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A photograph of an offshore oil rig in the middle of a calm, blue ocean under a clear sky. The rig is silhouetted against the horizon. A large blue arc is superimposed over the top of the image.

ATLAS TO EXPLORE HYDROCARBON OPPORTUNITIES IN THE DUTCH OFFSHORE

Explore in a mature basin



GEODE - Zechstein Play

Hauptdolomite distribution around the Elbow Spit High

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Presented by: Stefan Peeters

Team: Renaud Bouroullec (TNO), Stefan Peeters (TNO), Kees Geel (TNO), Harald de Haan, (TNO), Jurrien Dijk (TNO), Daan den Hartog Jager(EBN), Marloes Kortekaas (EBN), Milan Brussee (EBN)

Petrography: Jo Garland (CC)

1. Introduction



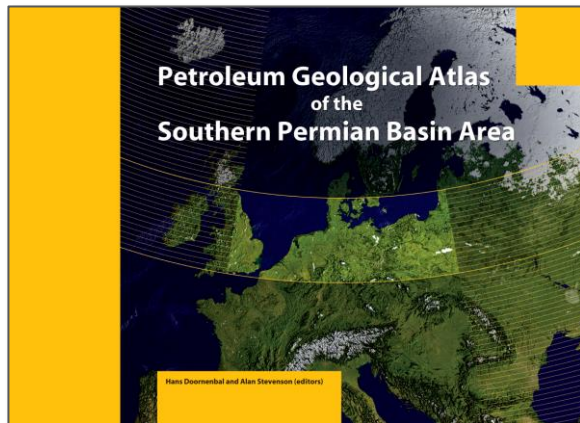
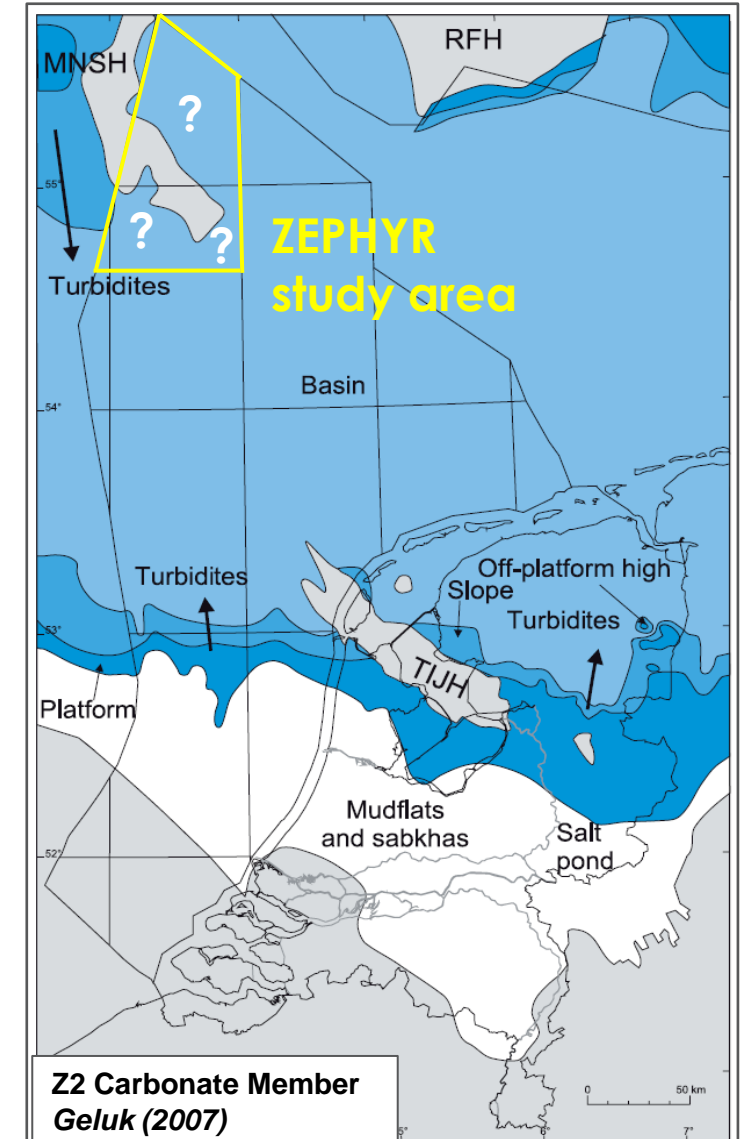
Zechstein play GEODE Atlas project

- › GEODE will cover both carbonate and siliciclastic plays in the entire Dutch offshore – Work in progress

ZEPHYR project - focus of current presentation

Aim: Improve understanding of the carbonate facies and distribution of Hauptdolomite (ZEZ2C) platforms around the Elbow Spit High (ESH).

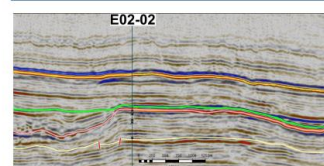
- › Pre-Atlas project on the ZEZ2C, filling knowledge gap around ESH
- › Study based on petrographic analysis of key wells and seismic interpretation around ESH



Seismic characterization of the Zechstein carbonates in the Dutch northern offshore

Sjoerd Tolsma¹ (Author)
Prof. Dr. Jan de Jager¹ (First supervisor)
Bastiaan Jaarsma² (Second Supervisor)
¹ Utrecht University, Netherlands
² EBN, Utrecht, Netherlands
June, 2014

