PANCRAZZI, Léo. *Architecture sédimentaire de la flèche de galets de La Mollière (Baie de Somme) : Une étude par prospection géoradar*. Mémoire de stage de « Master 2ème année IGL ». Université de Caen Normandie, 2019, 50 p.

LA MOLLIERE GRAVEL SPIT INTERNAL ARCHITECTURE (SOMME BAY, FRANCE) : A GPR PROSPECTING STUDY

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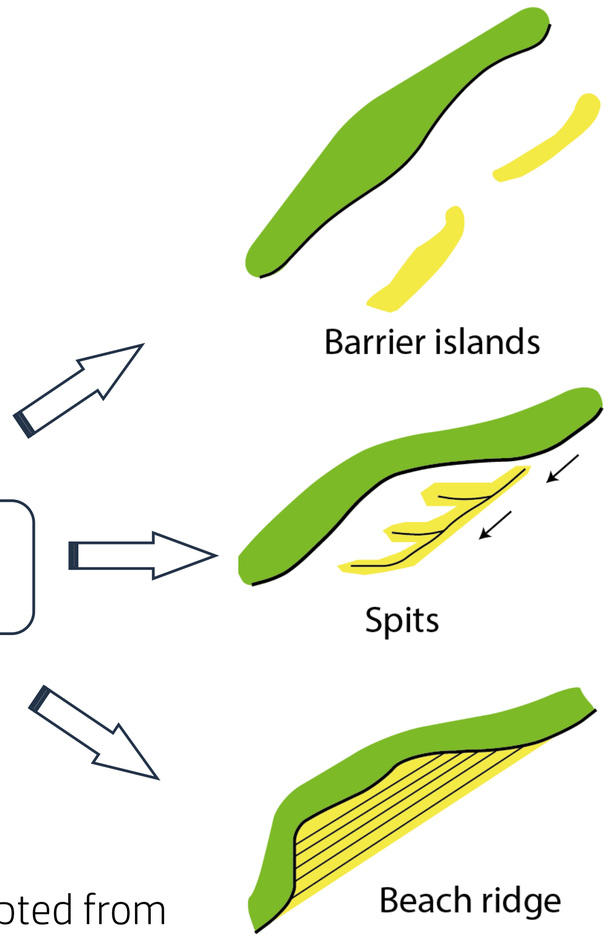
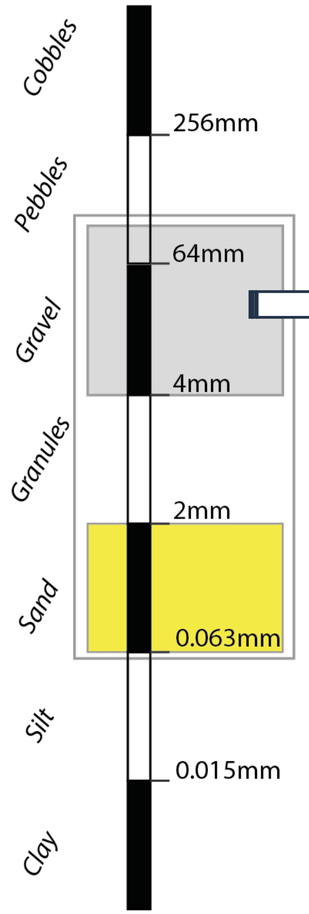
11 december 2019

Coarse coastal barriers

Types of barriers





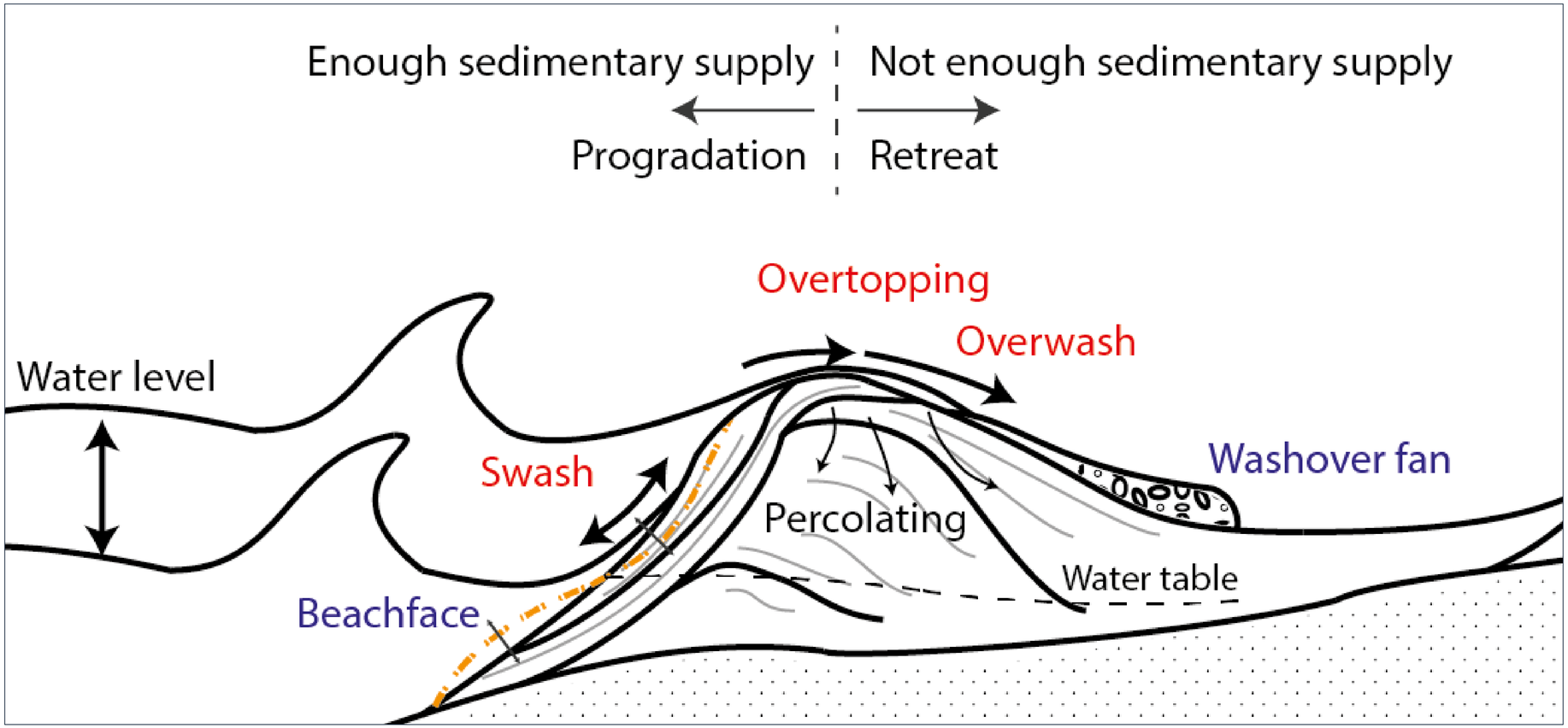
Protective function

Own dynamic

Sensitive to sediment ressource

Objective

Determine the internal structure of the spit and couple the results to morphological evolution

