Tectonic controlled sedimentary features at the NE marigin of the Sorgenfrei-Tornquist Zone (STZ), southern Sweden

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1. MOTIVATION

The Hanö Bay basin was formed during Late Cretaceous transgression as a sedimentary trough on the NE margin of the Sorgenfrei-Tornquist Zone (STZ), a narrow NW-SE striking intraplate inversion zone within the Fennoscandian Border Zone. Sedimentation within the basin was primarily controlled by inversion tectonics, resulting in a coarse-grained syn-inversion clastic wedge forming adjacent to the basin-bounding fault in the Santonian-Maastrichtian. Previous studies have highlighted the deposition of contourite sediments associated with topographic relief of the chalk sea created by such local inversion-induced uplift. Imaged upper Cretaceous clinforms in the marginal trough show a NE-ward progadational character, that is, away from the uplifted and eroded inversion zone. These extend along the inversion axis all the way to NE of the Mid-Polish trough.

To gain detailed stratigraphic constraints and to better understand the interaction of these synsedimentary features that developed during inversion tectonics, we use a combination of high resolution multichannel seismic data (MCS) from the 2019 AL526 cruise and a number of key profiles from reprocessed 70-80's legacy industry MCS.

Preliminary results suggest a drift-moat system developed during a stepwise uplift of the SW shoulder of the STZ, with the uplift driven by transpressional reactivation of basement faults. The resultant aggradational wedge formed a shelf margin extending fairly far into the basin. The overlying clinoform depositional successions clearly demonstrate several depositional stages; including highstand-progradation, highstand-aggradation and distinct transgression-retrogradation, during which an overall landward migration of the paleo-shoreline position is revealed. The results constrain relative sea-level changes in this area that were primarily related to tectonic events during the Santonian-Campanian.

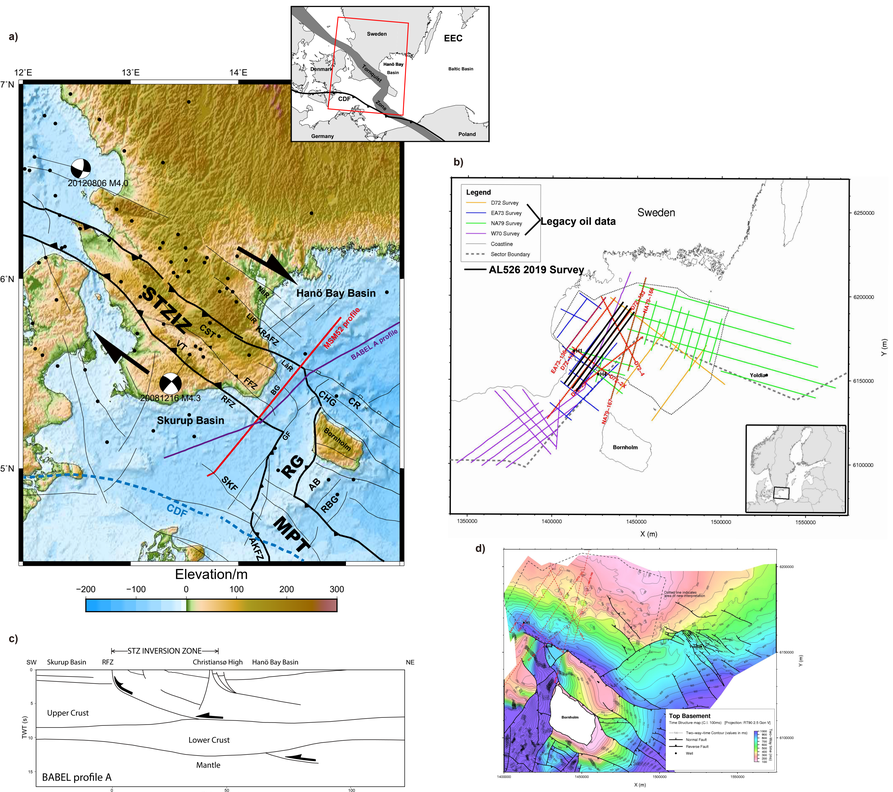
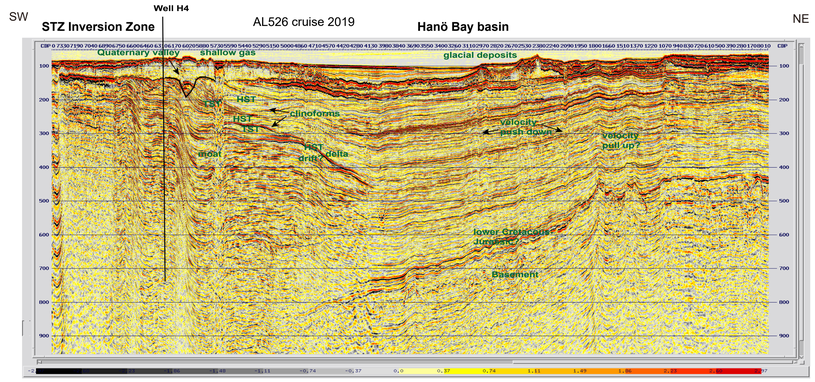
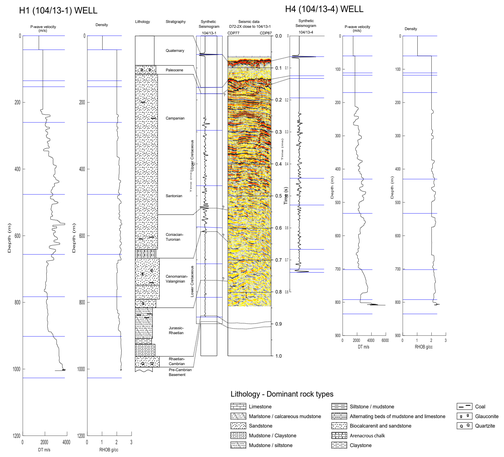


