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Automated Characterisation of Tidal Course Morphology for Intertidal Mudflat Study

Context

Why study intertidal mudflats?

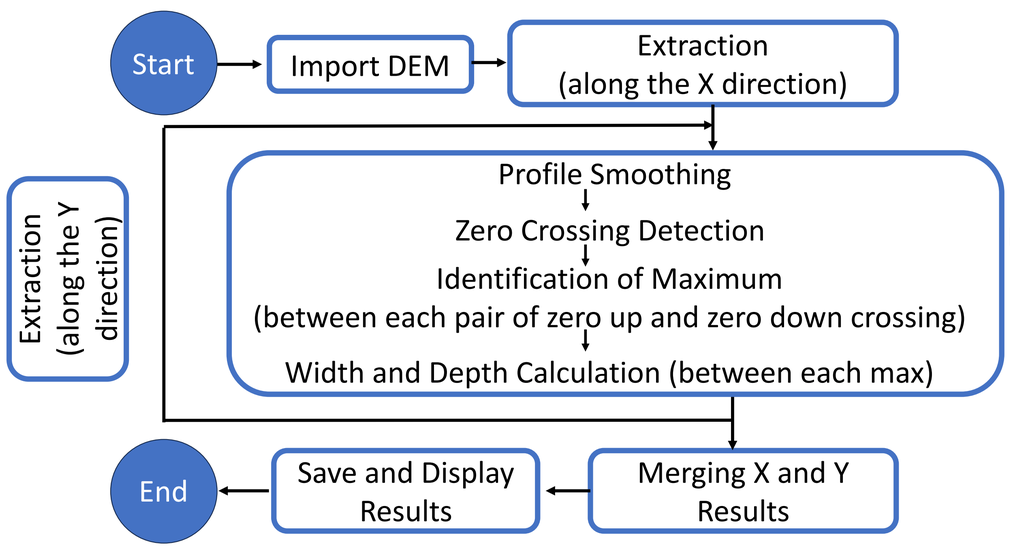
- **Coastal ecosystems**, especially **intertidal mudflats**, are increasingly vulnerable due to **climate change** and **human activities**.
- Intertidal mudflats play a key role in **water and sediment exchange** and overall **ecosystem stability**.
- The **dynamic nature** of tidal courses (channels, creeks) makes it difficult to understand the morphology and stability of intertidal mudflats.

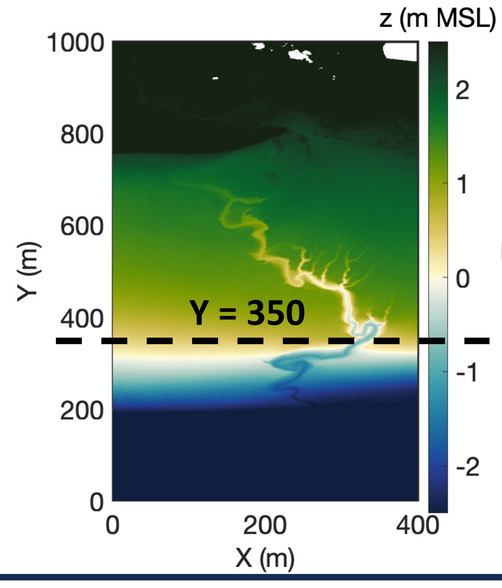
Challenges and Aims

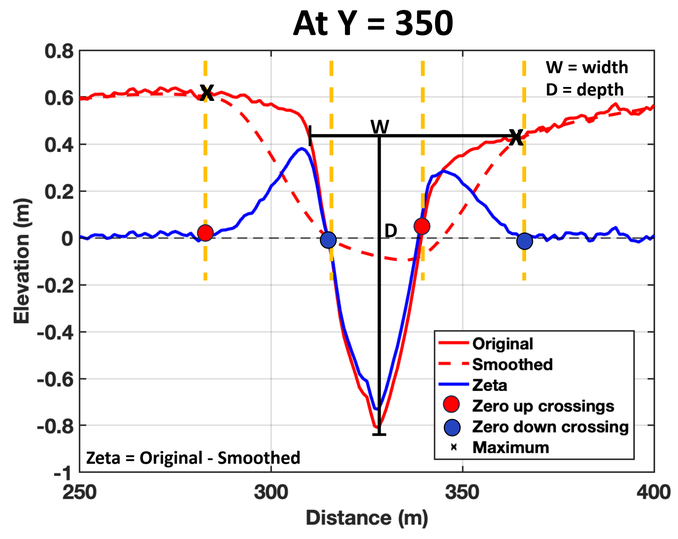
- Traditional methods are slow and labour-intensive.
- We developed a toolbox that automates analysis using DEMs.
- It measures width, depth, and calculates mudflat slope.