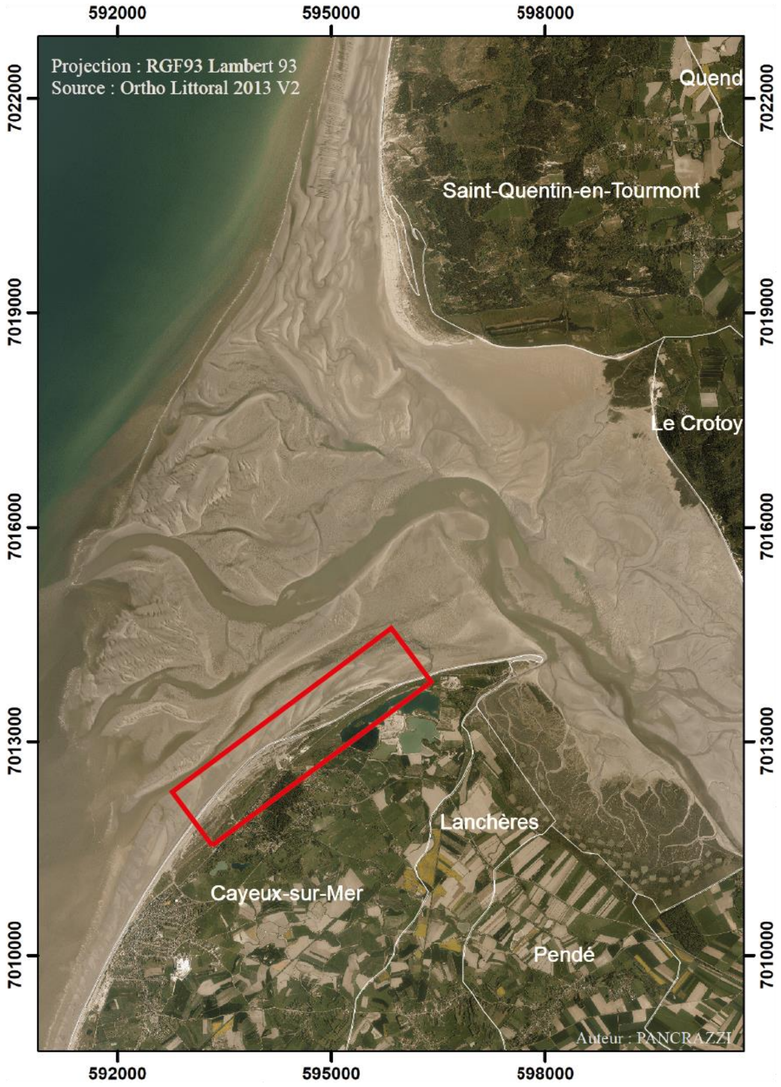


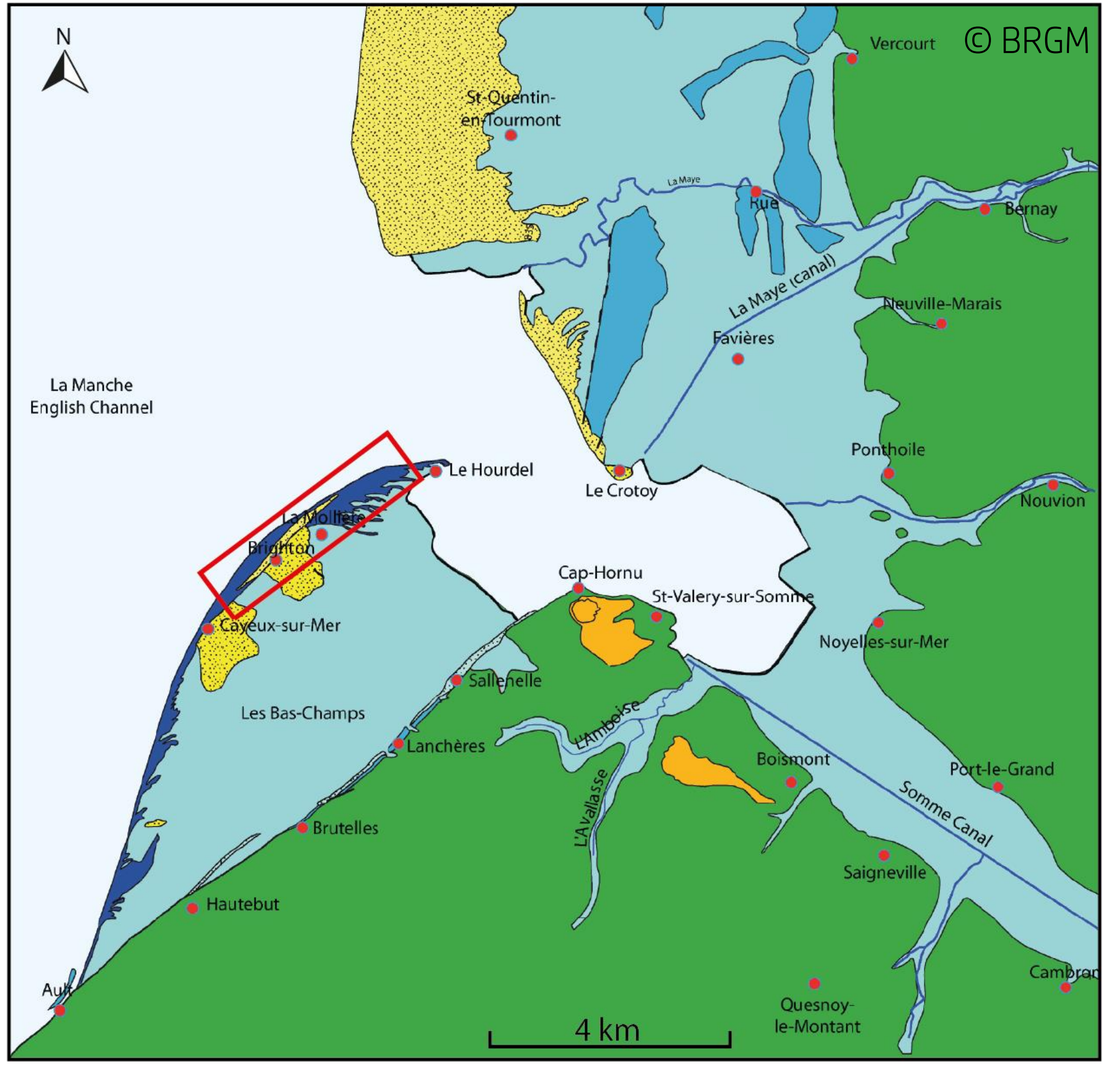
Porosity - permeability

Swash – ground water

Frequency and intensity of extreme events

Sedimentation rate



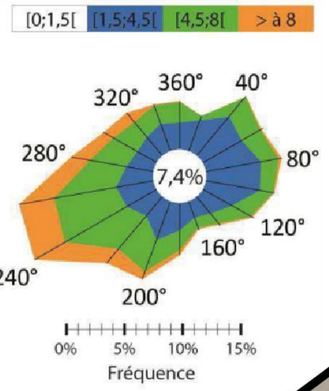


- Current marine deposits
- Gravel cords
- Current dunes
- Currrent dunes and overwash deposits
- Holocene deposits (Sub-Boreal and Sub-Atlantic)
- Holocene deposits (beach or sub-boreal barrier (?) along paleo-cliff)
- Pleistocene gravel deposits
- Tertiary : Thanetien and Ypresien. Often covered
- Cretaceous. Flush or covered by superficial deposits

Somme Bay | Estuary in a temperate megatidal environment

Wind velocity (m/s)

(Cayeux-sur-Mer)



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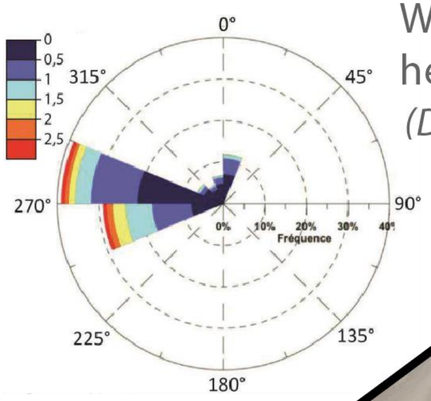

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Wave significant height (m)

(Dieppe)

Ortophotography Littorale V2 2013

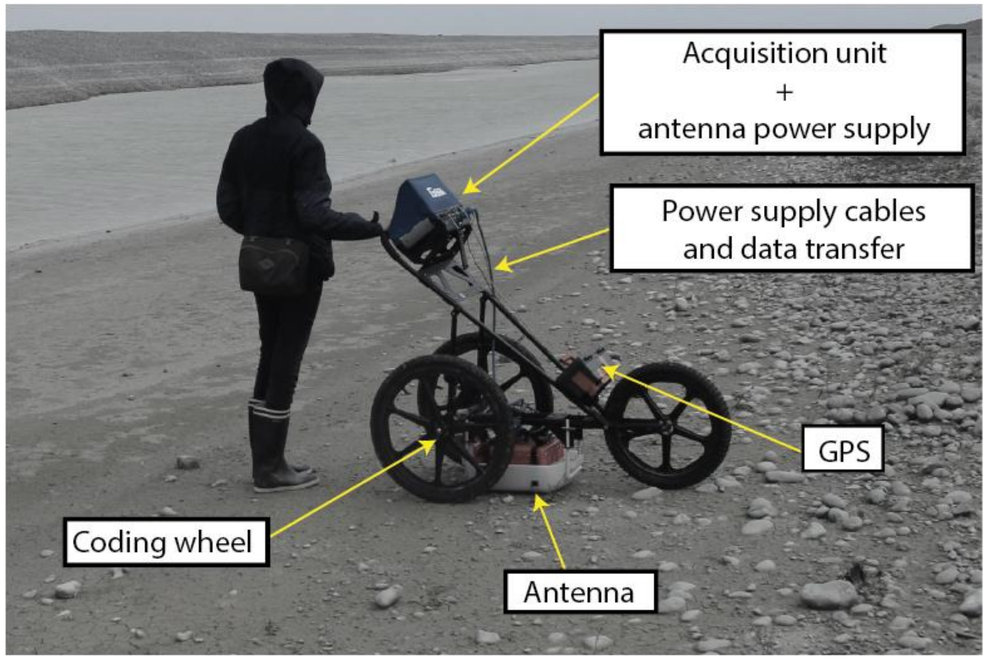
Topography (LiDAR 2013)