MSc. Thesis: Earth, Life and Climate

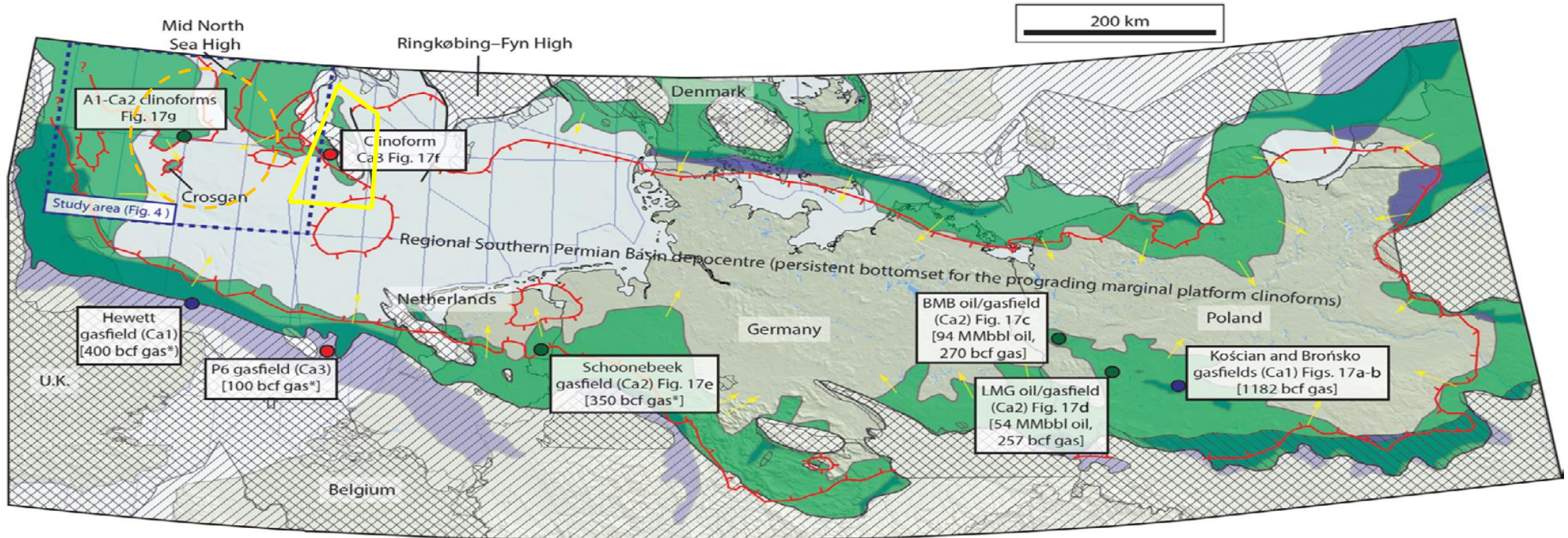


NLOG
Nederlandse Olie- en Gasportaal
Home / Datacenter

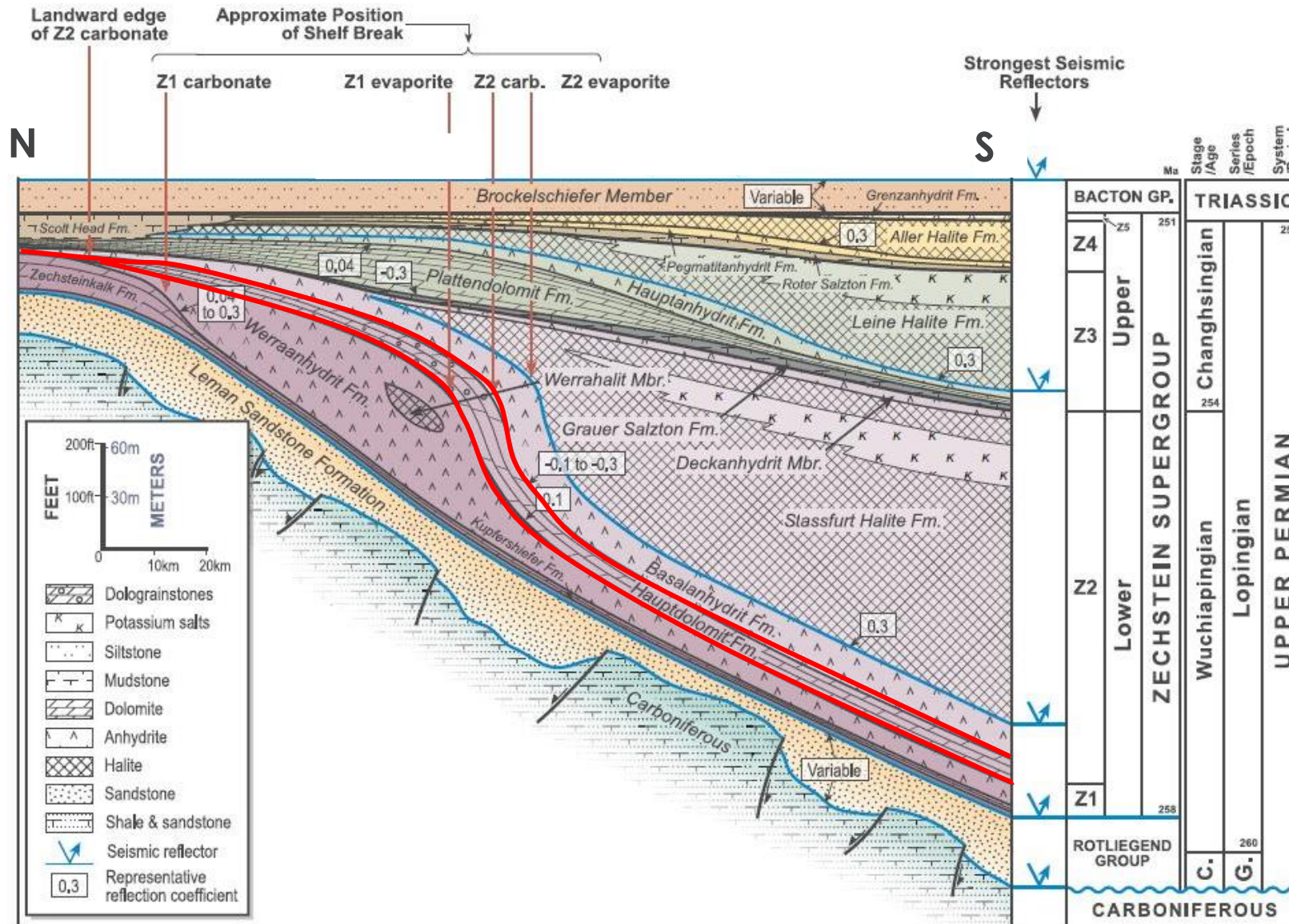
DINOloket
Data en Informatie van de Nederlandse Ondergrond
Stratigrafische Nomenclator

2. Regional setting ZE2C

- › Zechstein build-ups at the margins of the Southern Permian Basin
- › Examples of (recent) ZE2C discoveries south of MNSH: Auk, Argyll/Alma, Crosgan, Ossian



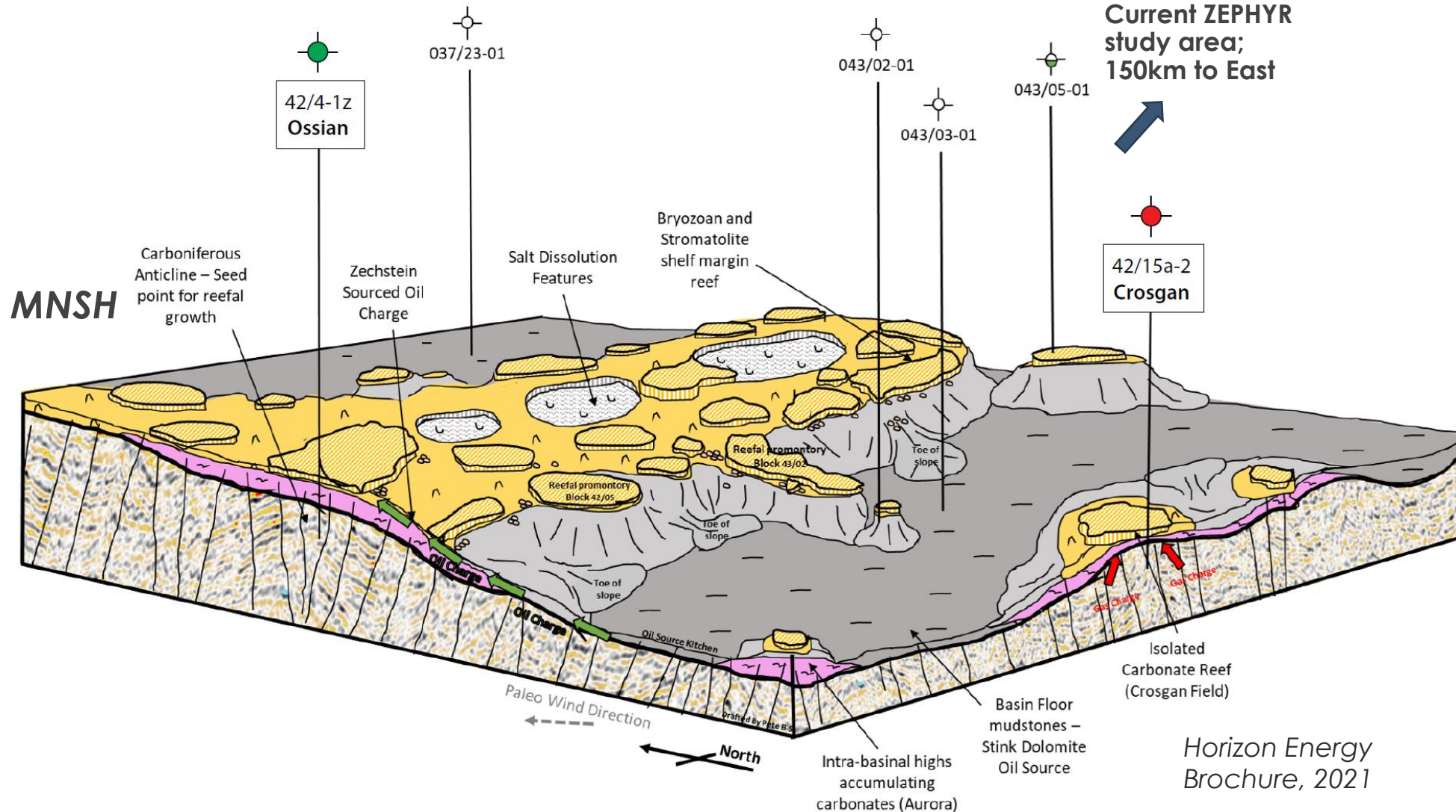
2. Stratigraphy ZE



- Upper Permian Zechstein Group comprises a series of marine evaporites and carbonates that were deposited into 4 cycles (Z1-Z4) under warm and arid conditions
- Each cycle is characterized by an initial transgression, followed by regressive phases

