

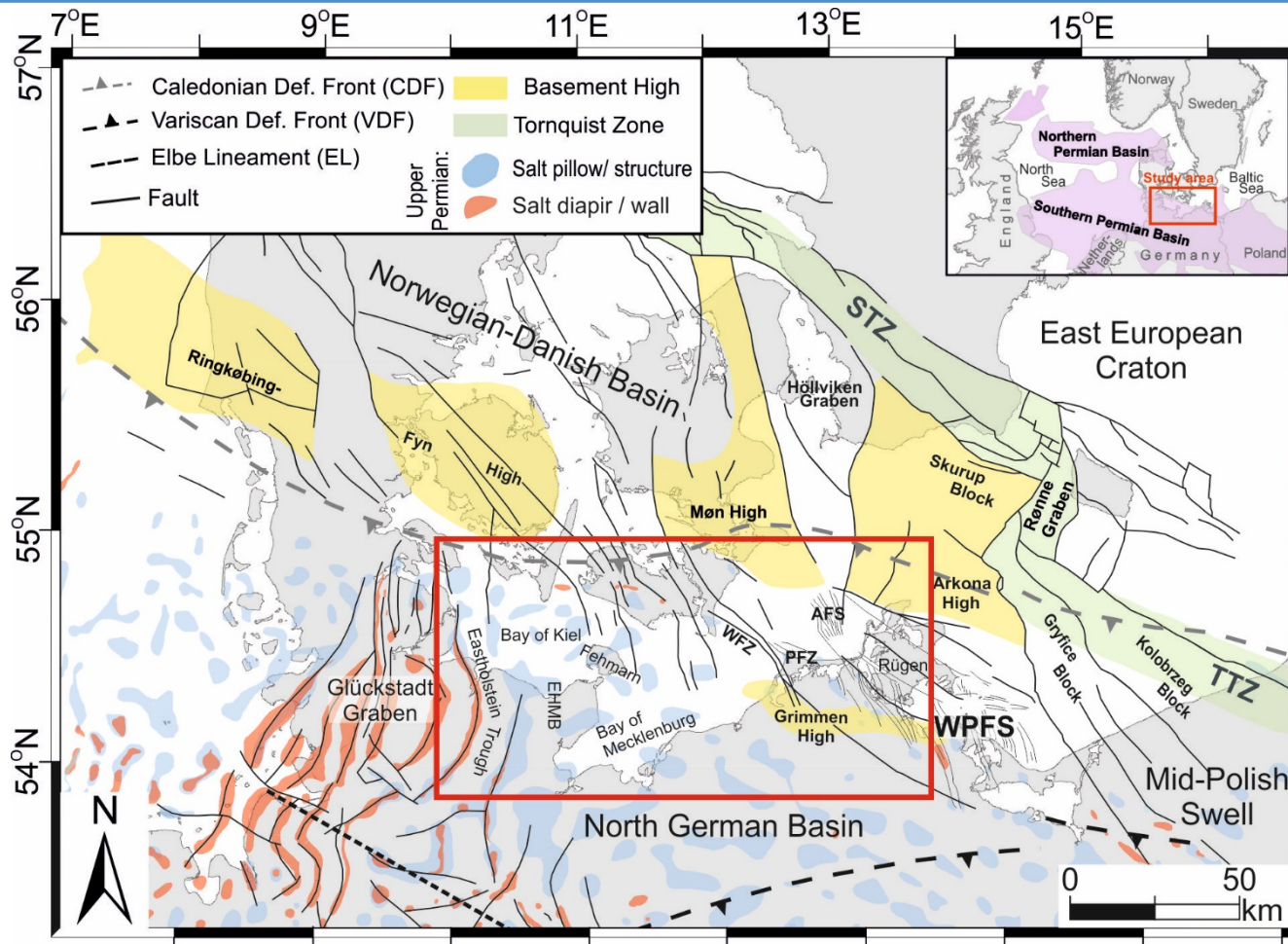
EGU General Assembly 2021 - Session GD1.6

Multiphase inversion in the Baltic sector of the North German Basin: Influence of Africa-Iberia-Europe convergence during the Late Cretaceous and Cenozoic