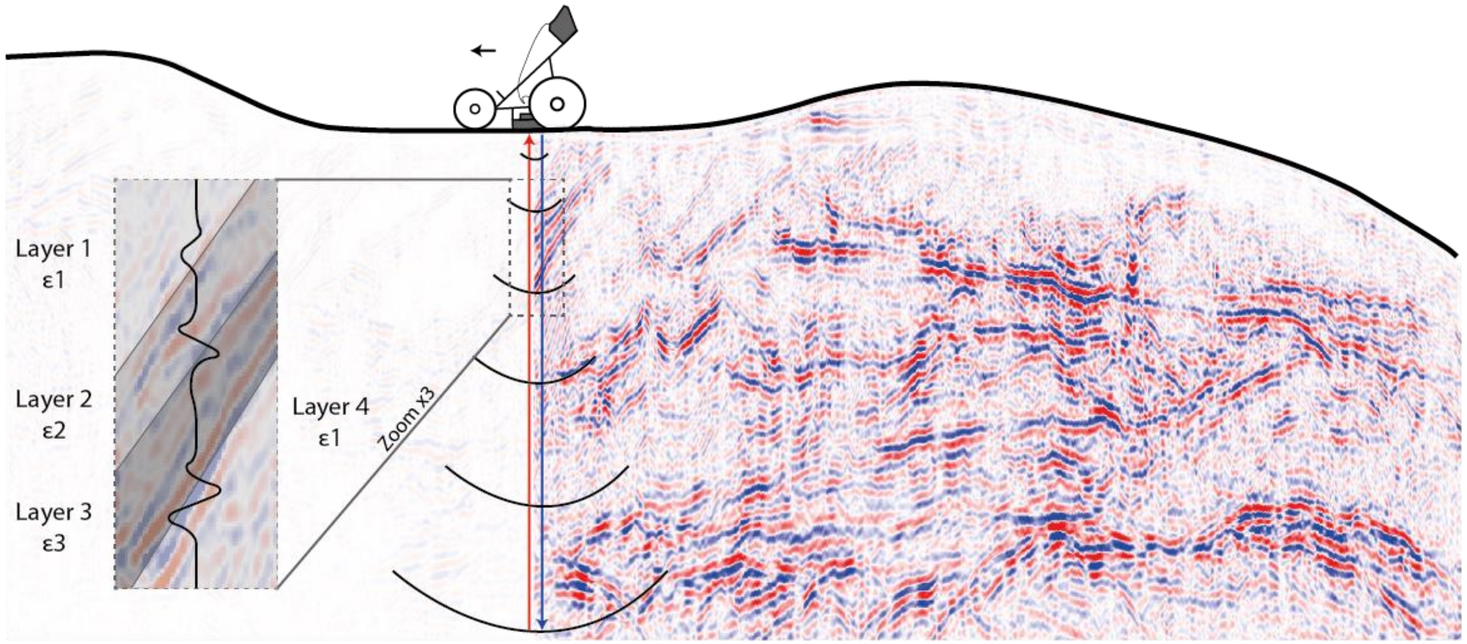
La Molliere spit

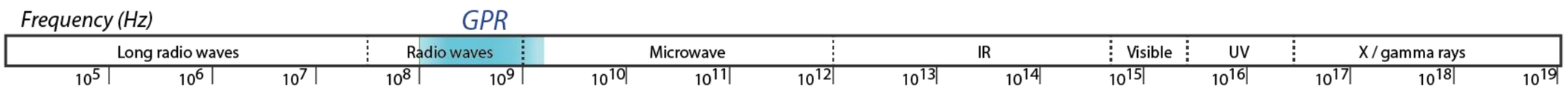
- South-west to north-east drift

- Recent history (since 1950)

- Anthropic pressure (quarries, coastal works)



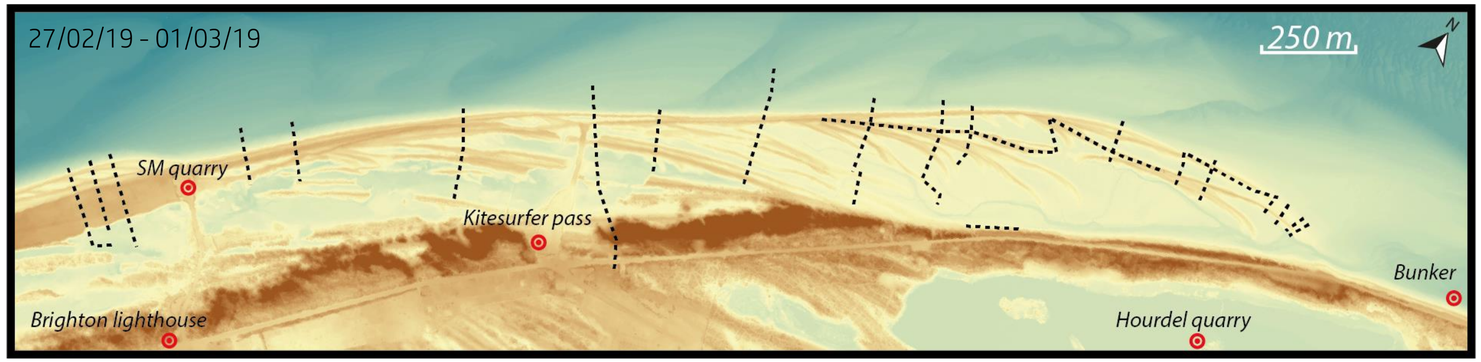




Geophysical method for non-destructive investigation (few cm – 100 m)

Principle | Emission, propagation and reception of electro-magnetic waves

Main parameters | Dielelectric permittivity / electrical conduction / magnetic permeability



Profiles number : 49

GPR profile

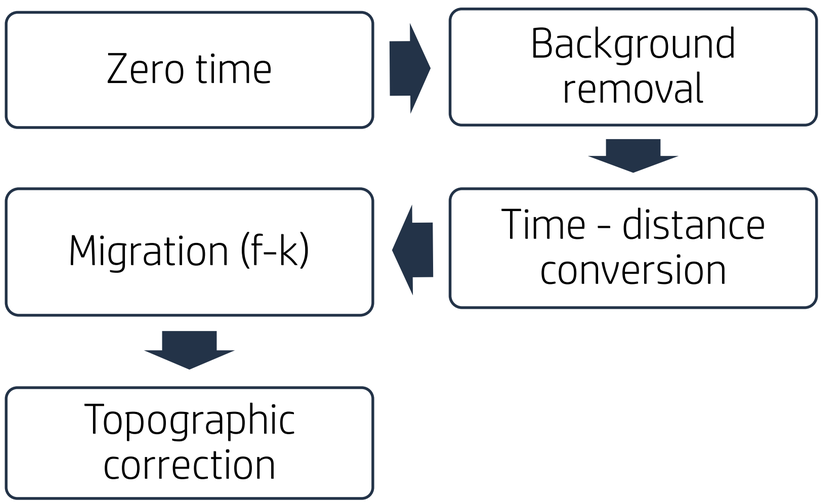
Acquisition

GPR GSSI SIR 3000 + DGPS Leica Viva GNSS GS10

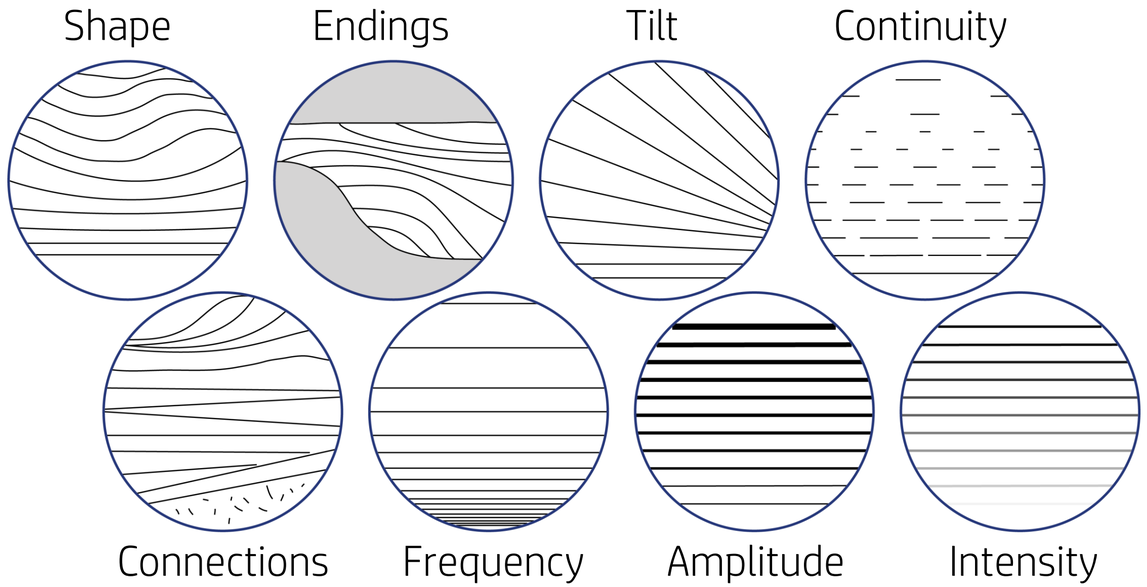
- Frequency : 400 MHz
- Dielectric constant : 6
- Mean viewing time : 150 ns
- Acquisition frequency : 50 scan/m
- Vertical sampling : 1024

Processing

GPRPy (Plattner, 2018)

