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Sediment dynamics under the influence of dense shelf water flows and Eastern storms, Roses continental shelf, NW Mediterranean Sea

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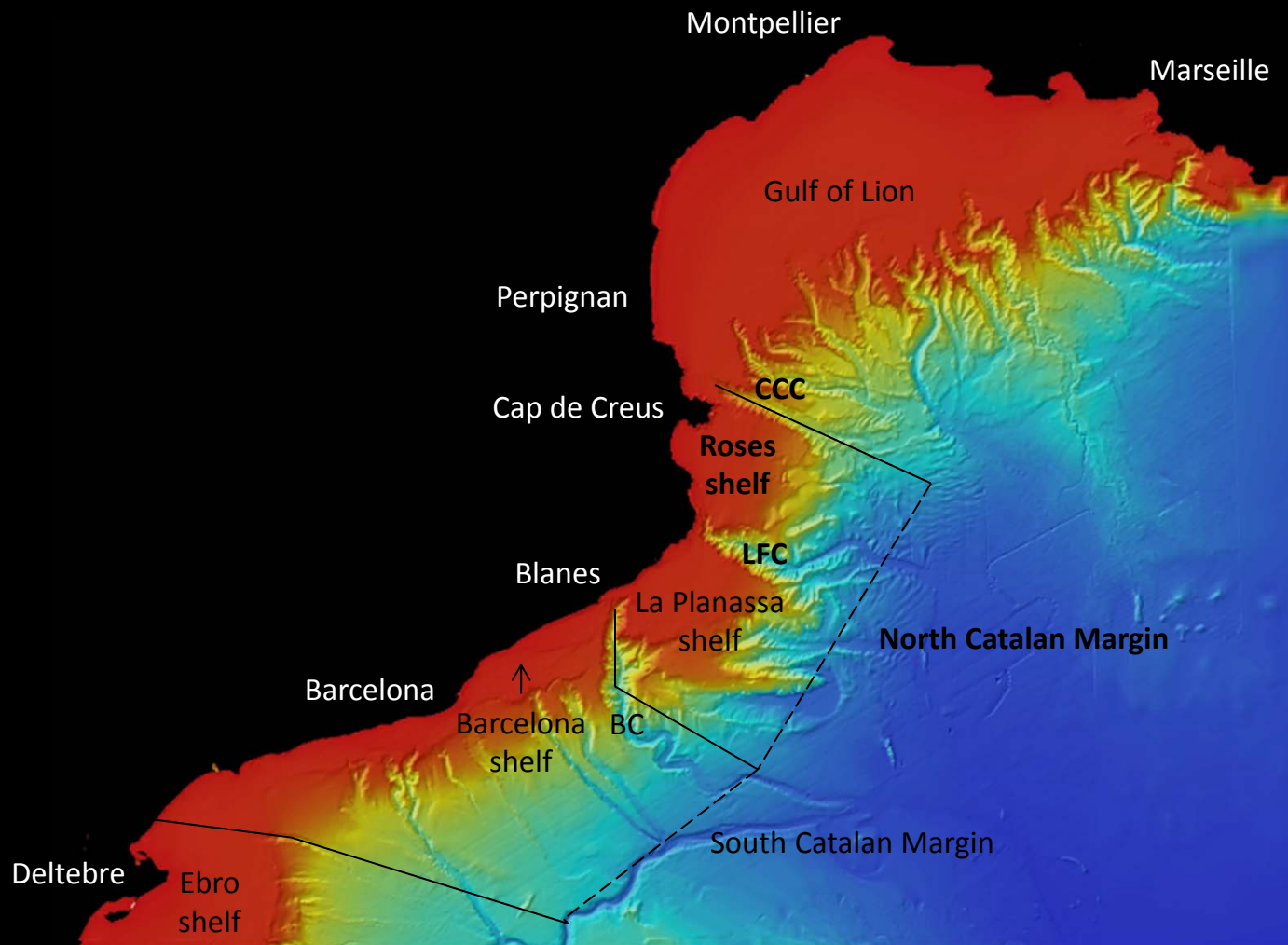


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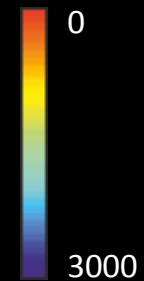


Mediterranean Sea

The Roses continental shelf



Depth (m)



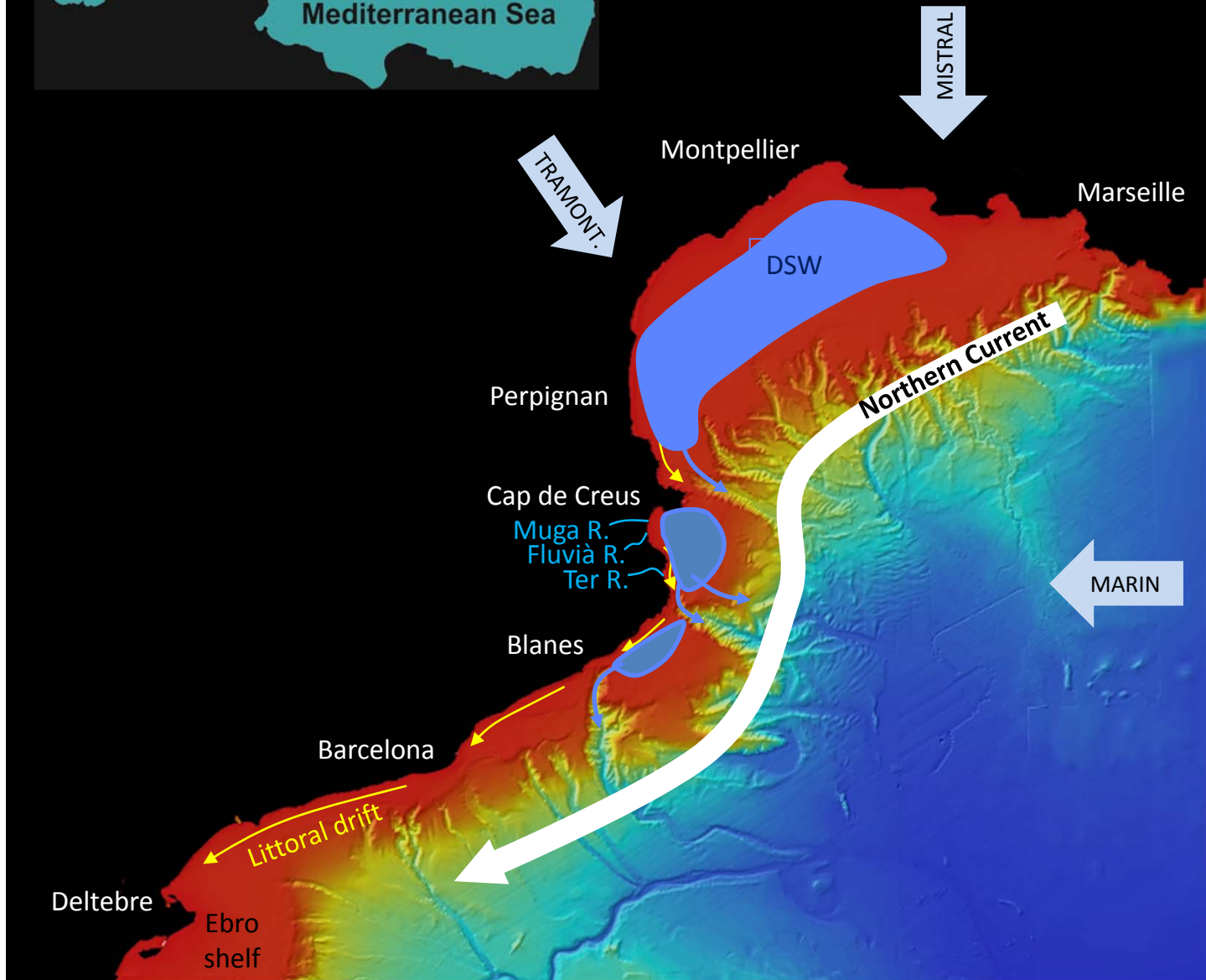
CCC: Cap de Creus Canyon
LFC: La Fonera Canyon
BC: Blanes Canyon

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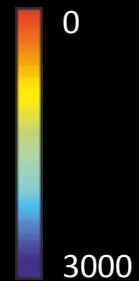


Mediterranean Sea

The Roses continental shelf



Depth (m)