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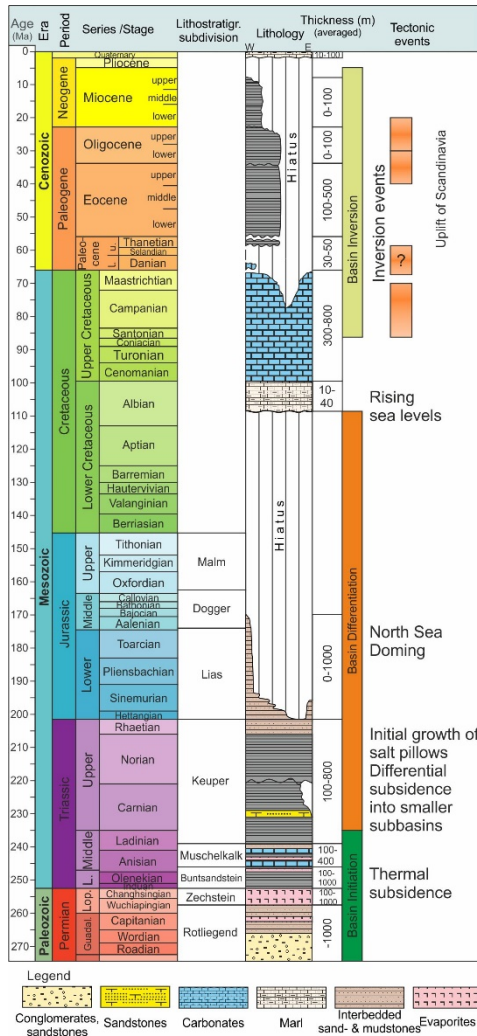
Study area: the Baltic sector of the North German Basin



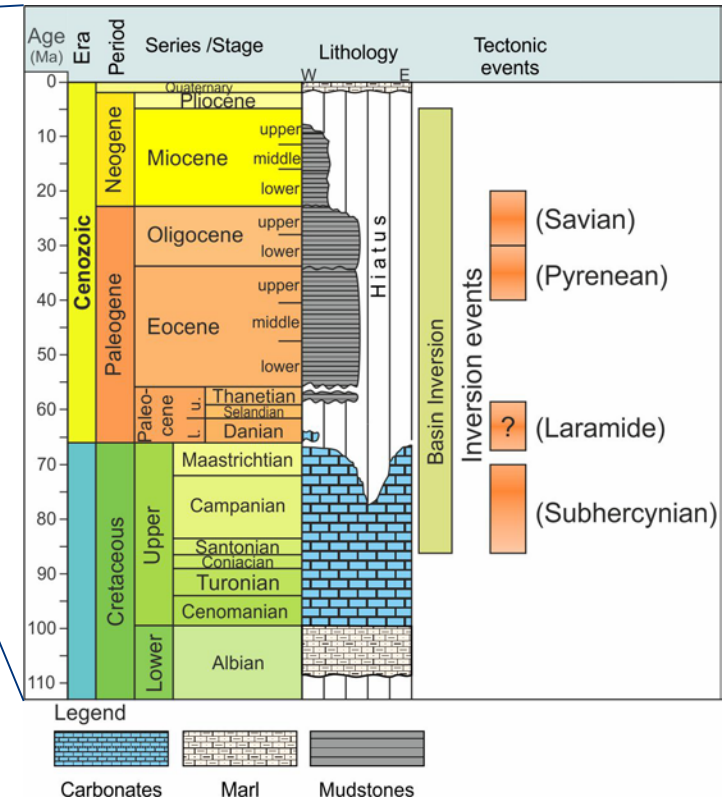
Study area with major structural elements. AFS: Agricola Fault System; EHMB: Eastholstein Mecklenburg Block; PFZ: Prerow Fault Zone; STZ: Sorgenfrei Tornquist Zone; TTZ: Tornquist-Teisseyre Zone; WFZ: Werre Fault Zone; WPFS: Western Pomeranian Fault System

Ahlrichs et al. (submitted to Basin Research)

