Age Determination of the Volcanic Sequence, Faroe-Shetland Basin, Northeast Atlantic Ocean*

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Abstract

In the Faroe-Shetland Basin a Paleocene to Early Eocene (T25-T45) sedimentary succession, stemming from the UK, interacts with the volcanic succession, originating from the Faroe Islands. The interaction and relative time relations is studied from well and seismic data in order to obtain a consistent timing of the geological evolution of the area. The siliciclastic sequence is biostratigraphically dated from offshore well data whereas the volcanic sequence is both biostratigraphically and radiometrically dated from onshore samples. These two dating methods are not comparative and in addition to that, the two existing biostratigraphic studies are not comparative to each other. It can be mentioned that one of the biostratigraphic studies support the radiometric dating method. Based on seismic interpretation in the central Faroe-Shetland Basin, the sedimentary succession can be extrapolated towards the west and the interpretation indicates the upper part of the volcanic material is time equivalent to the Flett Formation as T40 is found below and T45 above the volcanic. The onshore coal bearing Prestfjall Formation (A-horizon) is identified as a bright reflector in offshore seismic data. The A-horizon is traced into the central Faroe-Shetland Basin, and corresponds here to the boundary between T40/F1A and T40/F1B. Seismic interpretation in the Judd Sub-basin show that the lower part of the volcanic succession recorded in the wells is time equivalent with Lamba (T36-T38) and Vaila (T25-T36) formations. Thus, indirect age determination using dated sediment in wells and seismic interpretation place an age estimate of the volcanic material to be T25-T45 (possibly down to T22) which pronouncedly revise the dating of the volcanics and renews the idea of the geological development of the area, which is of importance regarding the hydrocarbon exploration.

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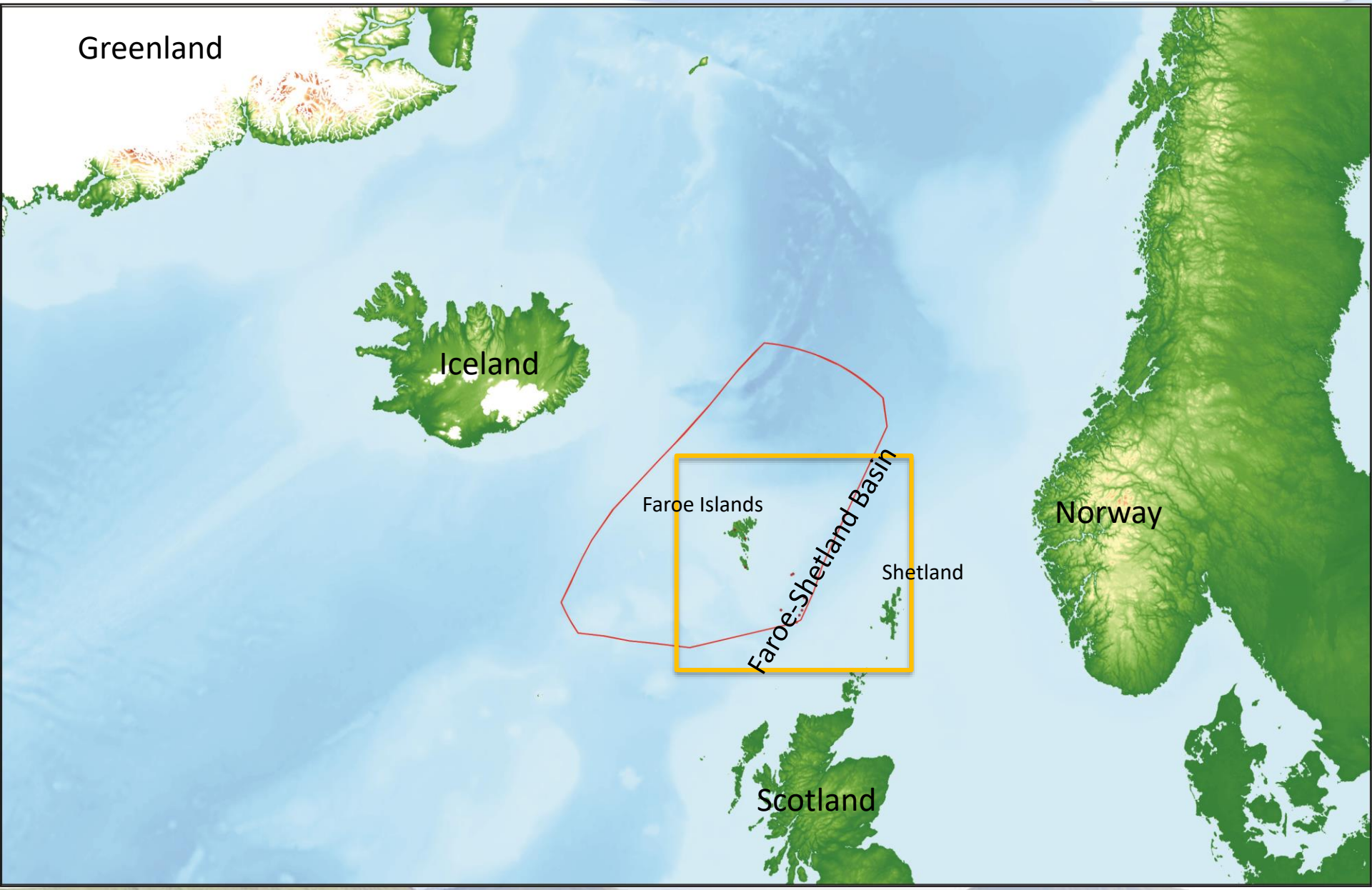
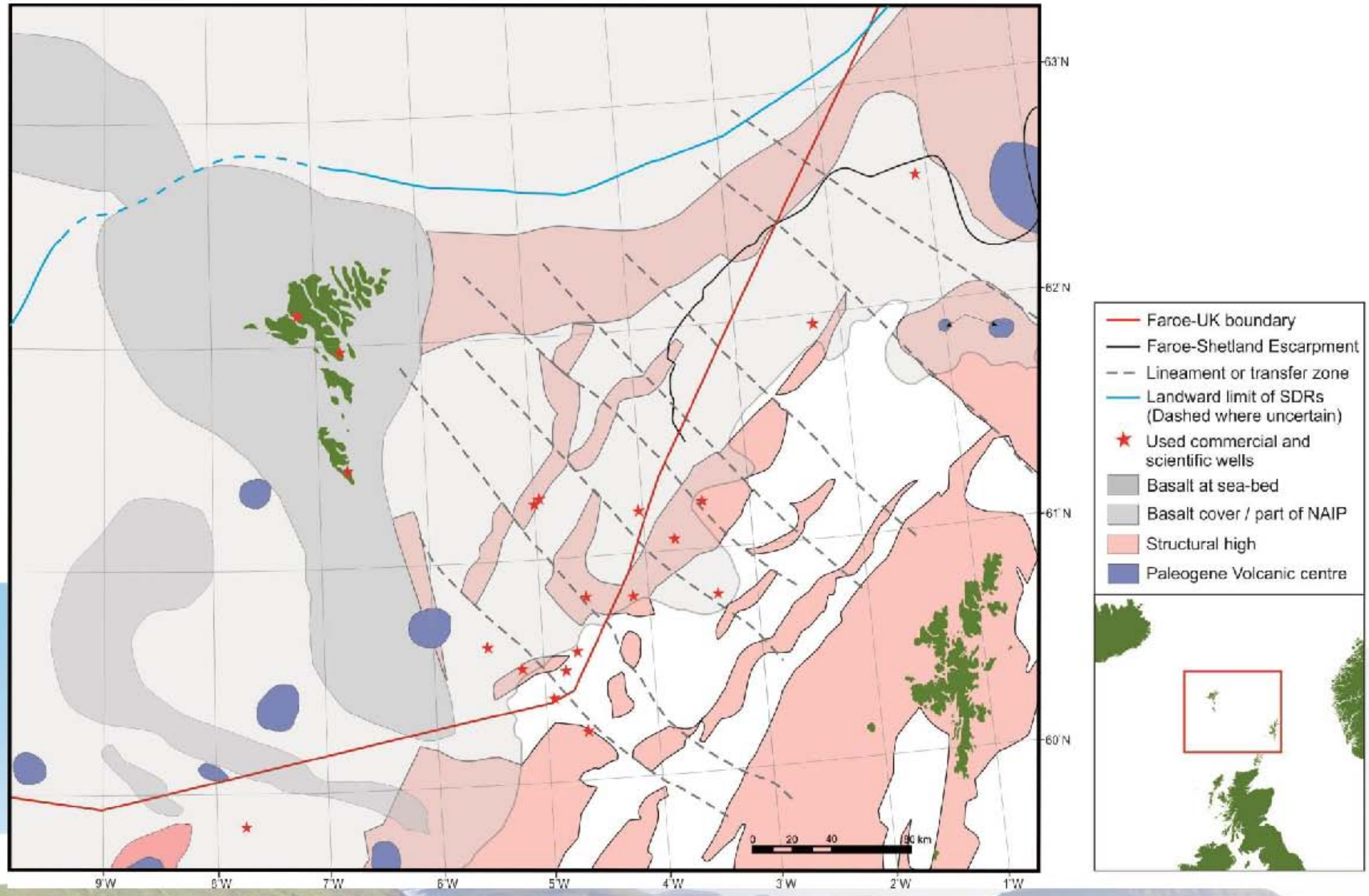
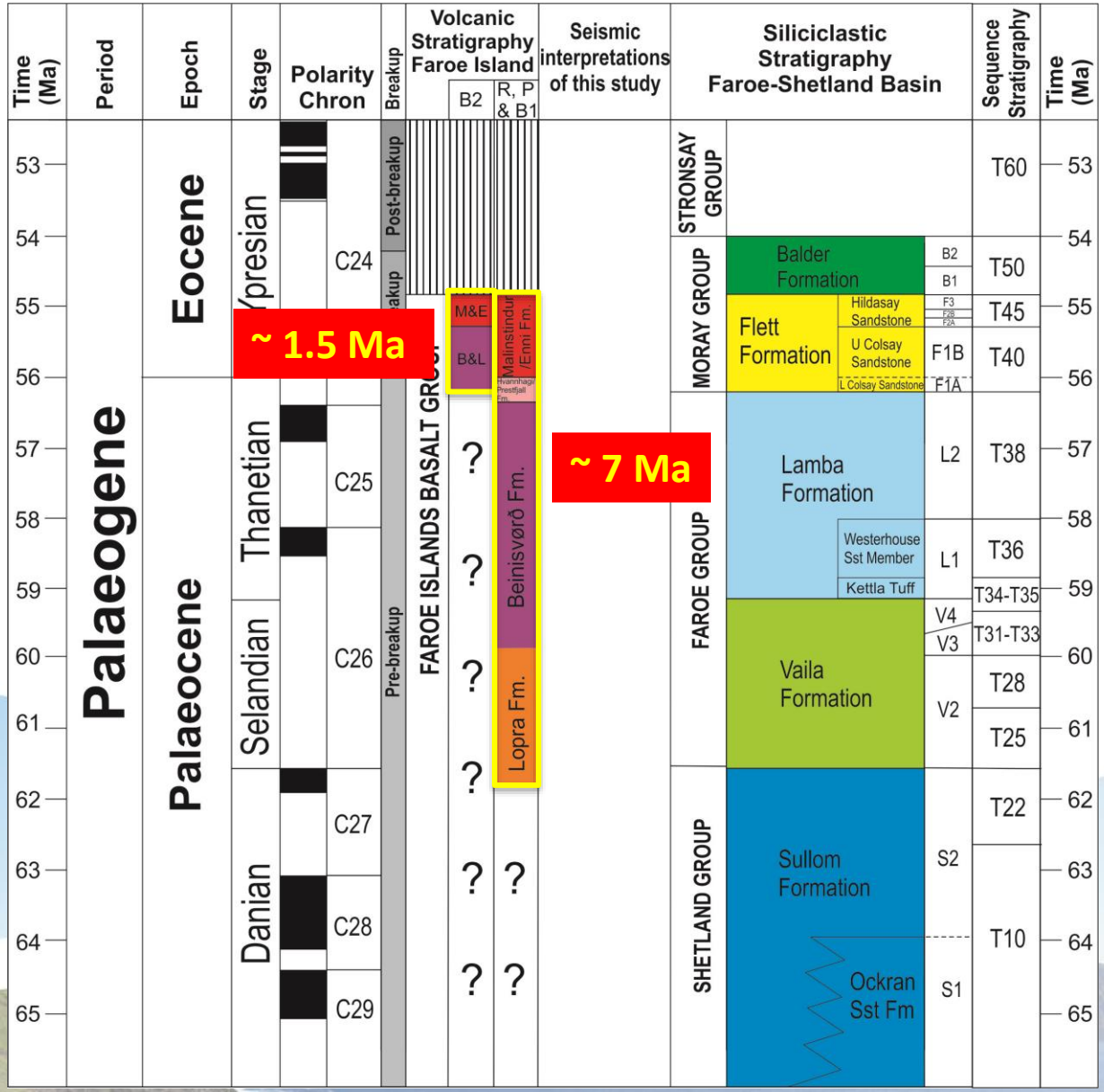
Óluva R. Eidesgaard (Faroese Geological Survey)