CCC: Cap de Creus Canyon
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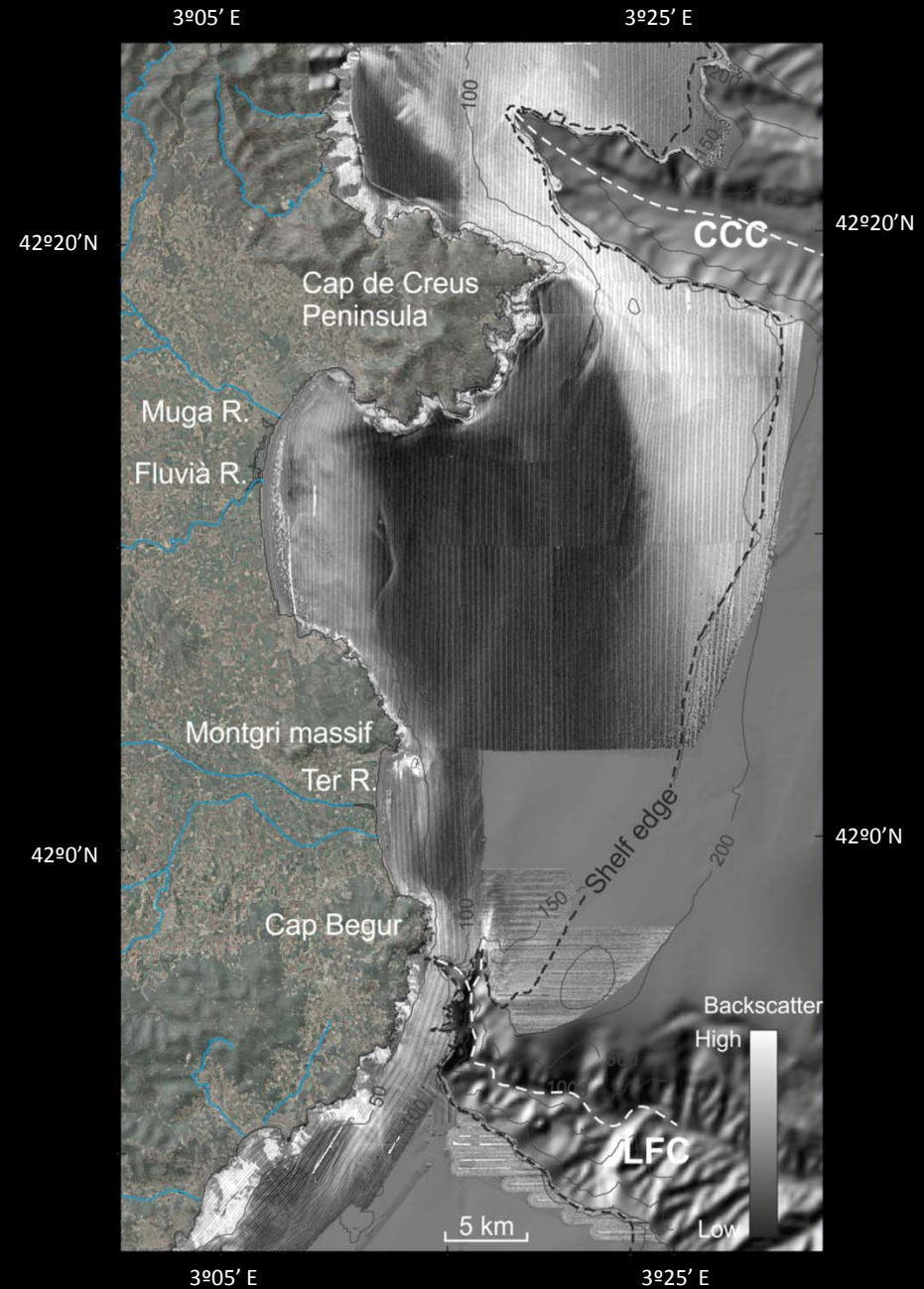
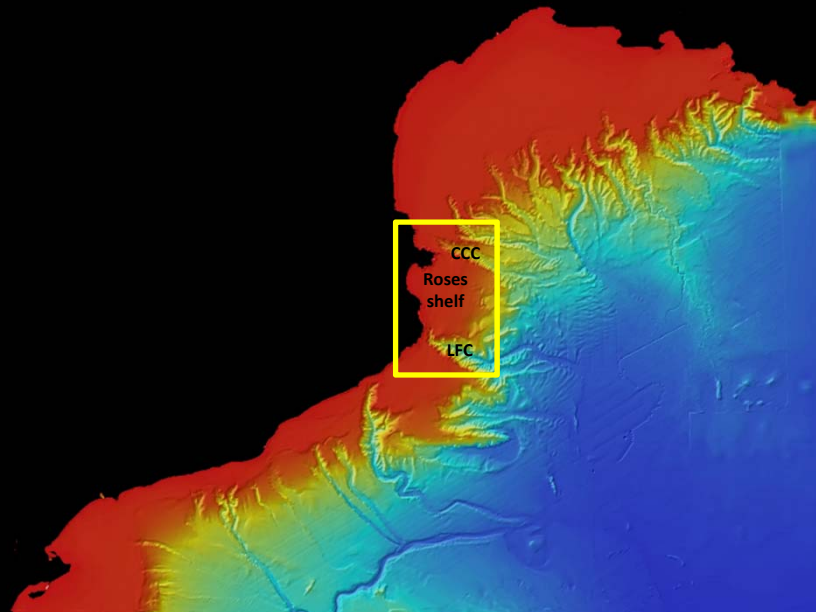
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Results: bathymetry, gradient and backscatter maps

The general bathymetric expression, gradient, and associated backscatter of the Roses shelf displays various types of bedforms, from erosional to depositional, and the rocky outcrops.

These bedforms often appear altogether in specific sectors of the study area.



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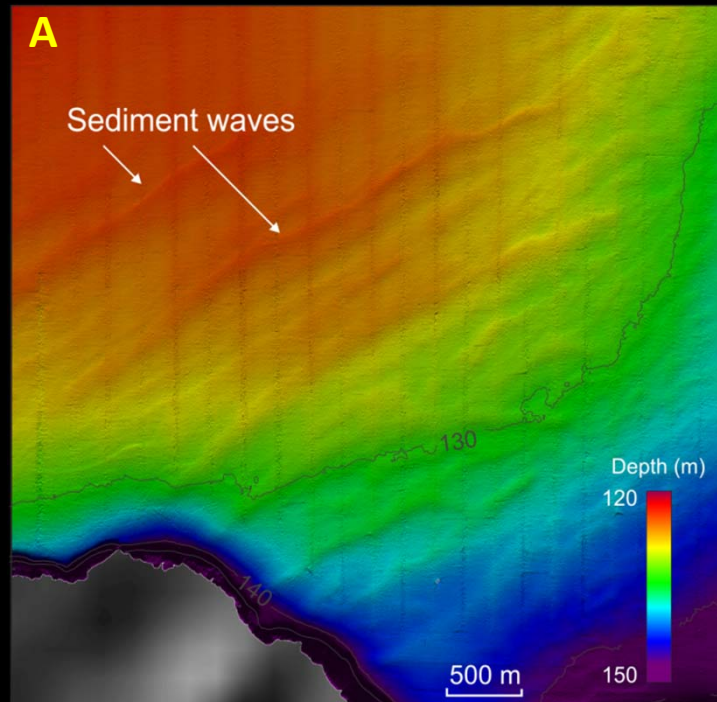
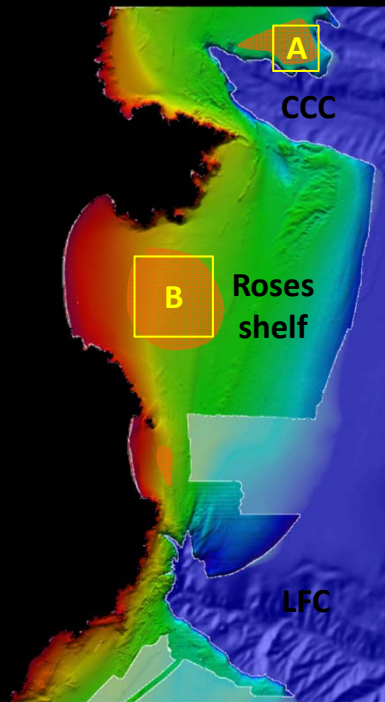
Mediterranean Sea

Results: Seafloor features

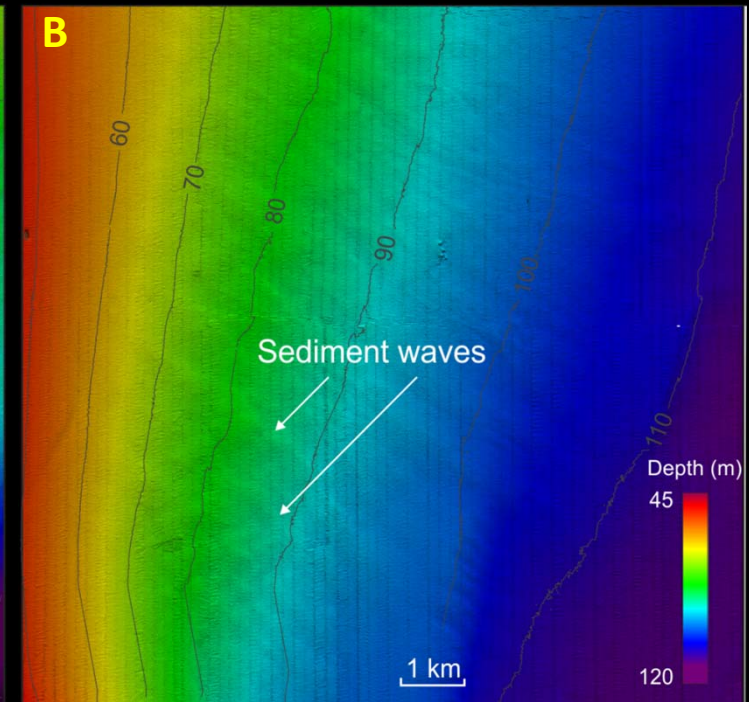
DEPOSITIONAL BEDFORMS: **sediment waves**

EROSIONAL BEDFORMS: Large-scale lineations, furrows, oval, elongate and irregularly shaped depressions

EROSIONAL-DEPOSITIONAL BEDFORMS: comet marks and sediment tails



Orientation: SW-NE
Water depth: 120-140 m
Mean wave height: 2 m
Mean wavelength: 250-500 m
Moderate backscatter



Orientation: NW-SE
Water depth: 66-105 m
Mean wave height: 0.5 m
Mean wavelength: 900-1300 m
Low backscatter