Modified from Grant et al., 2019

3. Depositional Model ZE2C

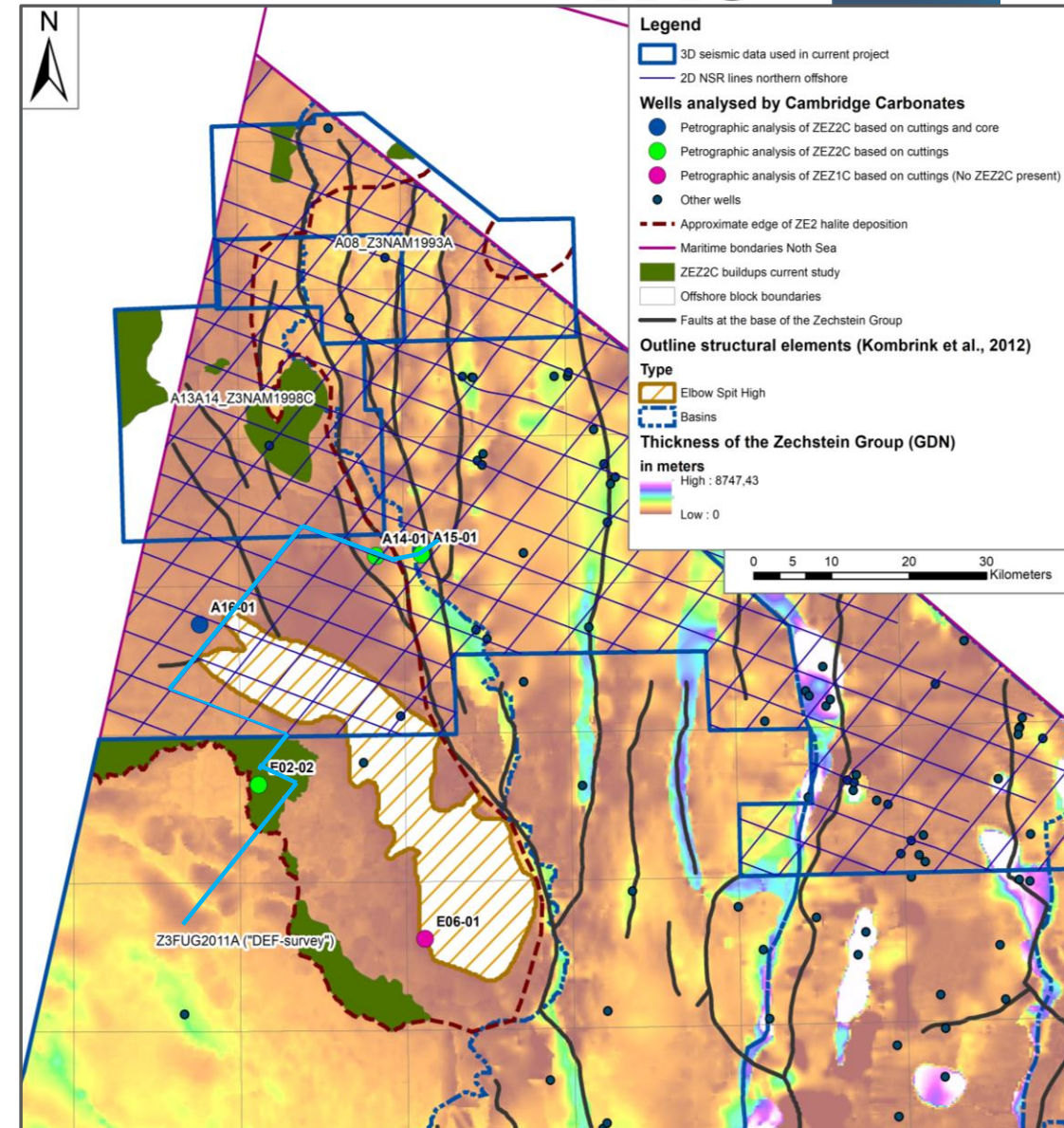
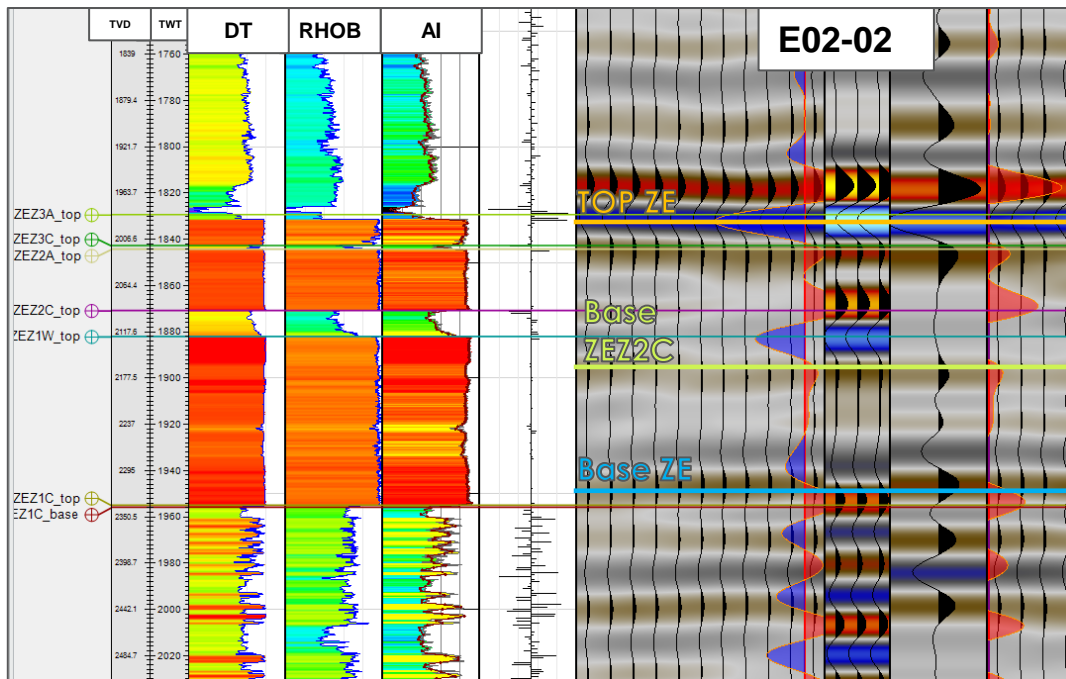


Horizon Energy Brochure, 2021

- › 4 main facies types for ZE2C:
 - › Platforms
 - › Slope
 - › Basinal
 - › Lagoonal/Back barrier
- › Thickest ZE2C platforms on top of pre-existing Carboniferous highs and Werra (ZE1W) platforms

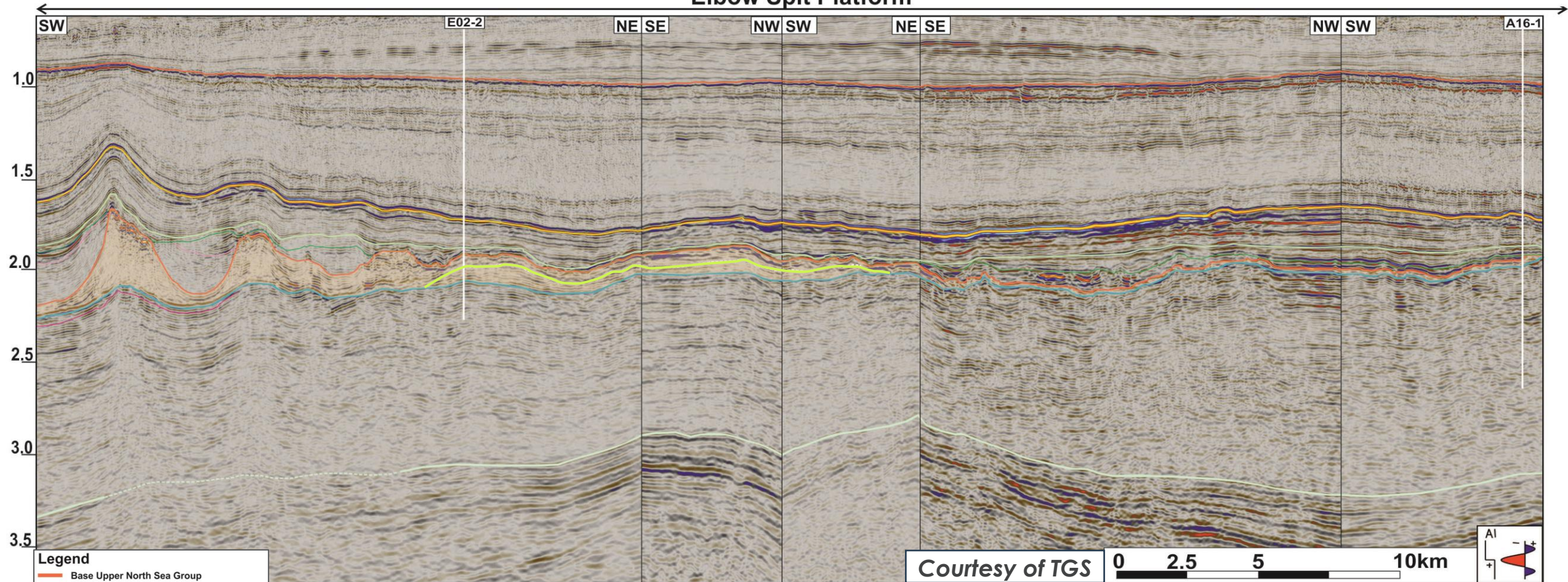
4. ZEPHYR Data

- › 3D seismic surveys
- › 2D NSR seismic lines
- › Petrographic analyses for 6 wells based on core and cuttings
- › Within DEF-survey mapping was performed of:
 - Base-, & Top Zechstein
 - Soft kick slightly underneath base ZEZ2C