→ Identifying the relationship between tidal courses and mudflat and site characteristics.

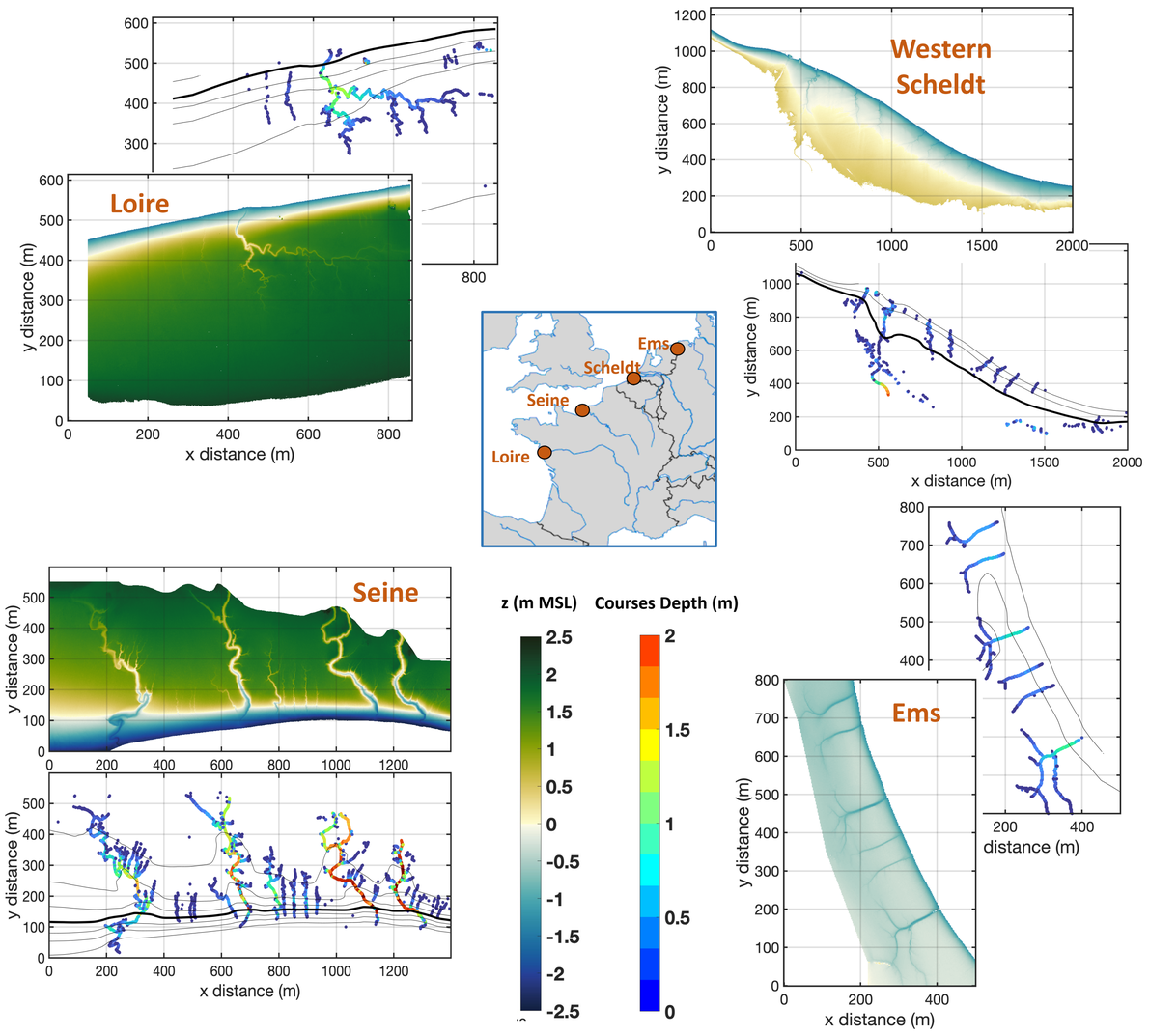
Methodology

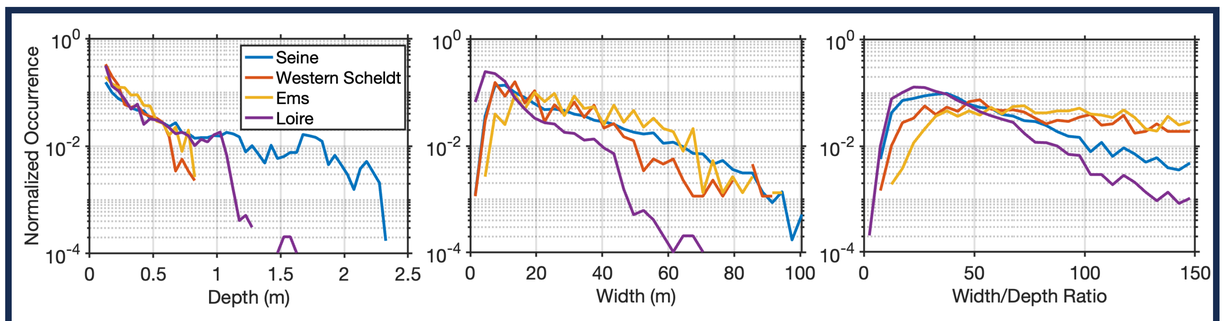




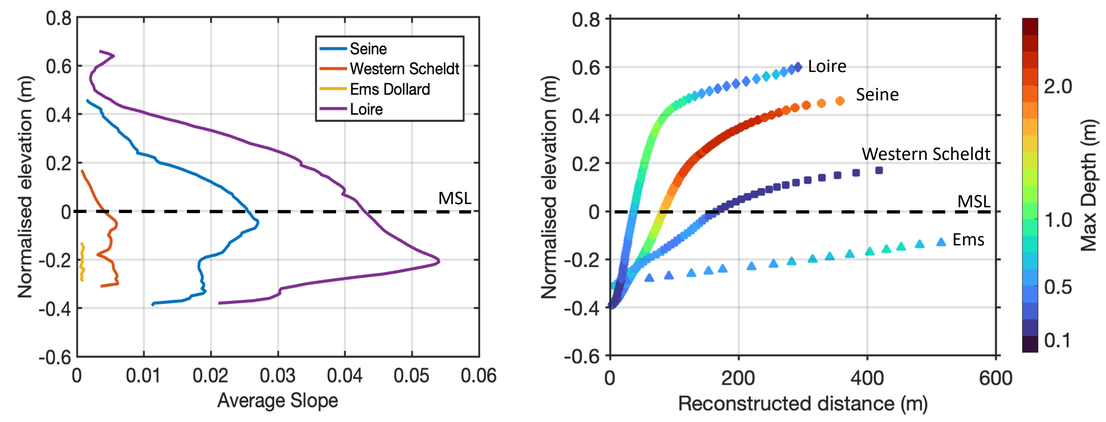


Results





In all the four sites, **low width/depth ratios dominate** because **narrow and deep channels efficiently transport water and sediment**, while **higher ratios are less frequent**, as **wider and shallower channels experience more resistance and energy dissipation**, which limits their formation.



Derived from the average slope, the reconstructed distance profiles combined with the courses depths show that the **deepest courses** tend to occur around the **slope break**, particularly those with a more pronounced **concave shape**.

Conclusions

- A toolbox was developed to automatically calculate the depth and width of tidal courses.
- Narrow, deep creeks are more common than wider, shallower ones, with deeper creeks occurring in mudflats that have larger tidal ranges.
- The study reveals a natural trend towards morphological equilibrium in tidal courses.

Perspectives

- Investigate the relationship between tidal course characteristics and mudflat drainage.
- Explore the relationship between tidal courses, mudflat morphology and varying global conditions (natural and anthropic).
- Use numerical simulations to simulate global changes.

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