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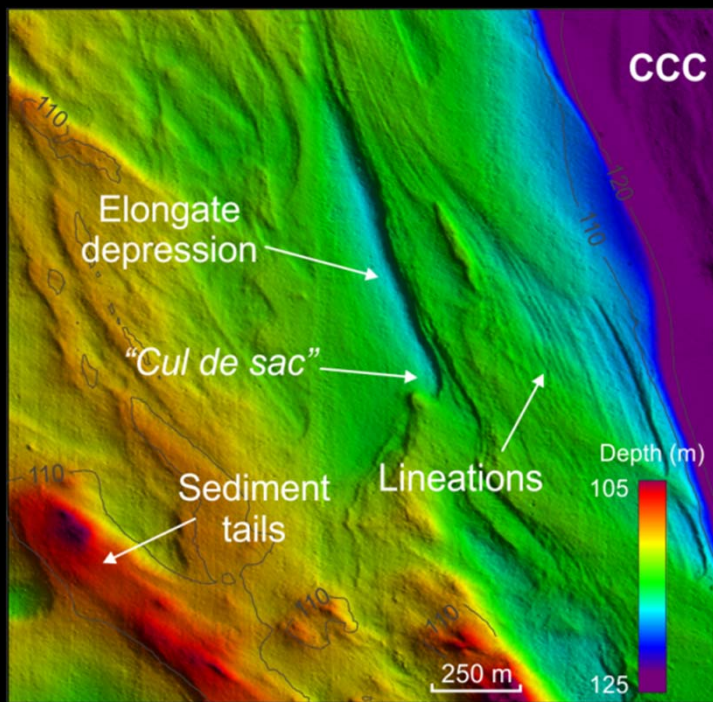
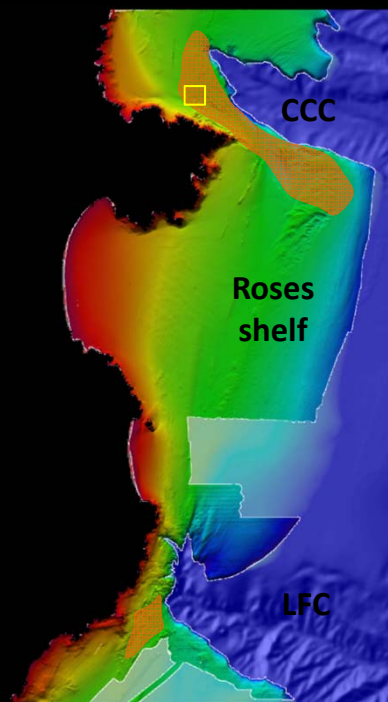


Results: Seafloor features

DEPOSITIONAL BEDFORMS: sediment waves

EROSIONAL BEDFORMS: Large-scale lineations, furrows, oval, elongate and irregularly shaped depressions

EROSIONAL-DEPOSITIONAL BEDFORMS: comet marks and sediment tails



LINEATIONS
Orientation: NW-SE
Length: 700-2000 m
Relief: 0.2-1 m
High backscatter

ELONGATED DEPRESSIONS
Orientation: NW-SE
Length: up to 900 m
Relief: up to 5 m
High backscatter

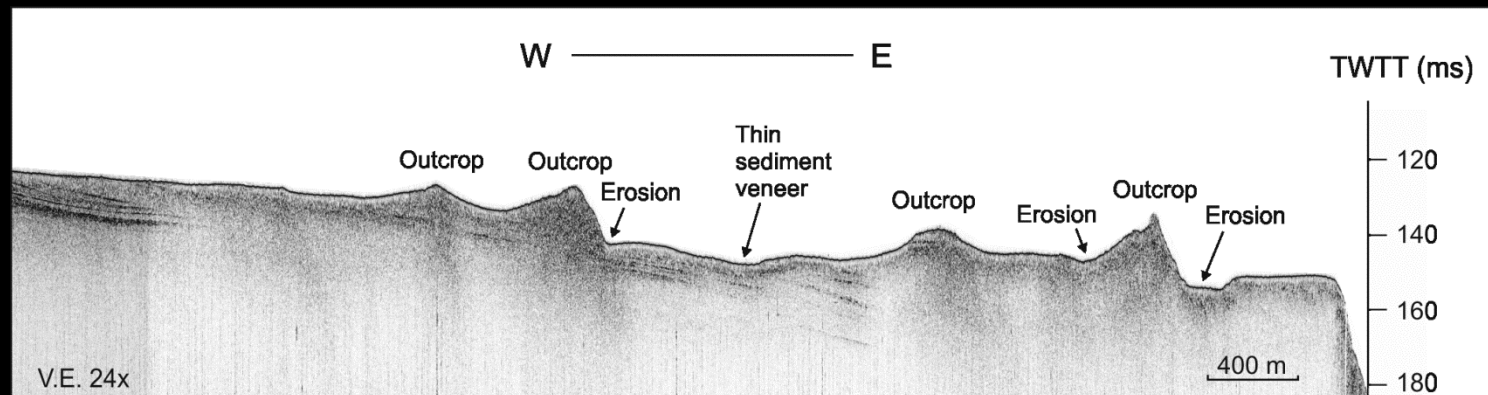
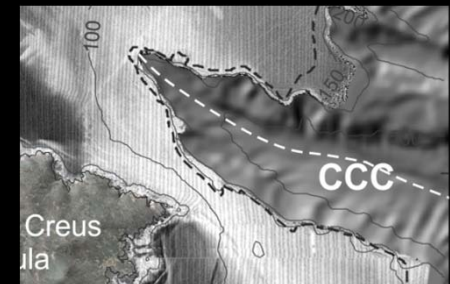
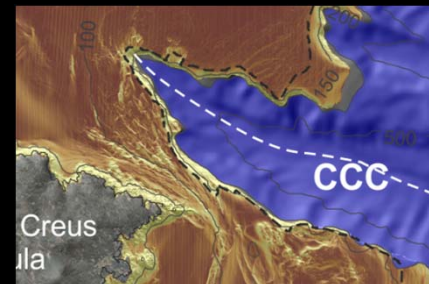
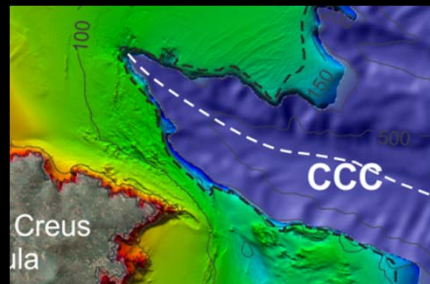
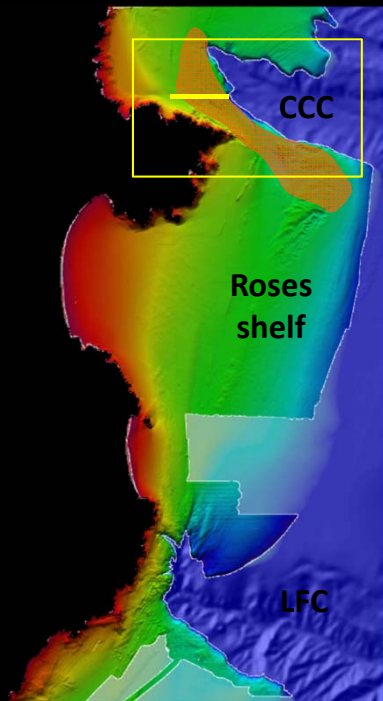
SEDIMENT TAILS
Orientation: NW-SE
Length: up to 900 m
Relief: up to 5 m
High backscatter

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Mediterranean Sea

Results: Seafloor features



The high resolution seismic profile illustrates the complex topography of this section of the continental shelf with rocky outcrops that often are clearly eroded in one of their sides and interspersed smoother depressions where a thin veneer of modern sediment is observed locally lying unconformably over faint slightly inclined reflectors from below.

