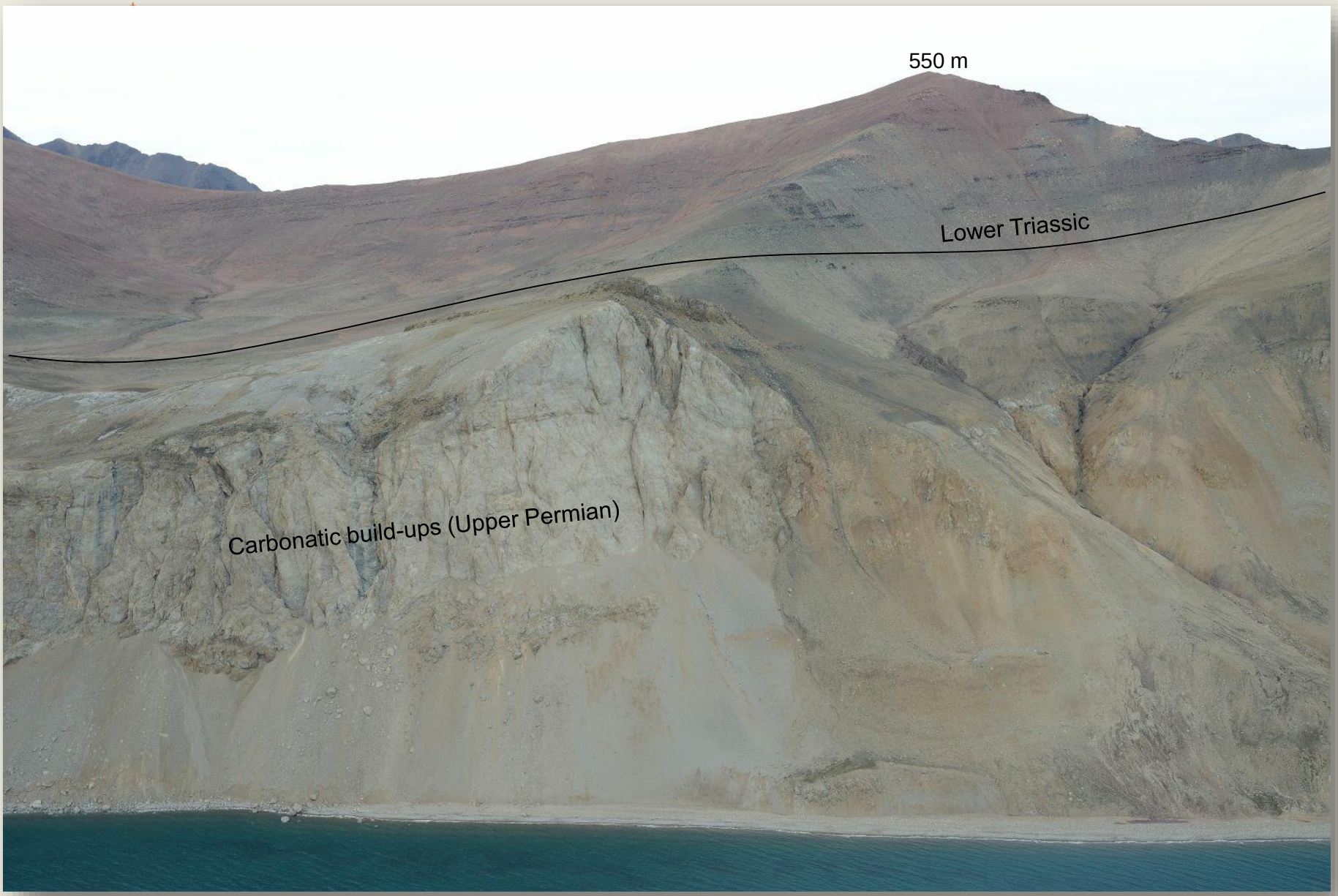




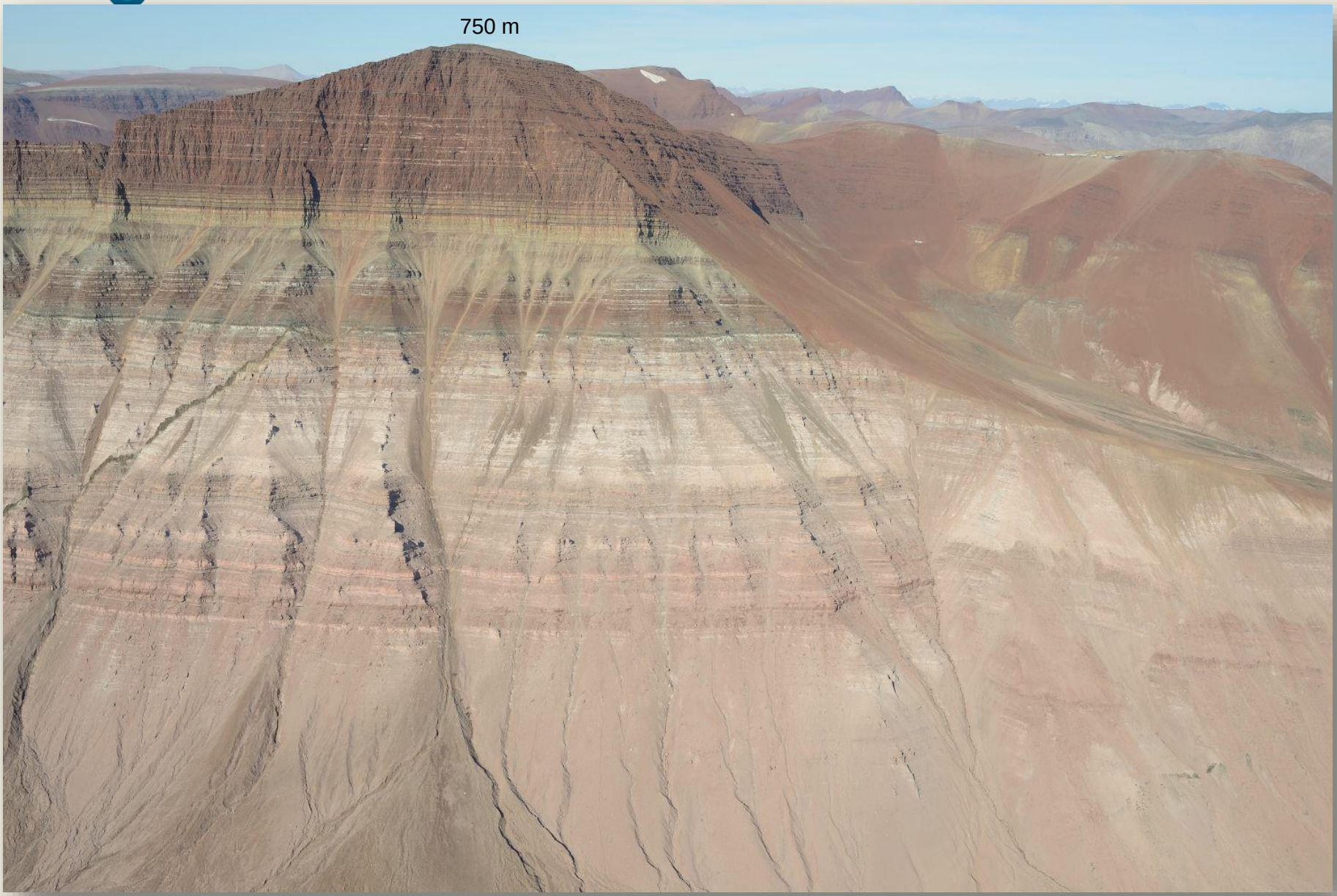
Stratigraphy

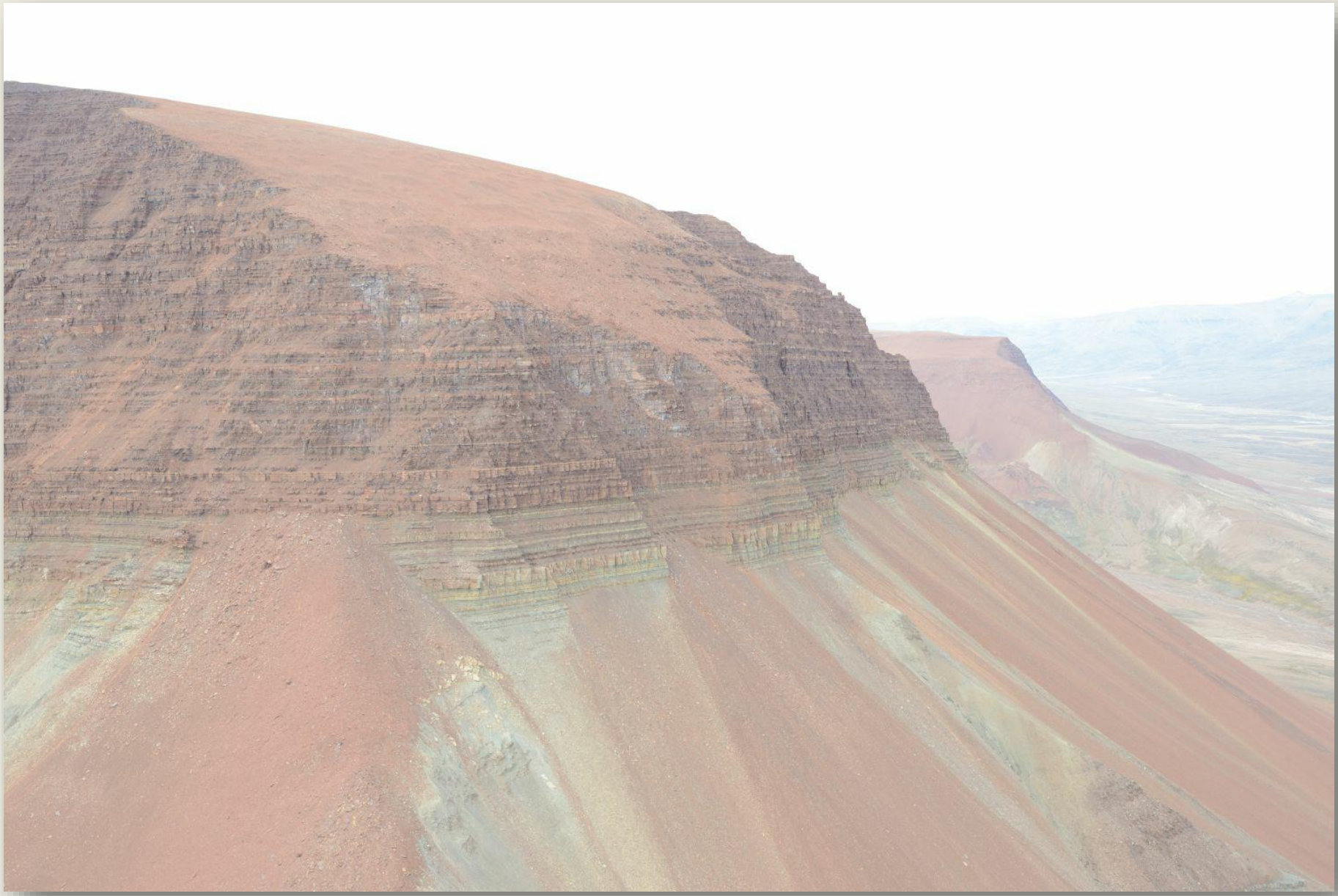


Stratigraphy


550 m
Lower Triassic
Carbonatic build-ups (Upper Permian)

