



Evolution-adaptation of coastlines in the context of climate change

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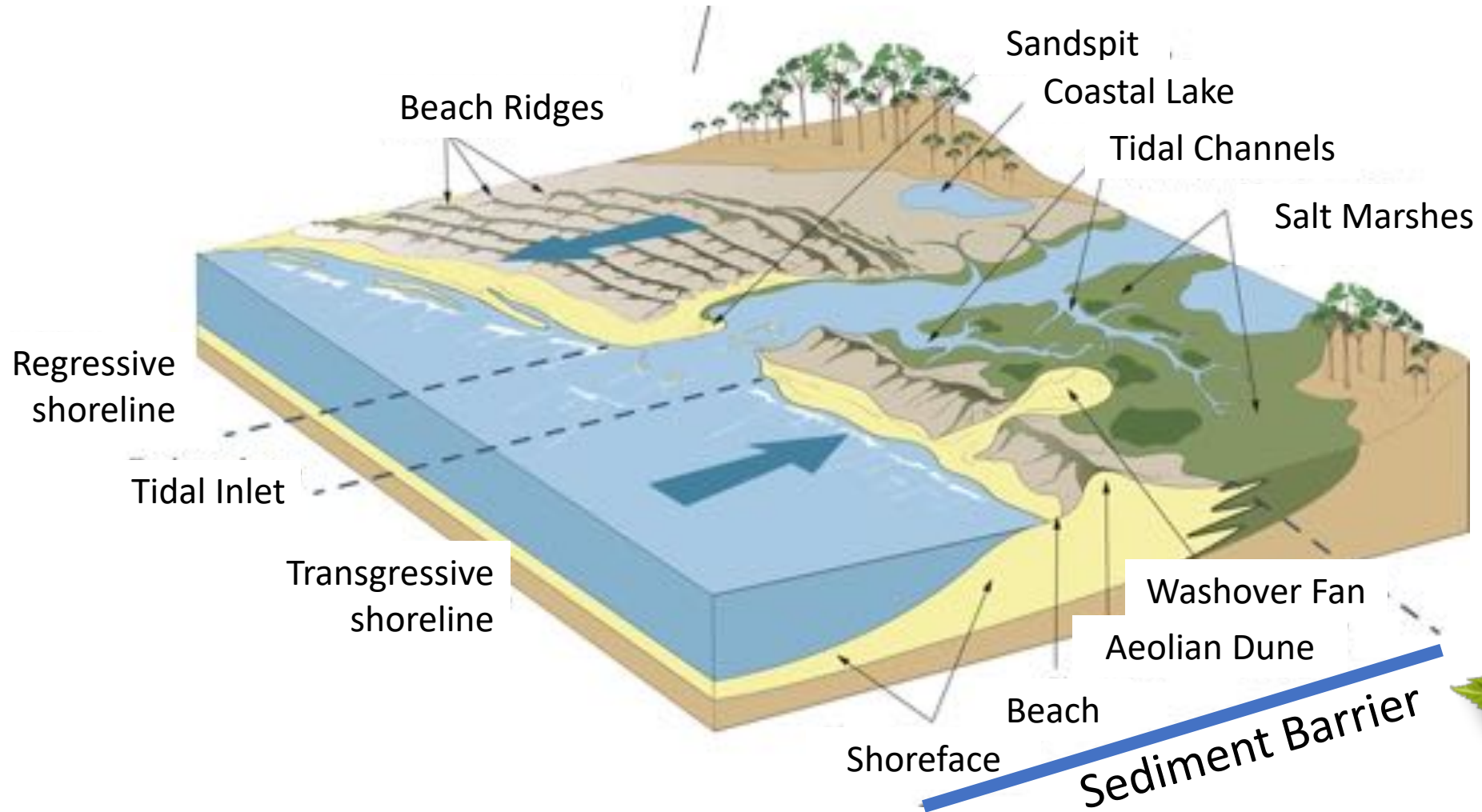
Italian-French Bilateral Cooperation in Heritage Science: “Human-centered approach for cultural heritage in green transition: disciplines talking to each other”