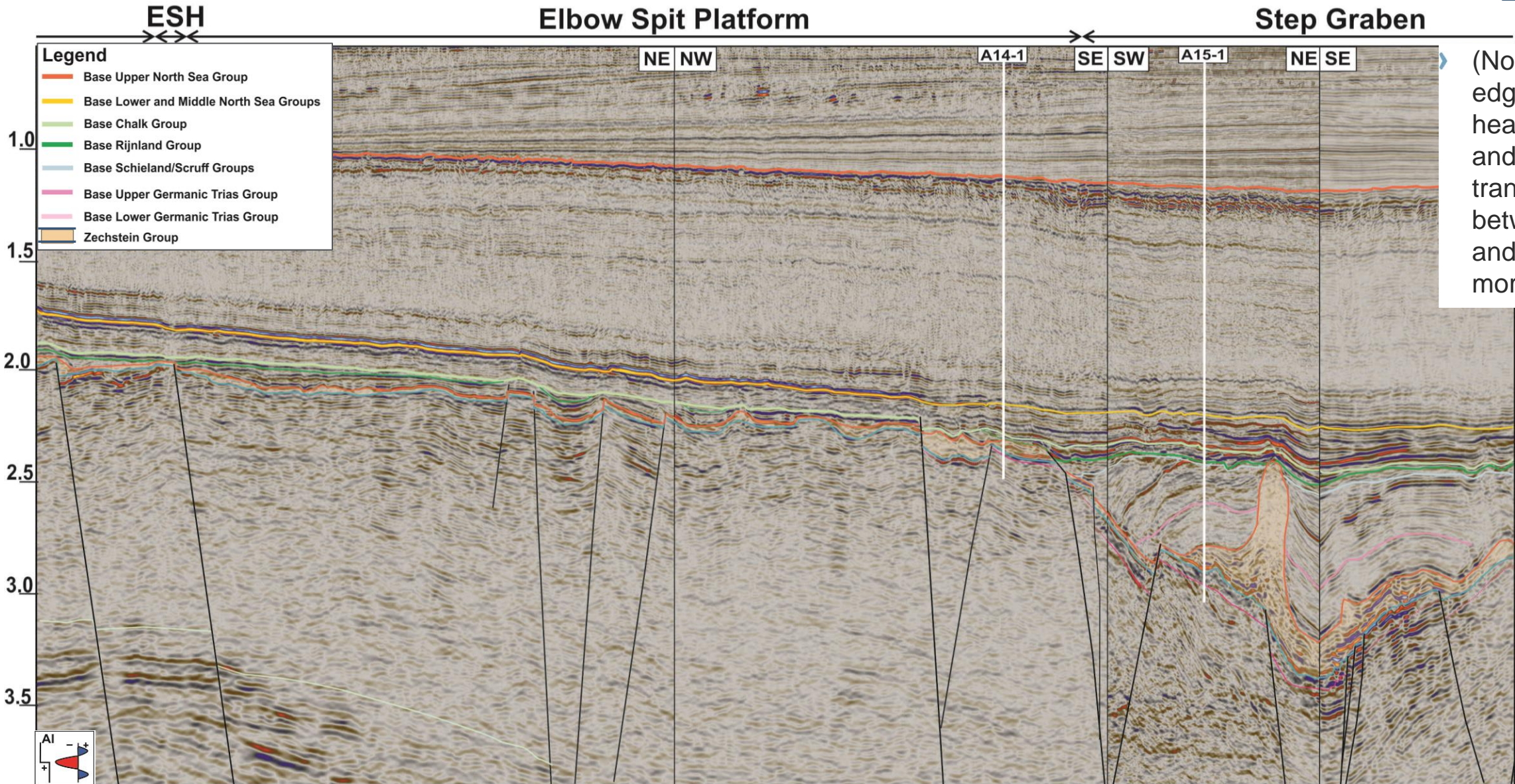
5. ZE2C distribution around ESH

Elbow Spit Platform

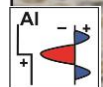


› Southern edge of ESH is characterized by gradual transition between marginal deposits (e.g. platforms) and the deep basin

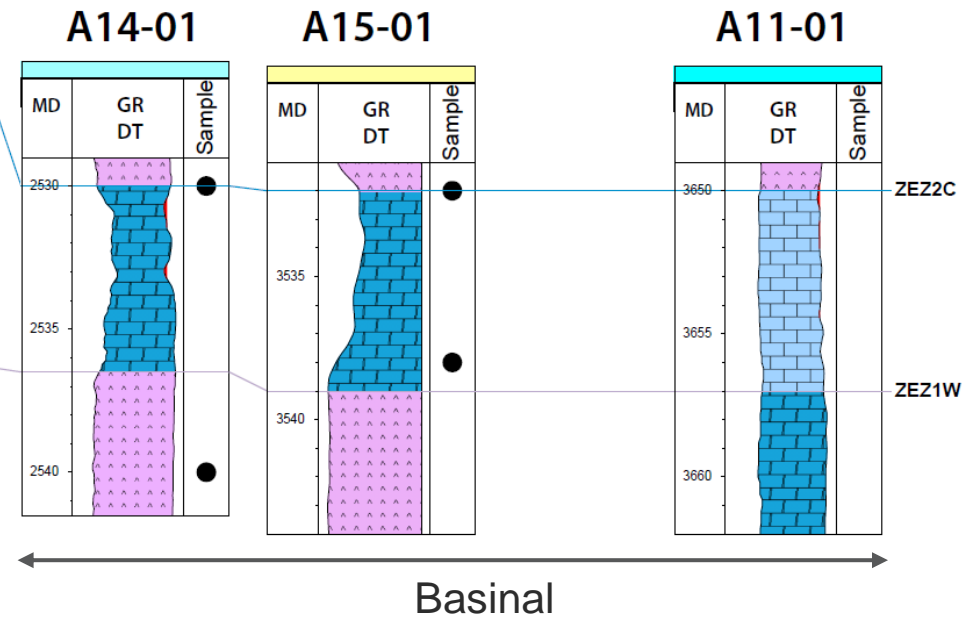
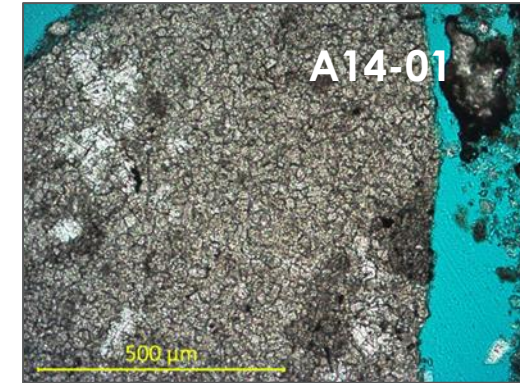
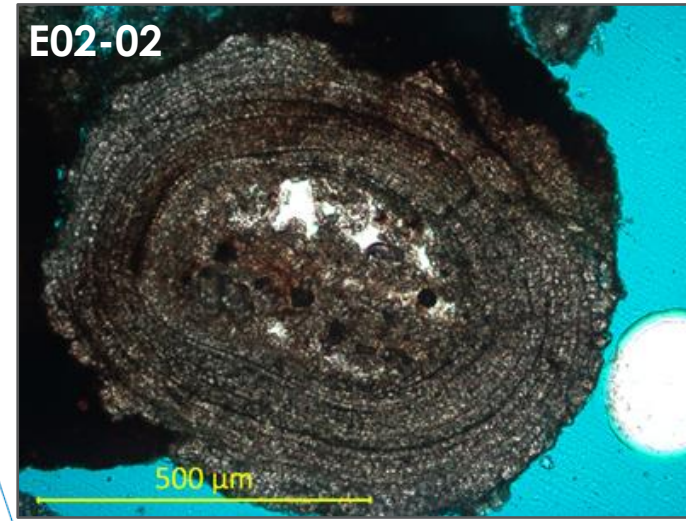
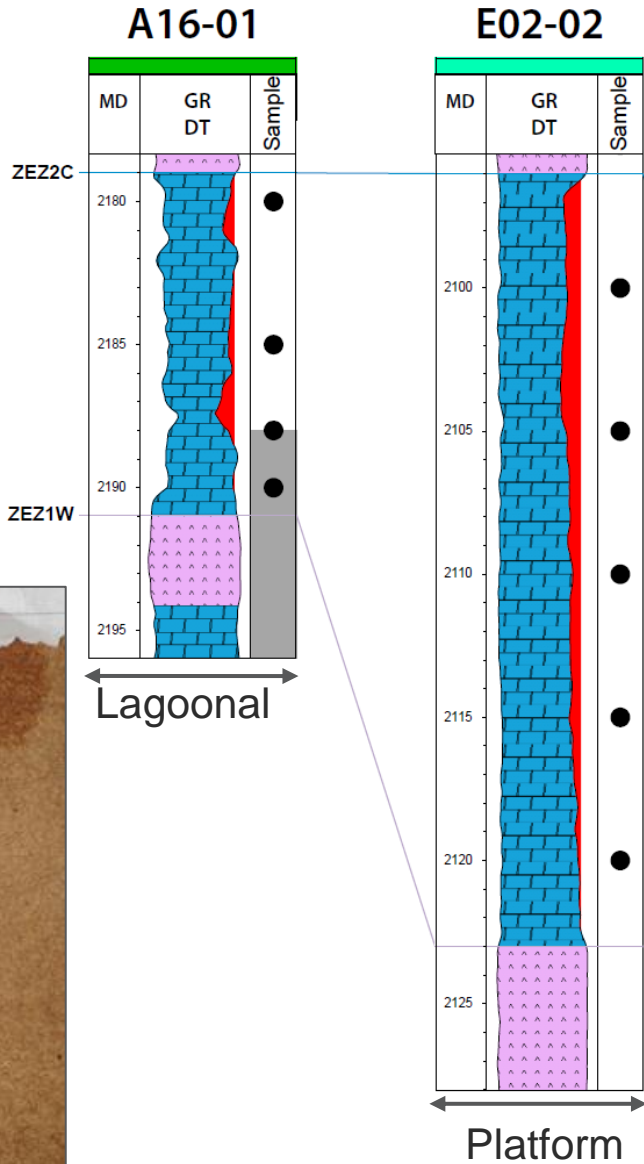
5. ZE2C distribution around ESH