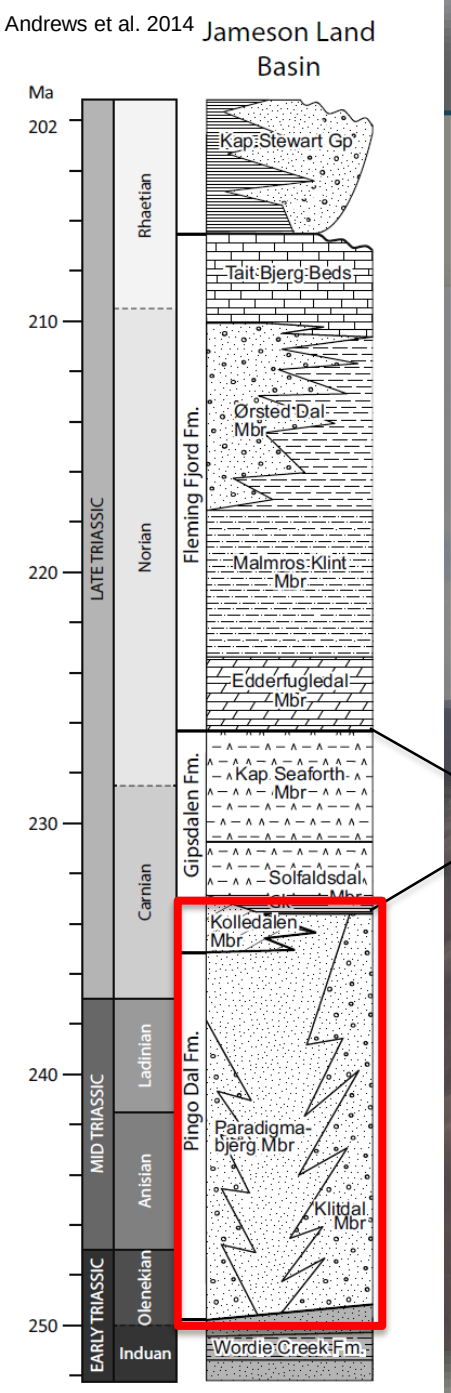
Stratigraphy

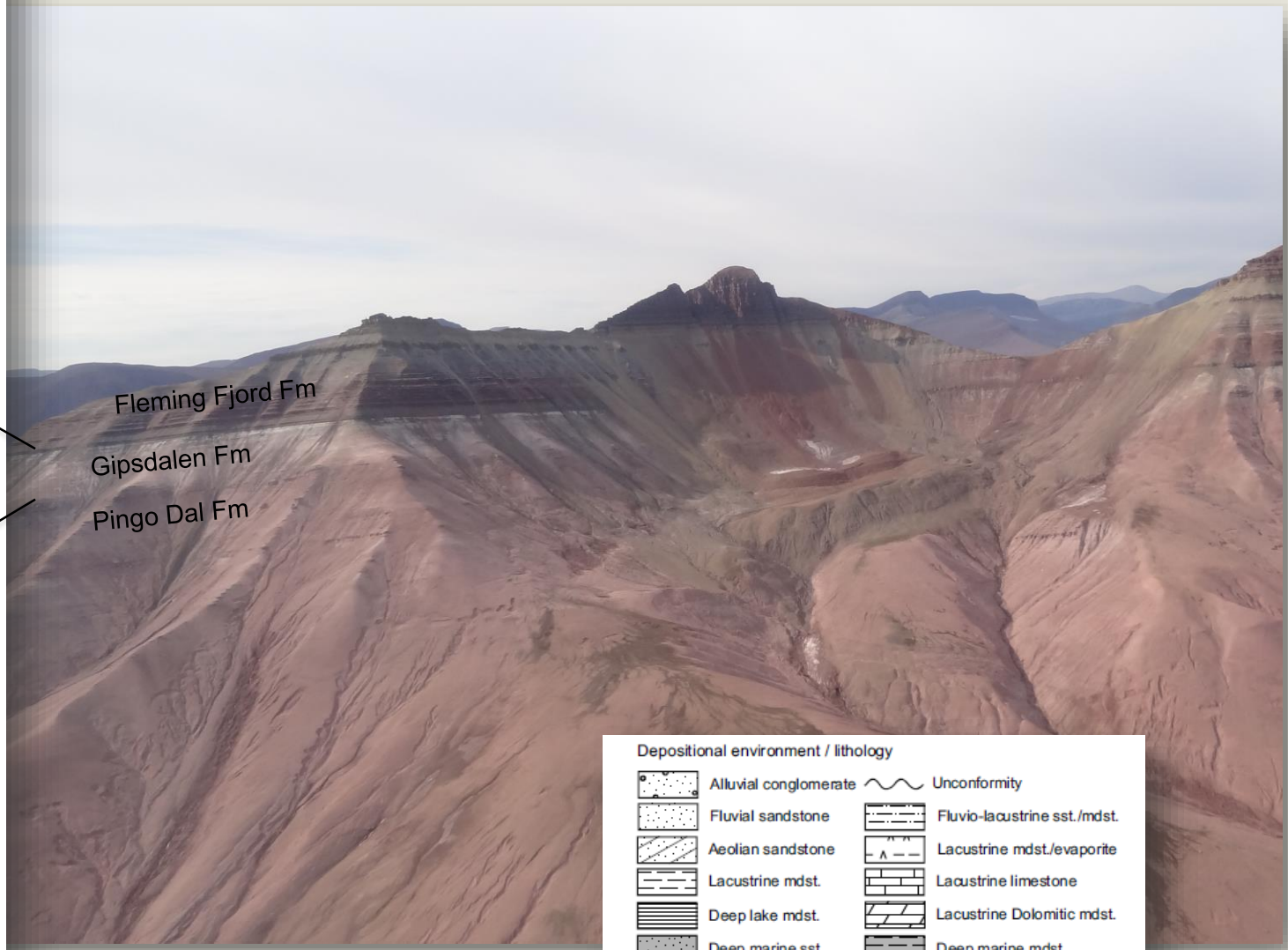




Stratigraphy

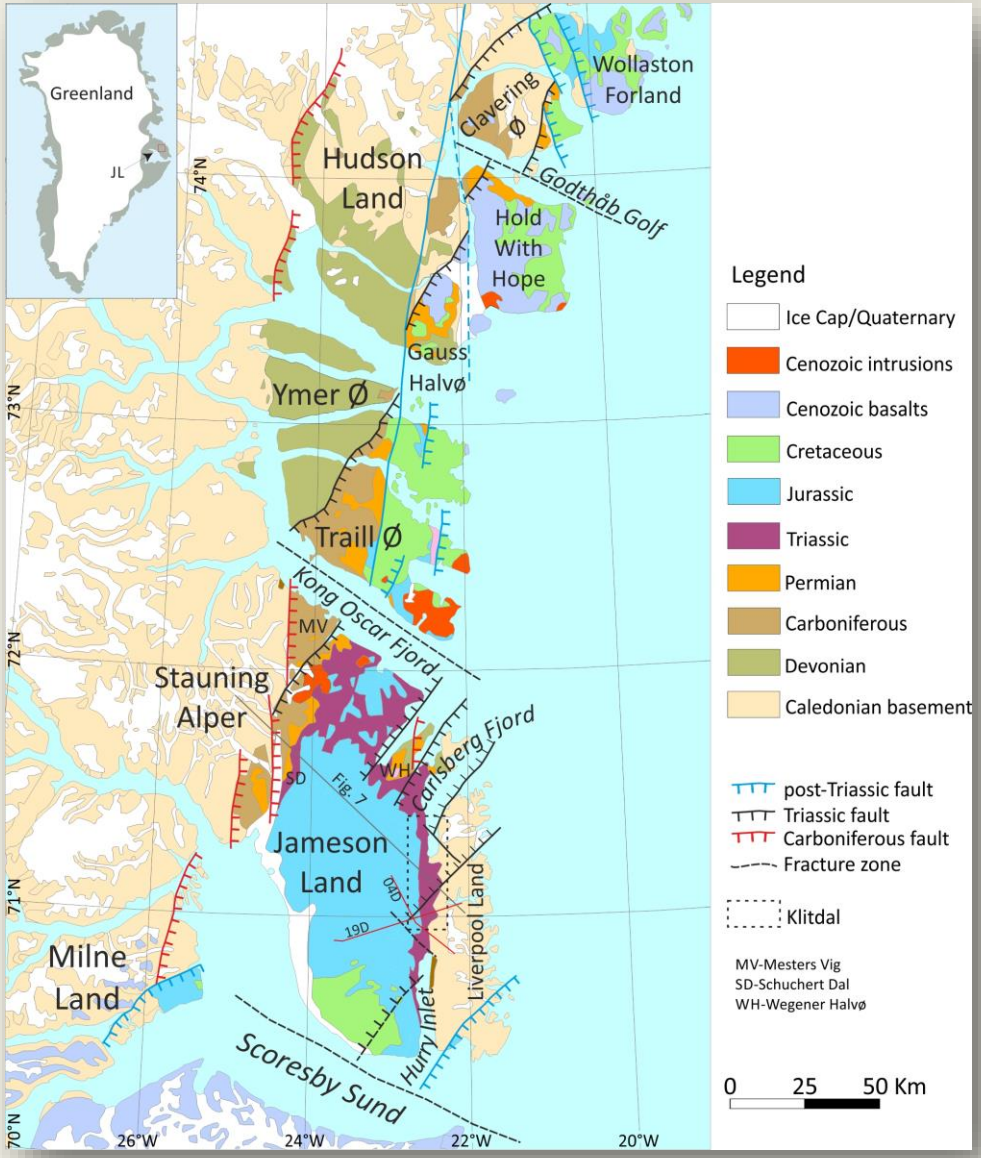
Andrews et al. 2014





Late Carboniferous rift

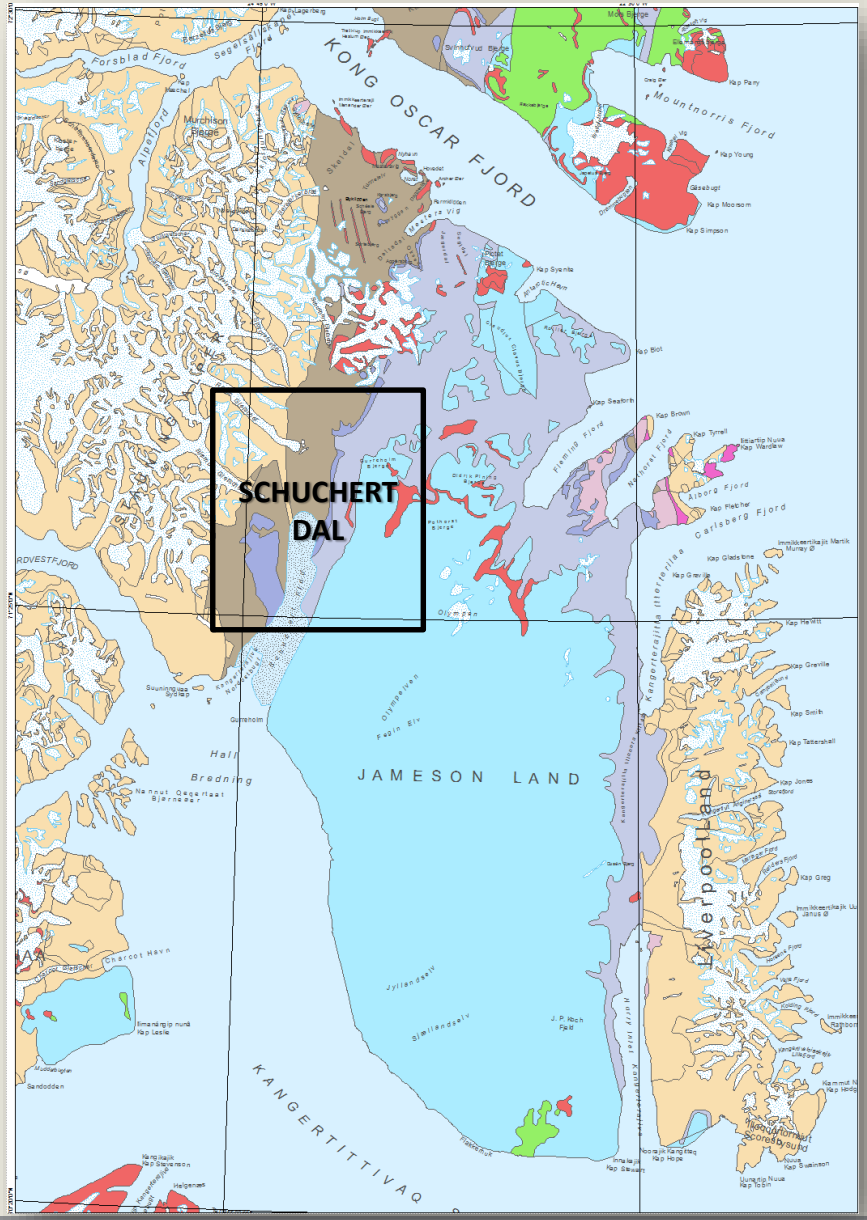
Guarnieri et al. 2017
Tectonics



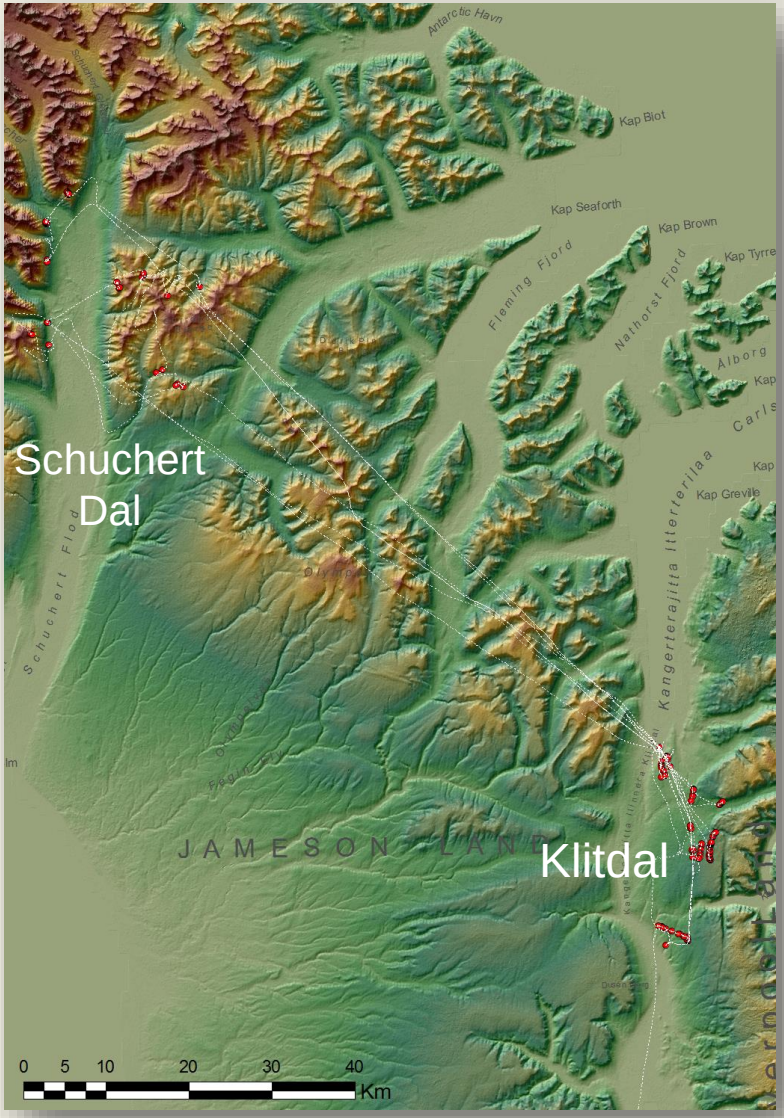
- N-S trending rift
- Westward-tilted blocks
- Half graben