Greenland
Iceland
Faroe Islands
Faroe-Shetland Basin
Shetland
Norway
Scotland

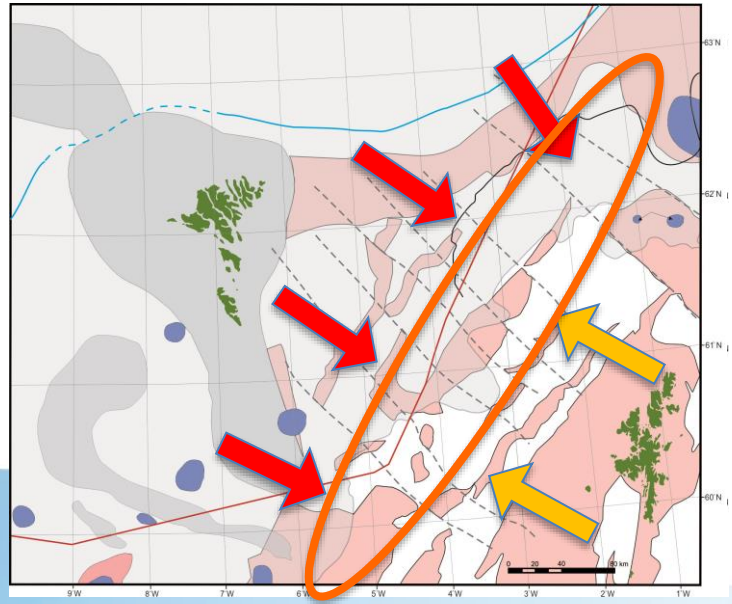
Present structural map of the Faroe-Shetland area