Geological Setting



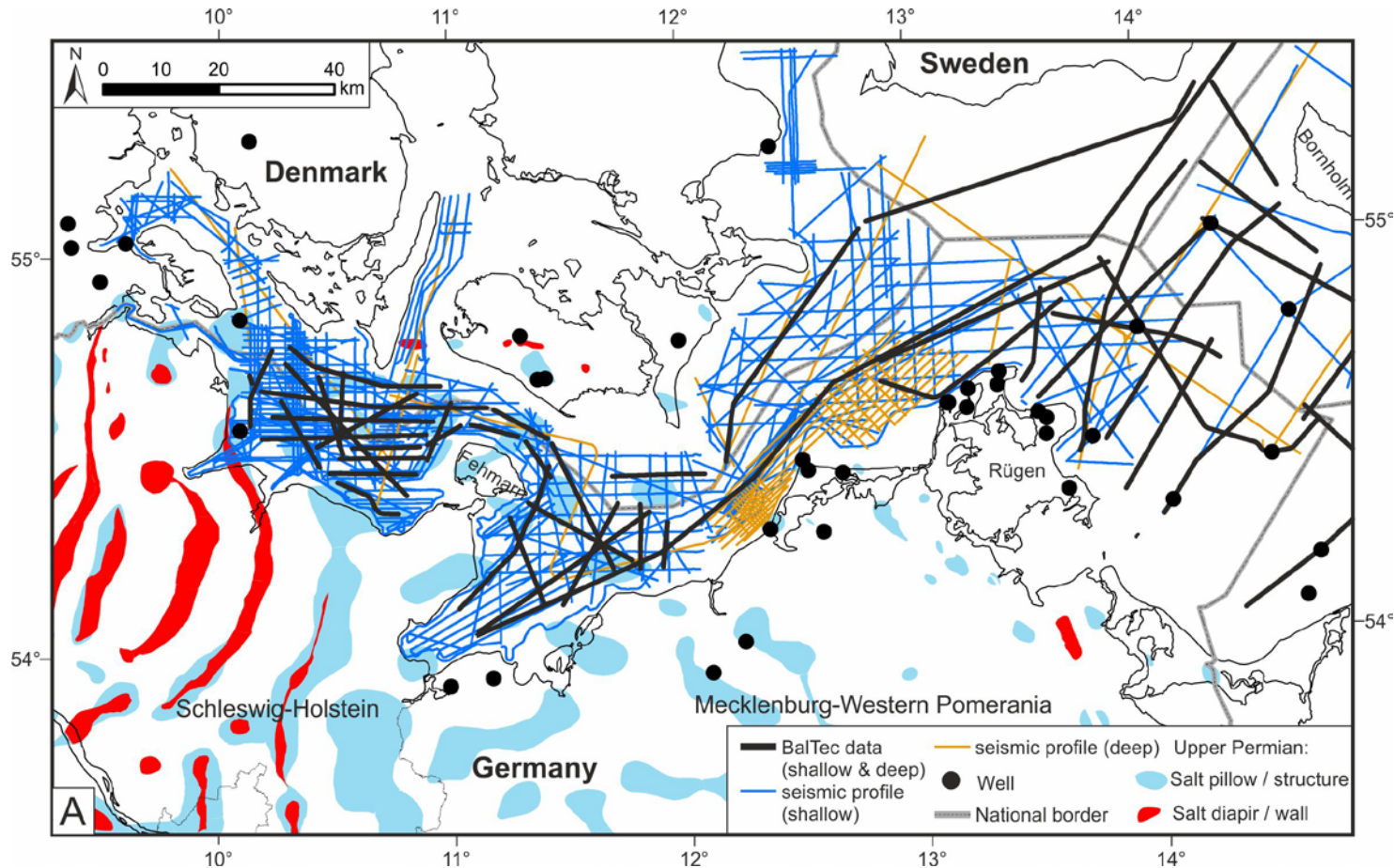
↑ Inversion and remobilization of salt structures
 ↔ Tectonic quiescence
 ↓ Hiatus due to North Sea Doming event
 ↓ Initial development of salt structures driven by extension
 ← Zechstein evaporites