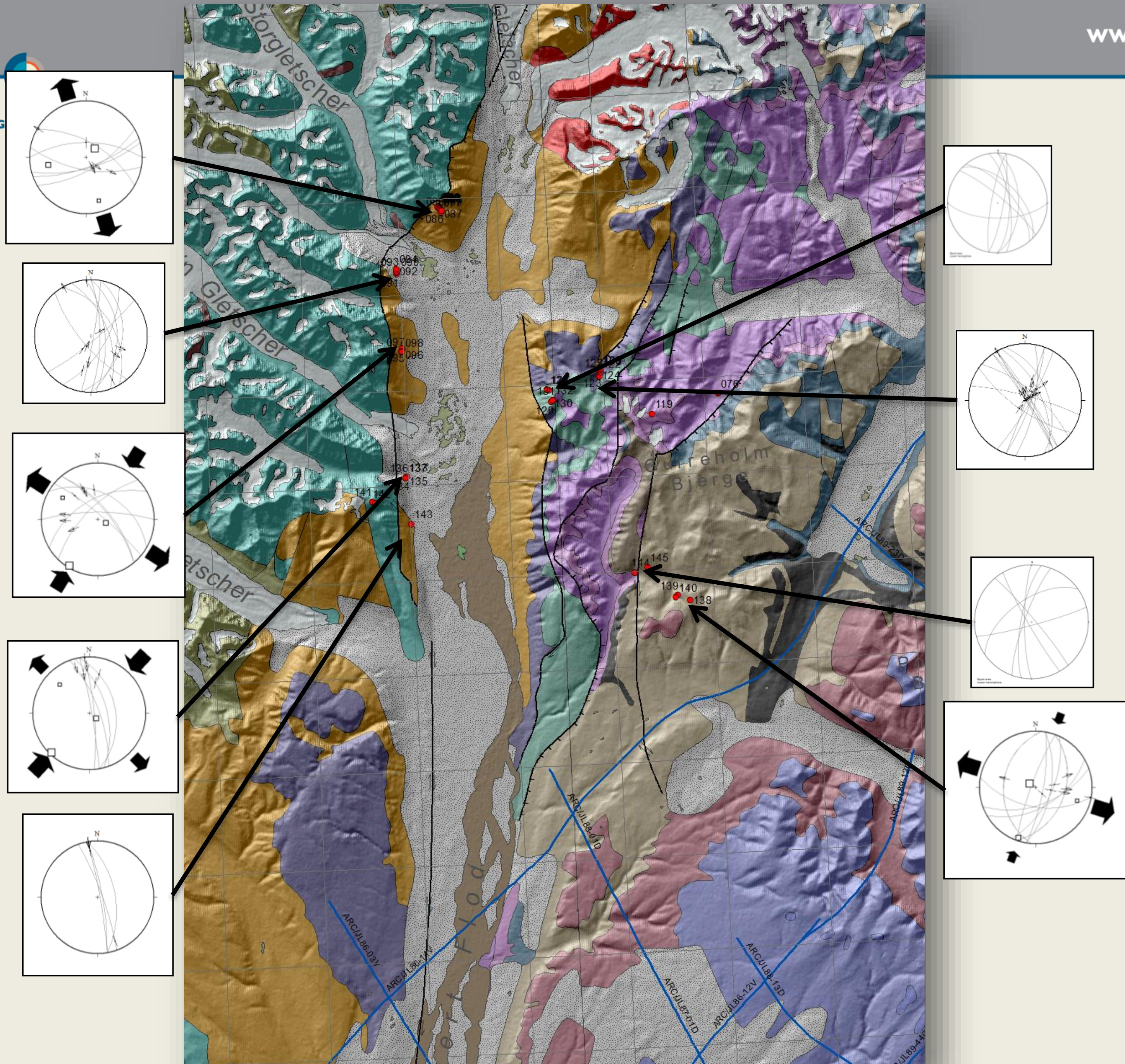
Late Carboniferous rift

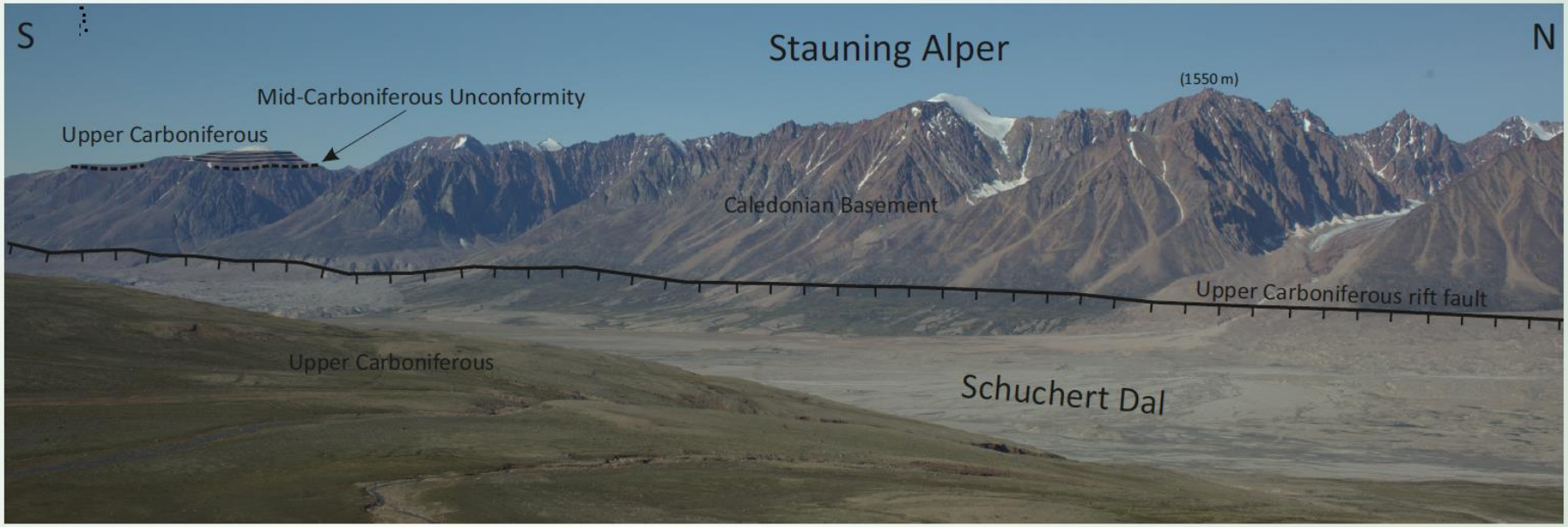
Western margin

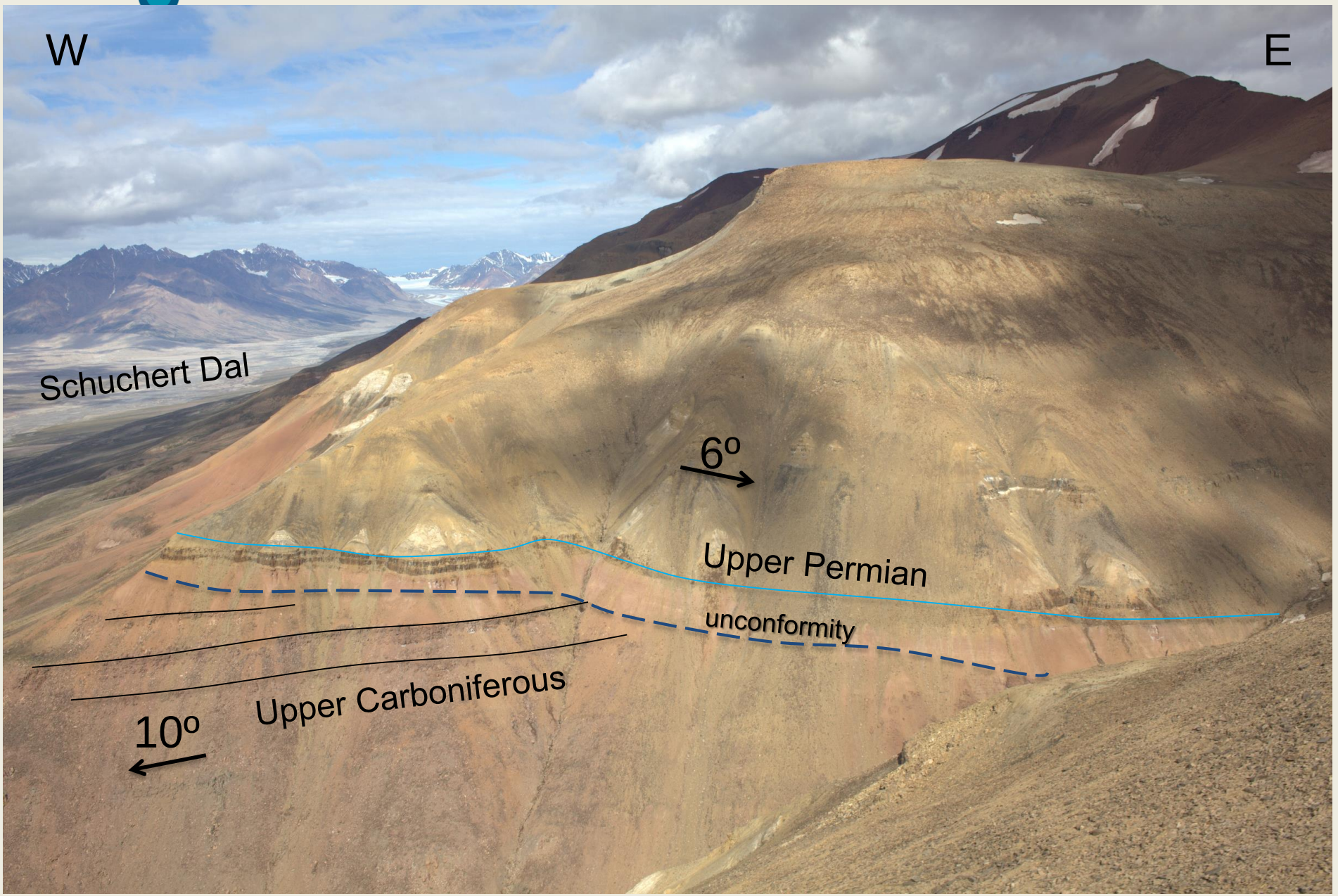


Fieldwork 2014

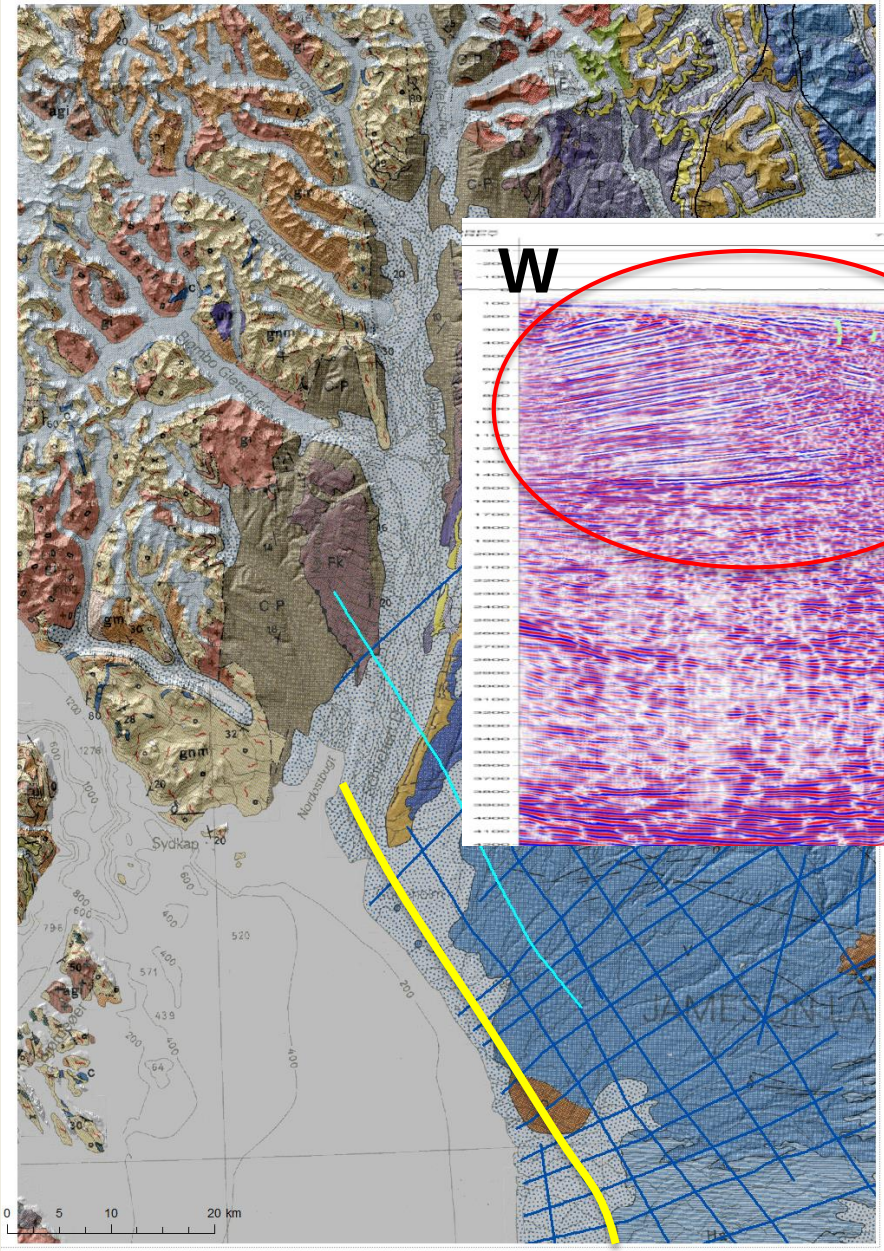


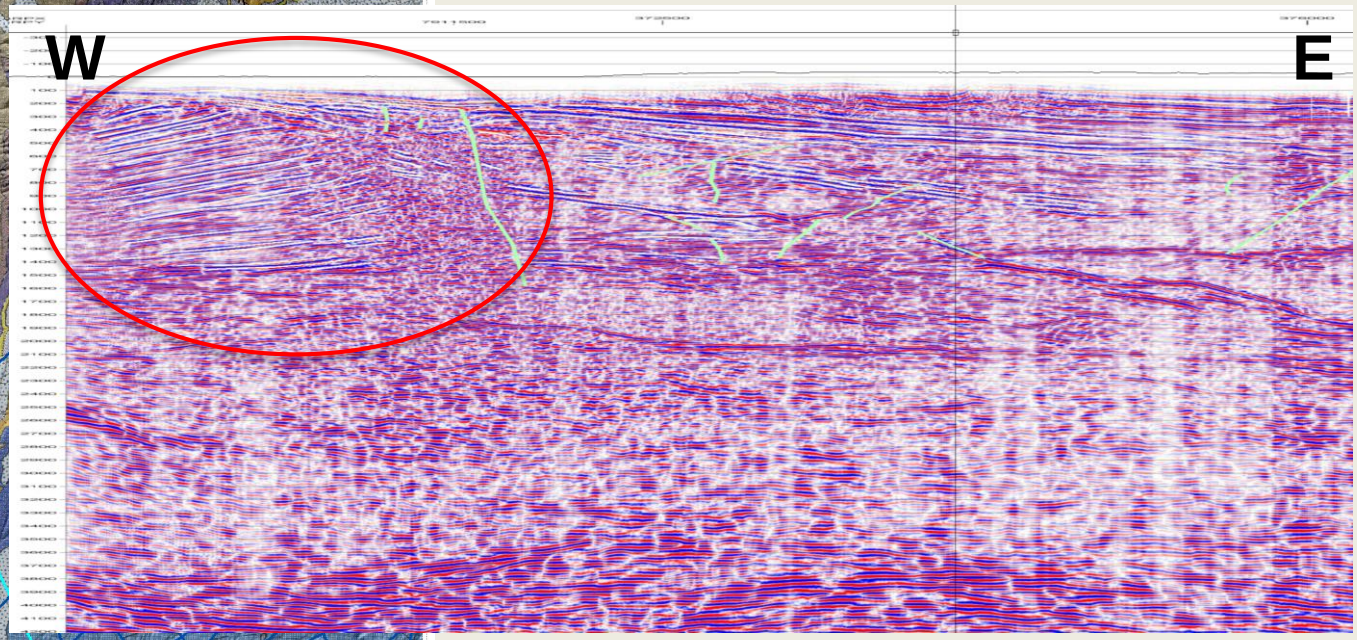

Storgletscher
Gletscher
Gurreholm Bjerge
Flod
ARC/JL86-03V
ARC/JL87-01D
ARC/JL86-12V
ARC/JL86-13D
ARC/JL86-01D
ARC/JL89-23


S
Stauning Alper
N
(1550 m)
Mid-Carboniferous Unconformity
Upper Carboniferous
Caledonian Basement
Upper Carboniferous rift fault
Upper Carboniferous
Schuchert Dal