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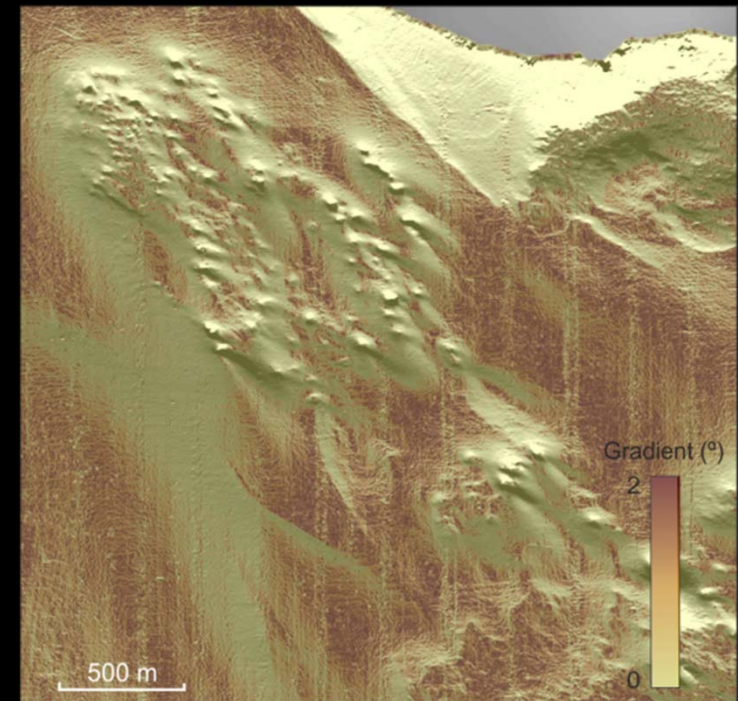
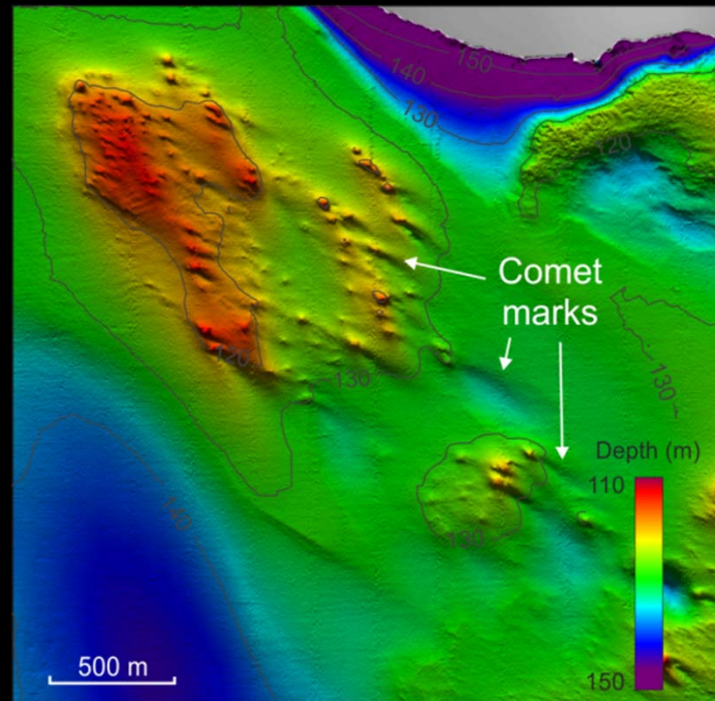
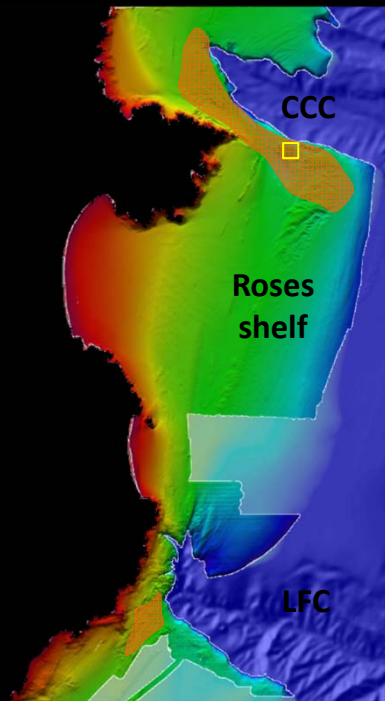
Mediterranean Sea

Results: Seafloor features

DEPOSITIONAL BEDFORMS: sediment waves

EROSIONAL BEDFORMS: Large-scale lineations, furrows, oval, elongate and irregularly shaped depressions

EROSIONAL-DEPOSITIONAL BEDFORMS: comet marks and sediment tails



COMET MARKS

Orientation: NW-SE

Length: 100-400 m

Width: 50-150 m

High backscatter

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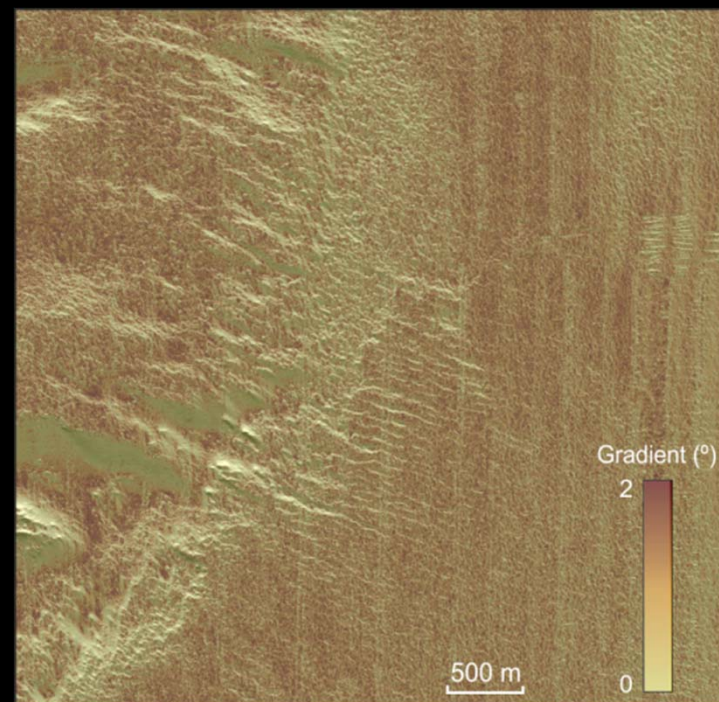
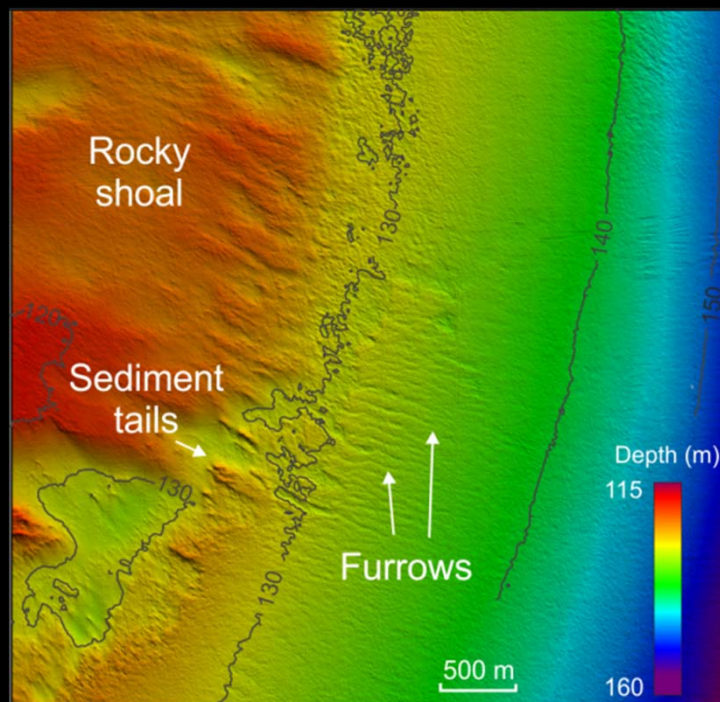
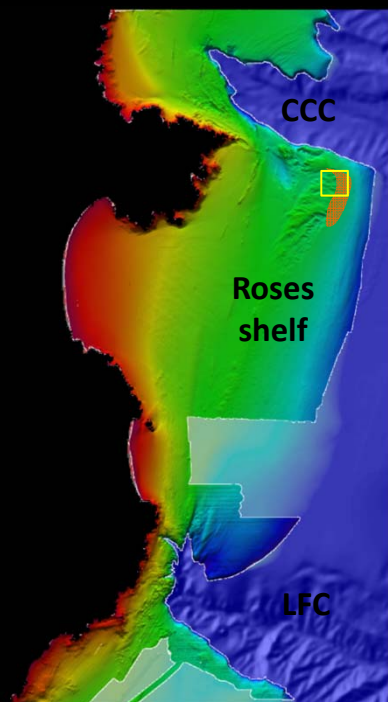


Results: Seafloor features

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EROSIONAL-DEPOSITIONAL BEDFORMS: comet marks and sediment tails