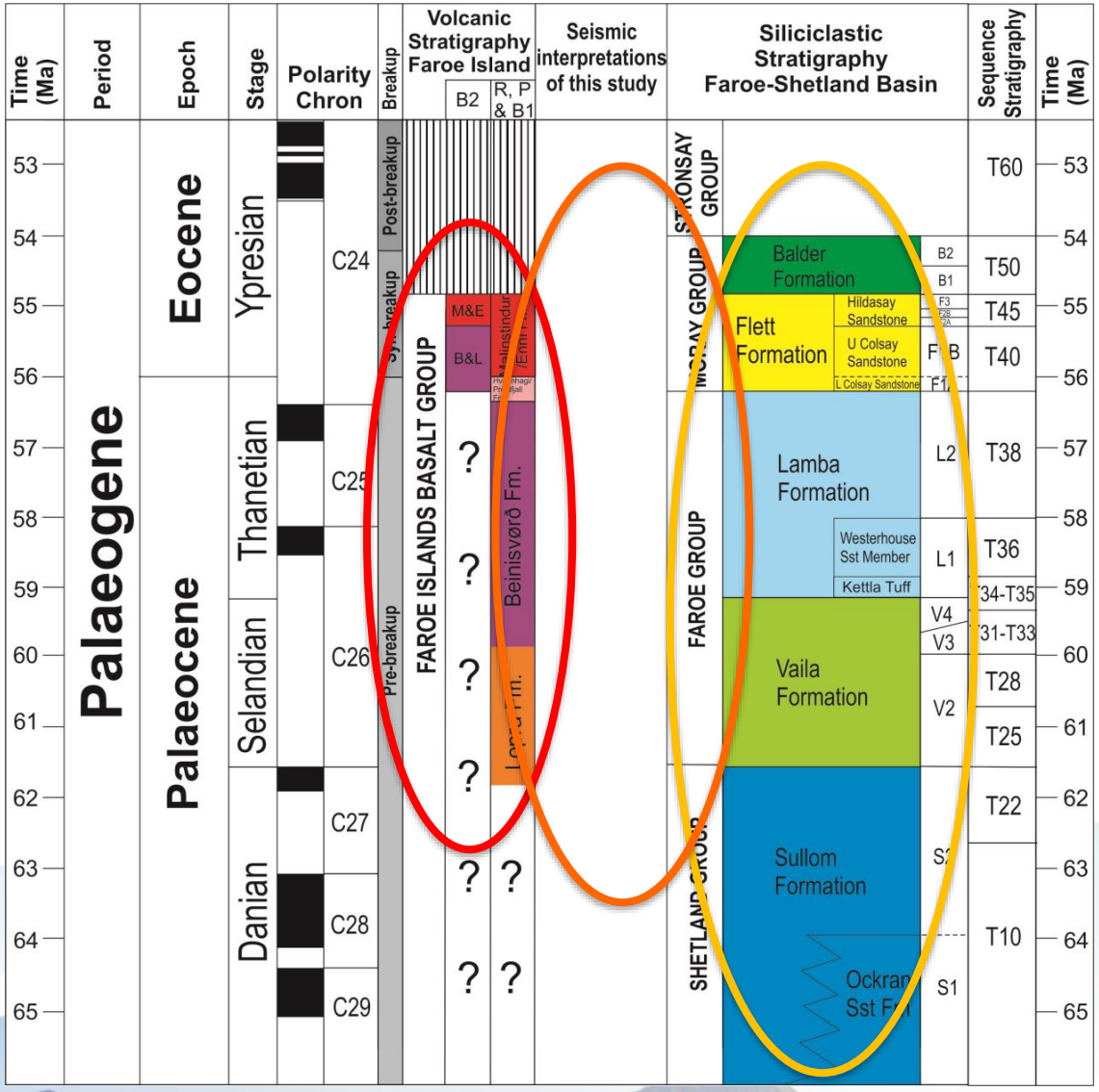


Age mismatch between radiometric and biostratigraphic dating methods of the volcanic sequence



Paleocene - Early Eocene input into Faroe-Shetland Basin





Paleocene - Early Eocene input into Faroe-Shetland Basin

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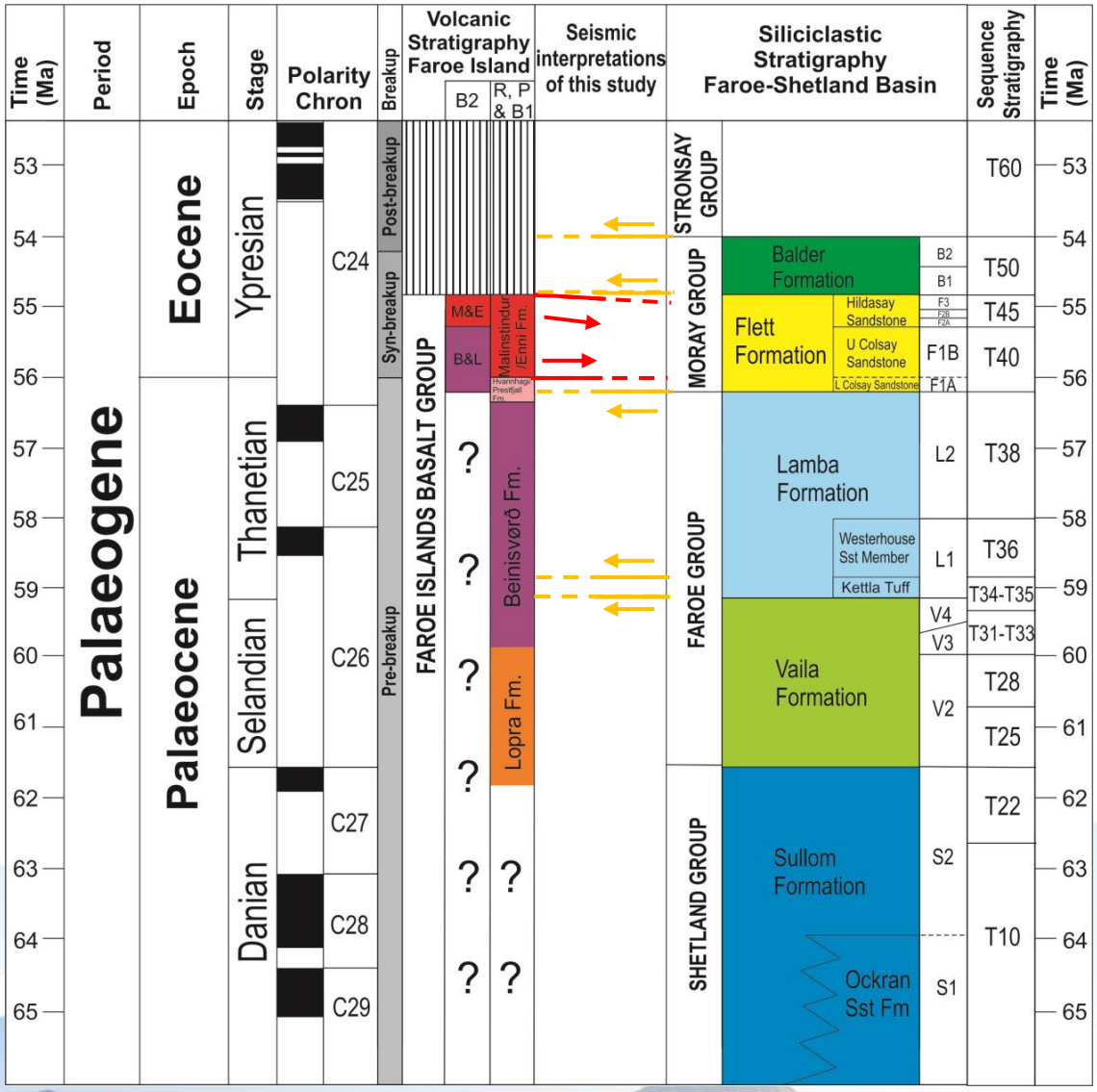
Volcanic horizons