(North)eastern edge of ESH is heavily faulted and the transition between basin and high is more rapid



5. ZEZ2C distribution around ESH

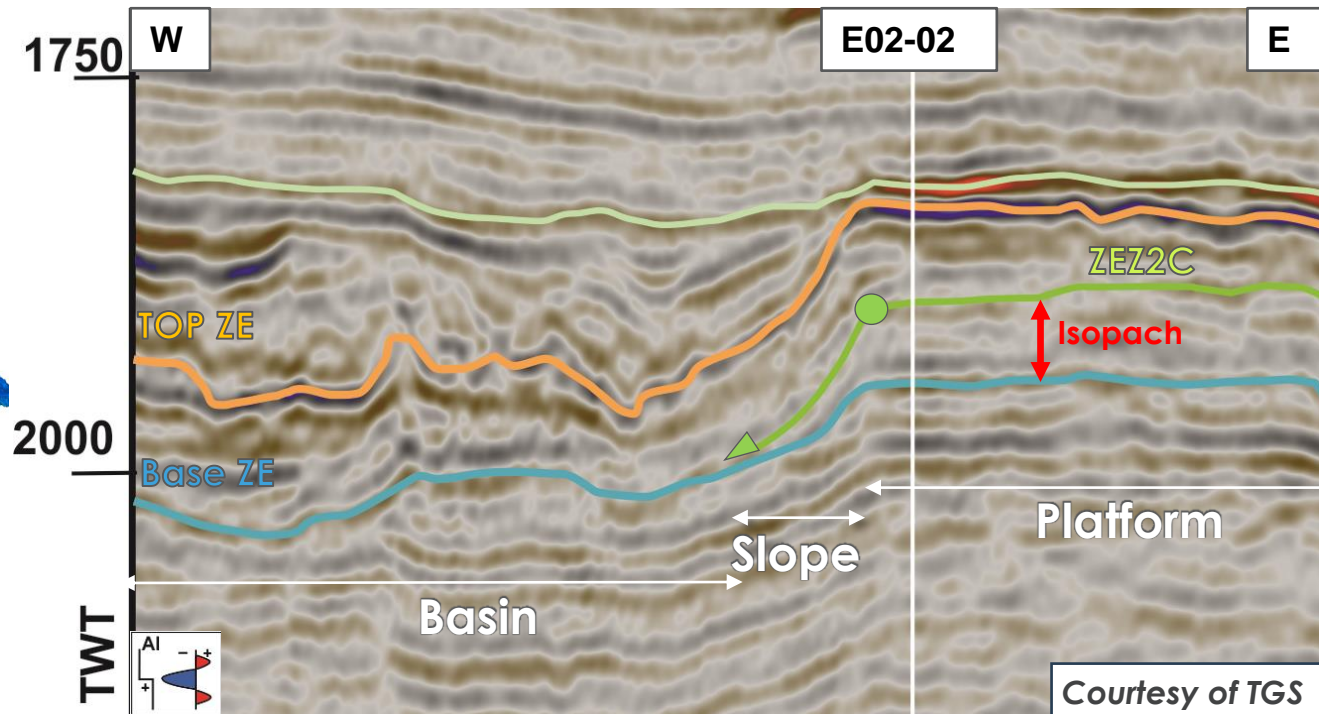
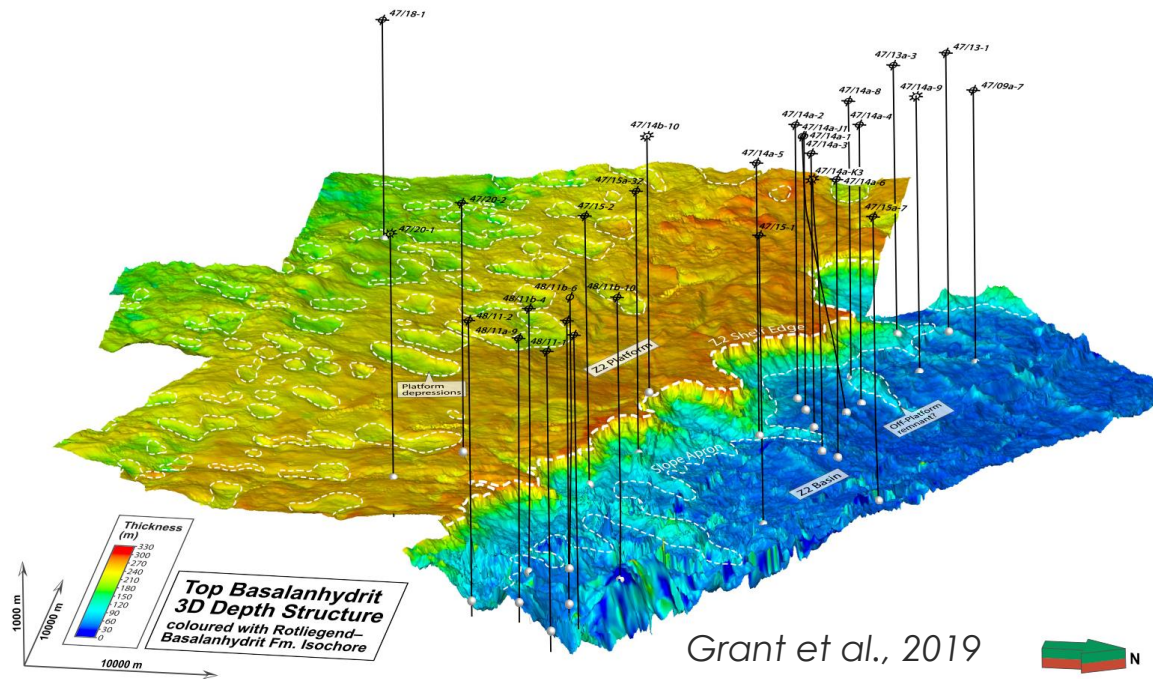