FURROWS

Orientation: NW-SE
 Water depth: 120-140 m
 High backscatter

Length: up to 900 m
 Width: 30-60 m
 Width-spacing ratio: 1:2

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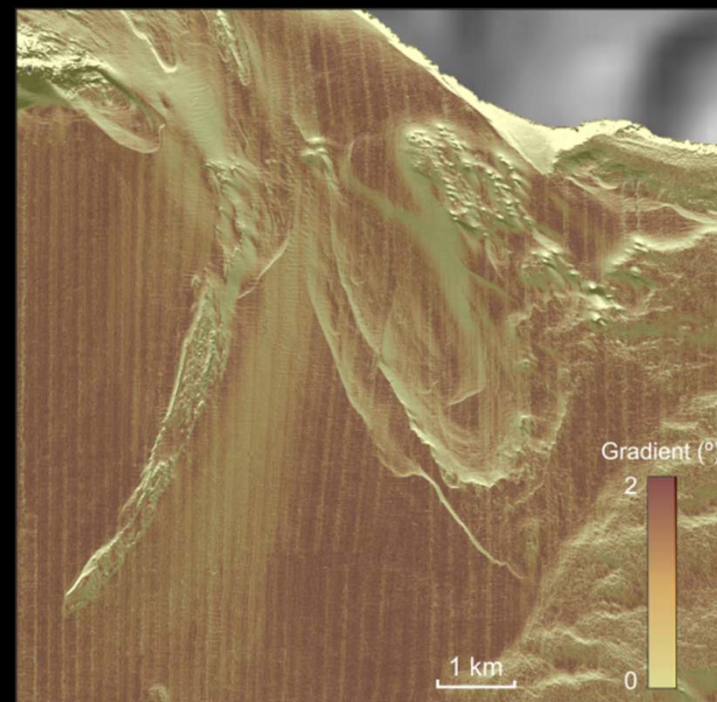
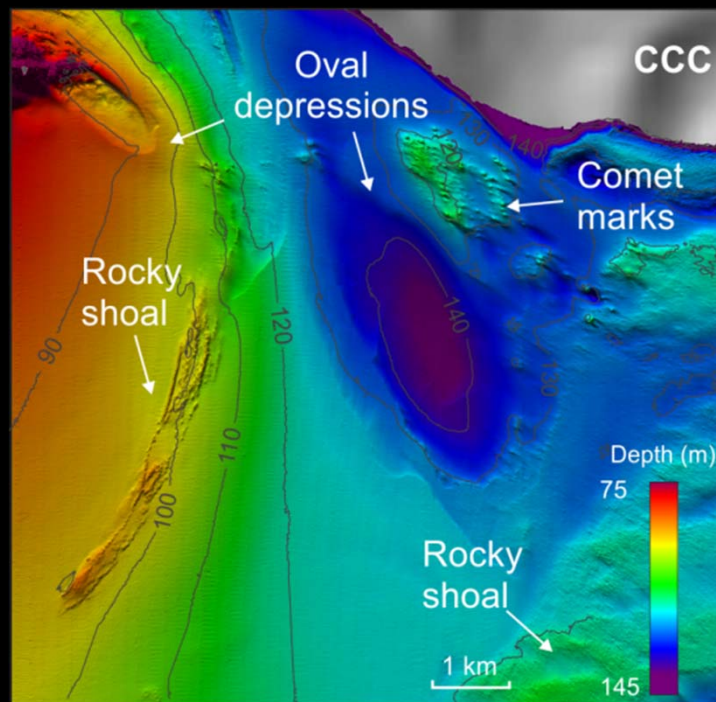
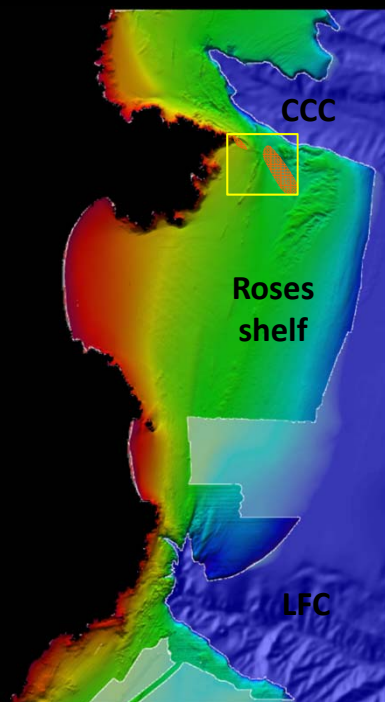
Mediterranean Sea

Results: Seafloor features

DEPOSITIONAL BEDFORMS: sediment waves

EROSIONAL BEDFORMS: Large-scale lineations, furrows, **oval**, elongate and irregularly shaped **depressions**

EROSIONAL-DEPOSITIONAL BEDFORMS: comet marks and sediment tails



SMALLER OVAL DEPRESSION

Orientation: NW-SE
Length: 1200 m
Width: 600 m
High backscatter

LARGE OVAL DEPRESSION

Orientation: NNW-SSE
Length: 4000 m
Width: 1500 m
Relief: 26 m

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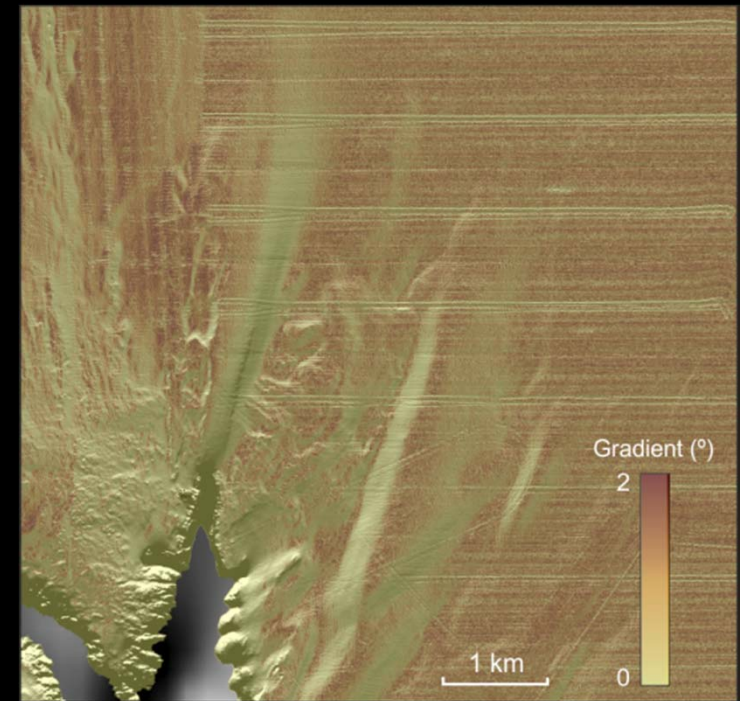
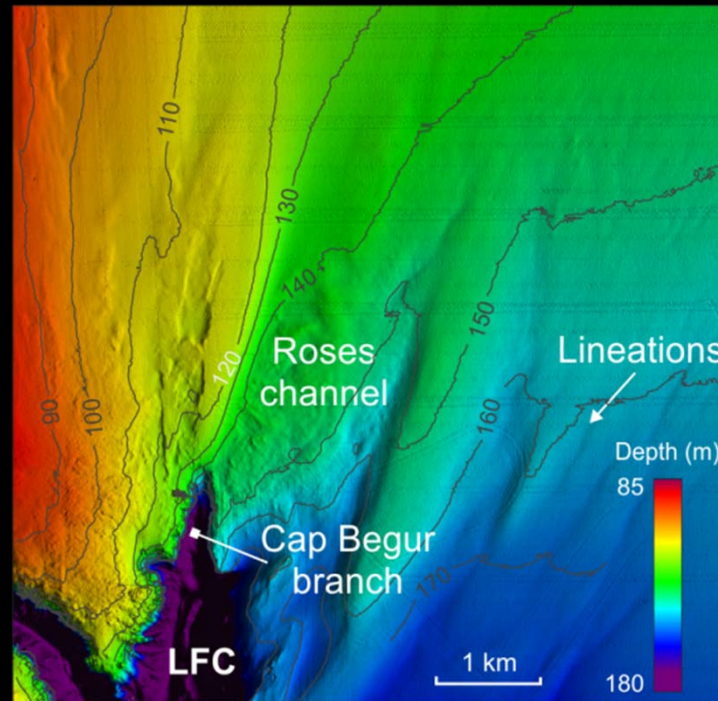
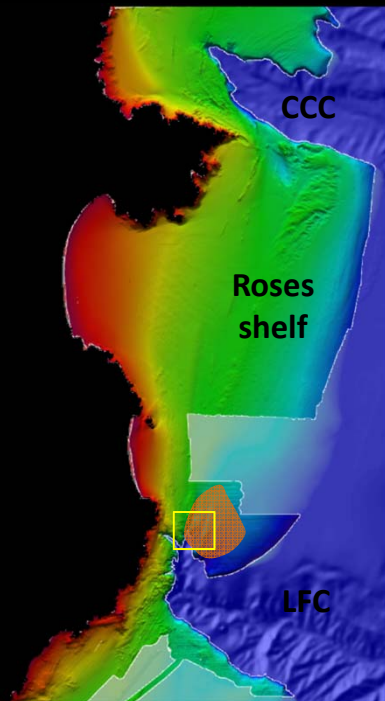
Results: Seafloor features

Lineations and furrows

DEPOSITIONAL BEDFORMS: sediment waves

EROSIONAL BEDFORMS: **Large-scale lineations**, furrows, oval, elongate and irregularly shaped depressions