- Top Volcanic
- A-horizon

Non volcanic horizons

- Top Balder
- Top Flett
- Top Lamba
- Top Kettla
- Top Vaila



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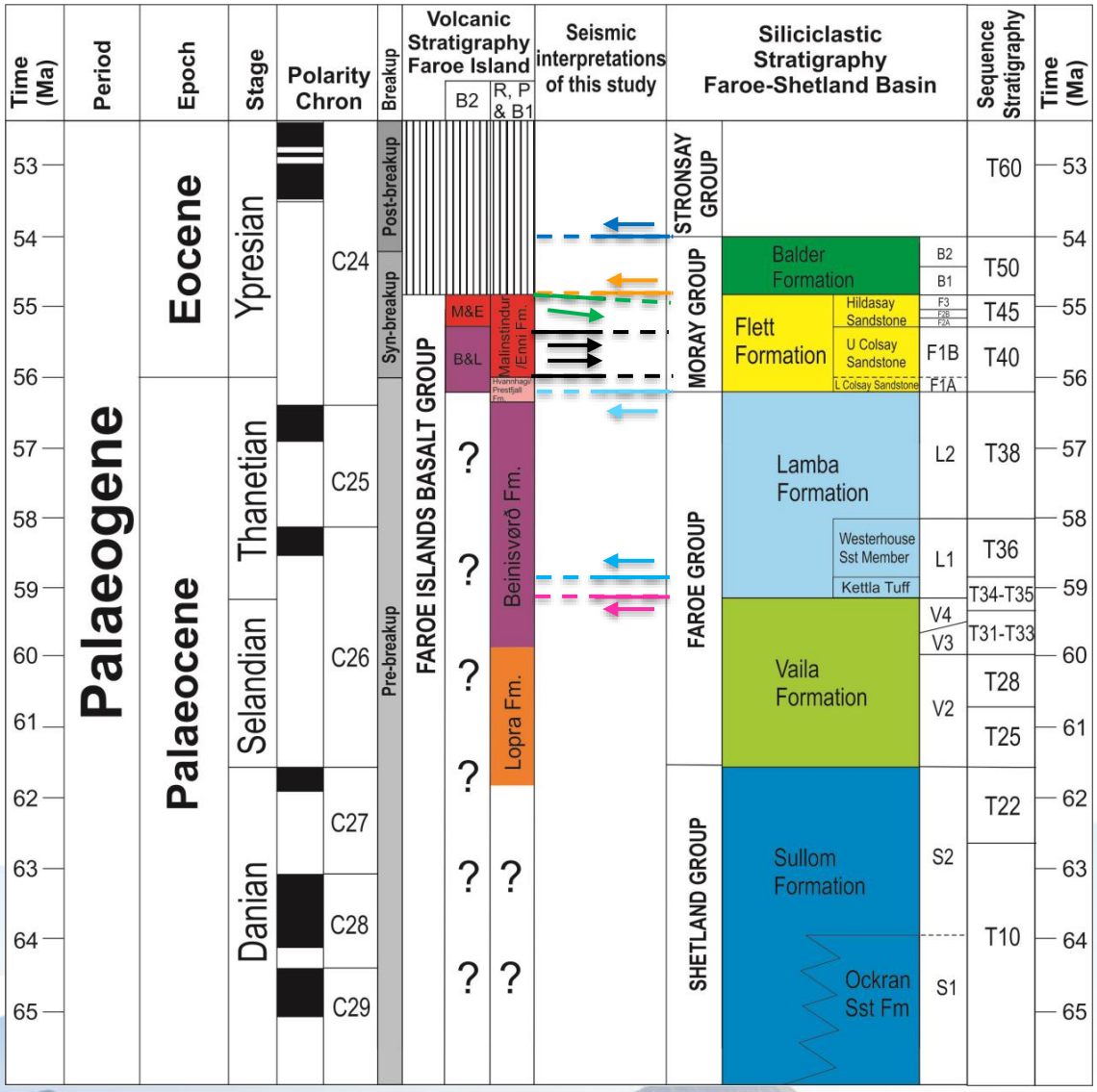

Judd Sub-basin - Faroe-Shetland Basin

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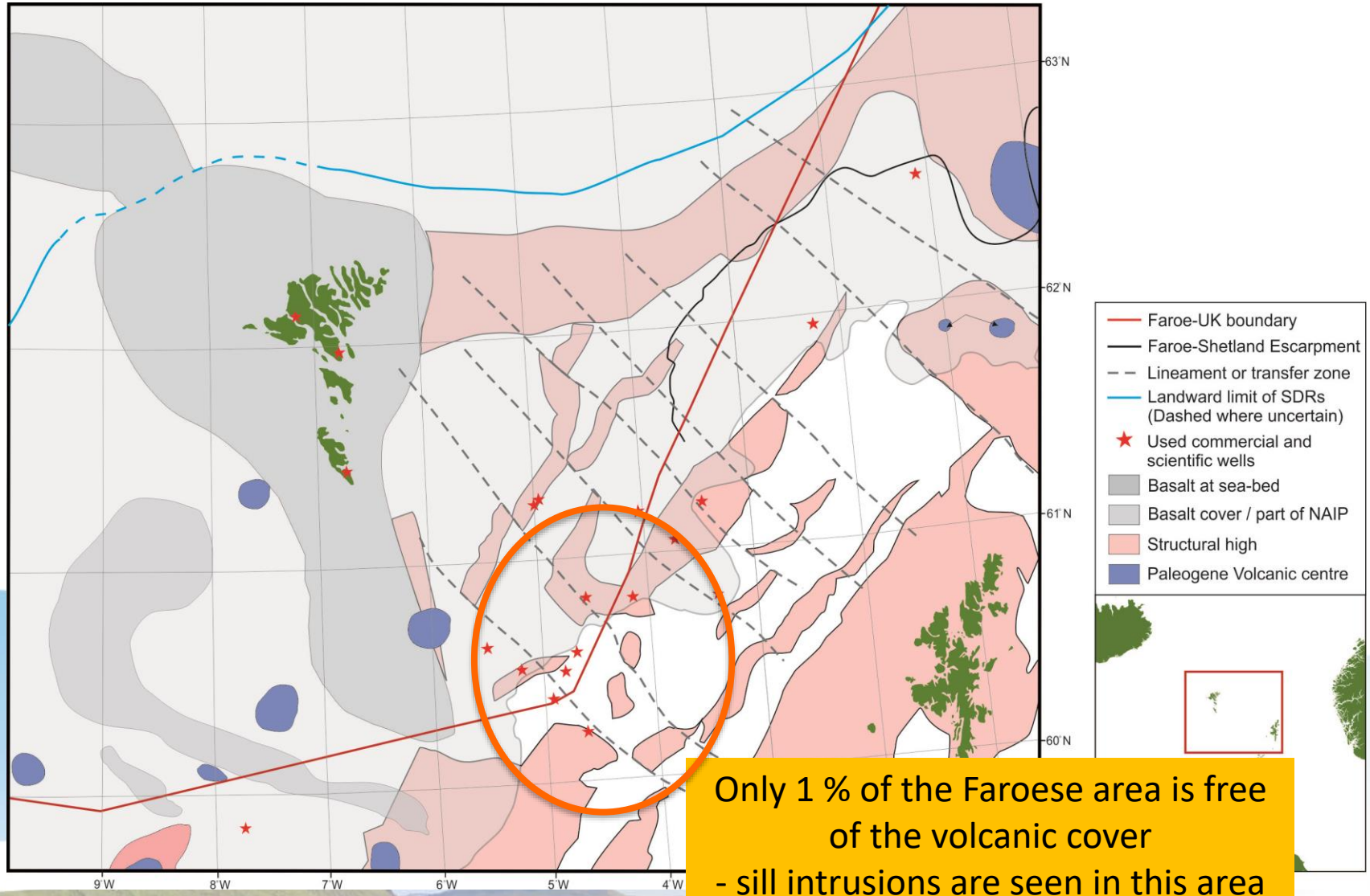

Only 1 % of the Faroese area is free of the volcanic cover
- sill intrusions are seen in this area