Online event

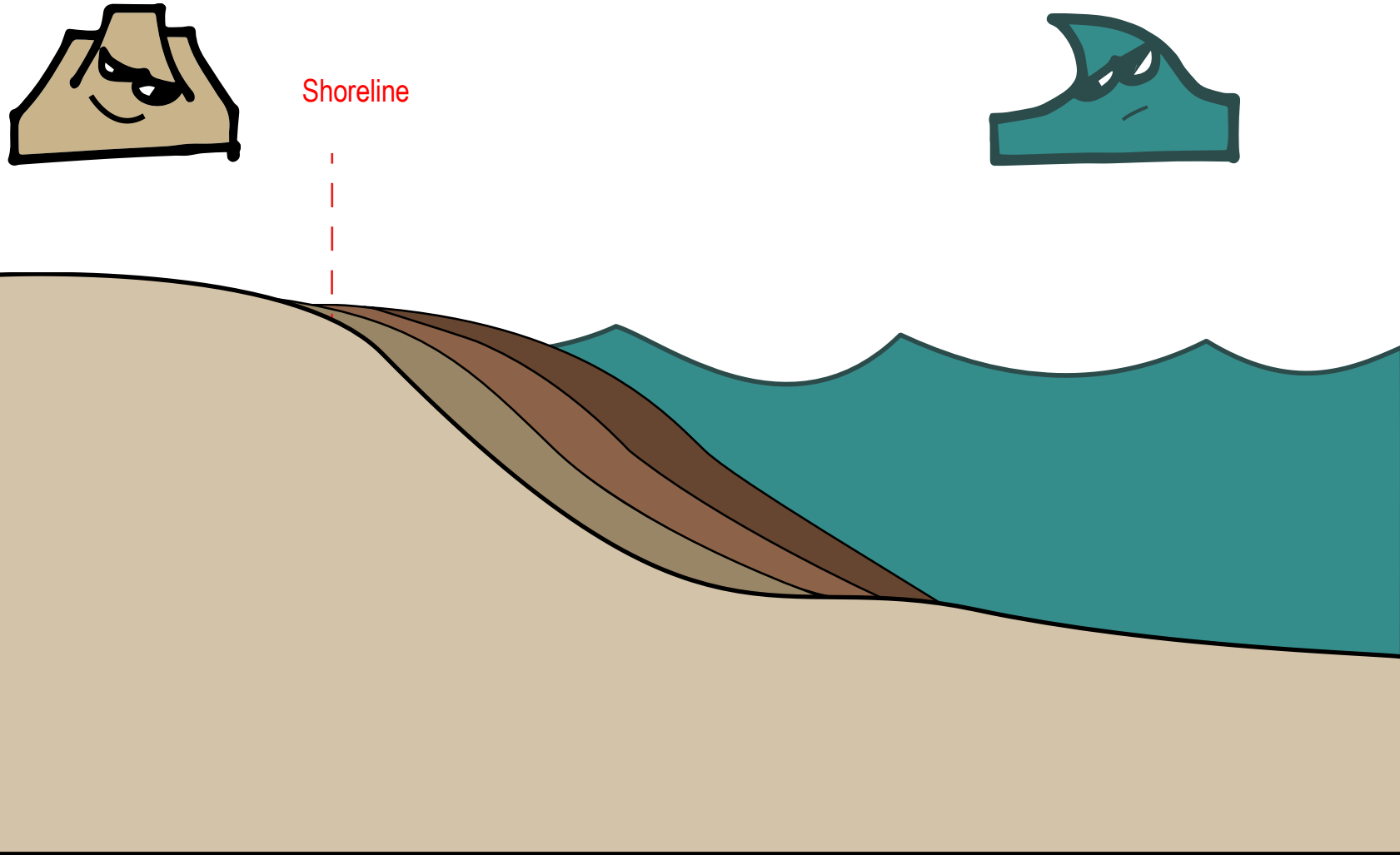
Thursday, 10th november 2022

Evolutions of Sedimentary coasts without Climate Change

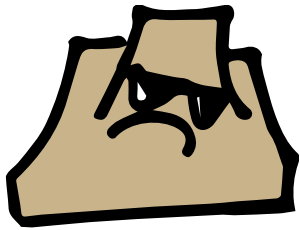
Transgressive vs regressive coasts