EROSIONAL-DEPOSITIONAL BEDFORMS: comet marks and sediment tails



LARGE-SCALE LINEATIONS

Orientation: NNE-SSW

Length: 1500 m

Relief: 0.3-5 m

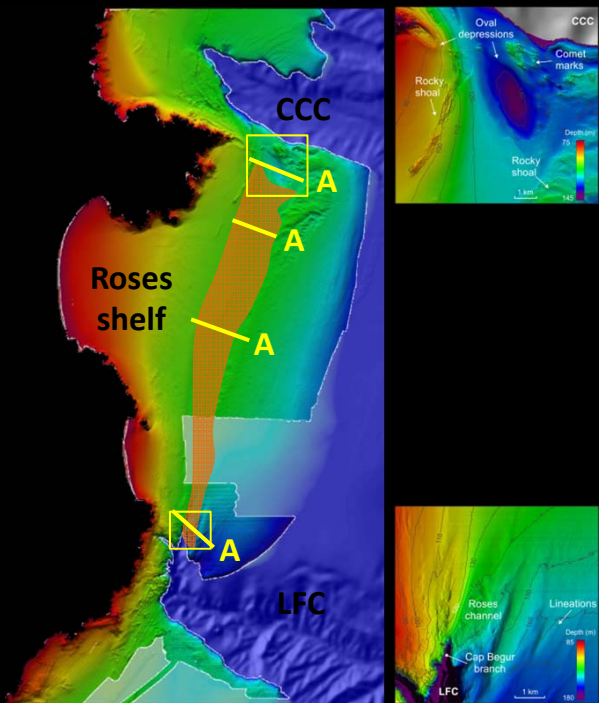
High backscatter

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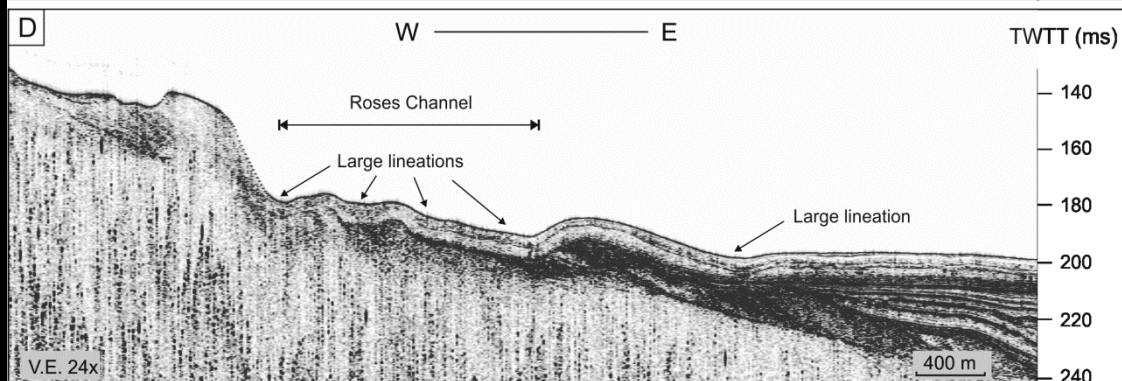
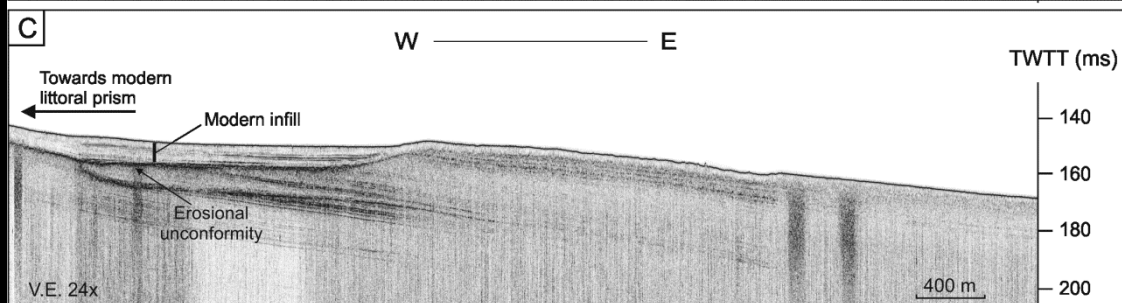
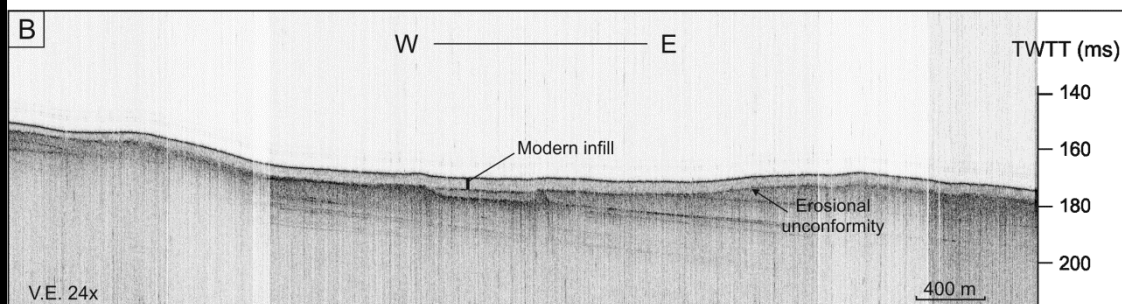
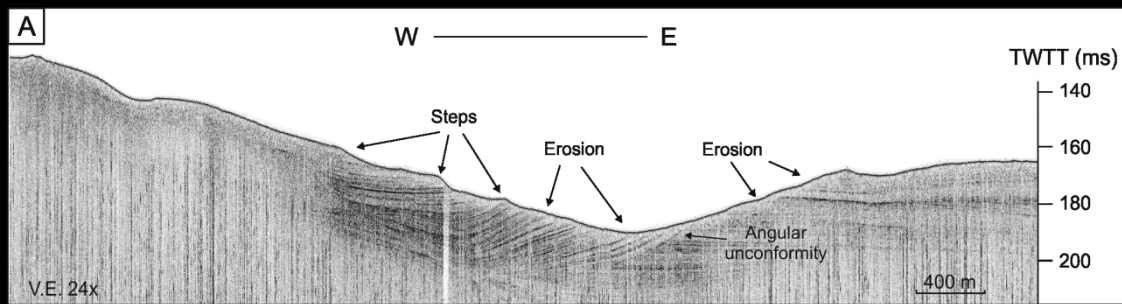
Mediterranean Sea

Results: Seafloor features



ROSES CHANNEL

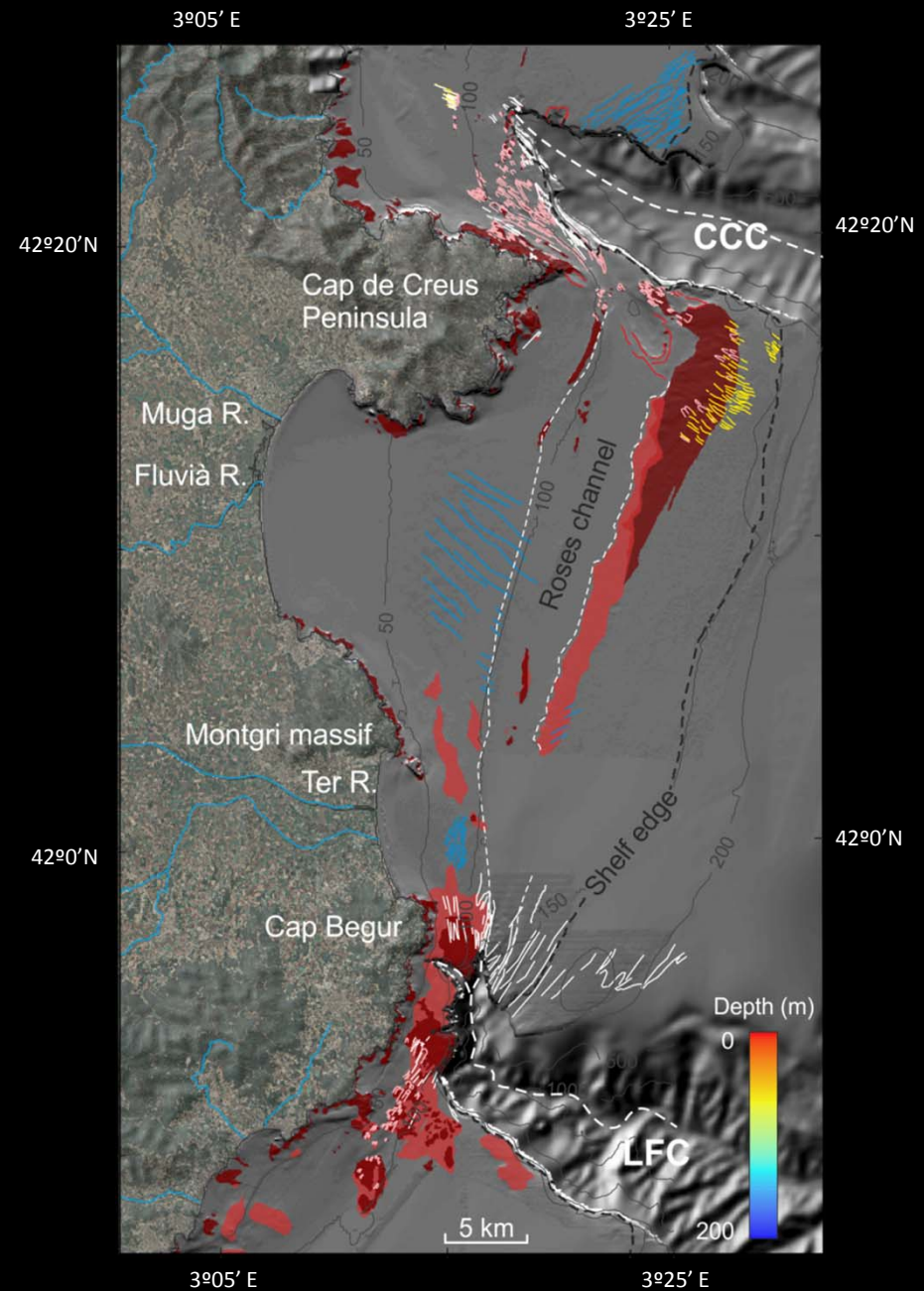
Orientation: N-S
 Length: 40 km
 Width: 1.5-5 km
 Relief: 15 m



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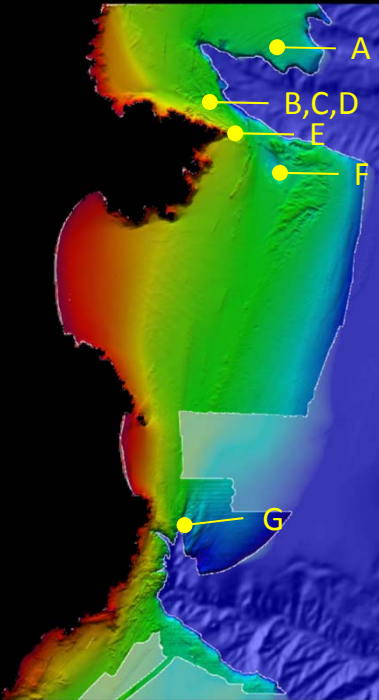
Results: Bedforms distribution