5. ZE2C distribution around ESH

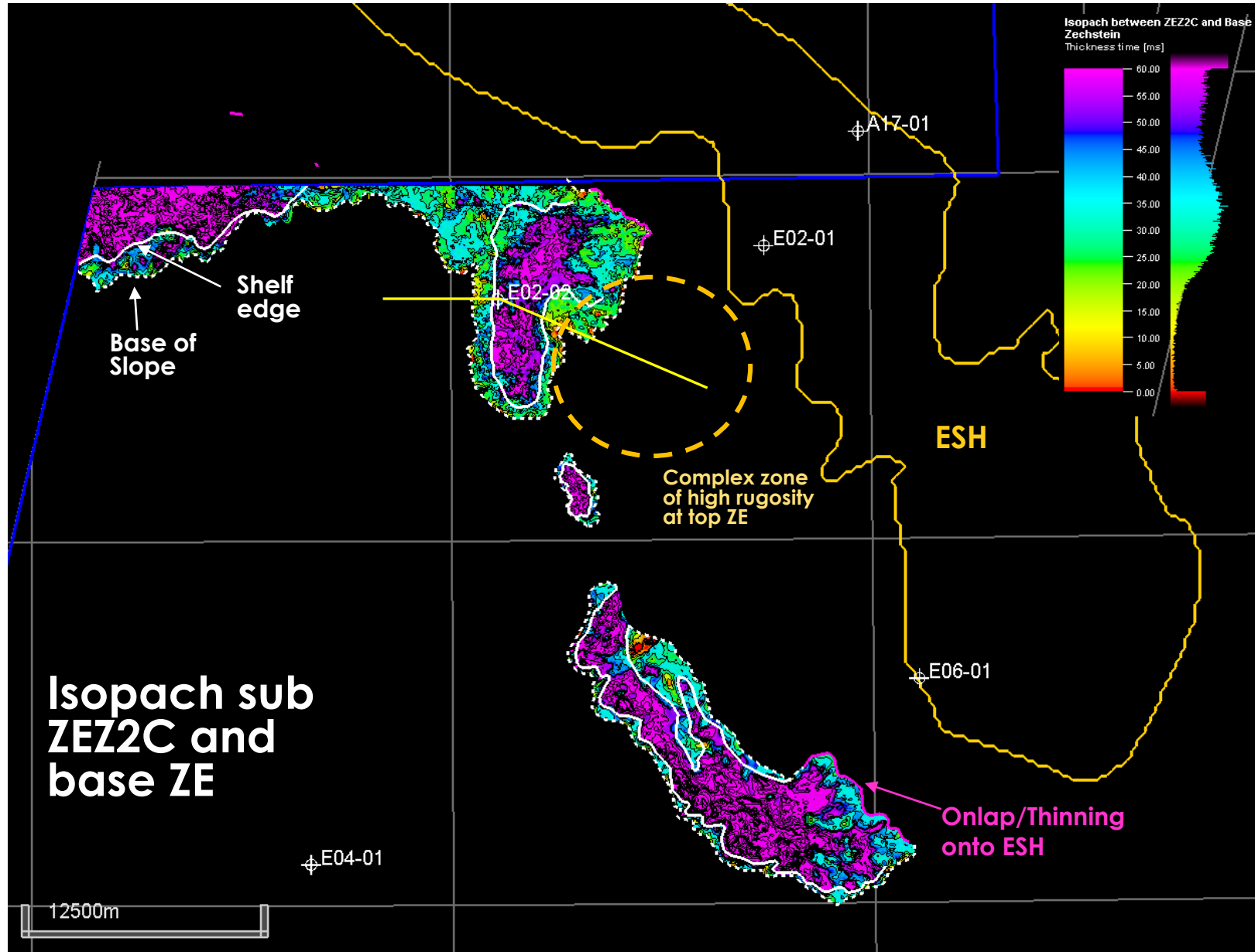


› Mapping was performed of:

- Base-, & Top Zechstein
- Soft kick slightly underneath base ZE2C
- The ZE2C shelf edge; inflection point of reflector ●
- The ZE2C slope apron; downlap of reflector ▲



5. ZE2C distribution around ESH

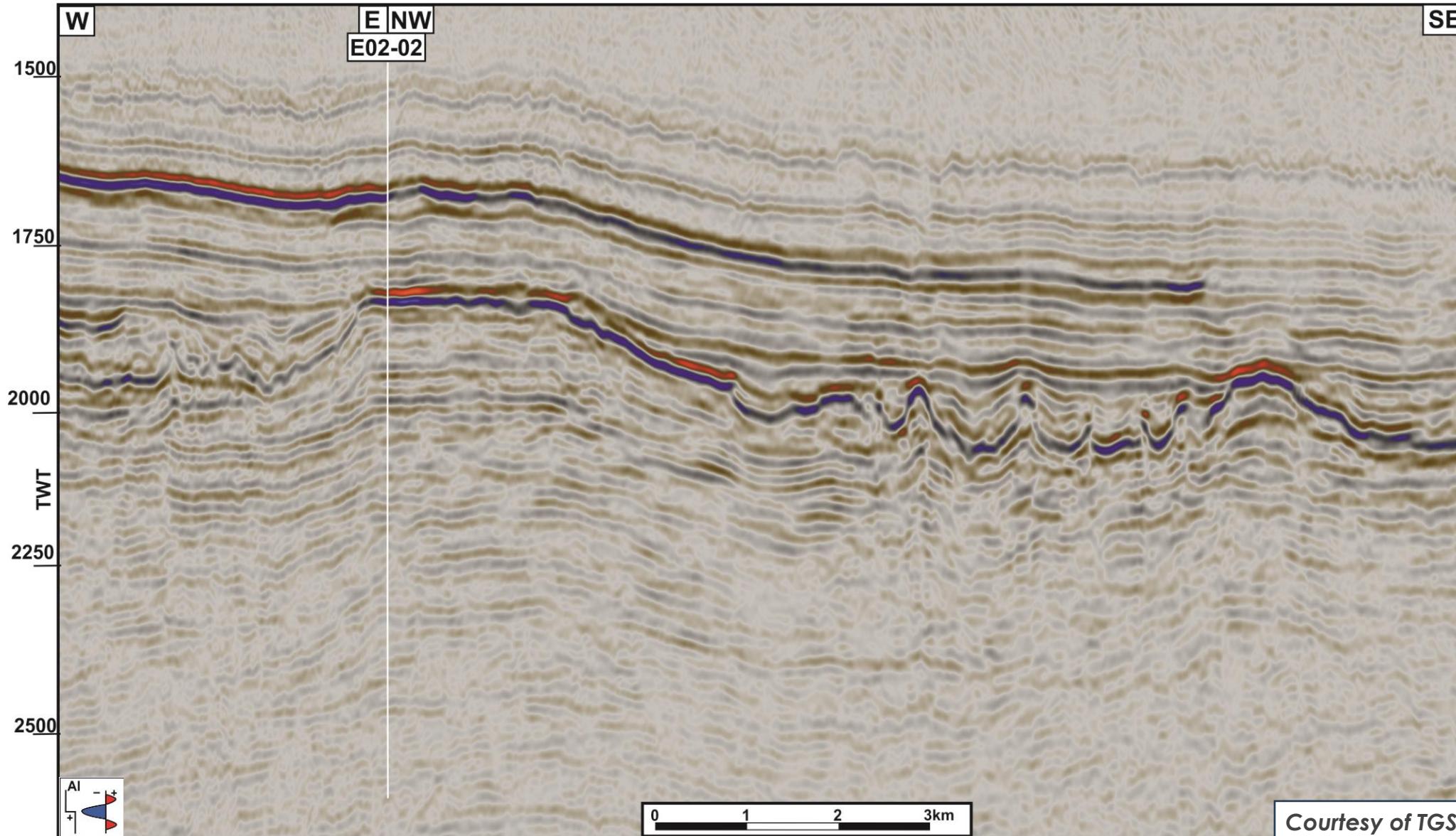


- › Thickest sub ZE2C interval in core part of the build-up then decreasing thickness both towards basin-, and lagoonal side