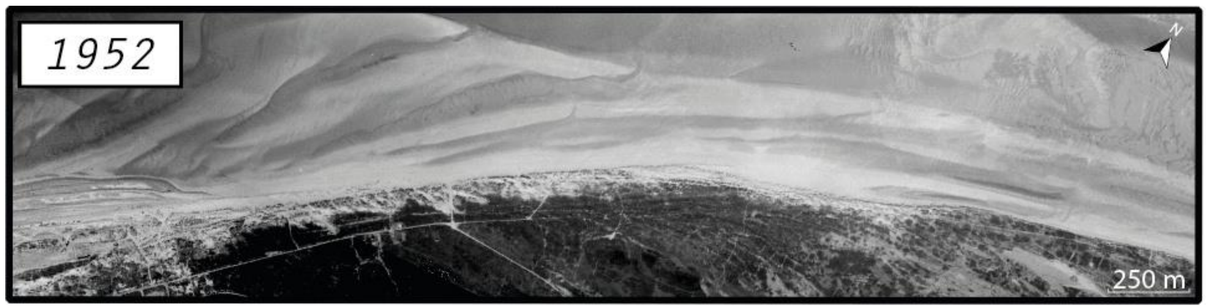


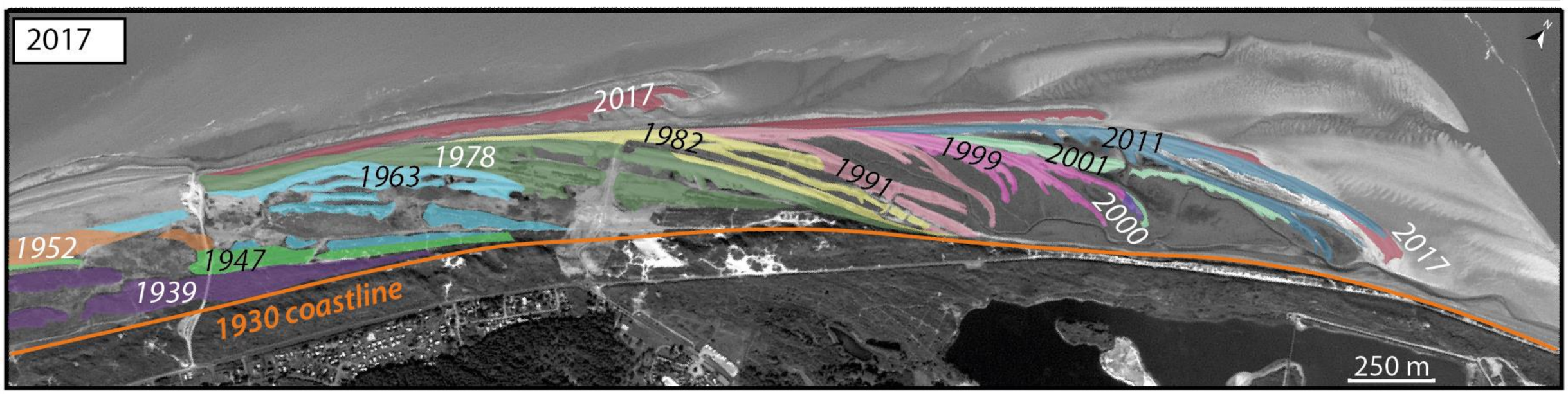
Interpretation



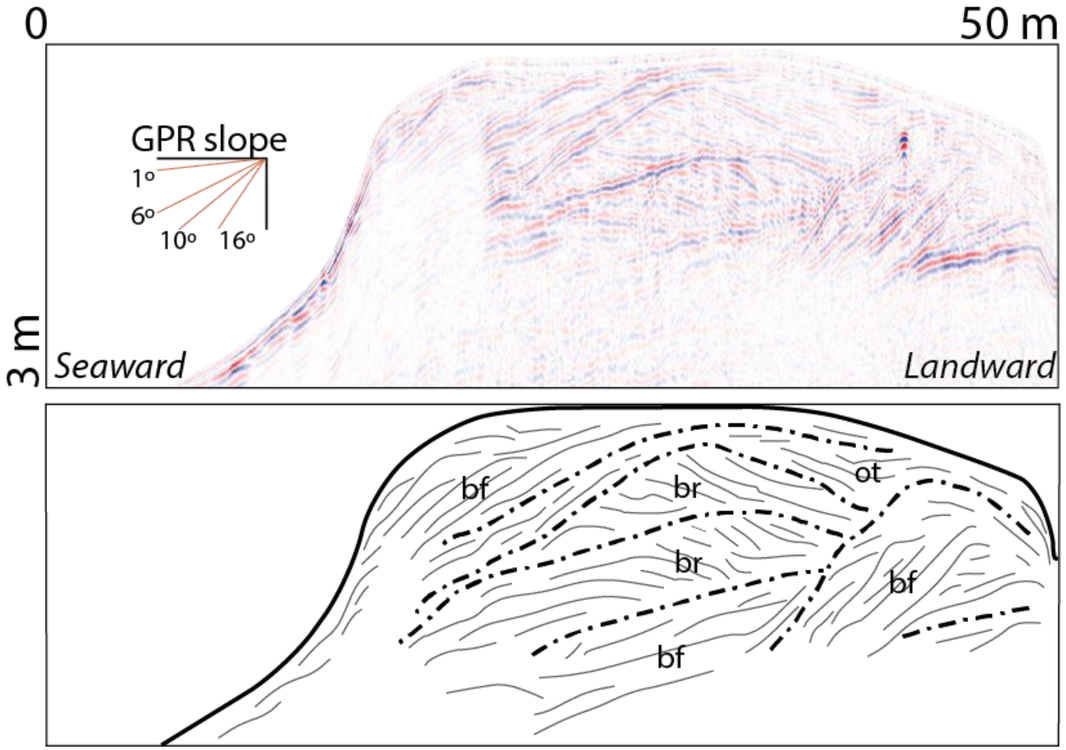
Cords mapping (GIS)

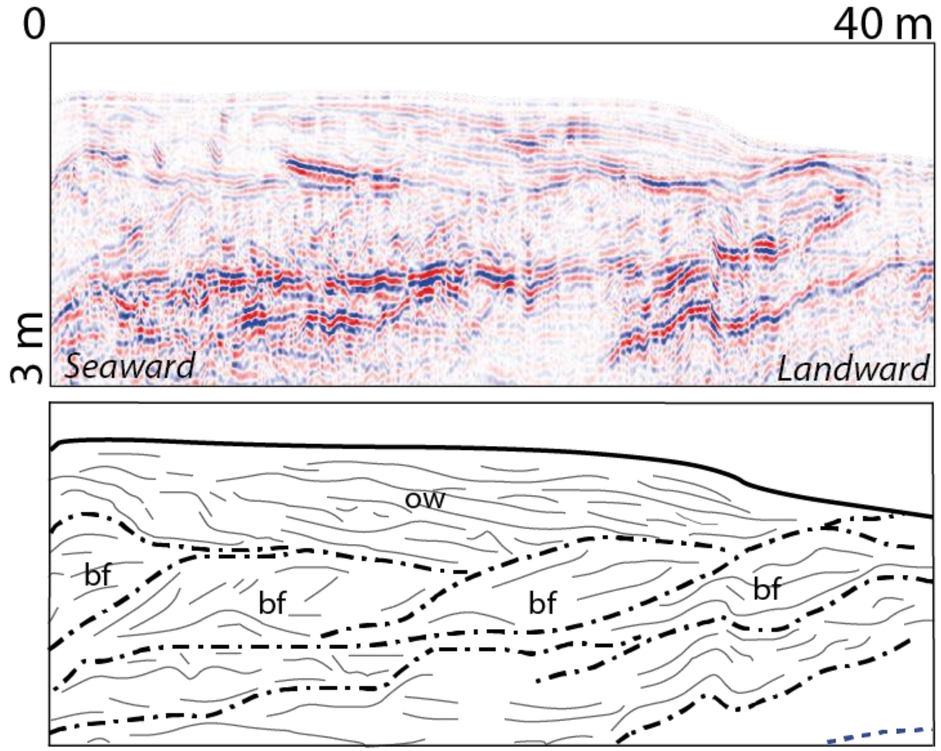
- Aerial photographs, orthophotographs, Pleiades images, SPOT images, LiDAR survey
- Chronological beginning in 1935



