

Characterization of storm-surge deposits: A multi-proxy approach along the northern Halland coast with implications for carbon storage

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Introduction

- Storm-surges are increasing coastal hazards
- Impacts on sediment dynamics and carbon storage
- Aim: use sedimentological and geochemical proxies along the northern Halland coast to identify storm-surge deposits and evaluate their role in coastal carbon storage.

Methods

- Sedimentological observations
- Geochemical analyses:
X-Ray Fluorescence
Loss On Ignition
C & N elemental analysis

Sedimentological results

- Erosional boundaries
- Lens-shaped / laterally discontinuous beds
- Coarse material inland (shells, cobbles)
- Alternation of coarse-grained and fine-grained layers (alternating depositional energies)



Rosendal's sedimentary scarp with laterally discontinuous coarse-grained beds and fine-grained beds.

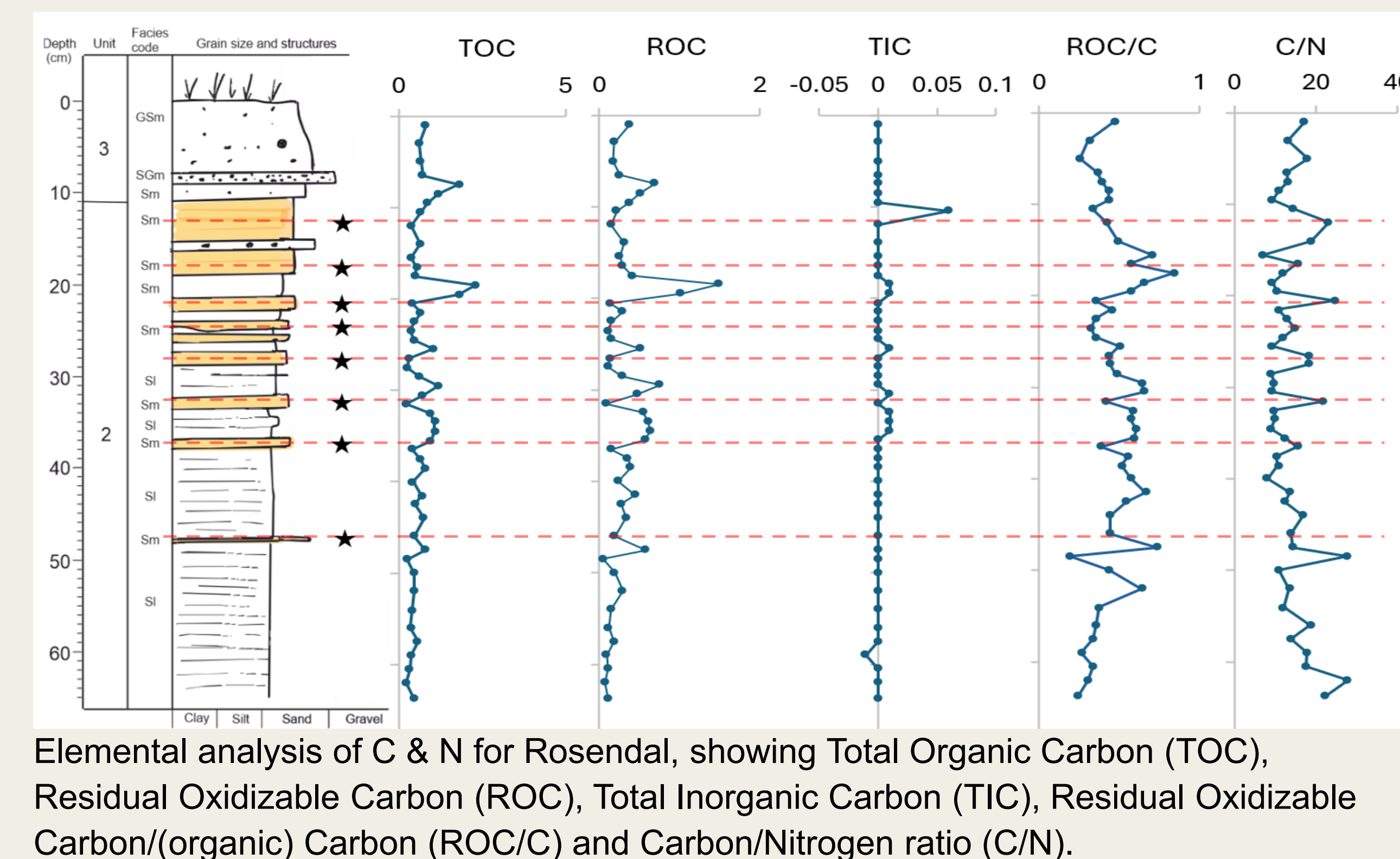
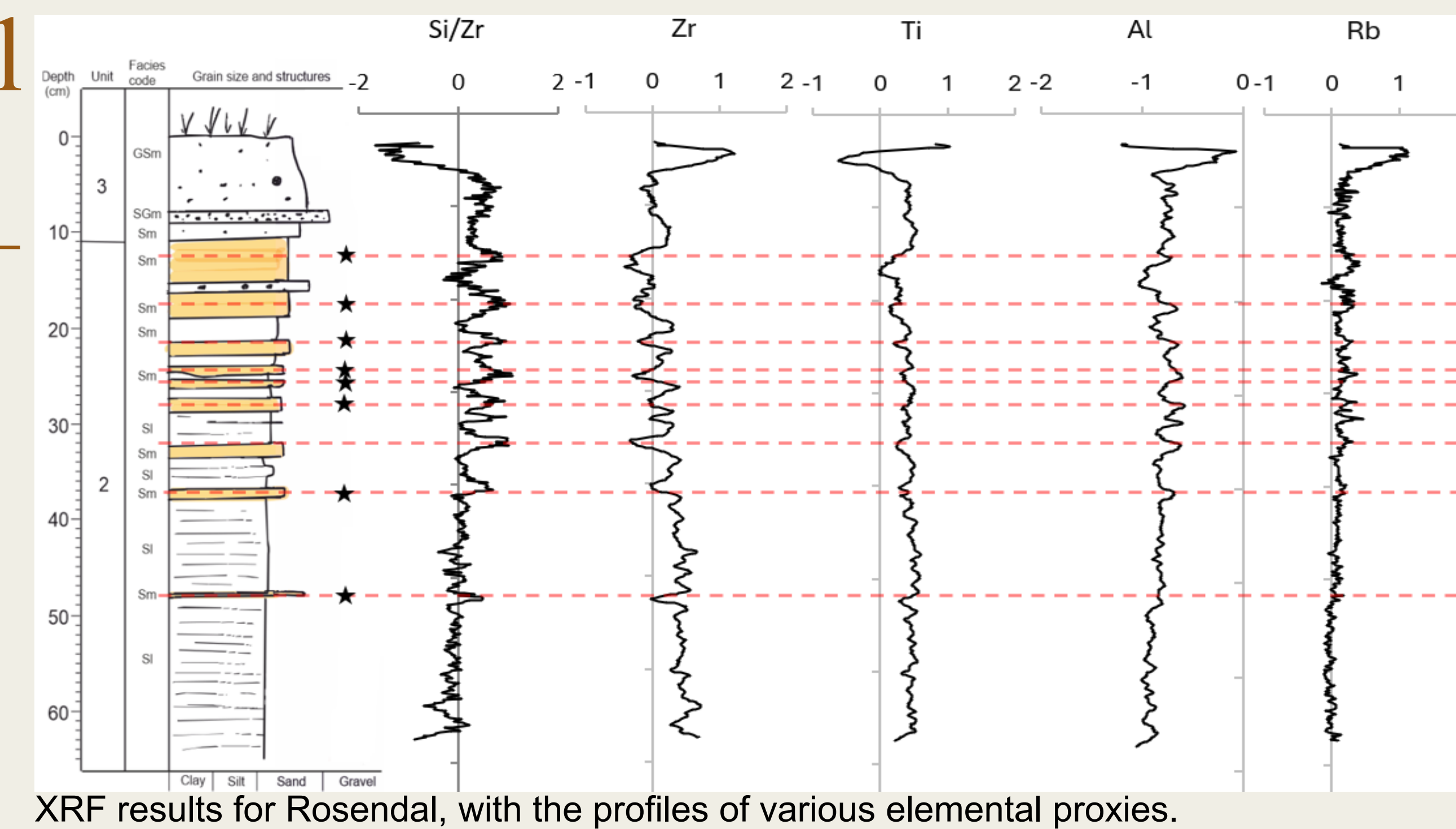