Timing of the four possible inversion phases in the study area

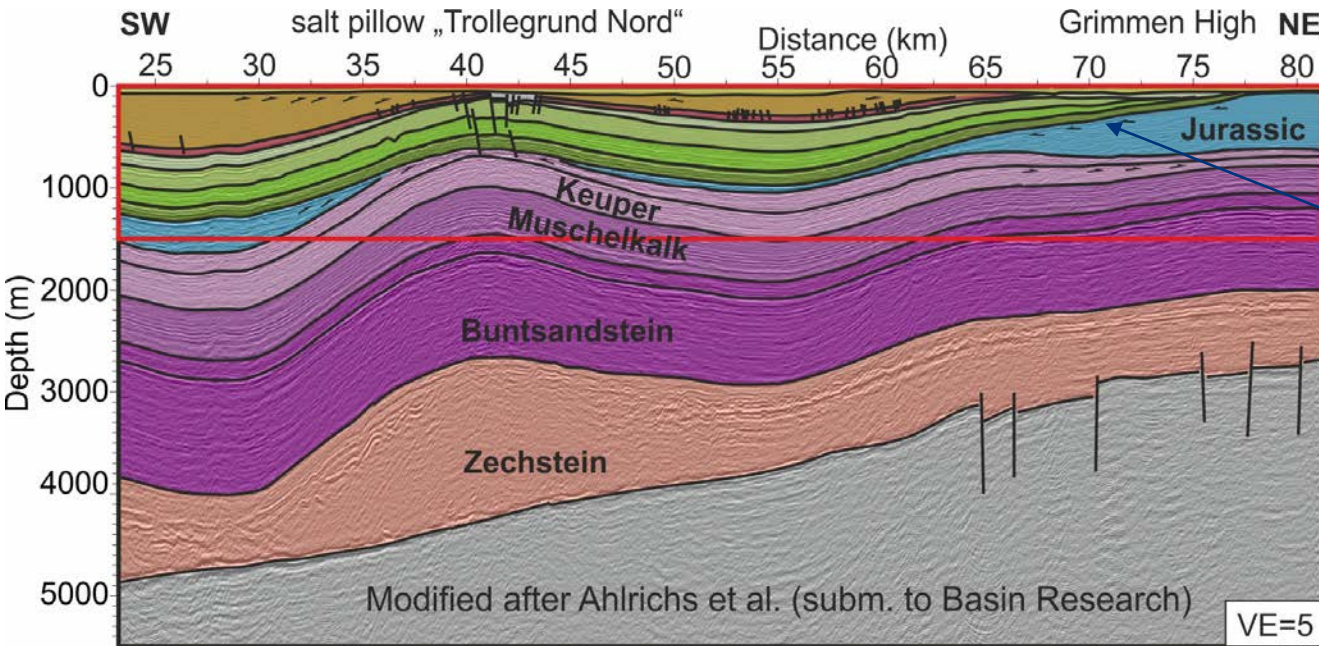
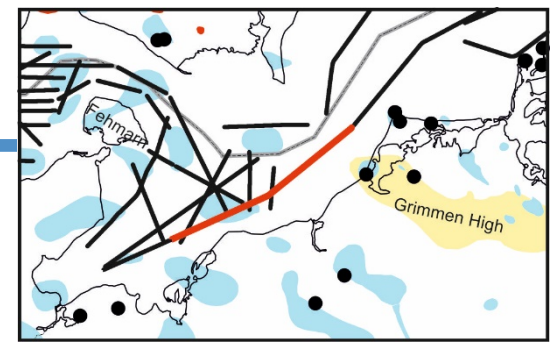
Modified after Ahlrichs et al. (subm. to Basin Research)

Database – seismic data and wells



Salt structures after Vejbaek, 1997; Reinhold et al., 2008; Warsitzka et al. (2018)