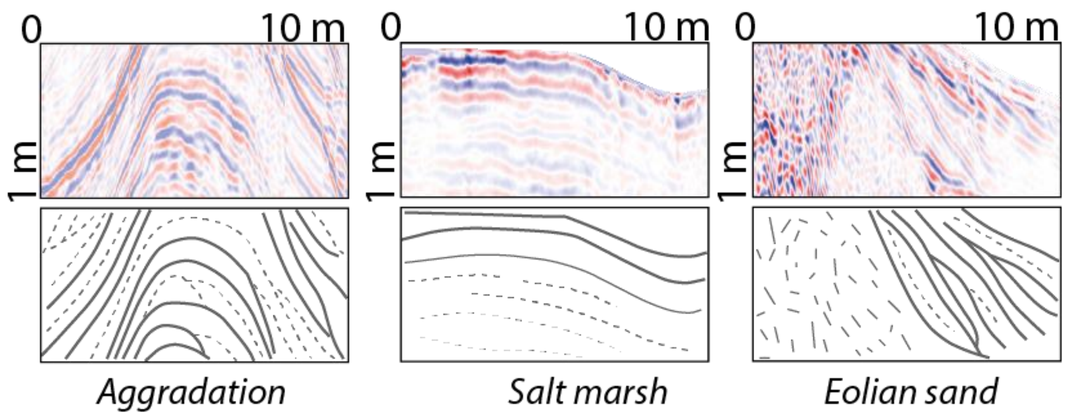


Radar facies

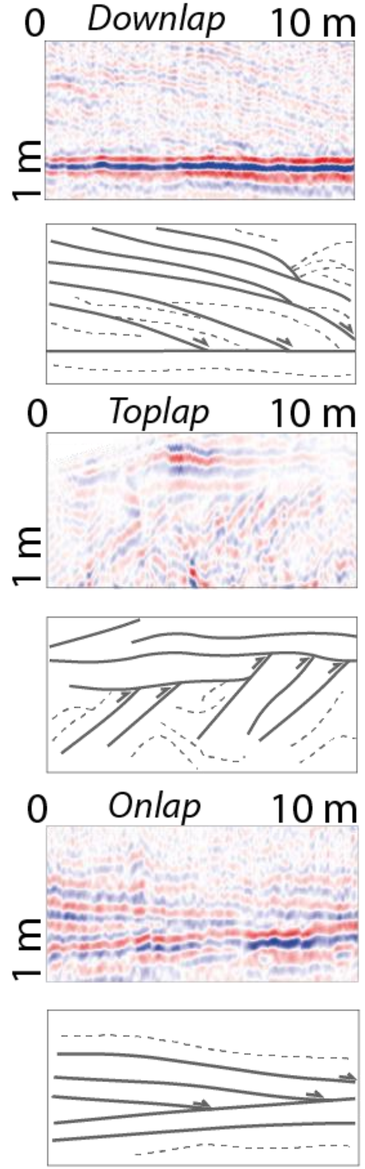




(bf : beachface ; br : berm ; ow : overwash ; ot : overtopping)

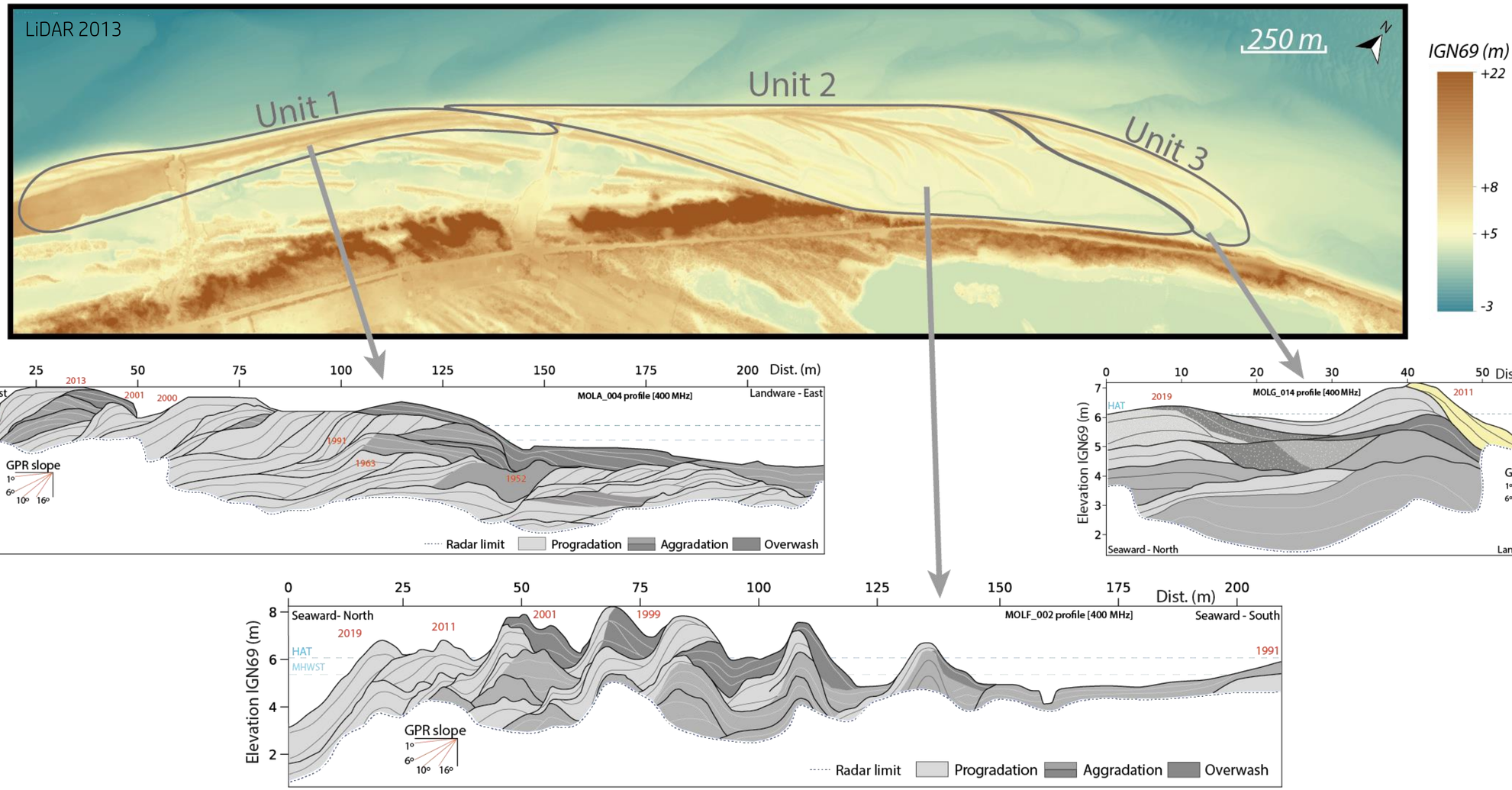


High spatial variability
of radar facies



3 morpho-sedimentary units :

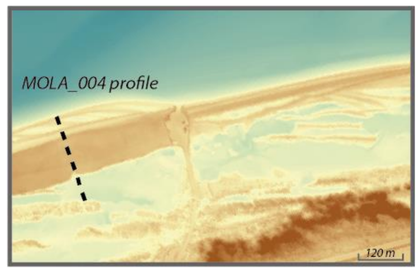
Unit 1 – Spit root | Unit 2 – Intermediate section | Unit 3 – Spit end

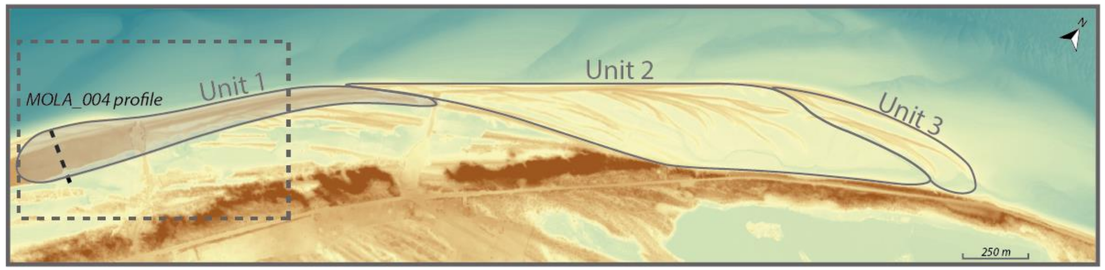


Morpho-sedimentary units

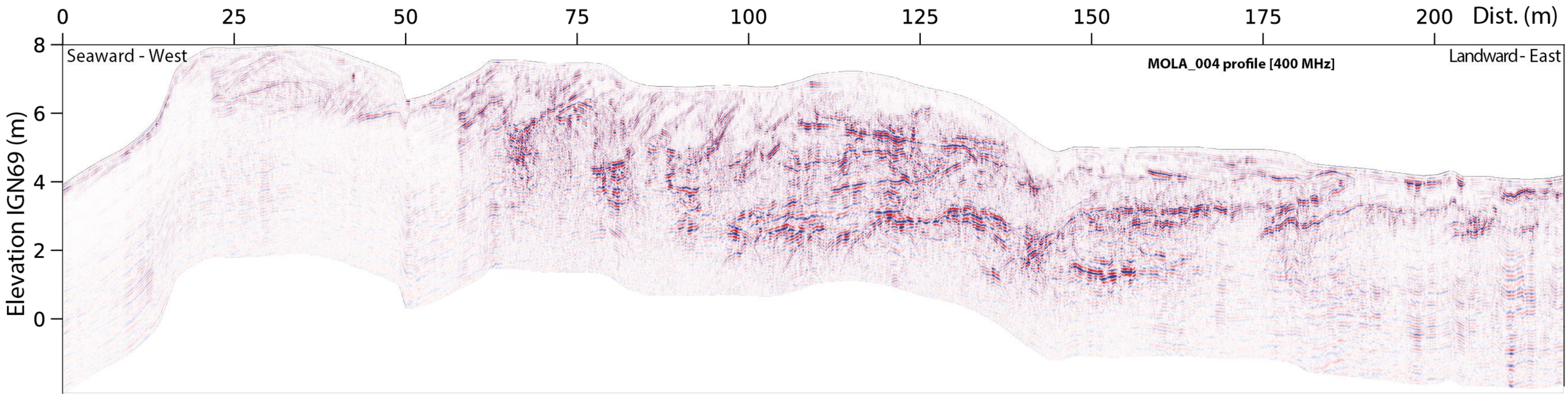
3 morpho-sedimentary units :