W
E
Schuchert Dal
6º
Upper Permian
unconformity
Upper Carboniferous
10º

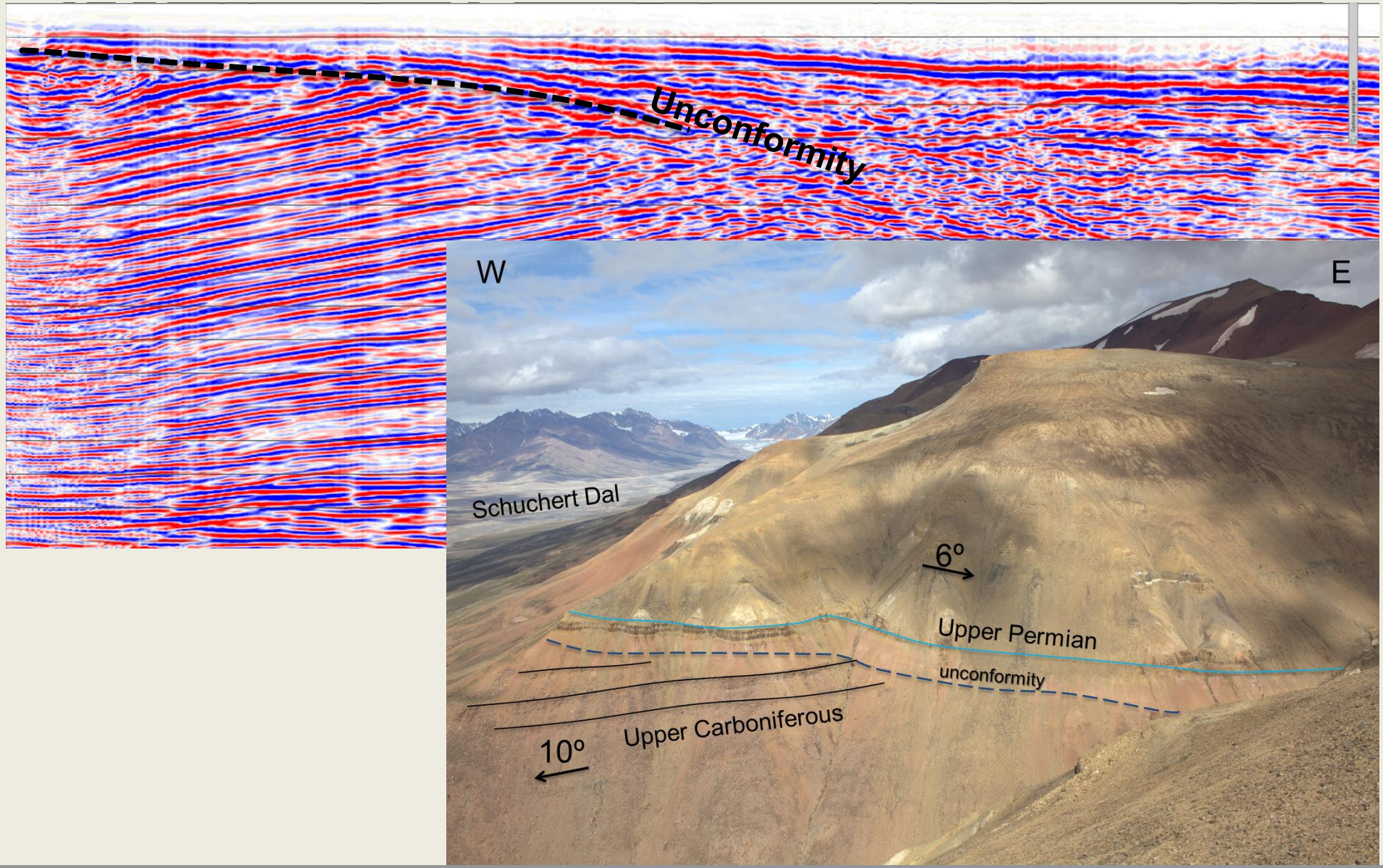
Permian Unconformity



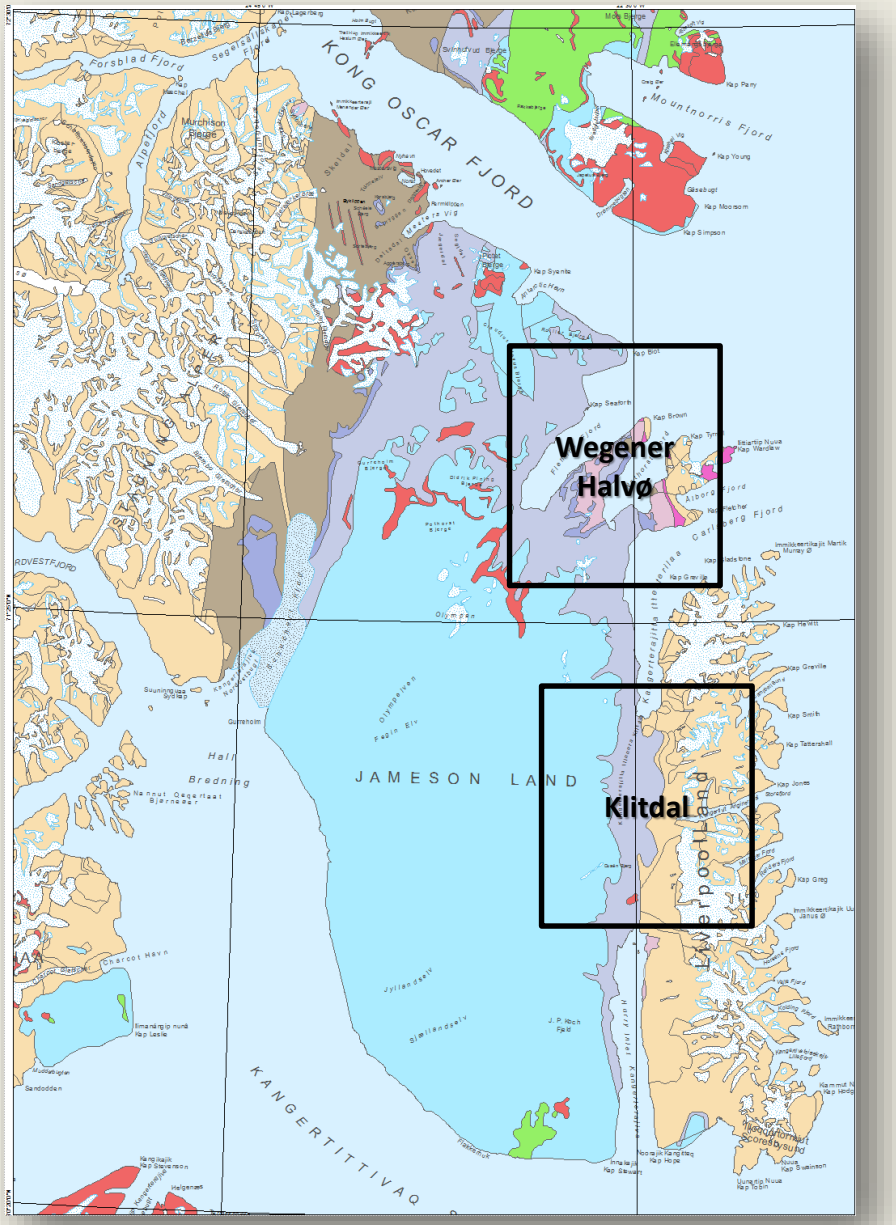


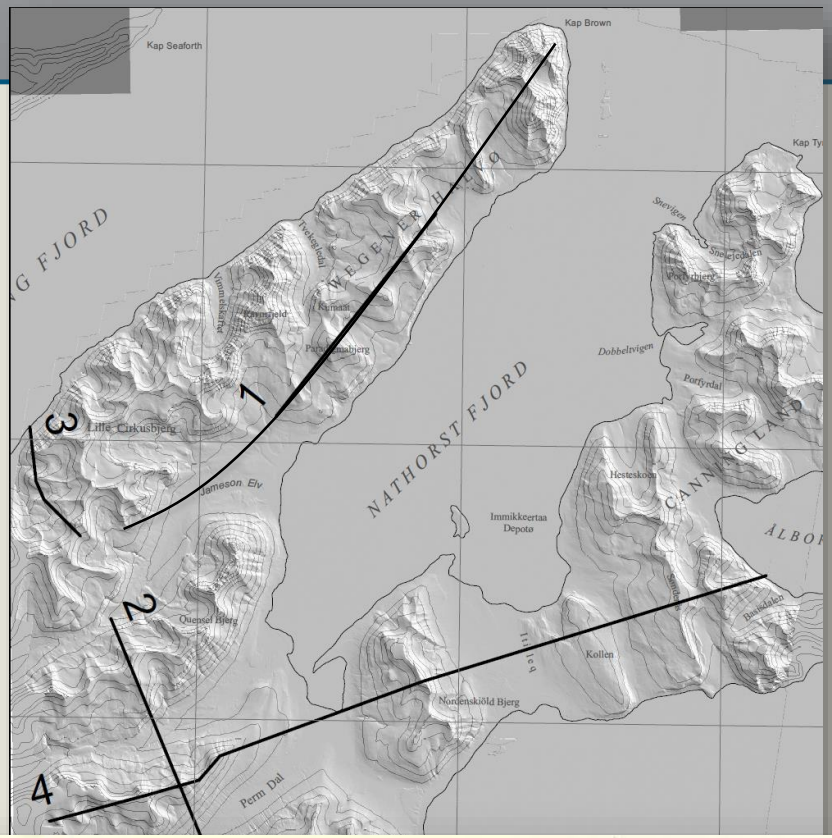
ARCO seismic line

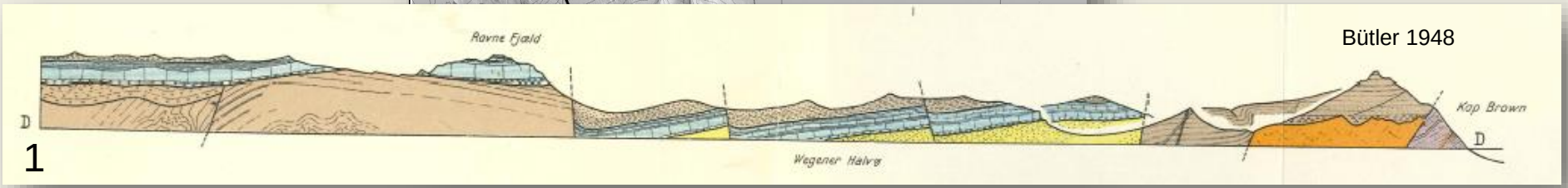
Permian Unconformity



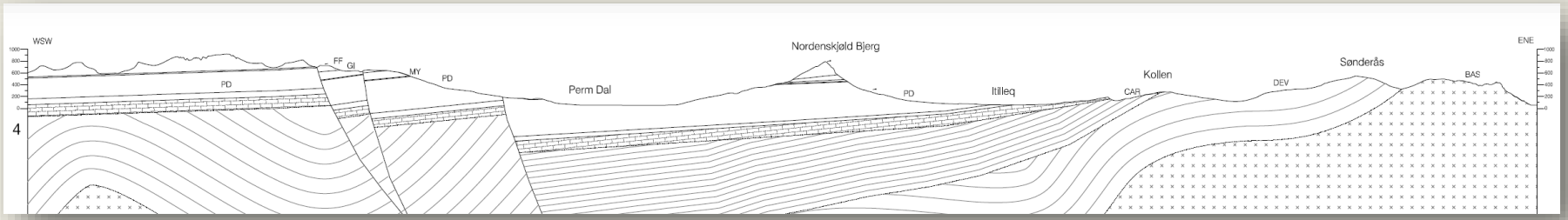
Eastern margin



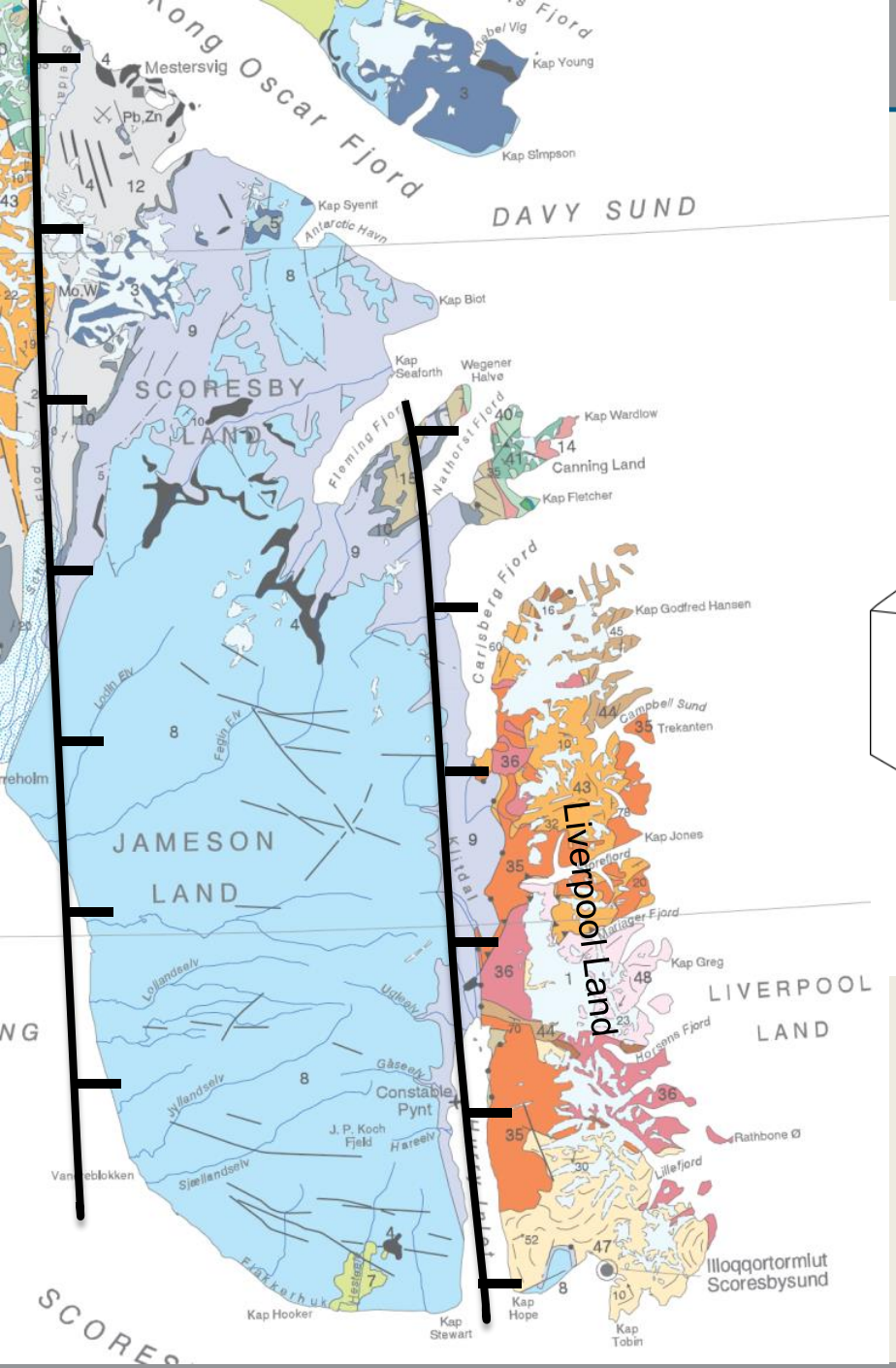

Kap Seaforth
Kap Brown