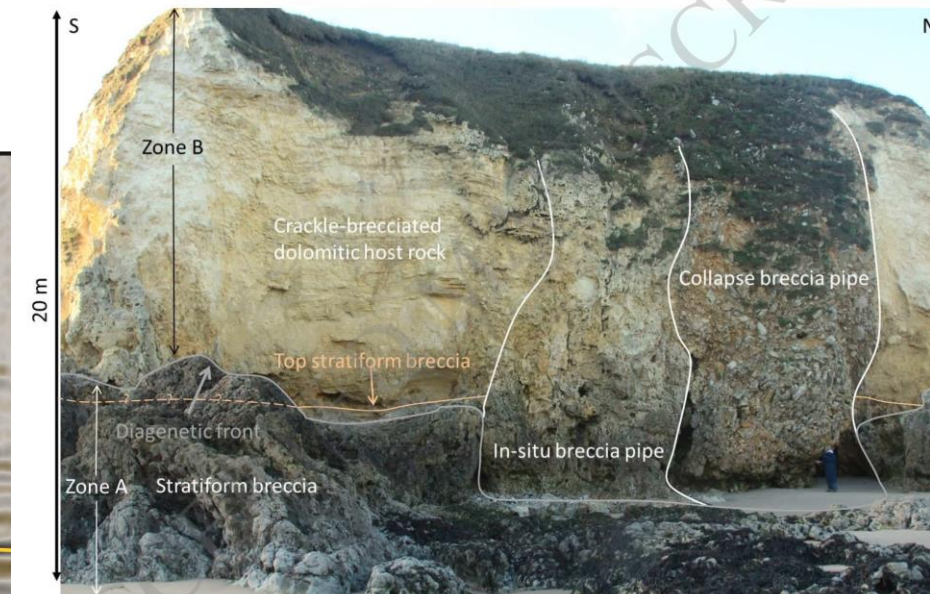
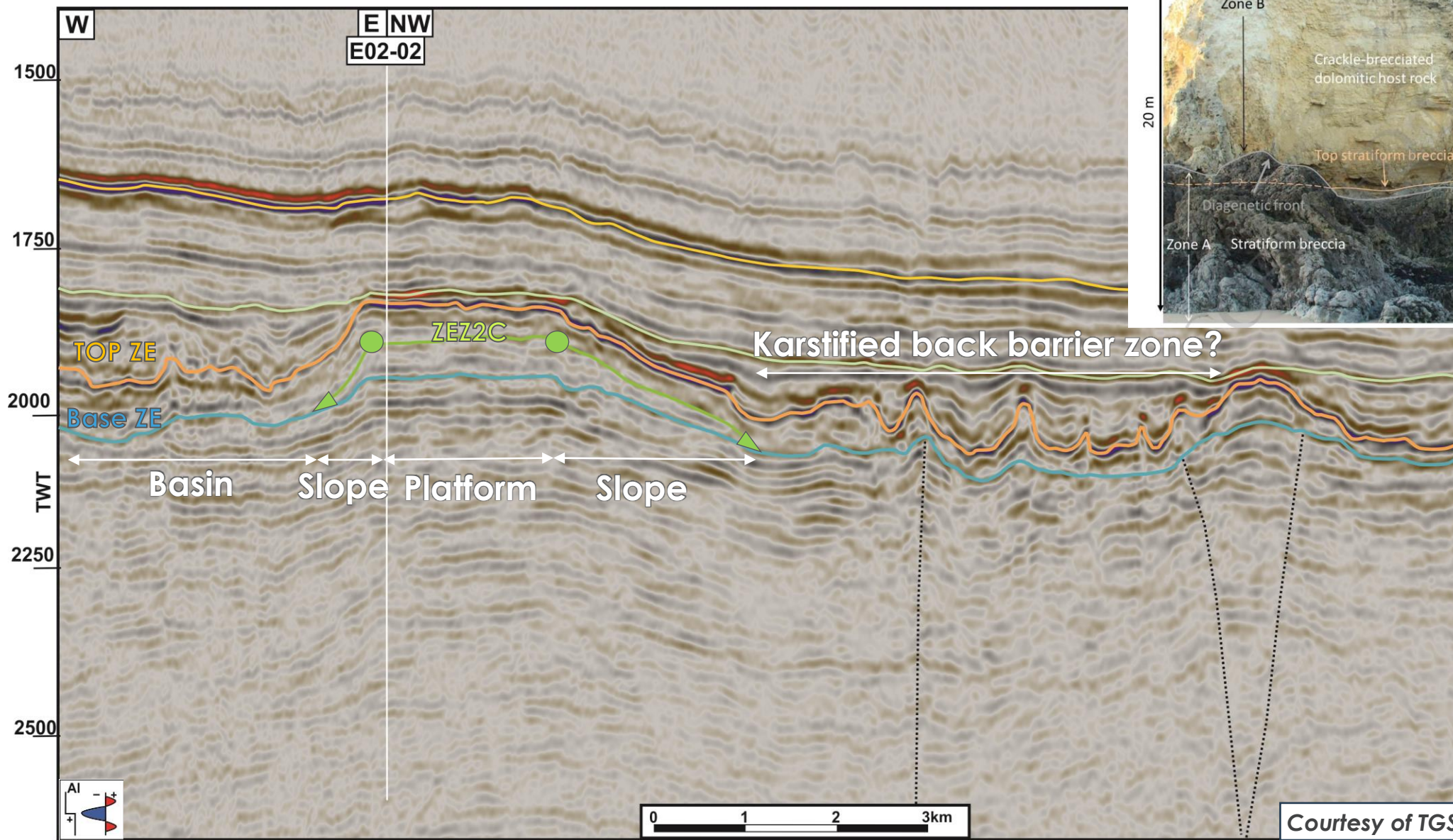
5. ZEZ2C distribution around ESH