- Unit 1 | Spit root
- Unit 2 | Intermediate section
- Unit 3 | Spit end





LiDAR 2013



Morpho-sedimentary units

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- Unit 1 | Spit root
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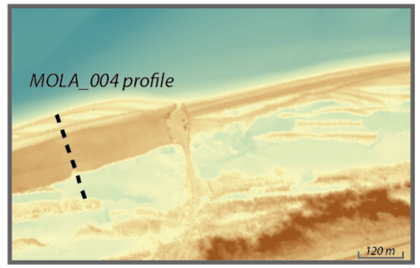
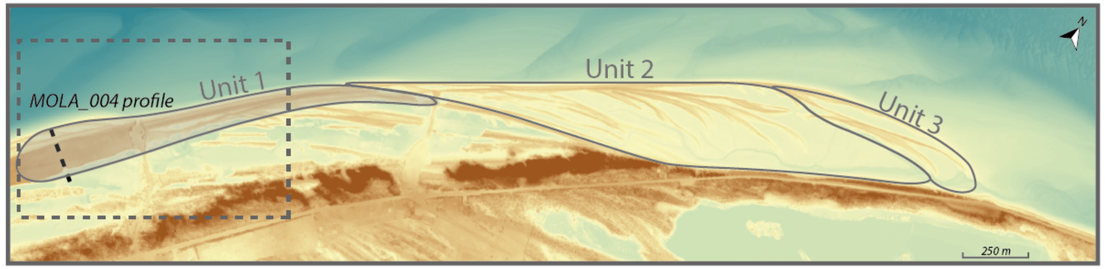
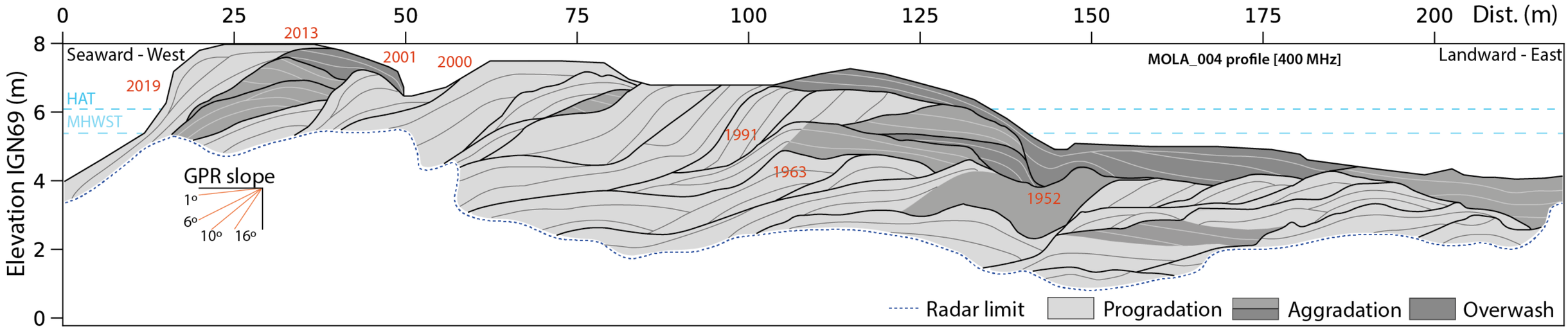




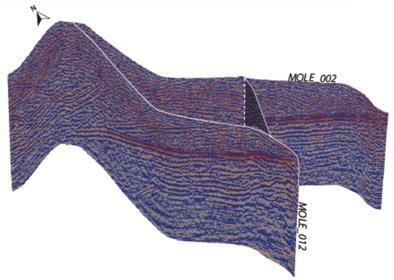
LiDAR 2013

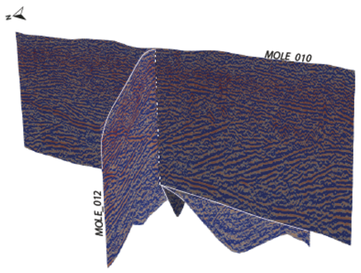


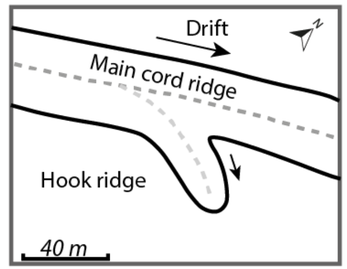
Progradating structures → Predominant cross-shore recording

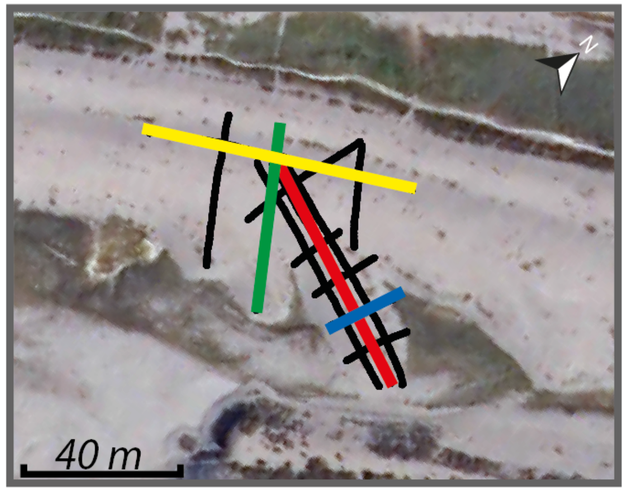
Inflection points

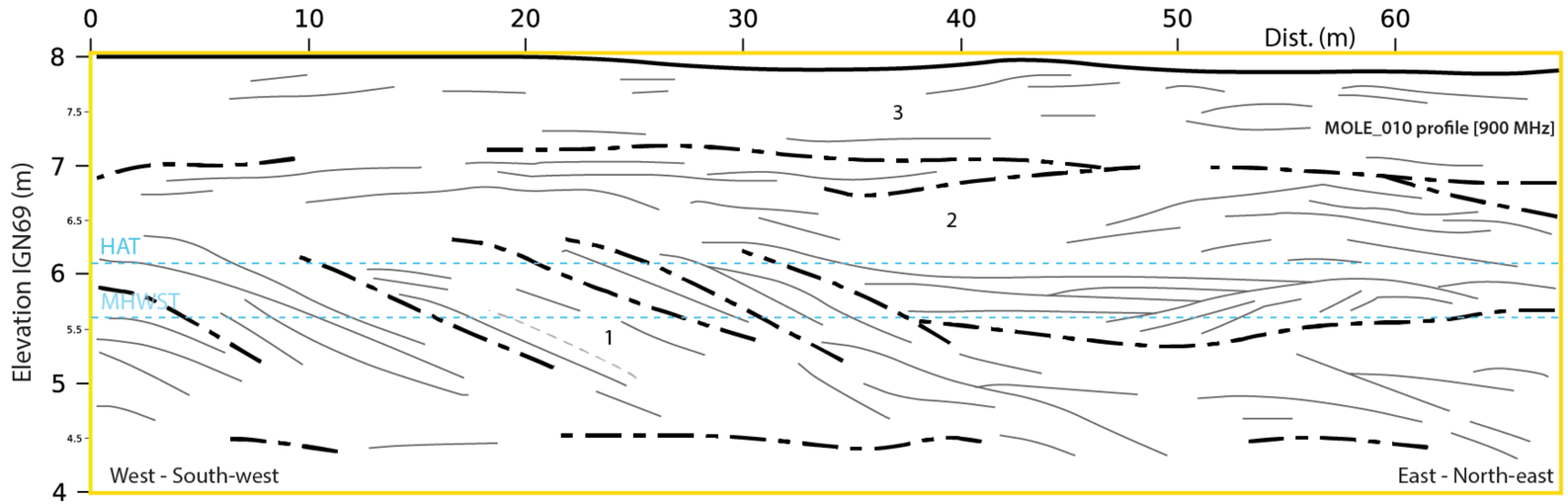
Finer analysis [900 MHz] of hook termination and inflection points using a 3-dimensional approach