Kap Ty
NATHORST FJORD
WEGENER HALVØ
CANNING LAND
Lille Cirkusbjerg
Jameson Elv
Immikkeertaa Depotø
Hesteskoen
Dobbeltvigen
Portfyrdal
Queensø Bjerg
Kollen
Nordenskiöld Bjerg
Perm Dal
Tilleq
1
2
3
4

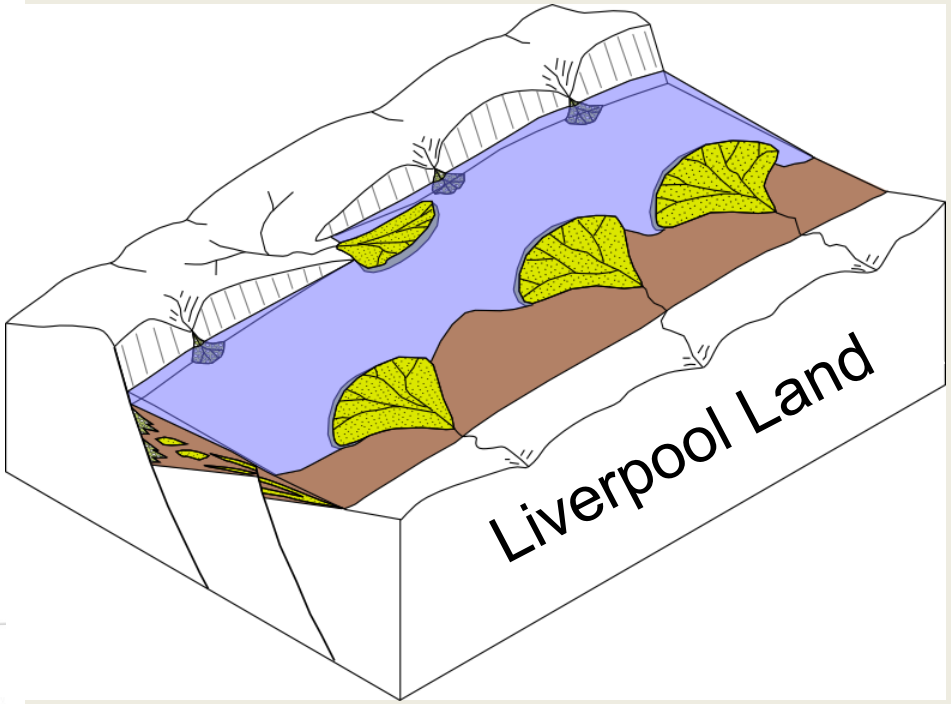

Ravne Fjæld
Kap Brown
Wegener Halvø
D
D
1

Bütler 1948

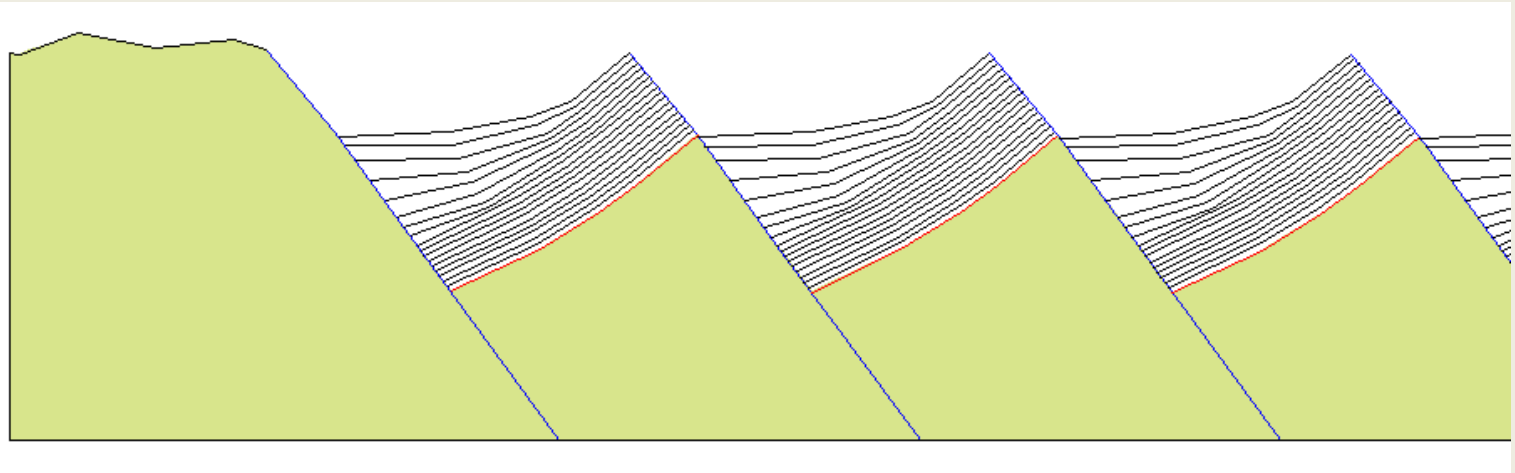

WSW
ENE
FF
GI
MY
PD
PD
Perm Dal
Nordenskjøld Bjerg
PD
Tilleq
CAR
Kollen
DEV
Sønderås
BAS
4