Salt pillow in the Bay of Mecklenburg



Base Upper Cretaceous
Unconformity

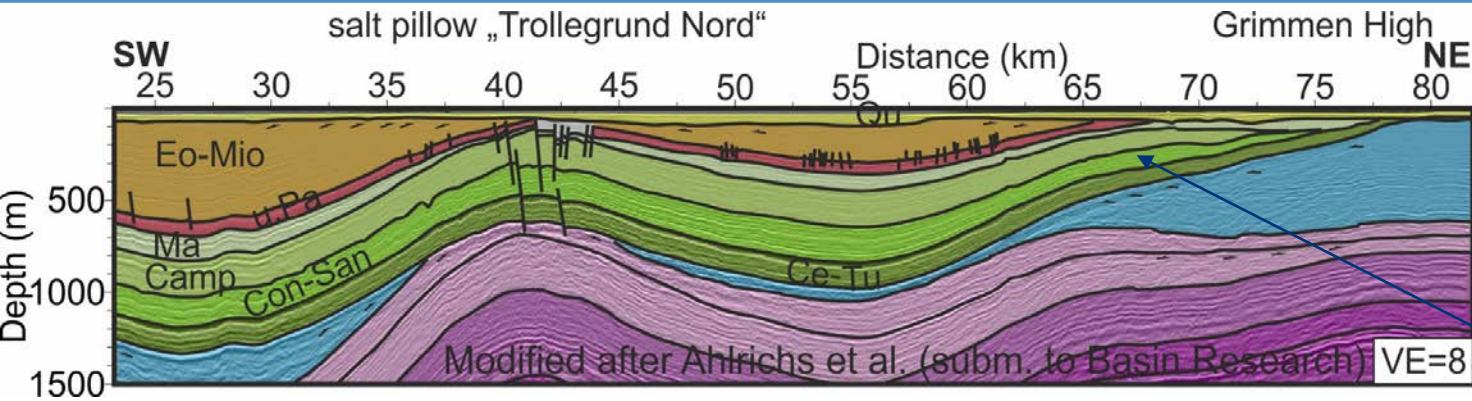
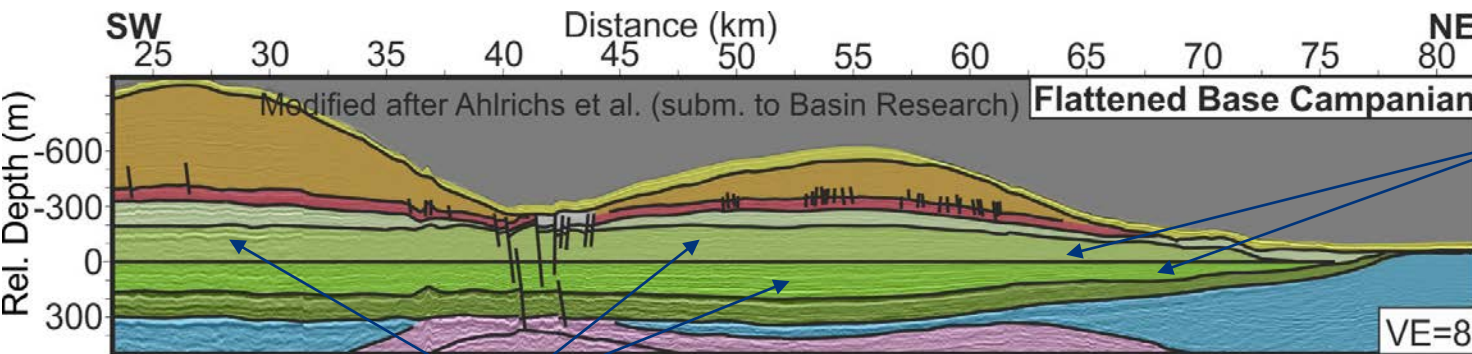
Observations:

- Zechstein salt pillow at southwestern flank of the Grimmen High
- Initial phase of salt movement during the Keuper & Jurassic
- Prominent Base Upper Cretaceous Unconformity



What happened in the Late Cretaceous?
see zoom of red box on the next slide!

Late Cretaceous inversion

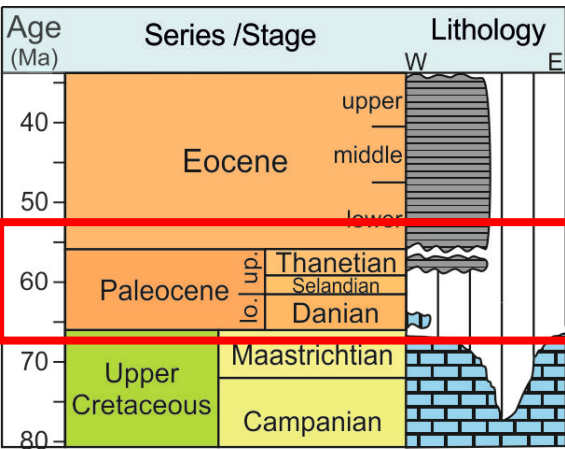


Thinning towards
Grimmen High
indicates uplift

Small increased thickness at the flanks of salt structure
„Trollegrund Nord“ indicates minor salt movement

- Beginning uplift of Grimmen High in the Coniacian-Santonian coeval with inversion in other basins across Central Europe
- Coeval minor salt structure growth