Figure 1. a) Topography map with simplified regional structure. The inset map shows the schematic Tornquist Zone and Caledonian Deformation Front (CDF). Black dots show the recent earthquakes. b) Survey map contains legacy oil data and AL526 2019 MCS data. c) Previous interpretation of the lithospheric scale BABEL A profile from Erlström et al. (1997), Thybo (2000) and Meissner et al. (2002) suggests a listric normal fault beneath the Hanö Bay Basin. d) Top of the basement structure map in the Hanö Bay basin.

AB:Arnager Block, AKFZ: Adler-Kamien Fault Zone, BG: Bornholm Gat, CR: Christiansø Ridge CHG: Christiansø Half Graben, CST: Colonus Shale Trough, FFZ: Fyledalen Fault Zone, GF: Gat Fault, KRAFZ: Kullen-Ringsjön- Andrarum Fault Zone, LiR: Linderöd Ridge, LåR: Långagrund Ridge, NäR: Nävlinge Ridge; RBG: Risebæk Graben, RFZ: Romeleåsen Fault Zone, RG: Rønne Graben, SKF: Skurup Fault, VT: Vomb Trough, STZIZ: STZ Inversion Zone, MPT: Mid-Polish

3. MCS data & Well data





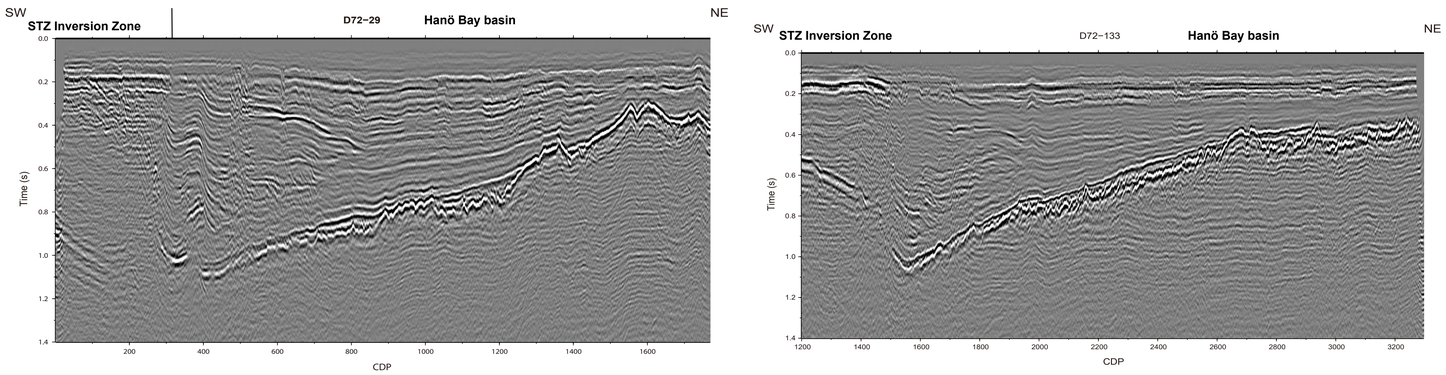


Figure 2. AL526 2019 high resolution MCS data (top) and legacy oil data (bottom). Attempt of well -tie (right).

3. Remarks

1. STZ-bounded area in the Hanö Basin is charaterized by thick-skinned deformation. Uplift of the southern STZ inversion zone resulted in formation of northeast prograding clinoforms.

2. High resolution seismic data allows detailed depositional nature to be revealled, charaterized by development of synsedimentary features during the inversion tectonics of the STZ.

3. Lithology and the chaotic seismic facies of the wedge body suggest an origin of mass-transport deposit along the STZ escarpment. The body shows a large aggradation during the reactivation of the bounding fault zone and the associated erosion of the inner shelf. Its relief may suggest a moat-drift system, which is related to bottom-current activity in the Satornian-Campanian.

4. Further development of multiple shelf-edge clinoforms were found overlying the drift body, displaying aggradational and retrogradational. This offers a good example of Late Cretaceous high-stand sea-level.

5. No evidence for the listric normal fault beneath the Hanö Basin, although it was proposed in numerous previous studies.

Reference:
1. Erlström, M., 2020. Chapter 24 Carboniferous–Neogene tectonic evolution of the Fennoscandian transition zone, southern Sweden. Geol. Soc. London, Mem. 50, 603–620. https://doi.org/10.1144/m50-2016-25
2. Sopher, D., Erlström, M., Bell, N., Juhlin, C., 2016. The structure and stratigraphy of the sedimentary succession in the Swedish sector of the Baltic Basin: New insights from vintage 2D marine seismic data. Tectonophysics 676, 90–111. https://-doi.org/10.1016/j.tecto.2016.03.012