Late Carboniferous half graben

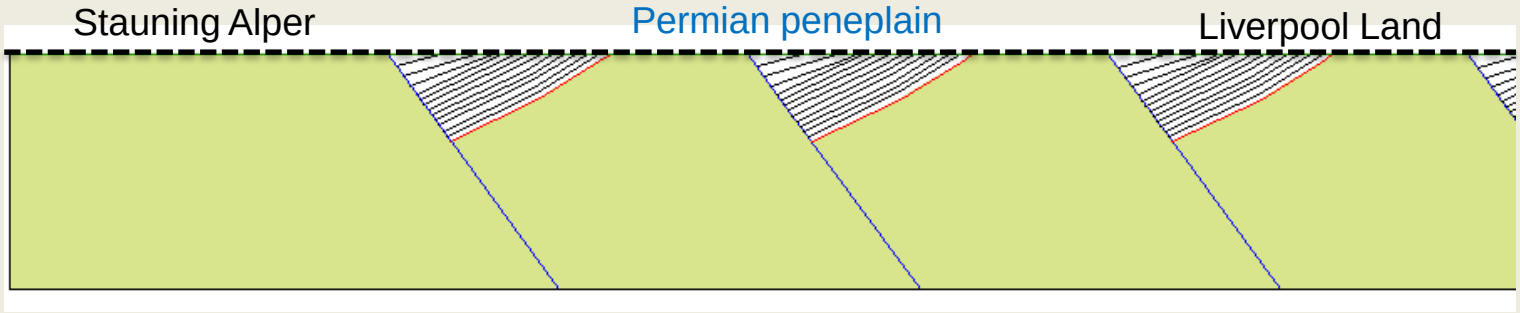


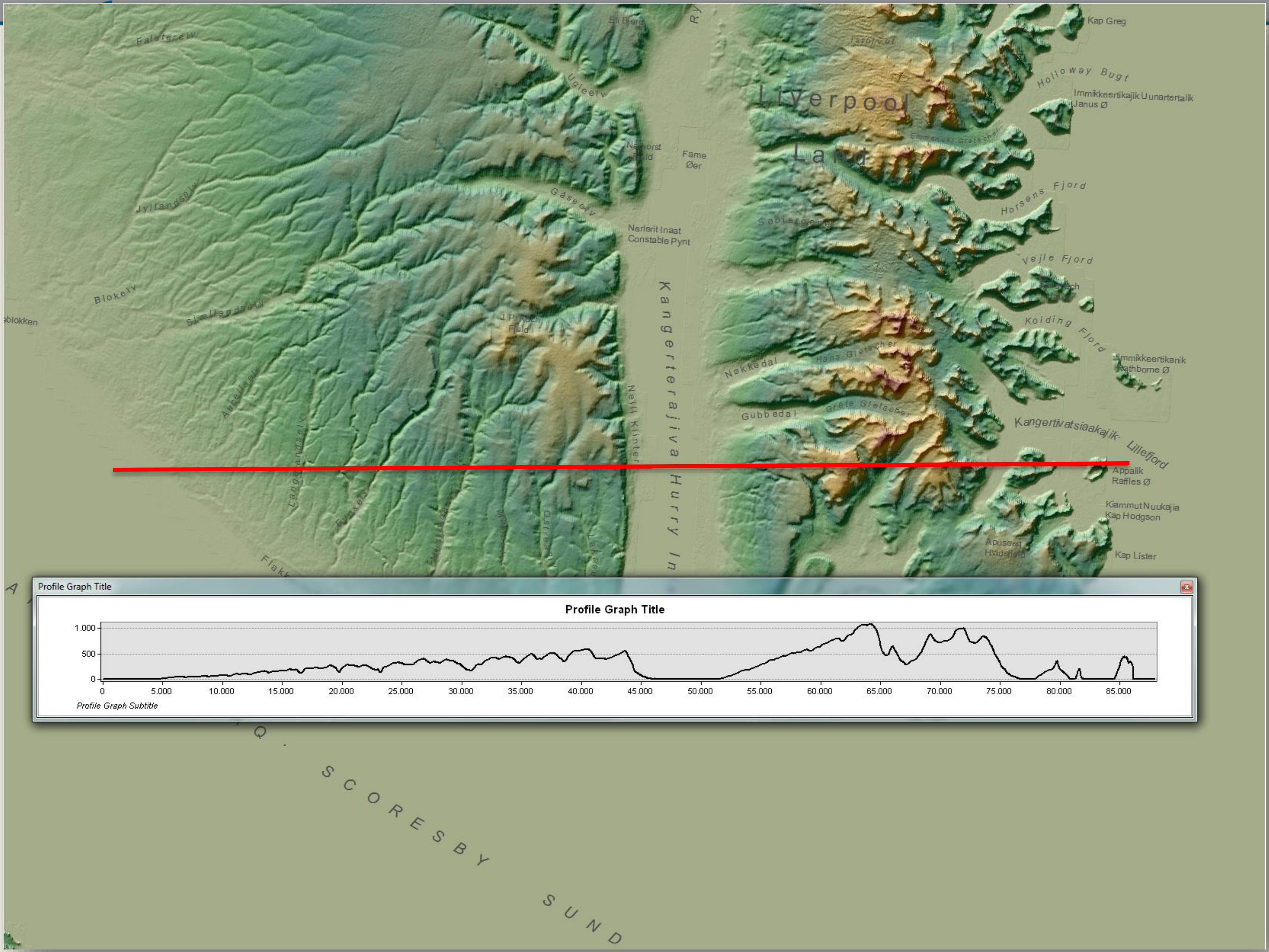


W Westard-tilted blocks E



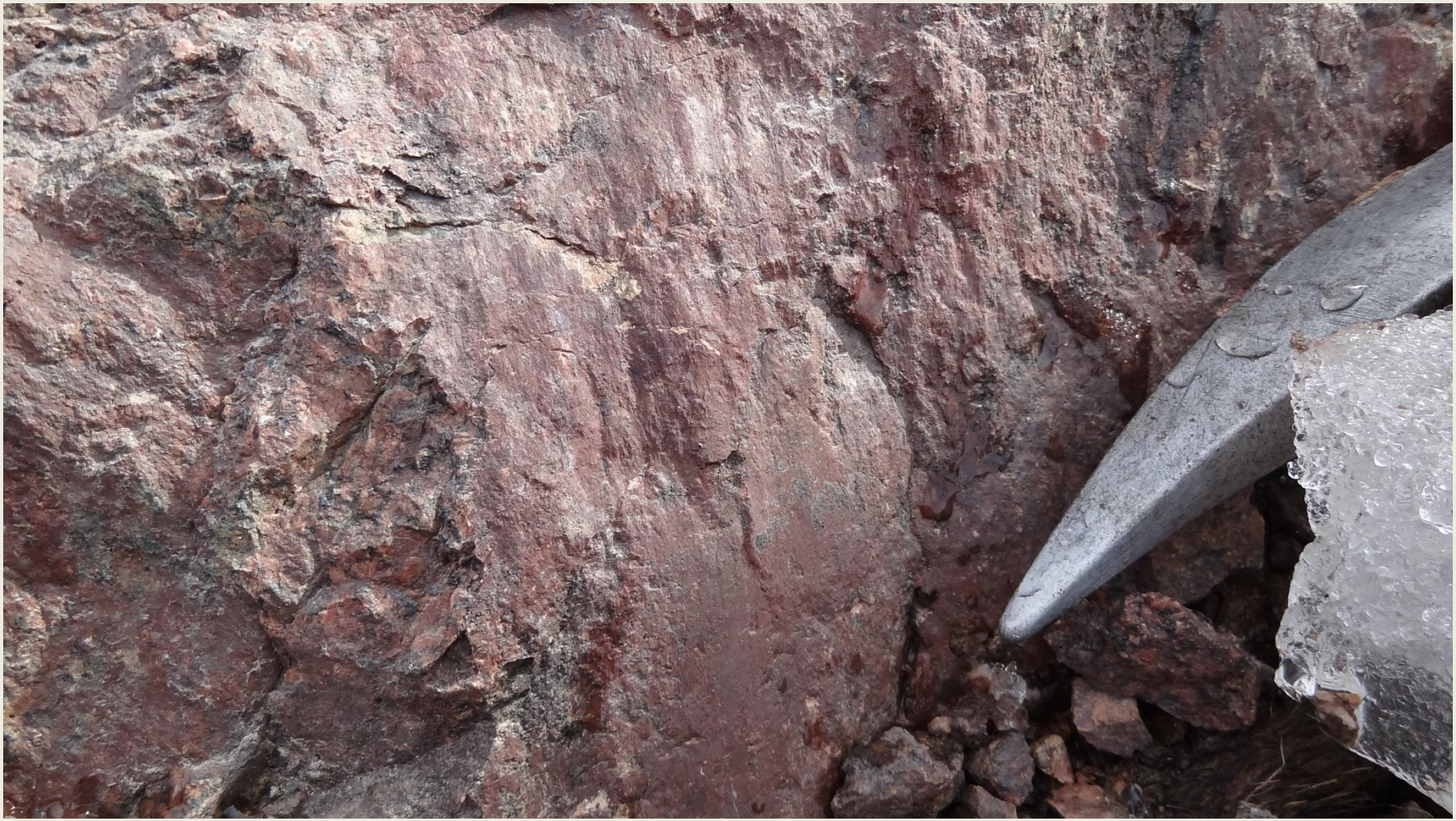
Footwall crests eroded




Liverpool Land
Kangerterajiva Hurry Inlet
Kap Greg
Holloway Bugt
Horsens Fjord
Vejle Fjord
Kolding Fjord
Nøkkedal
Gubbedal
Nerlerit Inaat
Constable Pynt
Fame Øer
Blokelv
Jyllandselv
Gåseelv
Ugleelv
Kap Lister
Kap Hodgson
Appalik
Raffles Ø
S C O R E S B Y S U N D
Profile Graph Title
Profile Graph Subtitle
1.000
500
0
5.000
10.000
15.000
20.000
25.000
30.000
35.000
40.000
45.000
50.000
55.000
60.000
65.000
70.000
75.000
80.000
85.000

Triassic rift


Klitdal Member
Klitdal Fault
basement rocks
(b)



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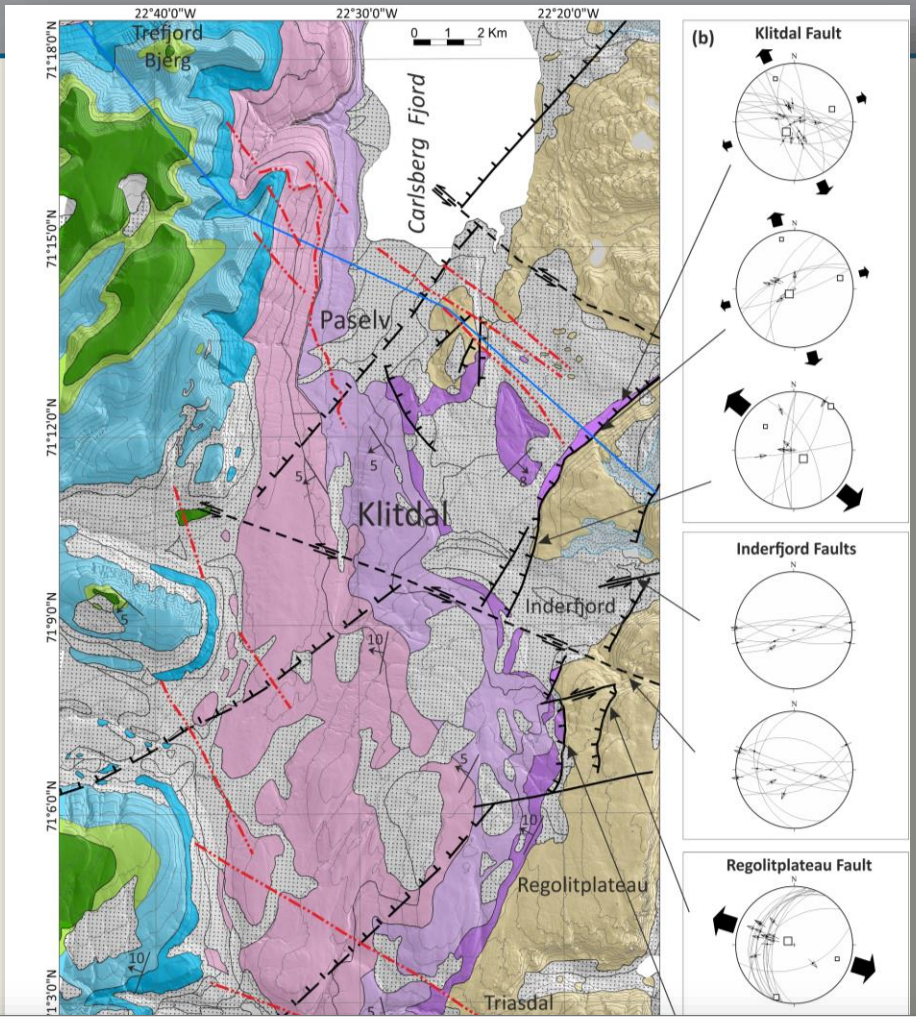