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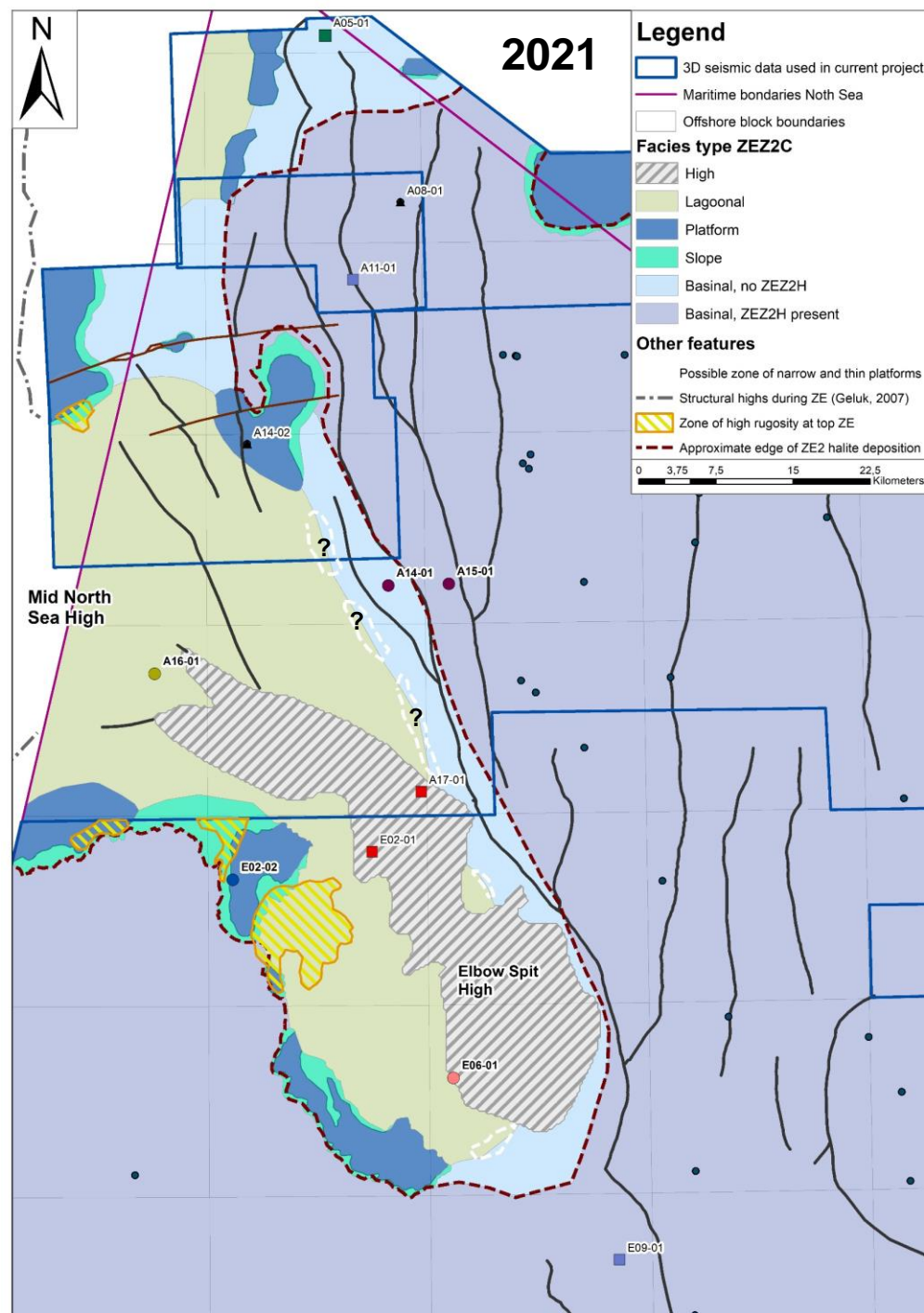
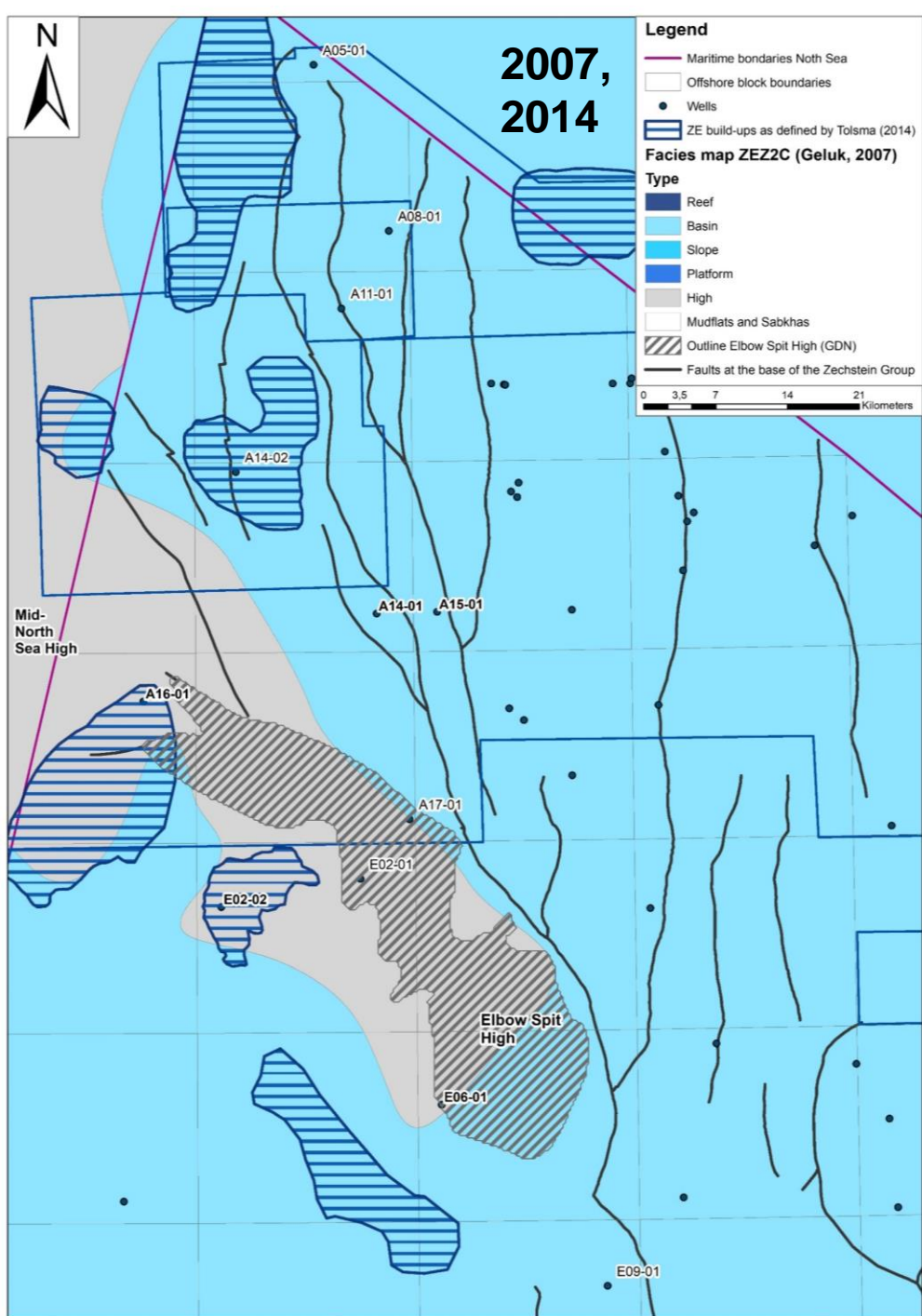
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5. ZE2C distribution around ESH

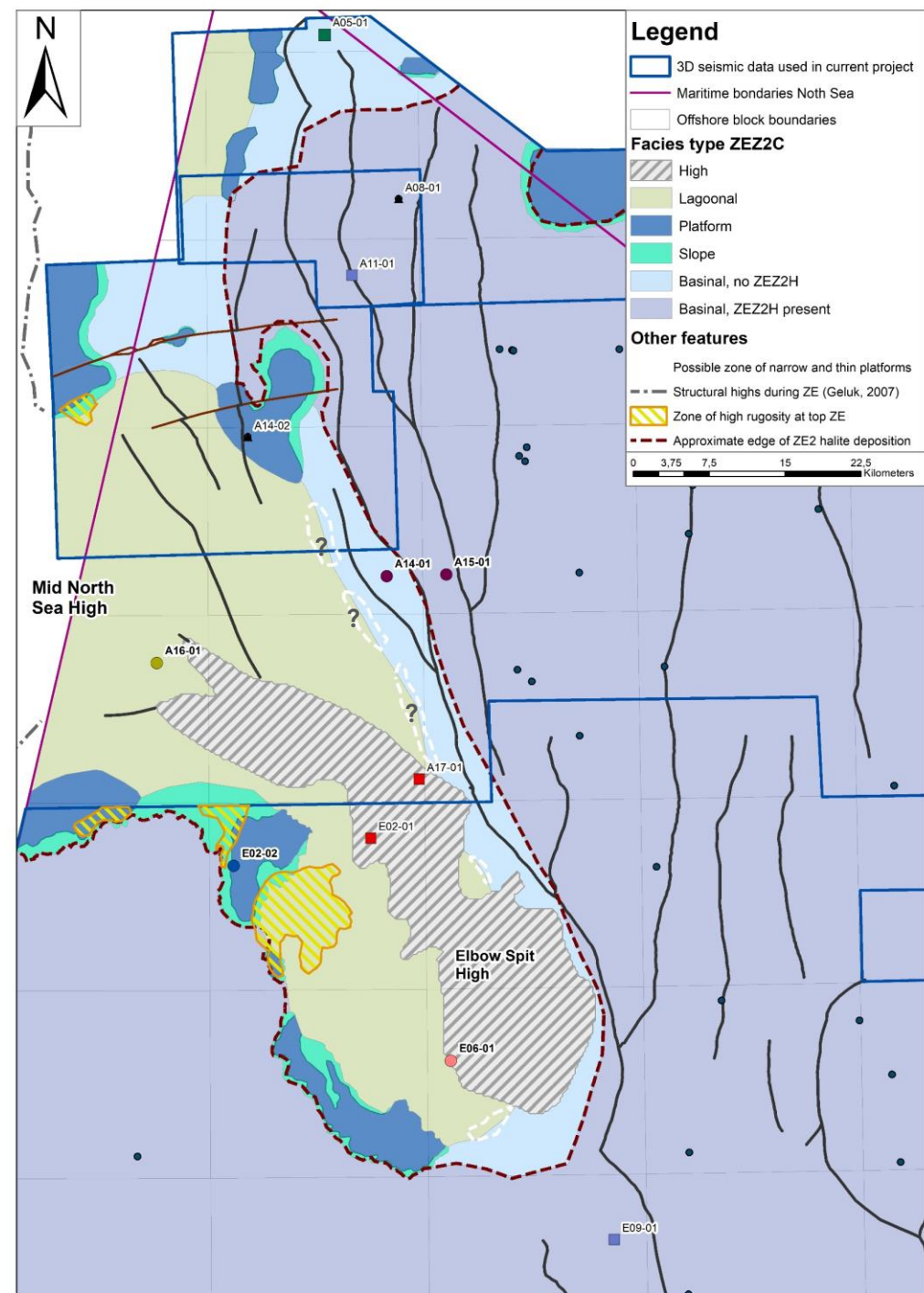


Daniels et al., 2020



6. Conclusions

- Left map shows the facies interpretation for the ZEZ2C from Geluk (2007) and the interpreted build-ups from Tolsma (2014)
- Right map shows the result of the current ZEPHYR project



7. Outlook

- › ZEPHYR report will be on nlog (TNO) and Kennisbank (EBN)
- › Results of ZEPHYR and additional GEODE work on Zechstein play will be available on GEODE portal before spring 2022

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Explore in a mature basin

GEODE is a joint initiative between EBN B.V. and TNO. We aim to provide an easy accessible web-based GIS environment where play based exploration data, such as maps and post-drill well analysis data, for the main hydrocarbon (sub)plays of the Dutch offshore, are available and can be displayed and downloaded.

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