Paleocene large-scale uplift

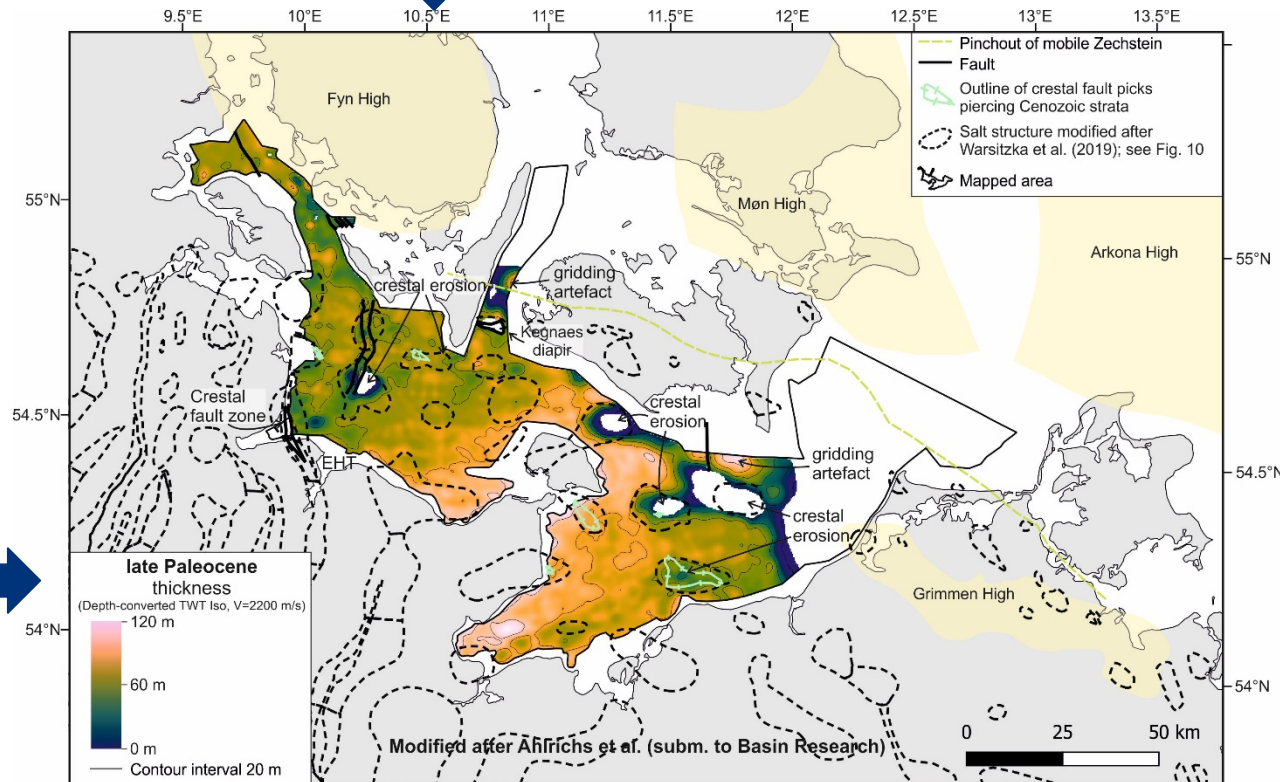


Legend

Carbonates Mudstones

Upper Paleocene thickness does not correlate with salt structures and is quite uniform