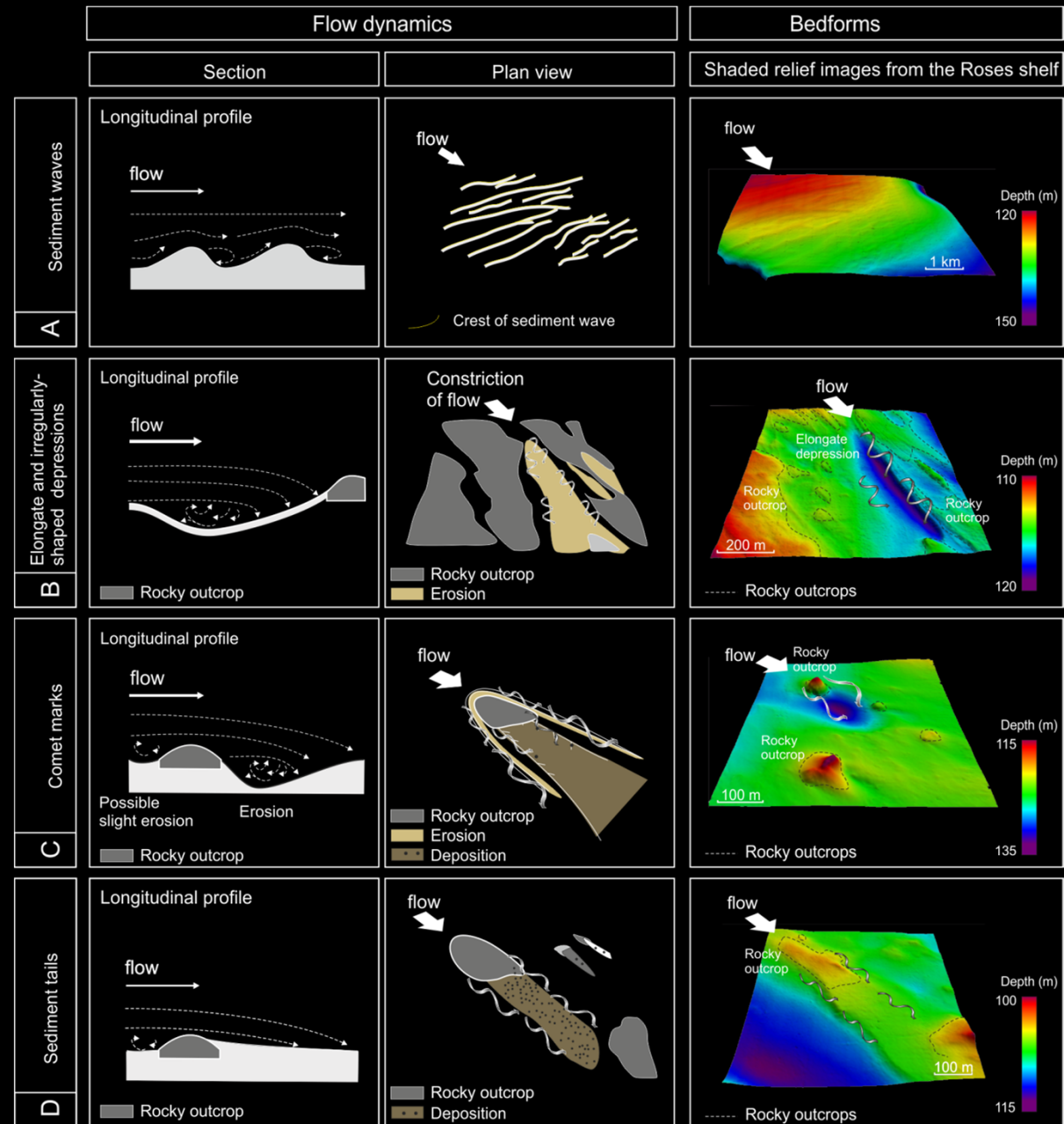
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Mediterranean Sea



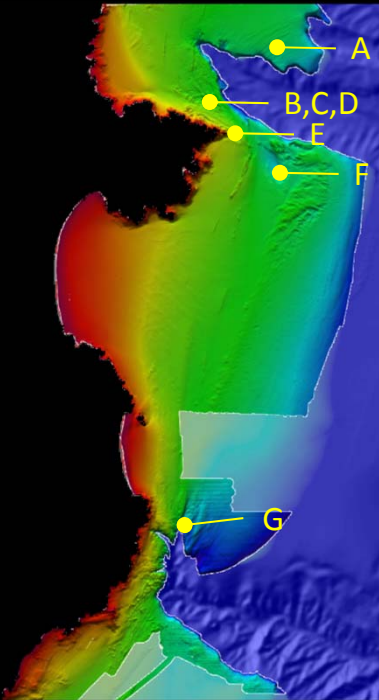
Results: Seafloor features and flow conditions



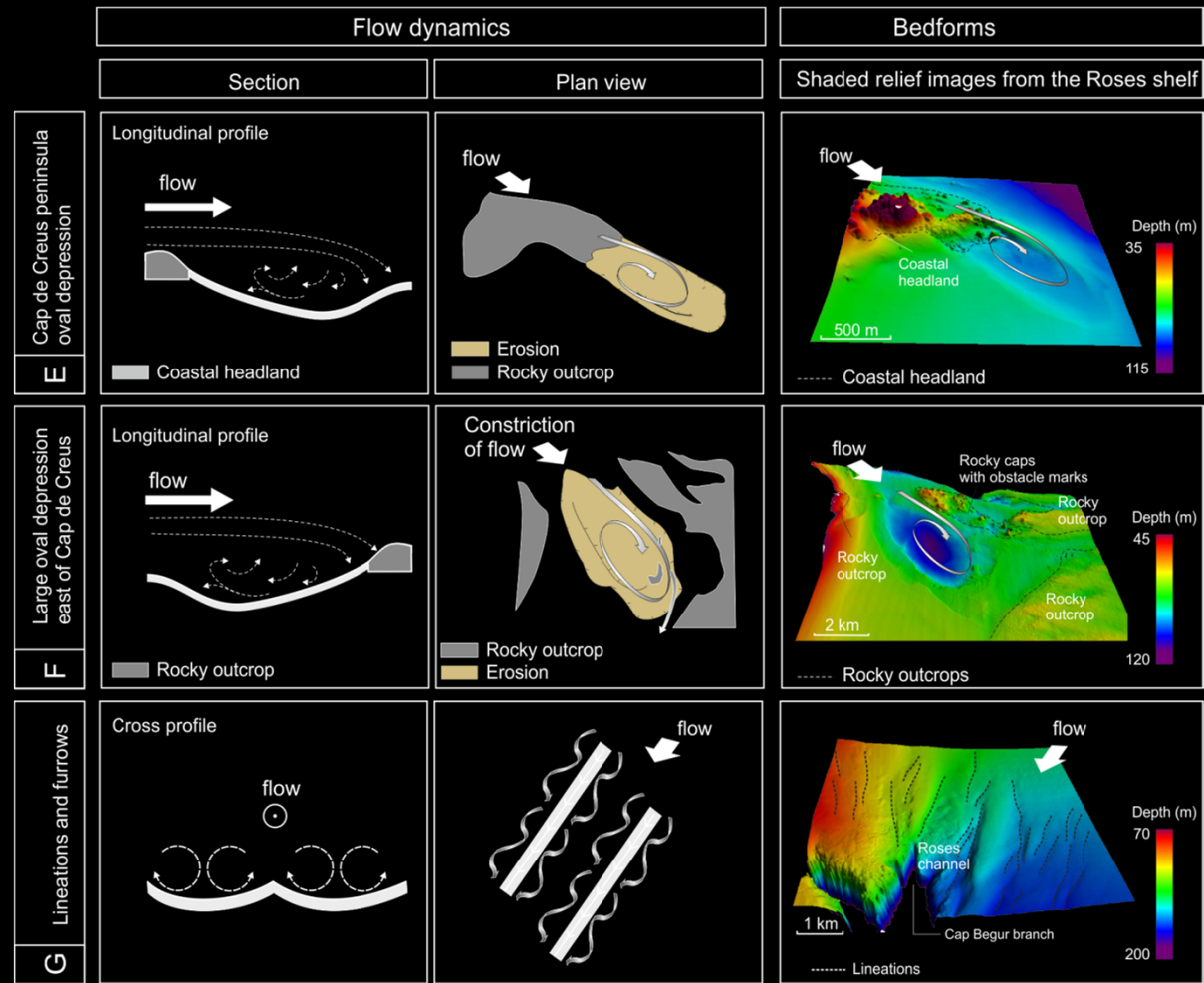
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Results: Seafloor features and flow conditions