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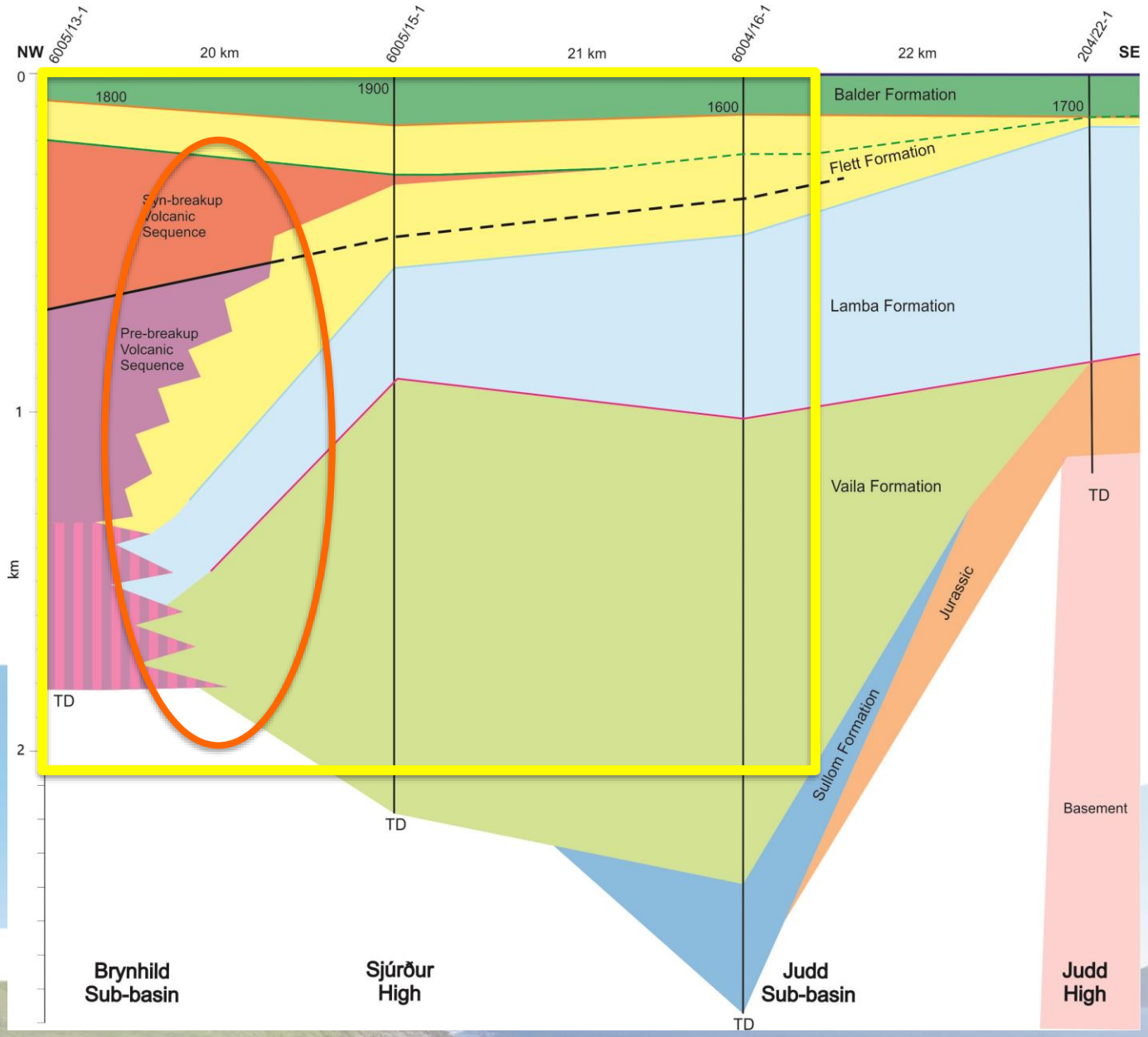
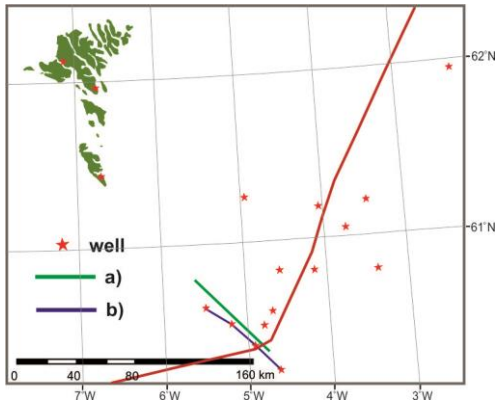
b)





Formaitons
- Balder Formation
- Flett Formation
- Lamba Formation
- Vaila Formation
- Sullom Formation
- Cretaceus
- Jurassic
- Triassic
- Carboneferous
- Syn-volcanic Sequence
- Pre-volcanic Sequence
- Hyaloclastites syn-breakup
- Hyaloclastites pre-breakup
- Basement

Seismic horizons
- Inferred
- A-horizon
- A-horizon equivalent
- Top Balder Formation
- Top Volcanic
- Volcanic Equivalent
- Top Flett Formation
- Top Lamba Formation
- Top Lamba Equivaltent
- Top Ketla Tuff
- Top Vaila Formation

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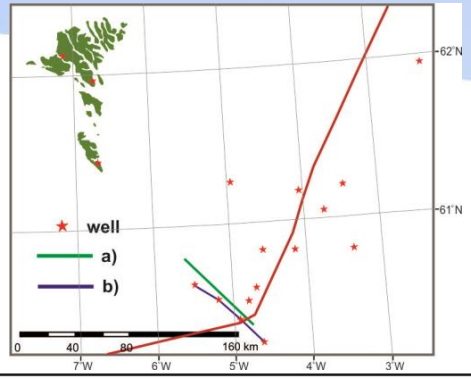
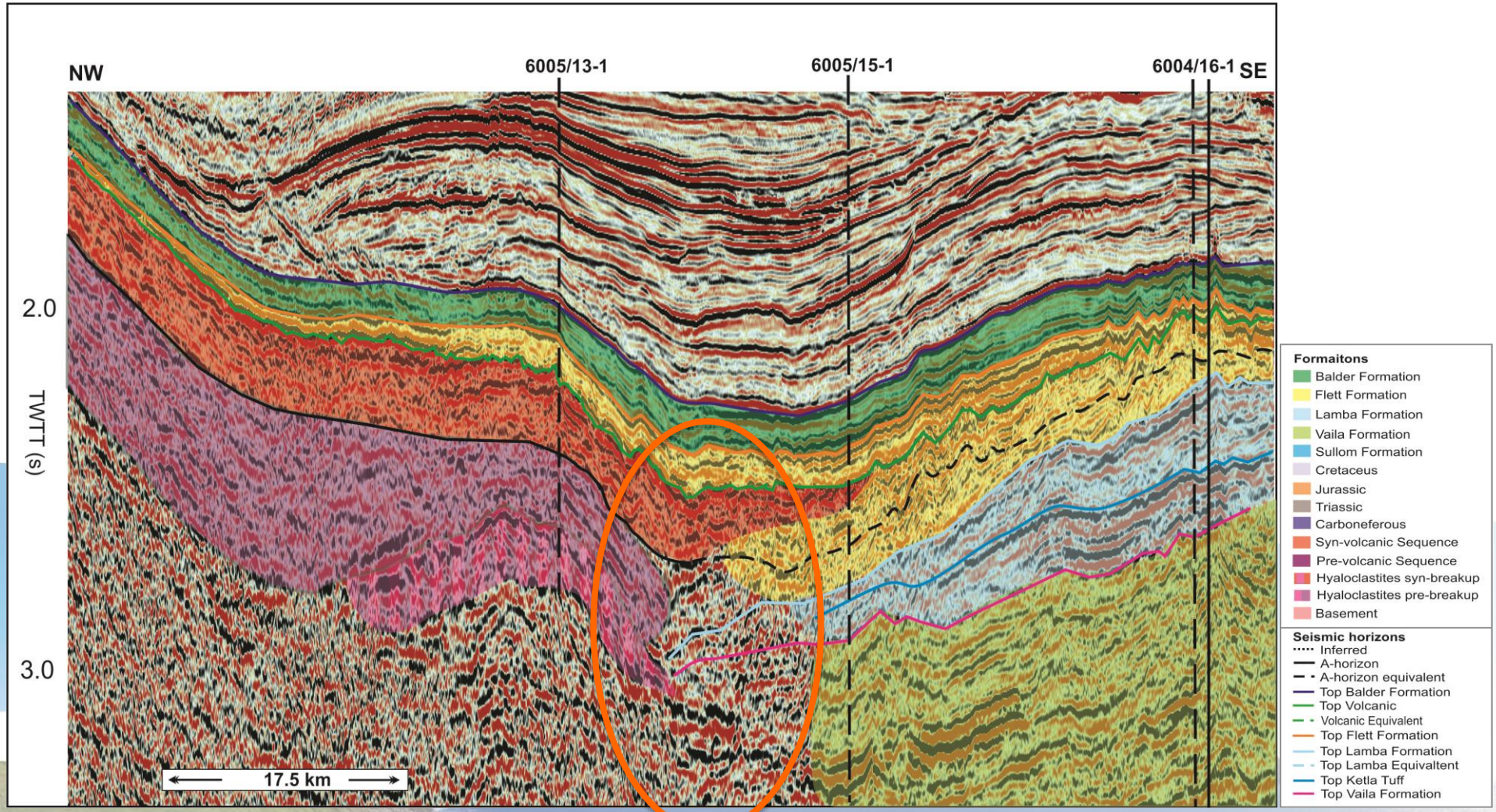
a)