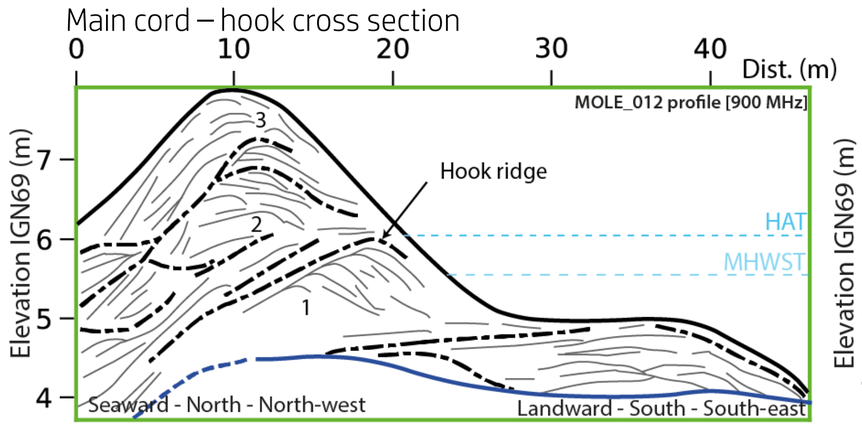


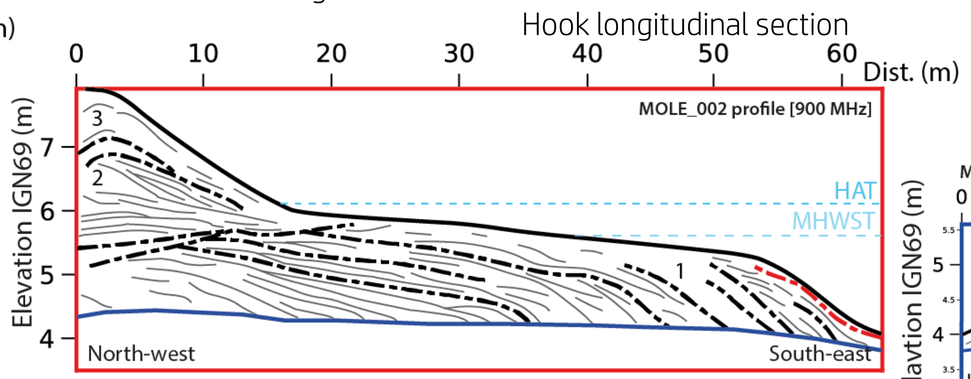


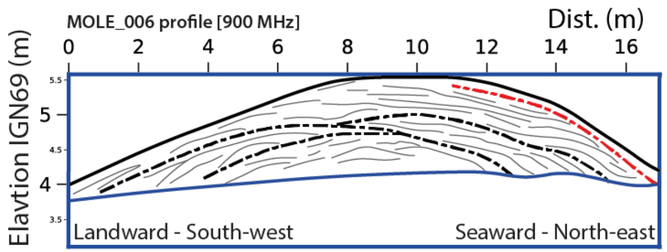




Main cord longitudinal section







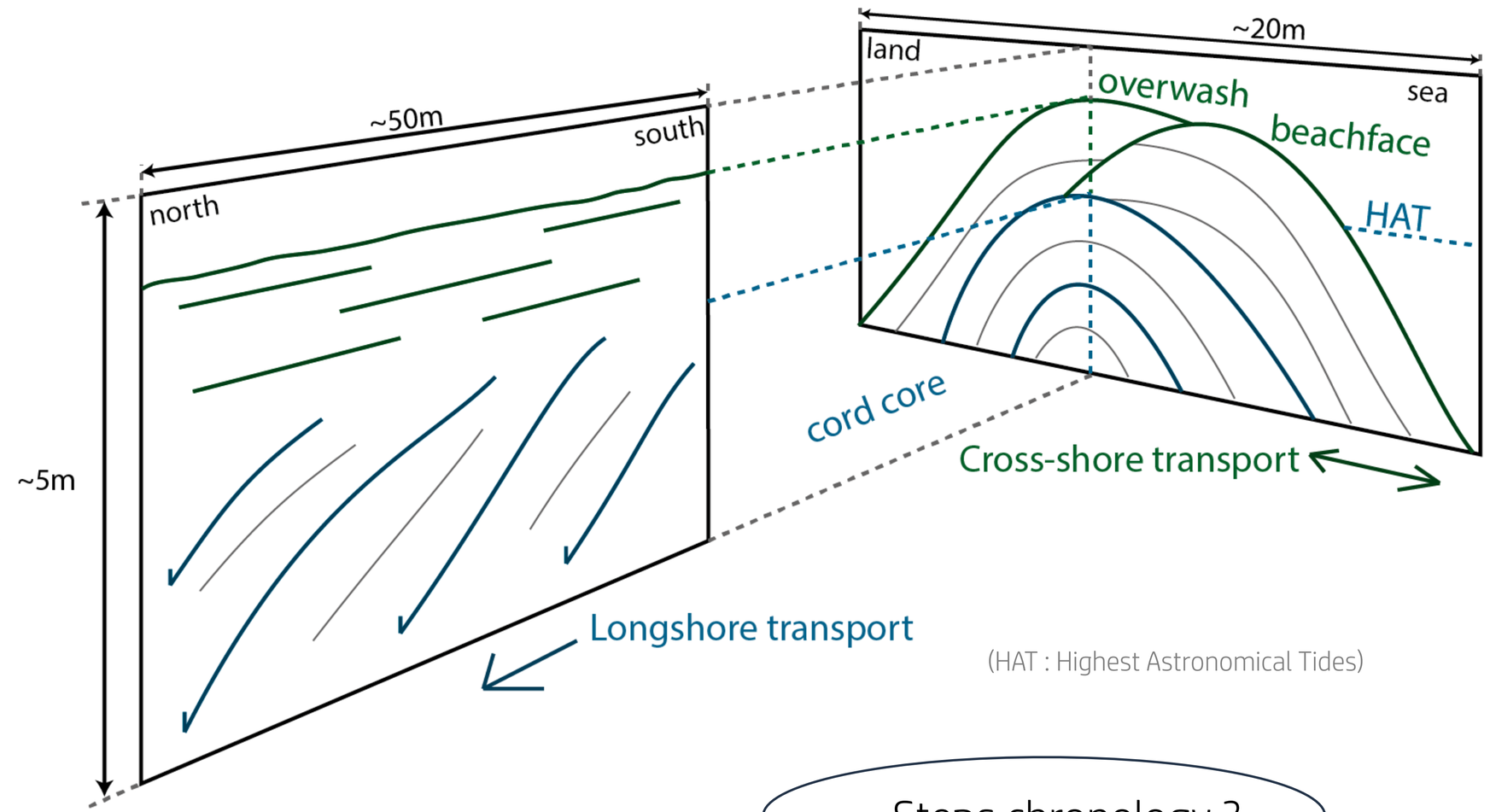
Hook cross section

- Erosional surface
- Notable erosional surface
- Water table
- Radar limit

- Step 1 | Core creation
  - Longshore dynamics
  - Drift currents

- Step 2 | Aggradation
  - Cross-shore dynamics
  - Waves, tide, marine surges

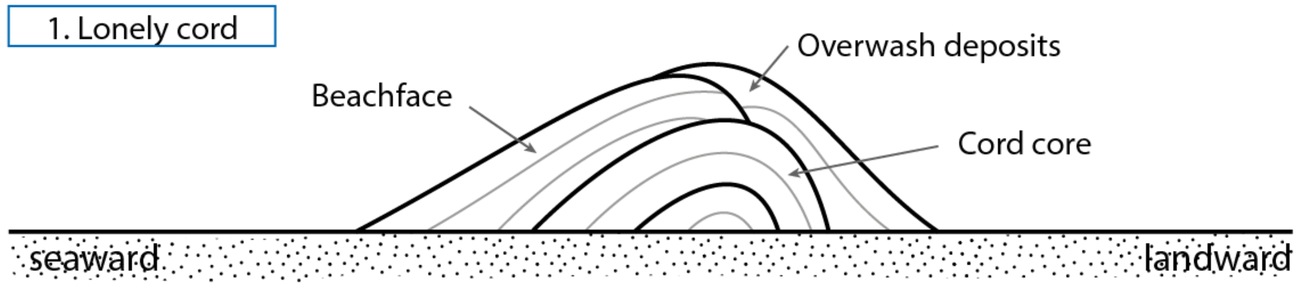
- Step 3 | Fossilization
  - Hook creation