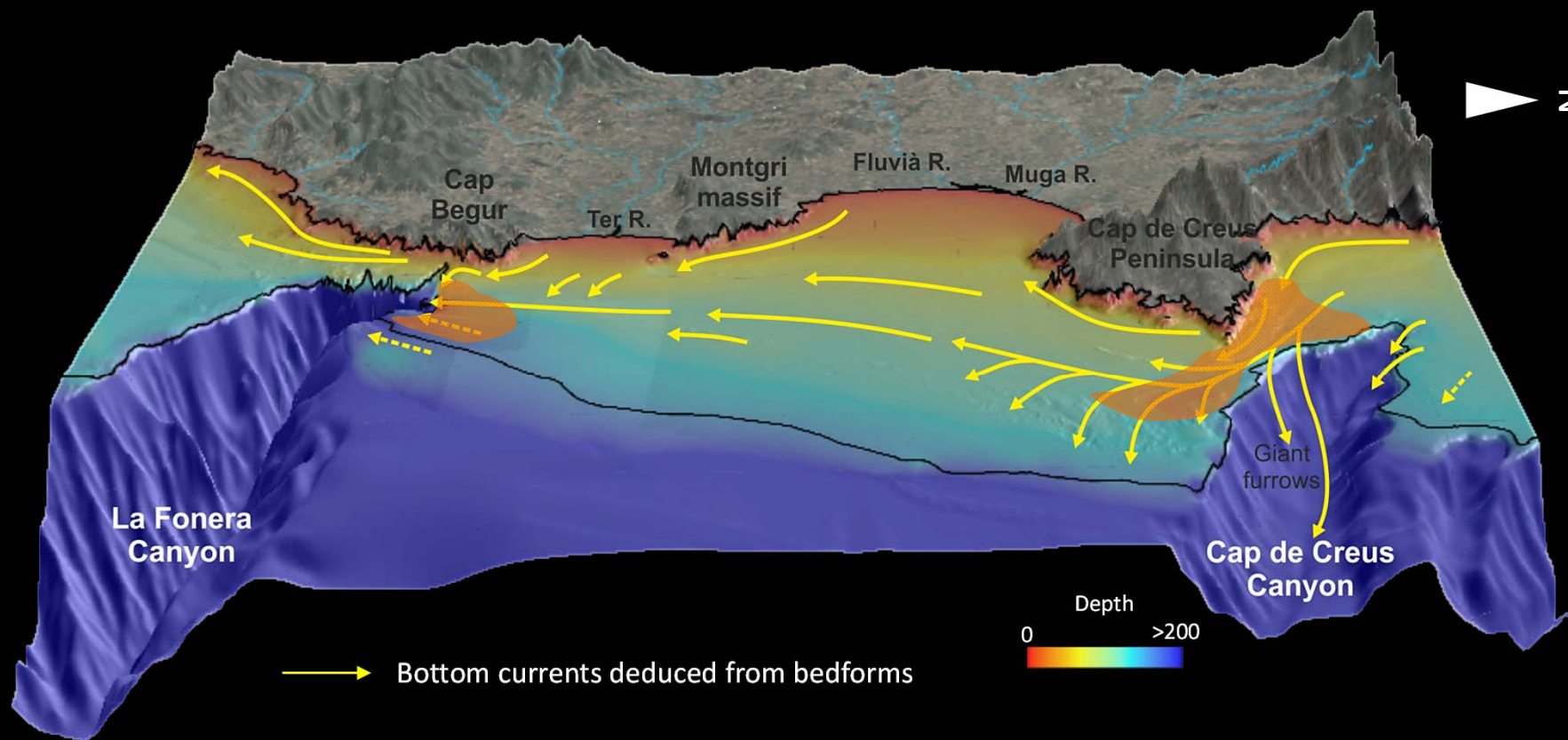


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Discussion: Bottom currents deduced from bedforms

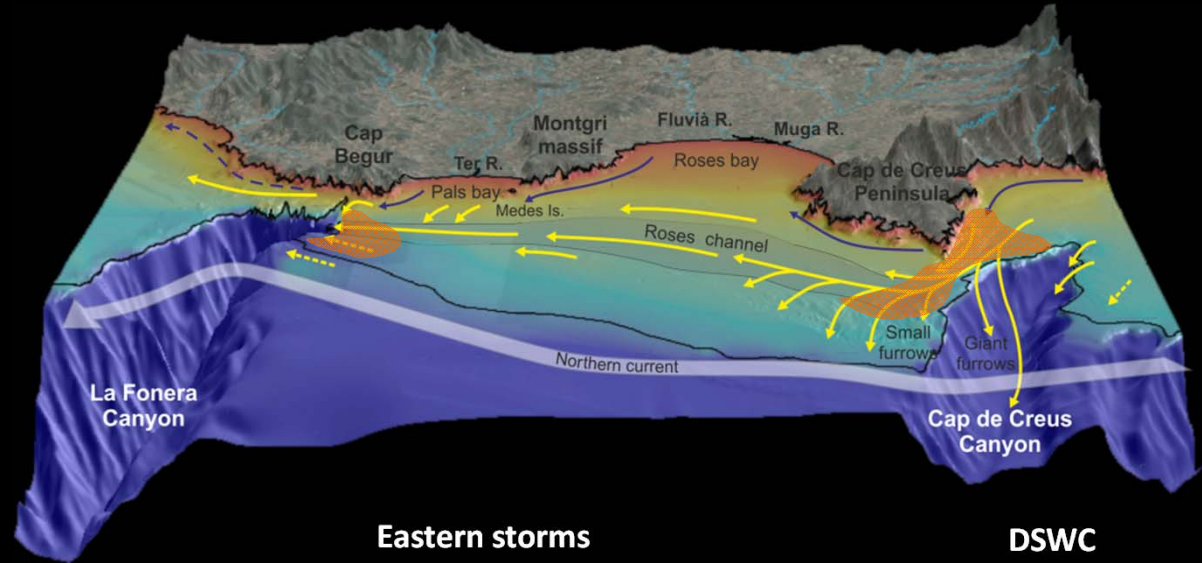


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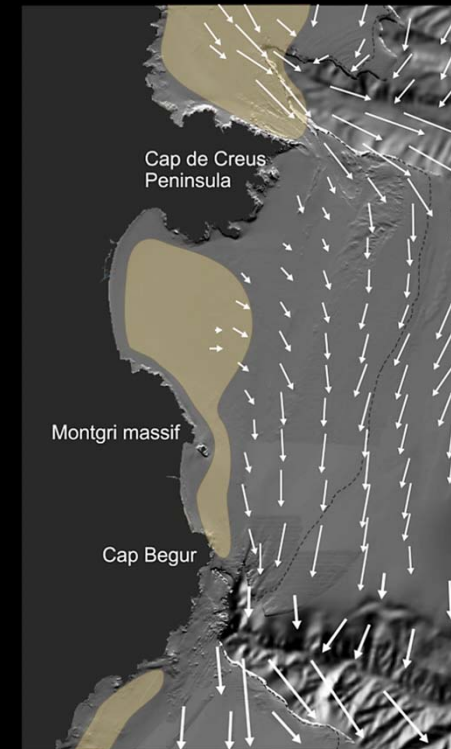
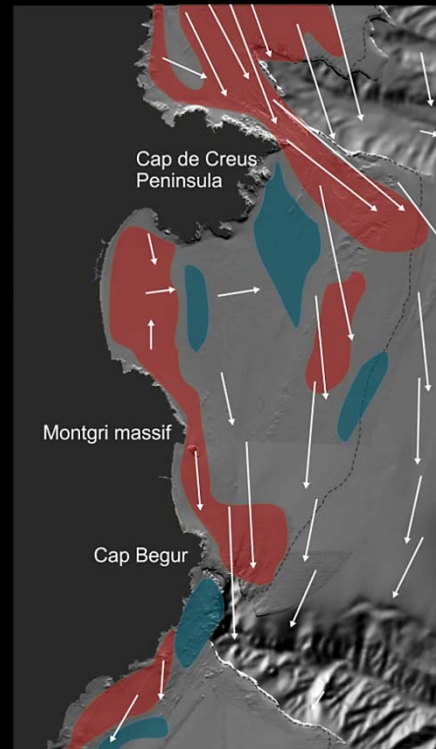
Discussion: Forcing mechanisms

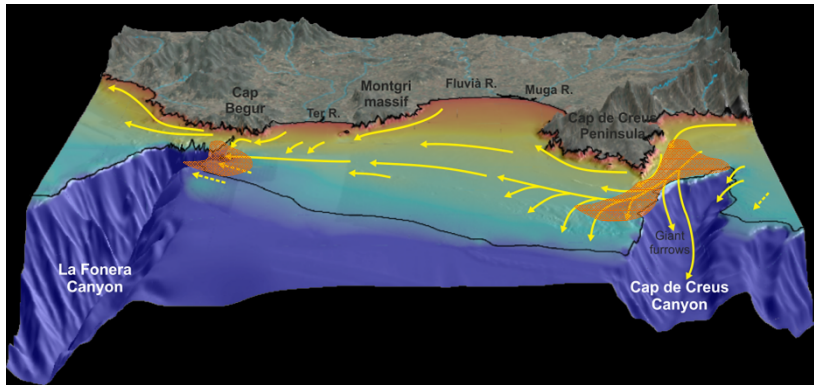


Eastern storms

DSWC

- Maximum bottom currents
- Seafloor erosion
- Seafloor deposition
- DSW formation





- The floor of the Roses continental shelf, in the North Catalan margin, includes a large variety of bottom types and bedforms, including rocky outcrops and sub-outcrops, and a number of erosional to depositional bedforms.
- Most bedforms appear to be active under present day conditions. High energy levels are reached at the occasion of temporary, atmosphere-driven events, which are DSW formation and intense storms.
- During these energetic events, southwards moving waters from the Gulf of Lion shelf concentrate on the shelf to the north of Cap de Creus peninsula and on the narrow shelf passage amongst the tip of the peninsula and the CCC head. Part of the strong water flow thus generated is deviated into the CCC head, whereas a branch flow surrounds the Cap de Creus peninsula and moves south mostly following the Roses channel. A third branch of the current moves straight to the SE opening and spreading in a fan-shaped pattern over a large outer shelf rocky shoal.
- Overall, the energy level of the bottom currents is high near the Cap de Creus submarine canyon head and diminishes southwards from the shelf around the submarine canyon heads.



Thank you