Brynhild Sub-basin to Judd Sub-basin



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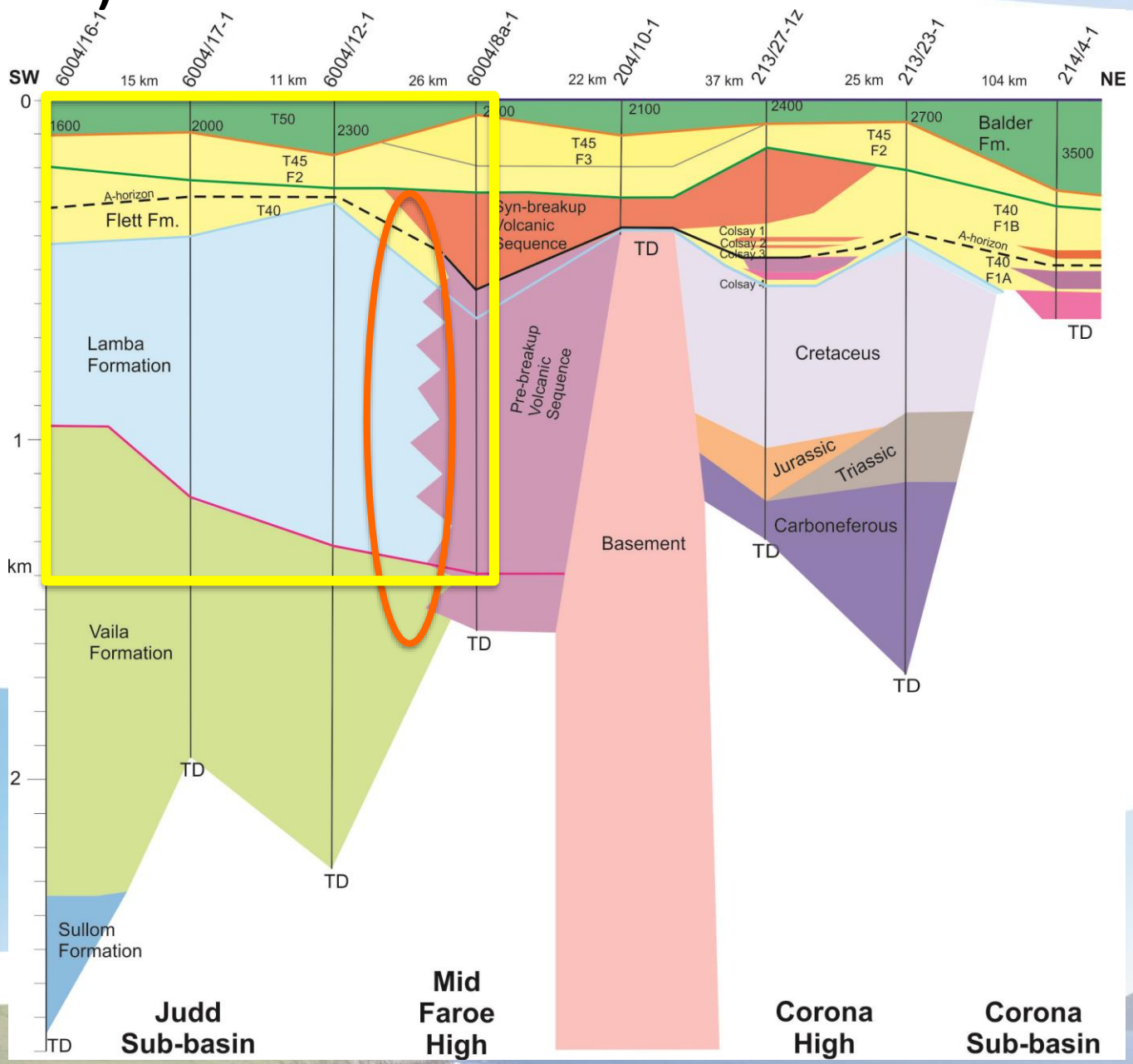