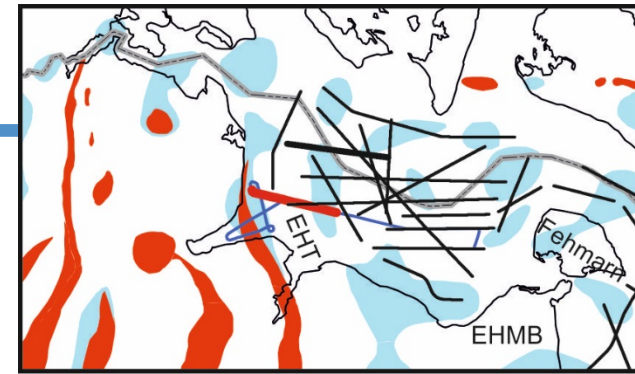
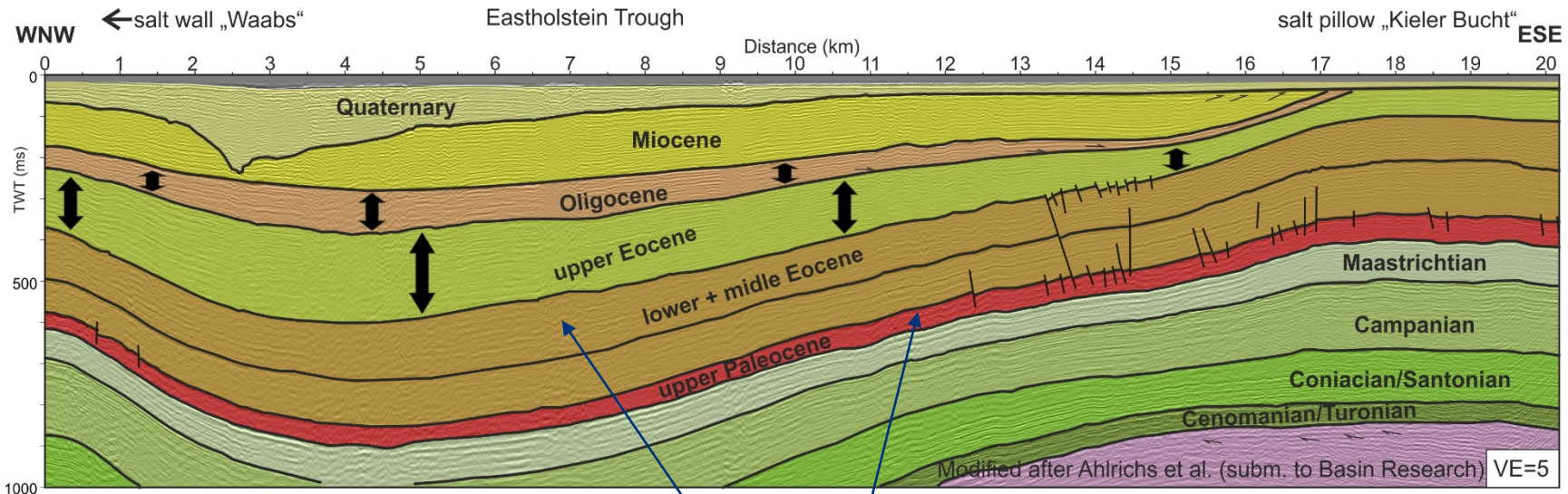
Regional hiatus followed by uniform distribution of upper Paleocene claystones



Salt movement ceased during the Paleocene!

Eastern Glückstadt Graben

Divergent upper Eocene and Oligocene units (compare black arrows) indicate salt remobilization



Uniform thickness of upper Paleocene to middle Eocene indicates tectonic quiescence

➔ Paleocene tectonic quiescence followed by Late Eocene – Oligocene salt remobilization

Summary

- Late Cretaceous inversion began in the Coniacian-Santonian and is characterized by uplift of the Grimmen High and minor coeval salt remobilization
- Salt movement ceased in Paleocene times, regional hiatus overlain by uniform thickness suggests large-scale regional uplift
- Late Eocene-Oligocene major salt remobilization in the outer Glückstadt Graben
- Salt movement coeval with regional inversion events driven by Africa-Iberia-Europe convergence

We are looking forward to your questions and comments!

Contact us

during the **chat Monday, 26. April 2021 - 09:40 – 10:30**

or via **niklas.ahlricks@bgr.de**

References

- Ahlrichs, N., Noack, V., Hübscher, C., Seidel, E., Warwel, A., & Kley, J. (submitted to Basin Research). Impact of Late Cretaceous to Cenozoic inversion phases on salt structure growth in the Baltic sector of the North German Basin. *Basin Research*. In review.
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- Vejbaek, O. V. (1997). Dybe strukturer i danske sedimentære bassiner. *Geologisk Tidsskrift*, 4, 1-31.
- Warsitzka, M., Kley, J., Jähne-Klingberg, F., & Kukowski, N. (2016). Dynamics of prolonged salt movement in the Glückstadt Graben (NW Germany) driven by tectonic and sedimentary processes. *International Journal of Earth Sciences*, 106(1), 131-155. doi:10.1007/s00531-016-1306-3