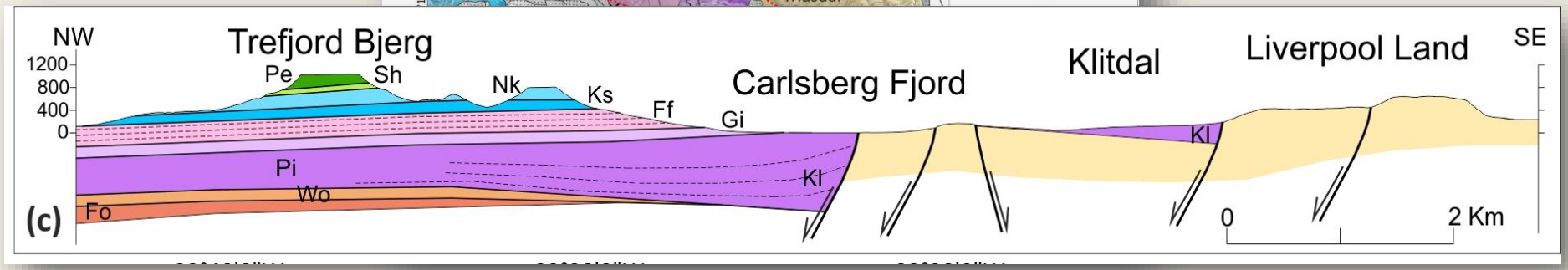

Aeromag data

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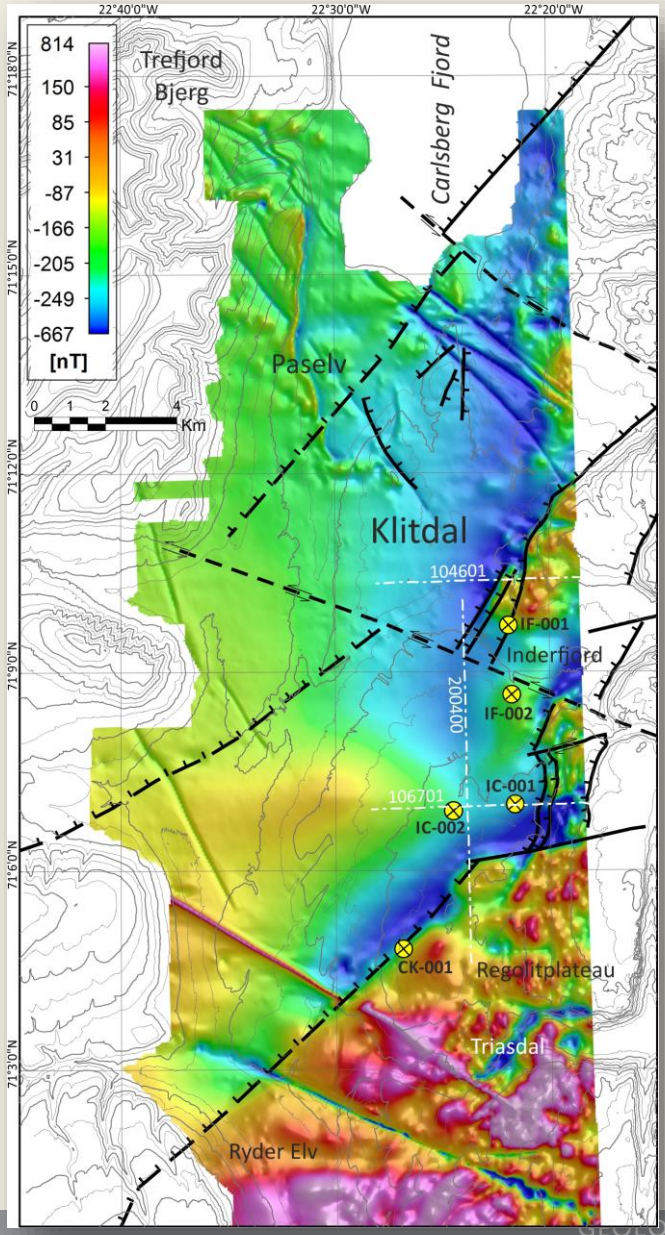
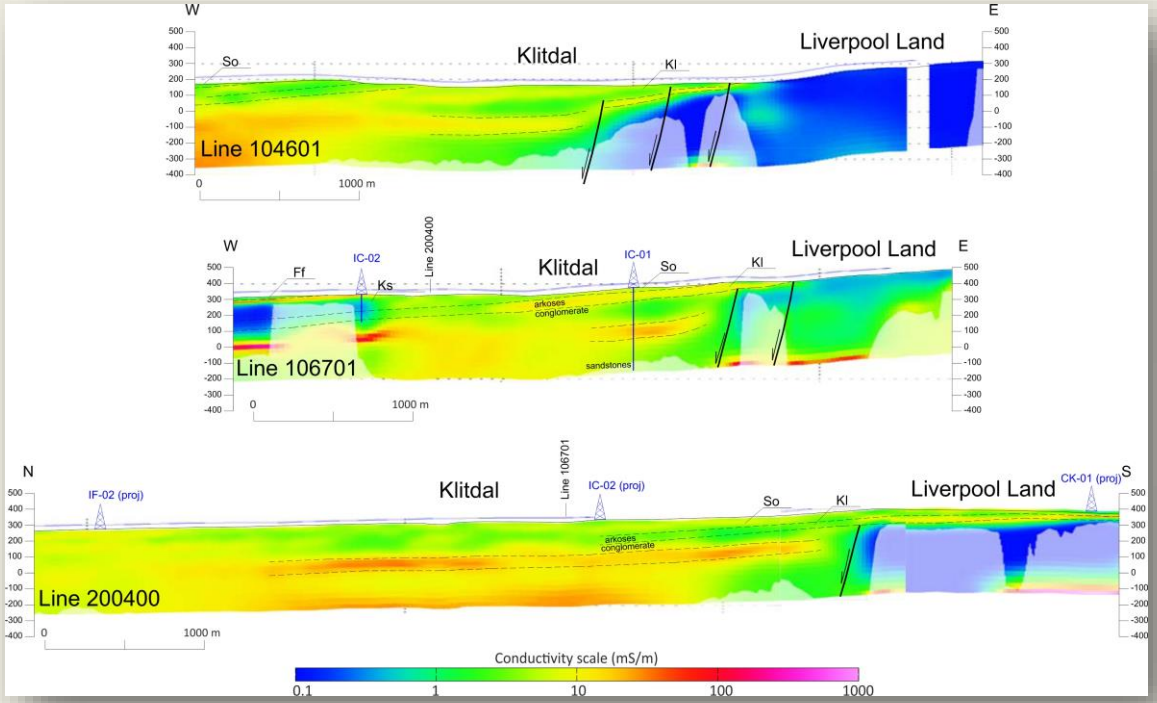
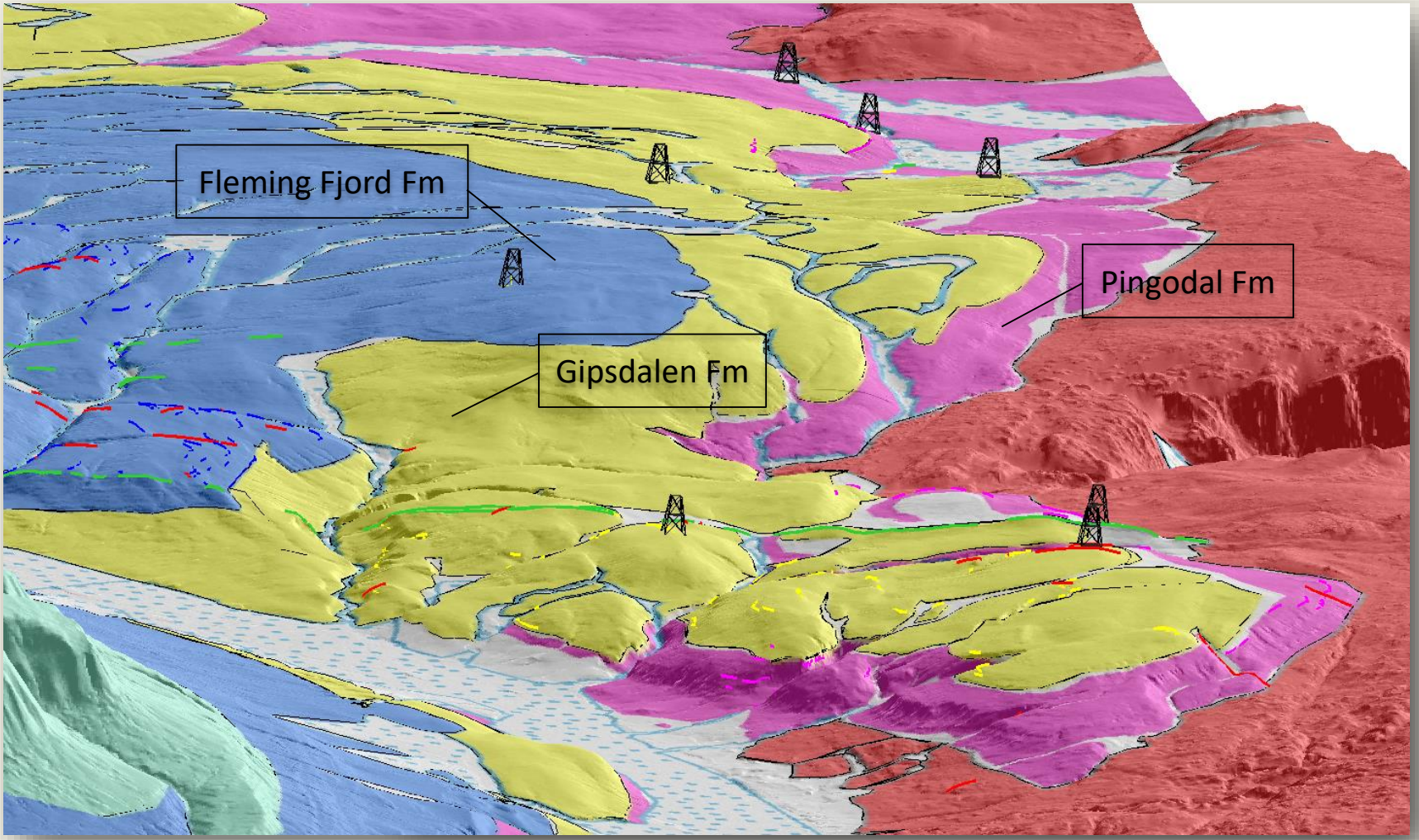
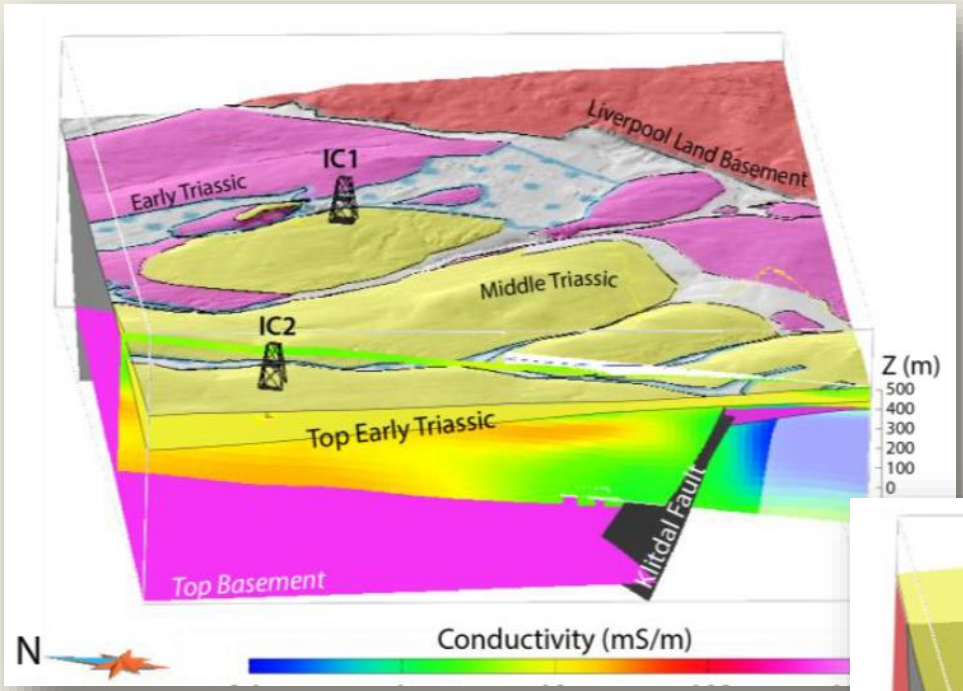
Tectonics

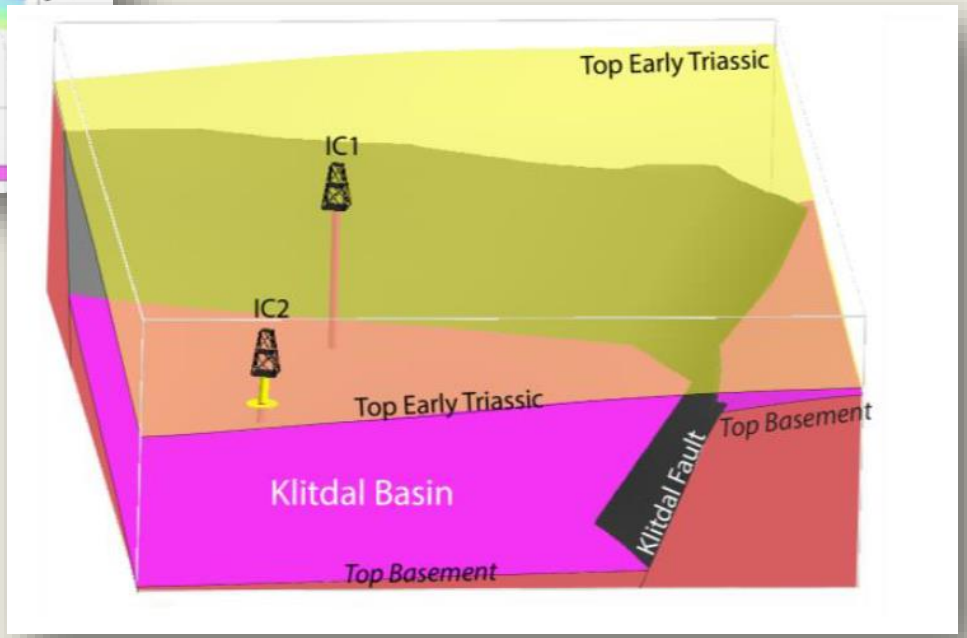


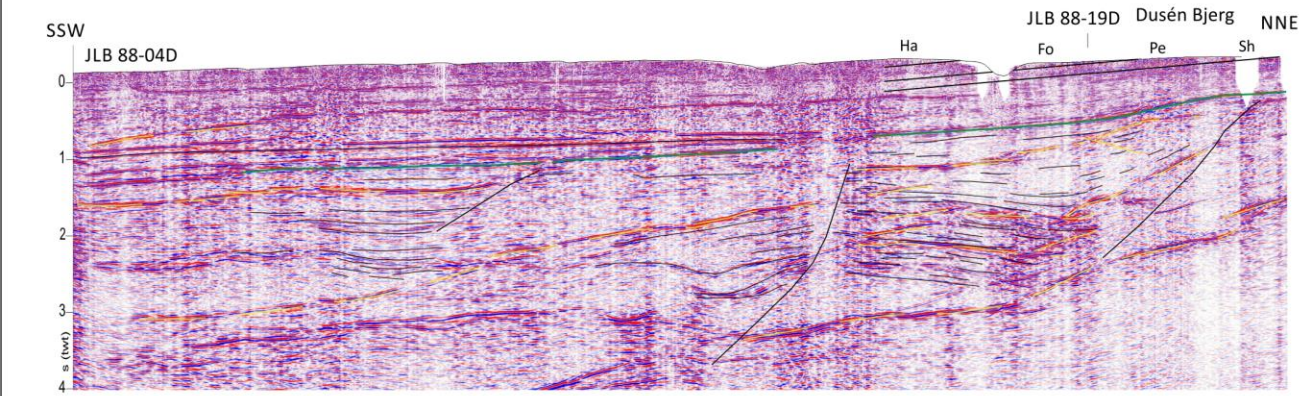
SkyTEM data



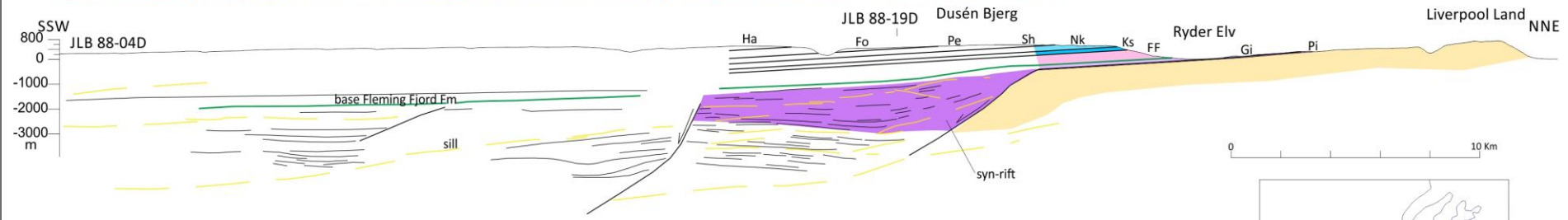

Fleming Fjord Fm
Pingodal Fm
Gipsdalen Fm

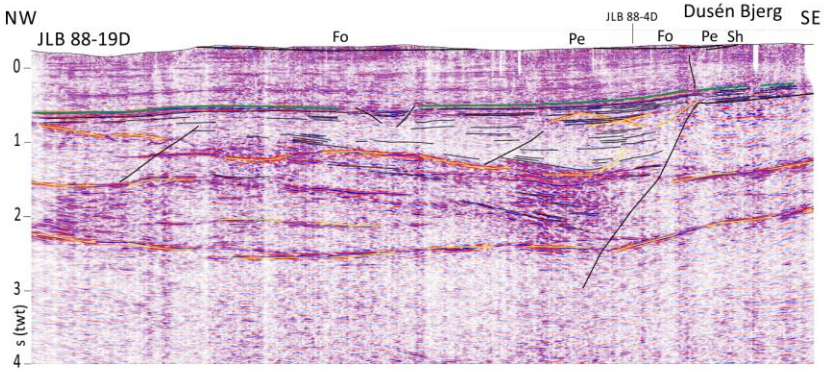

Liverpool Land Basement
Early Triassic
IC1
Middle Triassic
IC2
Z (m)
500
400
300
200
100
0
Top Early Triassic
Klitdal Fault
Top Basement
N
Conductivity (mS/m)

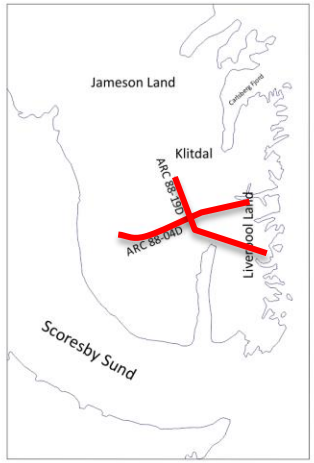

Top Early Triassic
IC1
IC2
Top Early Triassic
Top Basement
Klitdal Fault
Klitdal Basin
Top Basement