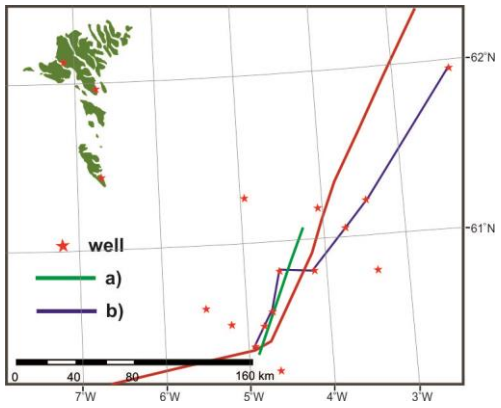

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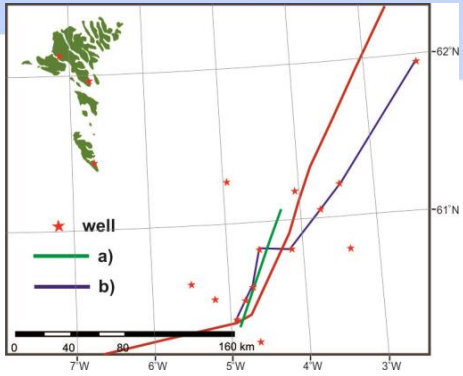
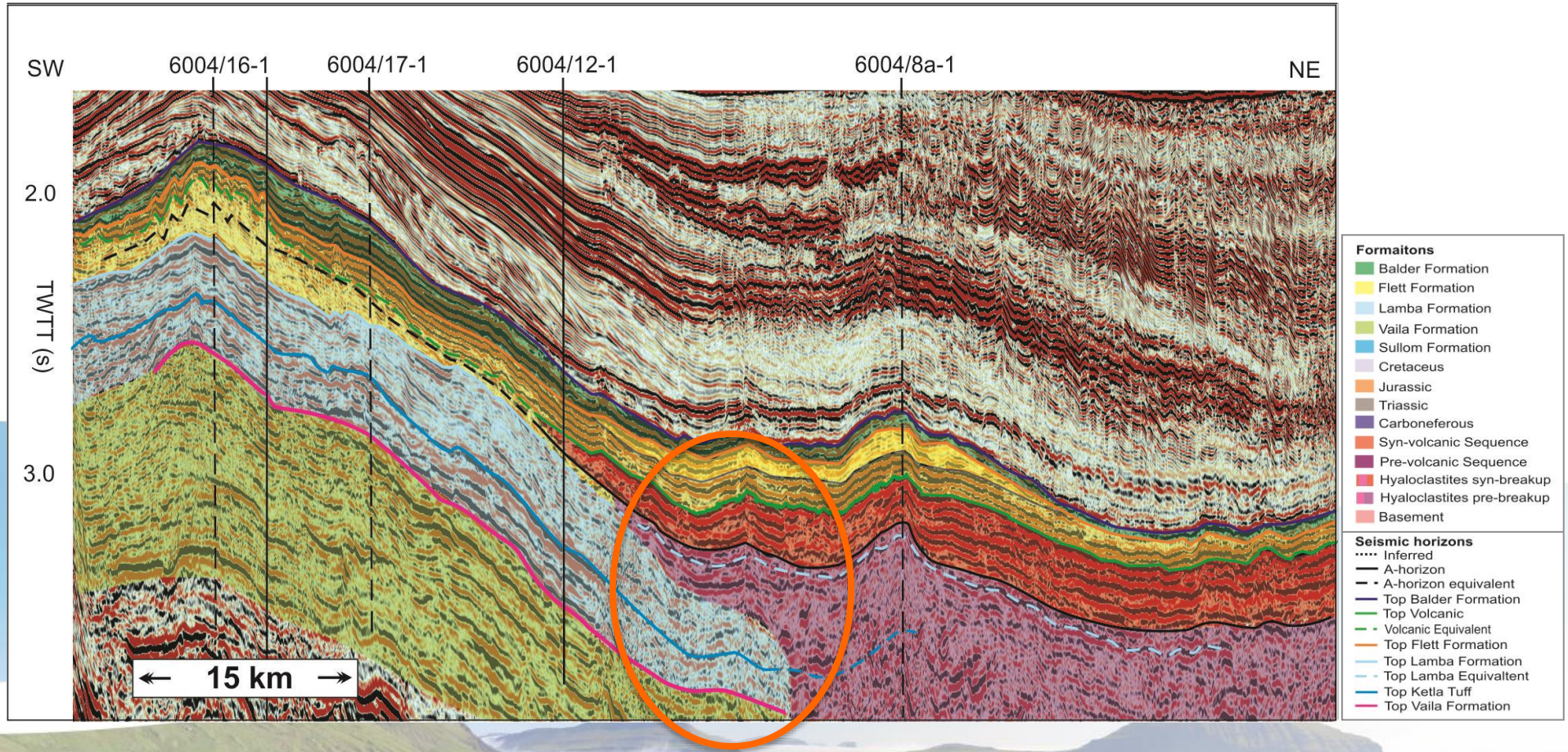
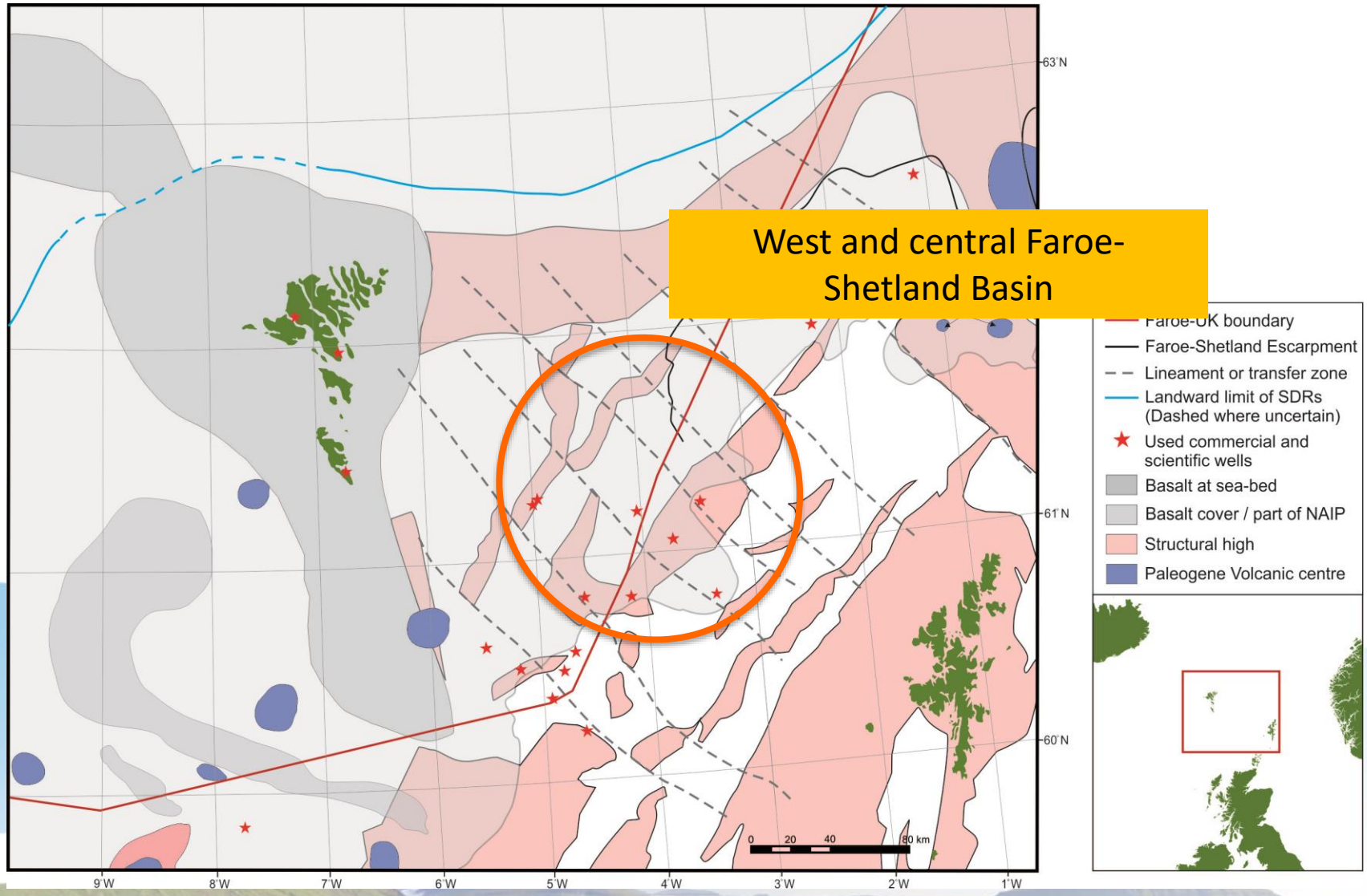


Judd Sub-basin to Mid-Faroe High




West and central Faroe-Shetland Basin
Faroe-UK boundary
Faroe-Shetland Escarpment
Lineament or transfer zone
Landward limit of SDRs (Dashed where uncertain)
Used commercial and scientific wells
Basalt at sea-bed
Basalt cover / part of NAIP
Structural high
Paleogene Volcanic centre
63°N
61°N
60°N
9°W
8°W
7°W
6°W
5°W
4°W
3°W
2°W
1°W
0 20 40 80 km