Shell-rich unit in Träslöv.



Geochemical results

- Distinct coarser, sandy storm beds aligns with site-specific shifts of XRF signals
- LOI shows overall low organic matter content
- The carbon response shows dilution of organic matter and very high values for C/N ratios.



Discussions

- Sedimentological features (erosion contacts, coarse layers, shell deposits) combined with geochemical signals confirm episodic high-energy events, though their expression varies across sites due to local morphology and sediment supply.
- XRF signals differ between sites, showing that storm-surge identification cannot rely on a single proxy but requires site-specific interpretation and integration with sedimentological data
- High-energy events cause higher accumulation rates which could result in short-term increased carbon burial and could possibly introduce seagrass in the sediments.
- More frequent storm events could potentially lead to long-term carbon loss due to higher erosion.

Future studies

- Expand multi-proxy dataset: more cores, more sites, higher resolutions
- Add complementary analyses: grain-size & grain-shape, CT scanning, micropaleontology
- Improve dating & process understanding: OSL, ^{210}Pb / ^{137}Cs , hydrodynamic modelling

Important for future coastal management & protection

Conclusions

- Storm-surge deposits are identified along the coast of northern Halland, with clear hydrodynamic shifts.
- No single proxy provides all information in such a complex coastal environment.
- Multi-proxy approach is essential for cross-validation and improved interpretation.
- Carbon implications: short-term (enhanced burial) vs long-term (potential carbon loss by erosion)