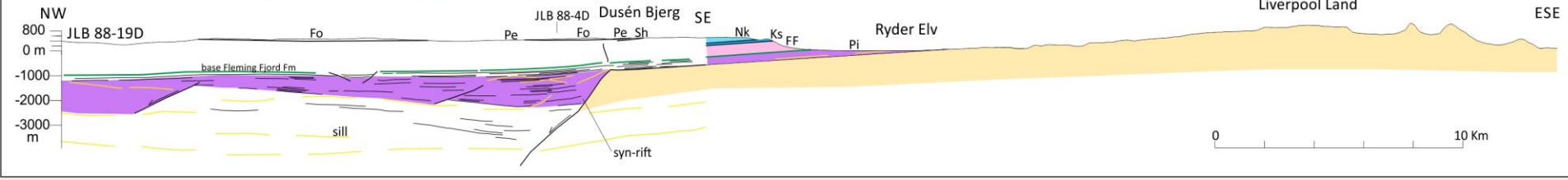


Guarnieri et al. 2017
Tectonics

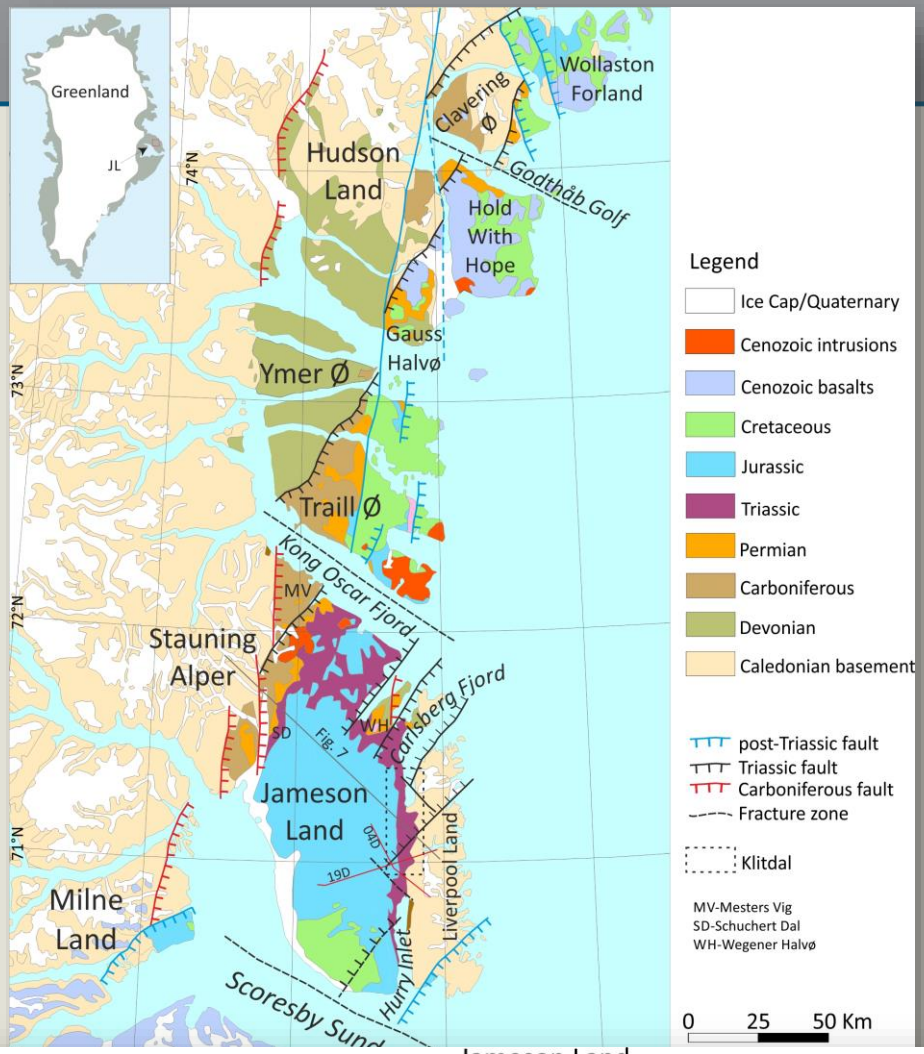


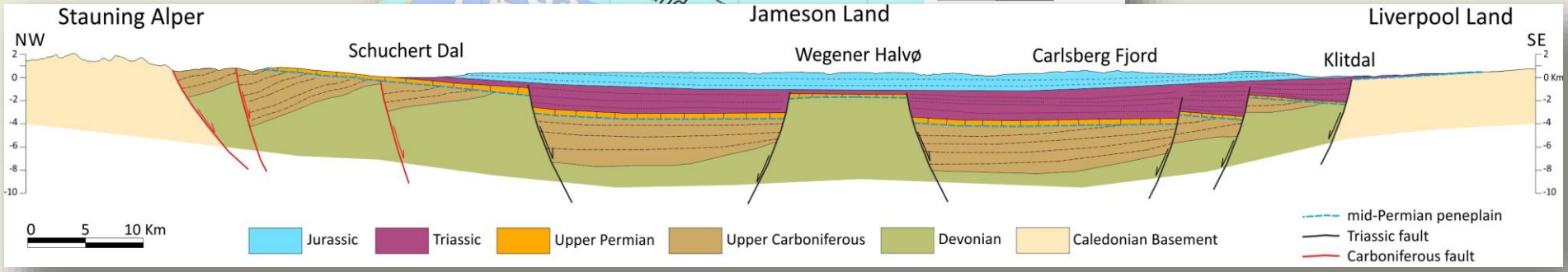




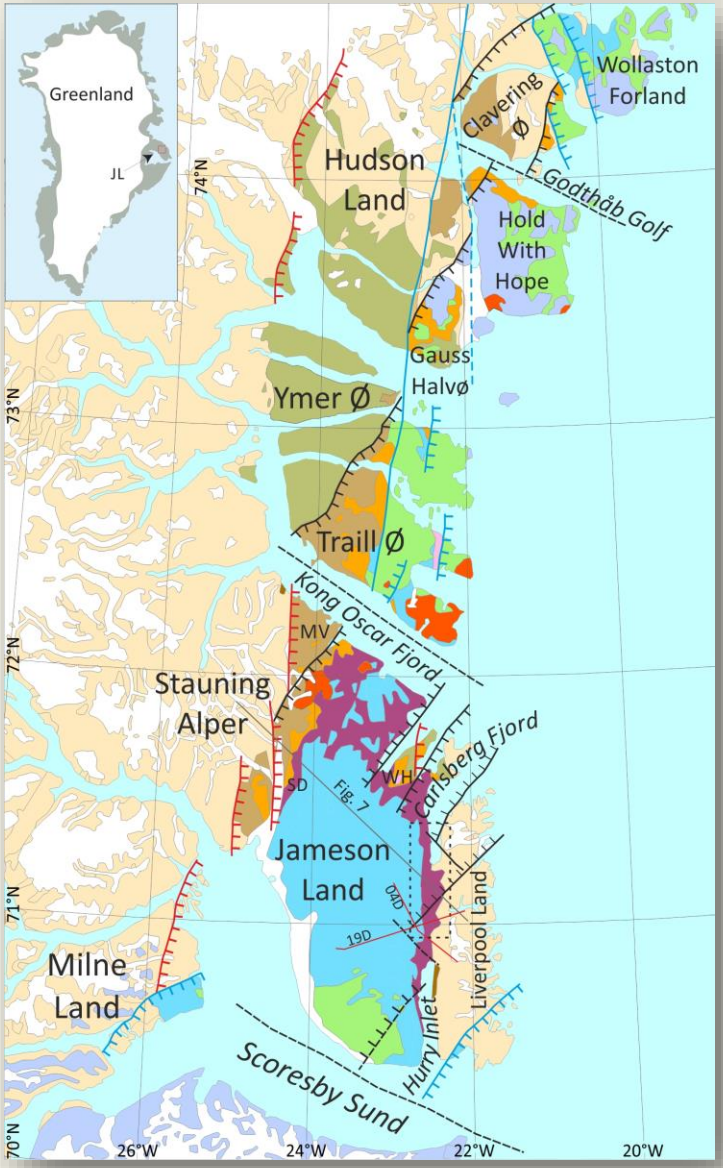


Guarnieri et al. 2017
Tectonics





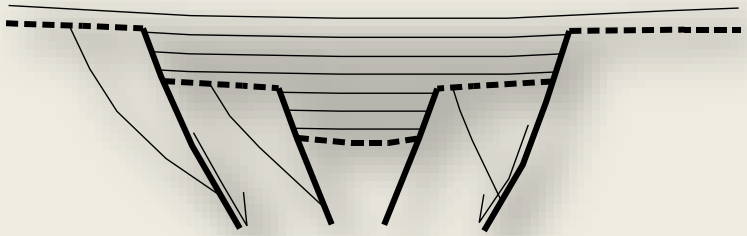
Conclusion #1



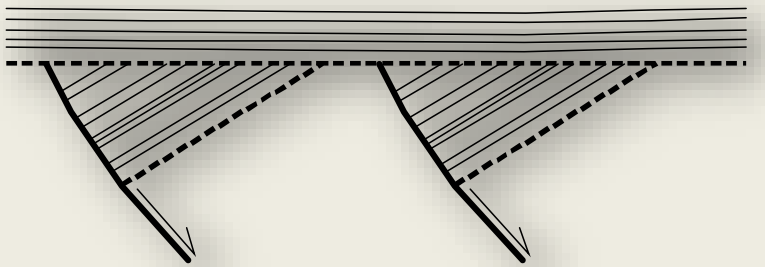
Neogene uplift (AFT)

Palaeogene magmatism

Triassic rift (NE-SW)



Late Carboniferous rift (N-S)



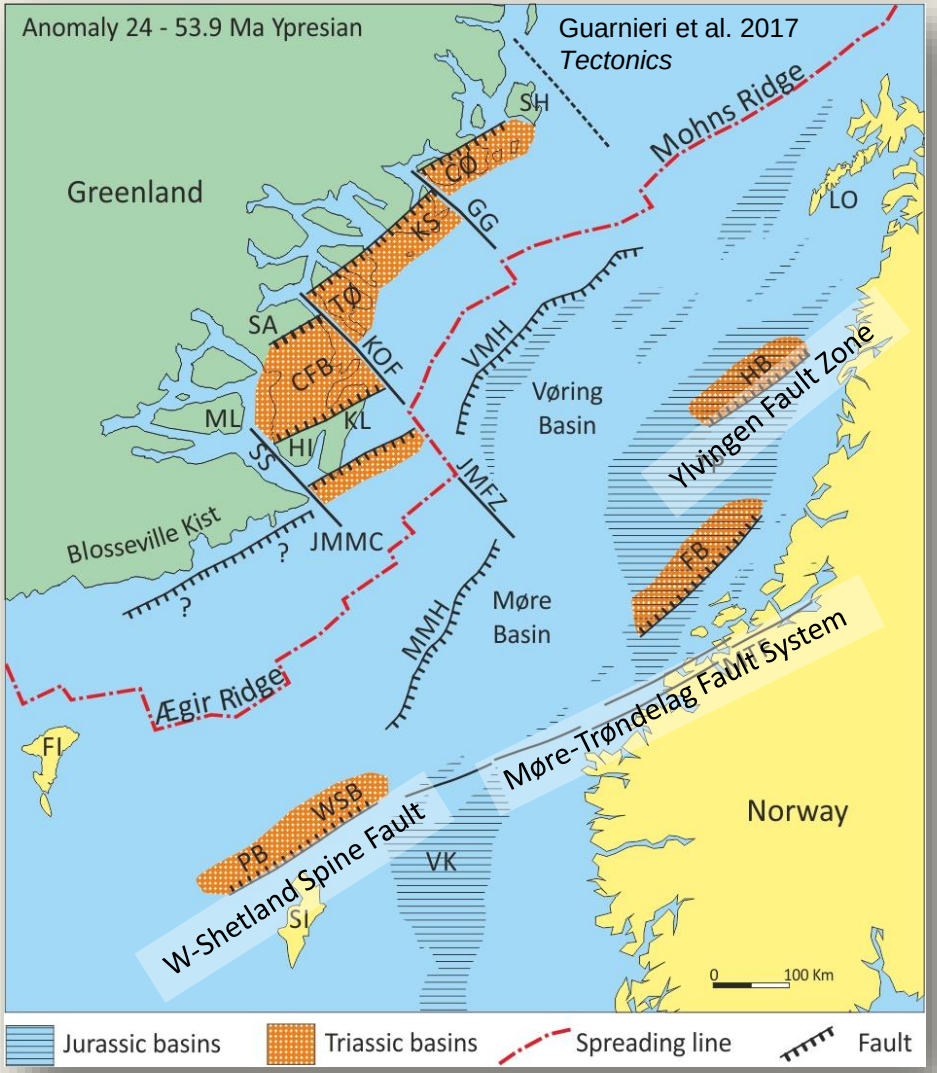
Conclusion #2

The inheritance of basement structural grain is widely considered to be an important factor in the structural development of the Northwest European Atlantic margin that is somehow considered to follow the old Caledonian suture line line (Surlyk 1978; Coward, 1990; Doré *et al.*, 1999).

The lineament analysis of the Atlantic margin shows a predominance of NE—SW, N—S and NW—SE trends reflecting Mesozoic—Cenozoic extensional faulting (Doré *et al.*, 1999)

The initial line of break-up/spreading and the Early Eocene rift zone show a correlation with major Triassic fault trends and fracture zones, suggesting a possible inheritance from the Triassic rifting (Guarnieri et al. 2017).

Major trends of the Early Triassic rift basins in the northernmost part of the North Atlantic.



Froan Basin; Helgeland Basin; Papa Basin; West Shetland Basin

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