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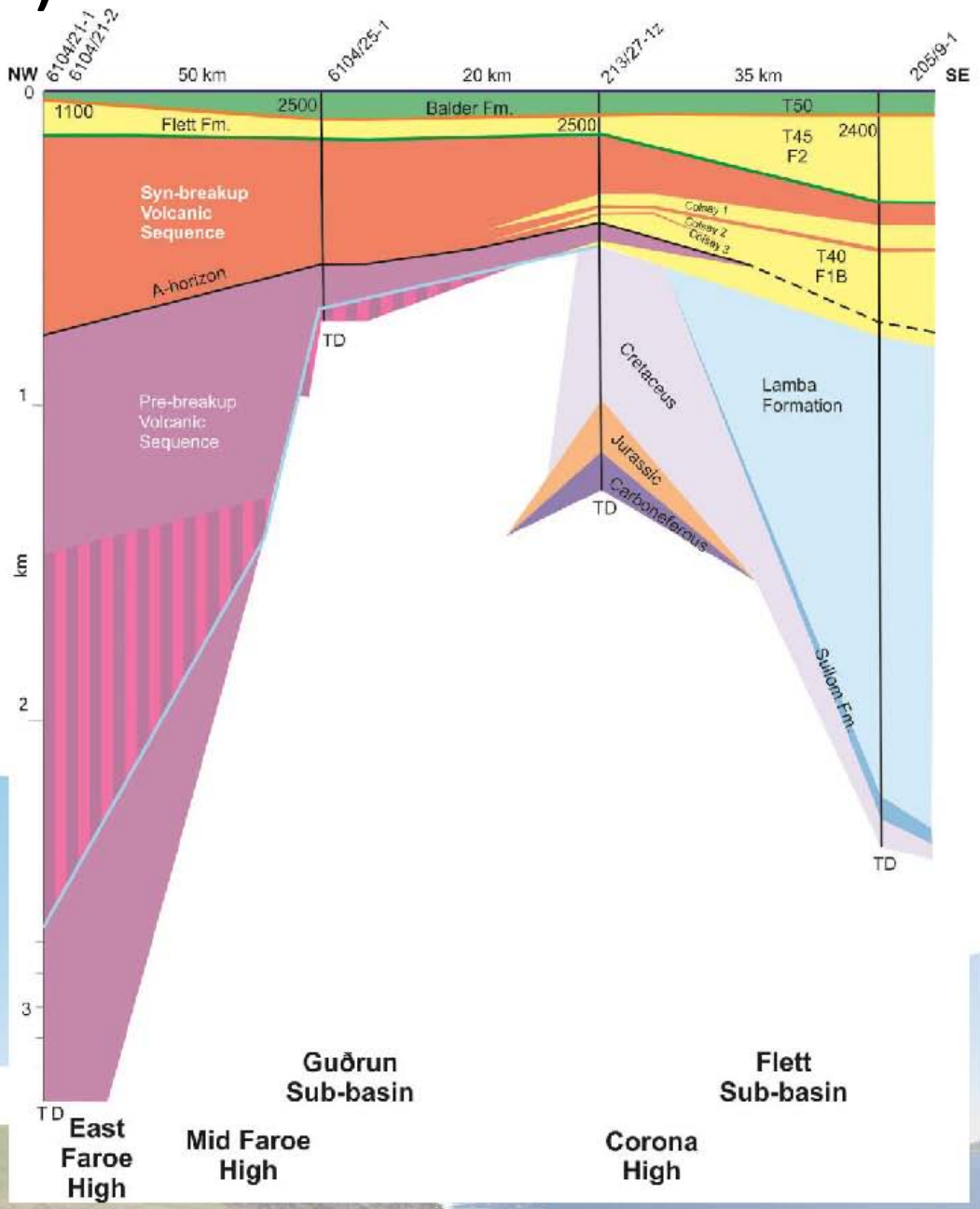
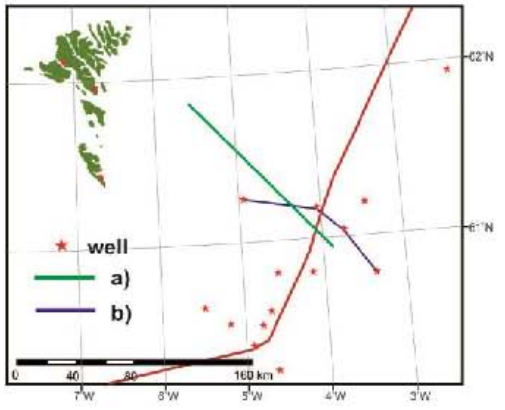
b)





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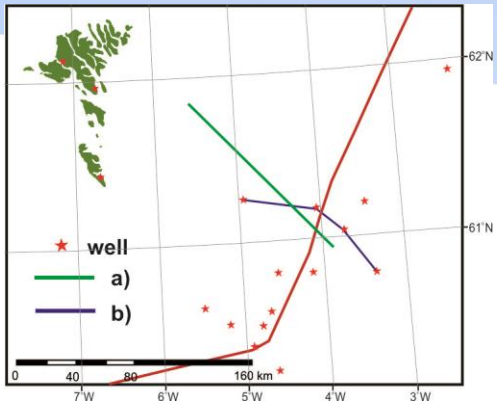
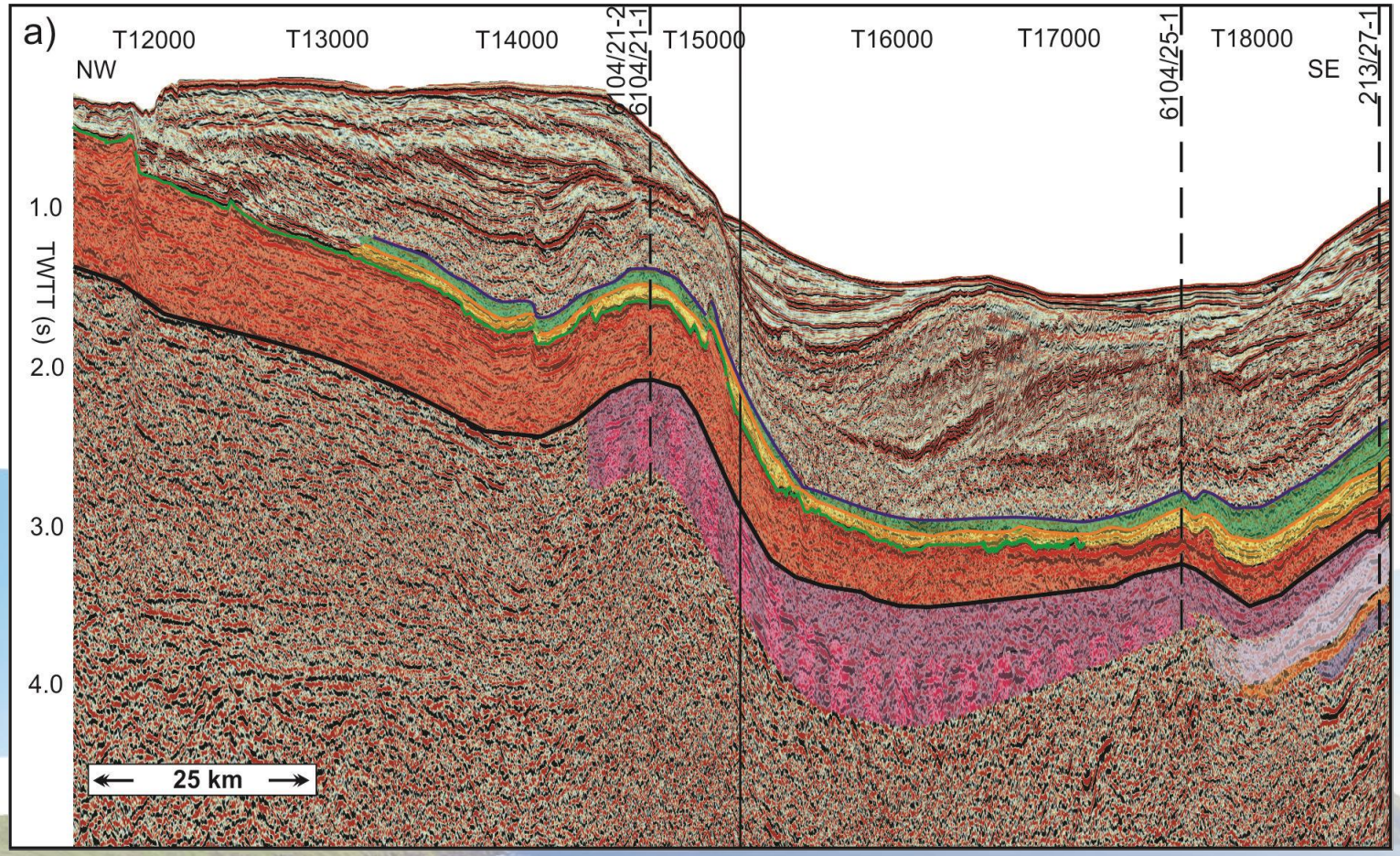


East Faroe High to Corona Sub-basin



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Conclusion

- The volcanic sequence in the Judd Sub-basin has an age range from ~55 to > 60 Ma.
    - Support the radiometric dating method
- The four wells drilled in the highs and sub-basin west of Corona High ends up in the pre-breakup volcanic strata and have an age range from ~55 to > 60 Ma.
    - Support the radiometric dating method
- The drilled volcanic sequence in the central part of the Faroe-Shetland Basin east of and on the Corona High has an age ranging from ~55-56.5 Ma.
    - Corona High seem to acts as an obstacle during Paleocene time.

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Thank you