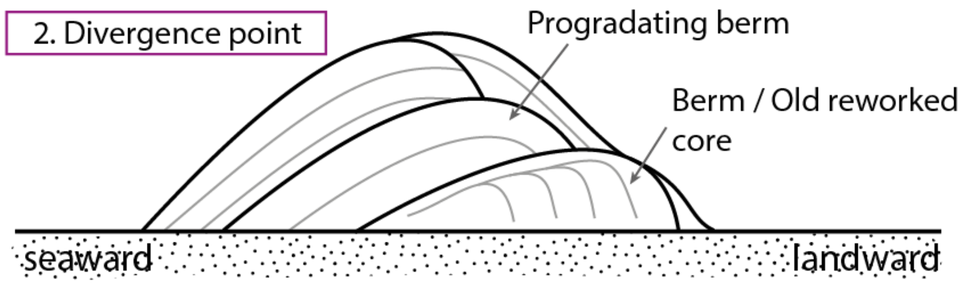


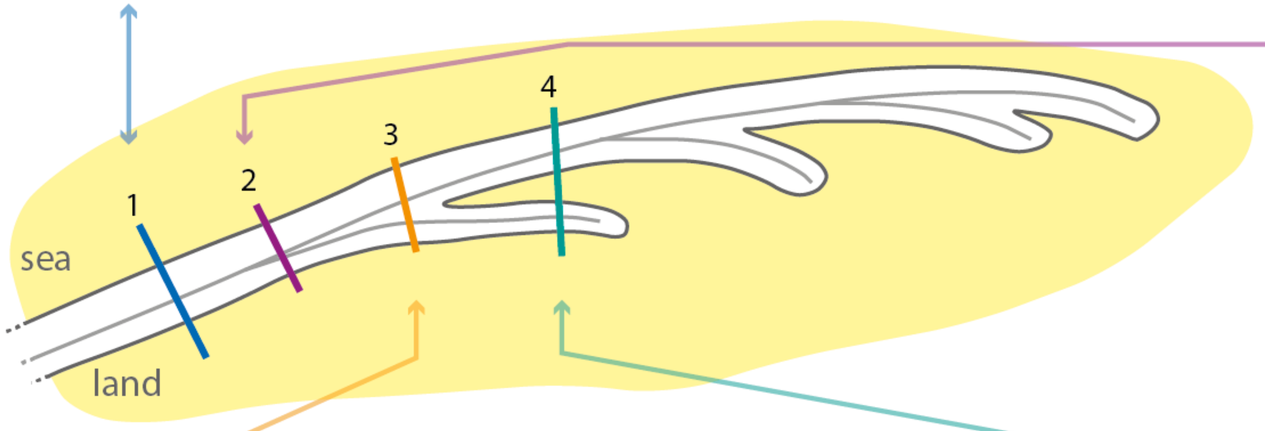
(HAT : Highest Astronomical Tides)

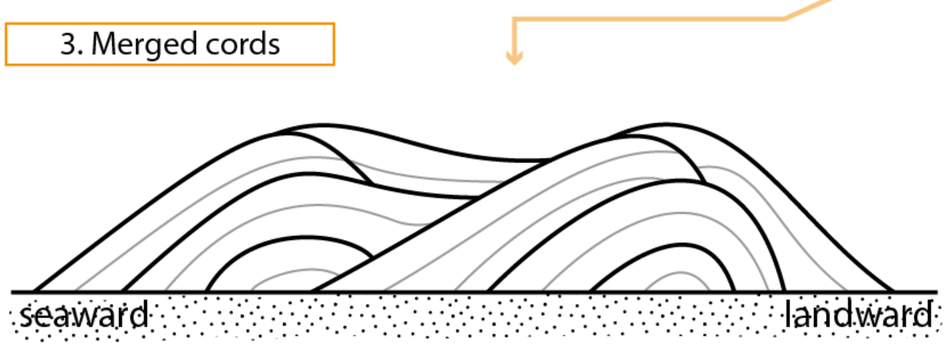
Steps chronology ?

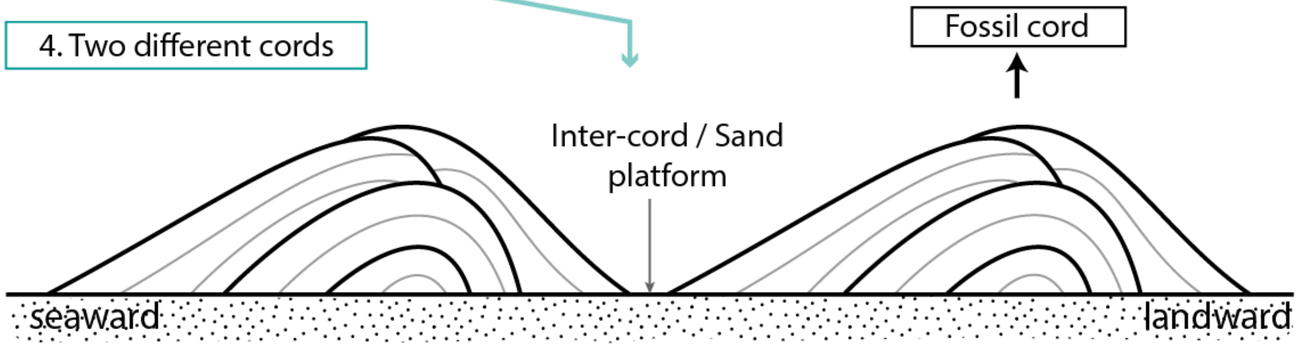
Sedimentary flows divergence





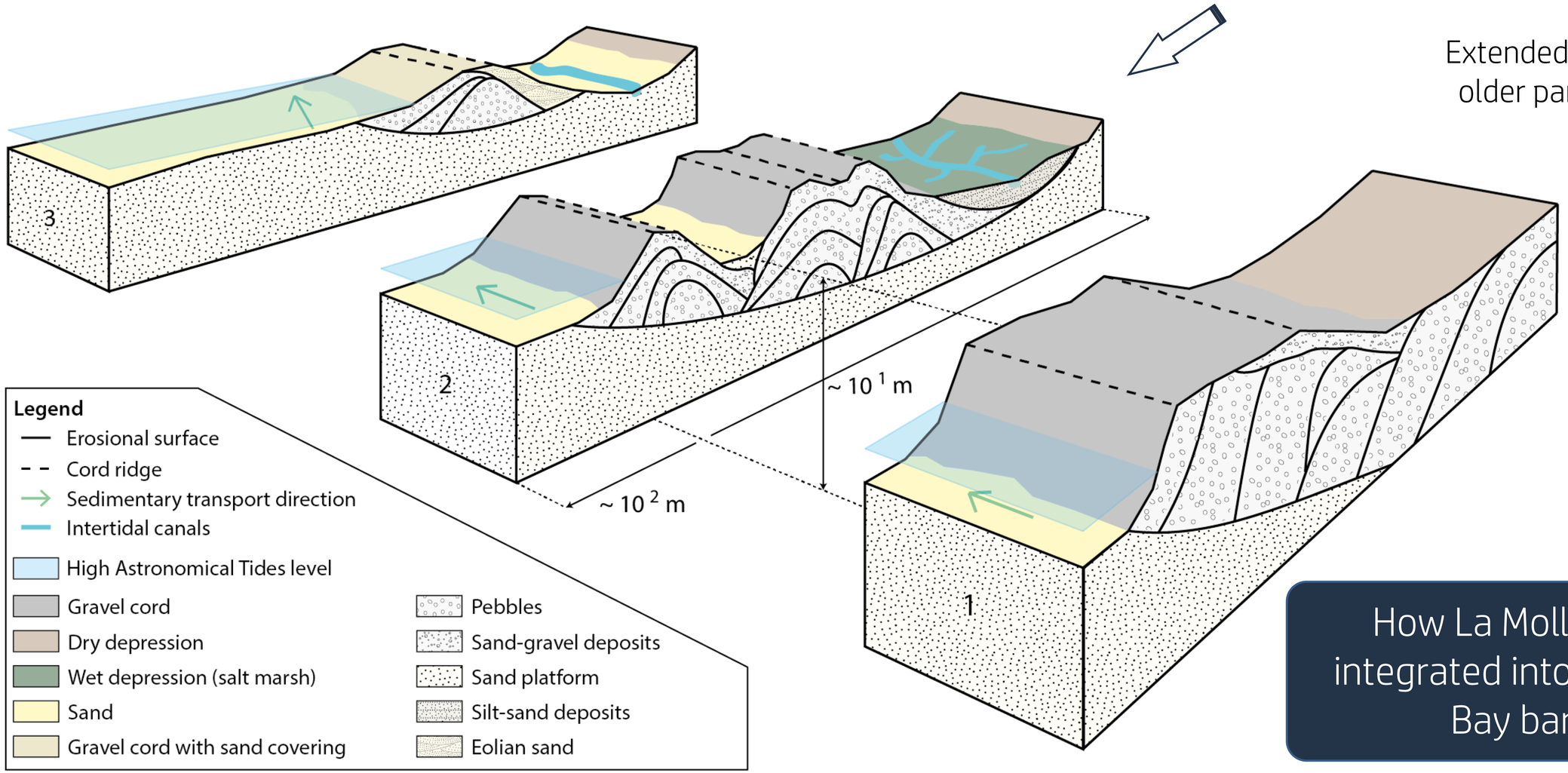






3 morpho-sedimentary units

Sedimentary flows divergence diagram



Extended GPR prospecting in older parts of the coastline

How La Molliere spit is integrated into the Somme Bay barrier ?

THANK YOU FOR YOUR ATTENTION

This work was supported by the EC2CO-Dril National Program (GIPSIeS - Geophysical Investigation of a Pebble Spit Internal Structure)

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- **Plattner, A. (2018)** Ground Penetrating Radar Data Processing and Visualization using GPRPy. AGU Fall Meeting Abstracts, 51.