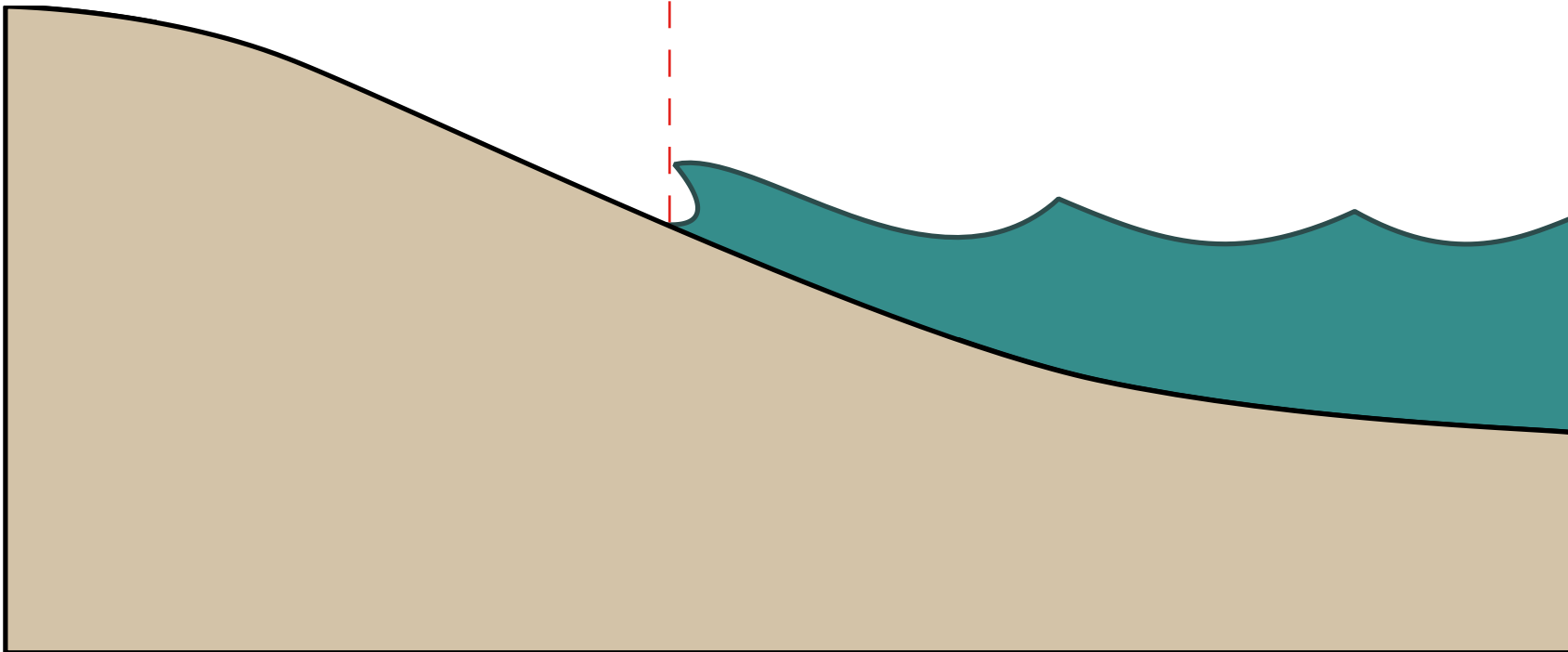
Regressive Coasts



Transgressive Coasts

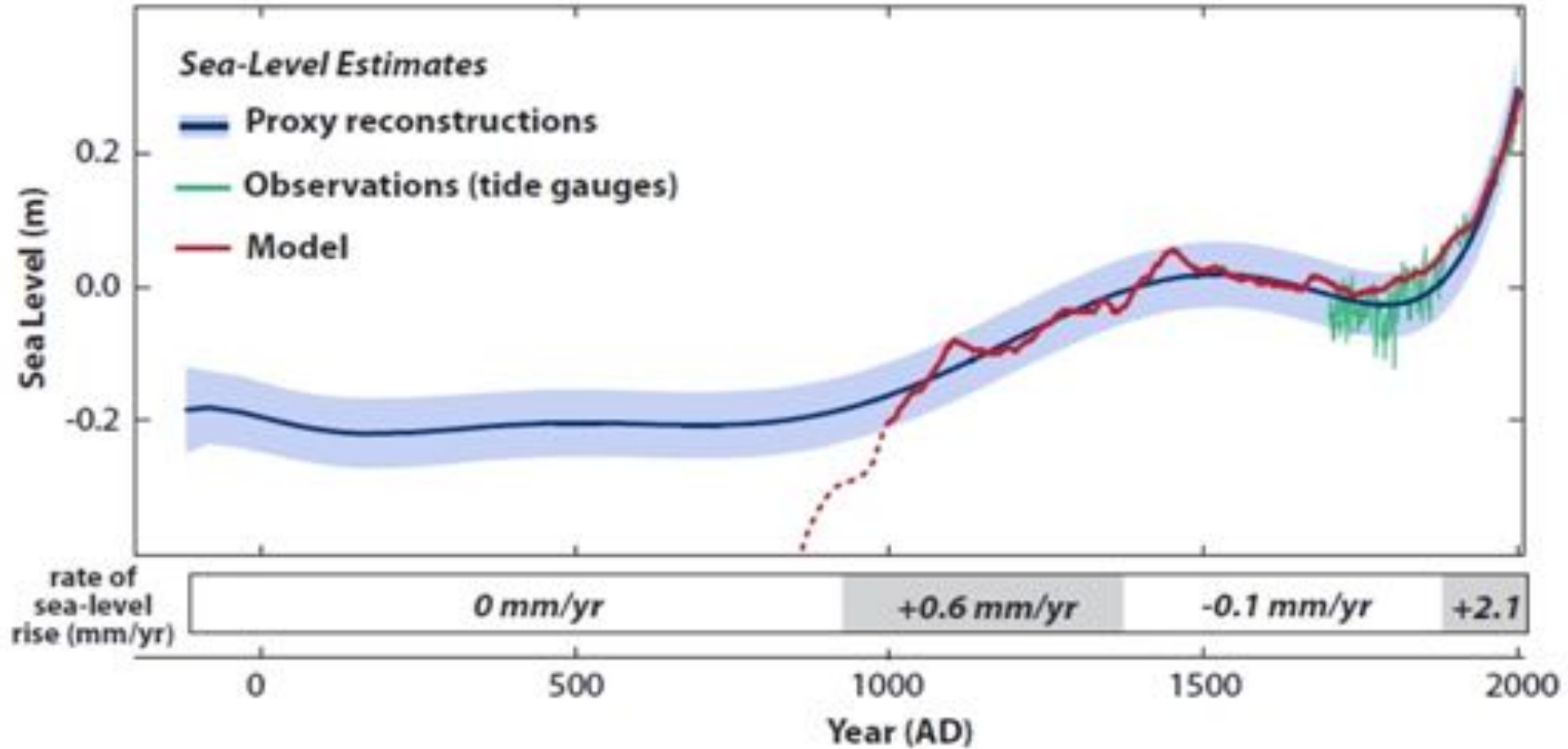


Shoreline

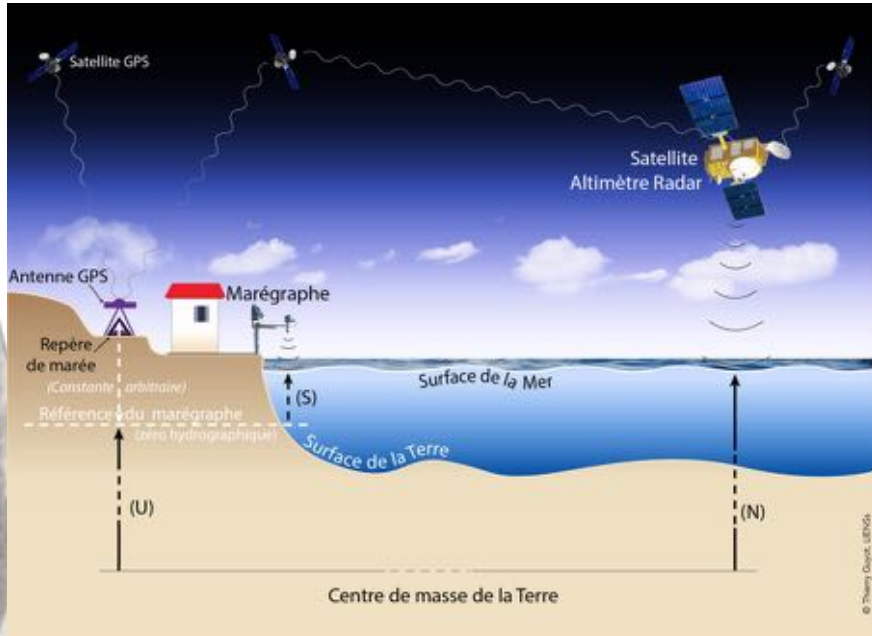


Global Sea Level Rise

Since 1900 CE, sea level rise is 3 to 5 times faster than during the last 1000 years



Global Sea Level Rise Observations vs Forcing parameters

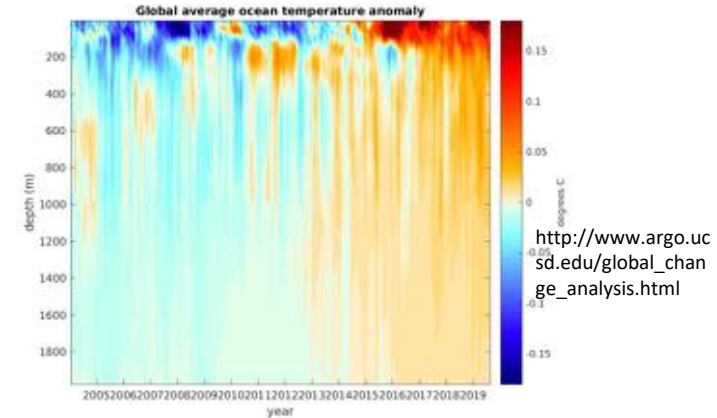


3,6 mm / an

1,8 mm / an



1,4 mm / an



0,4 mm / an

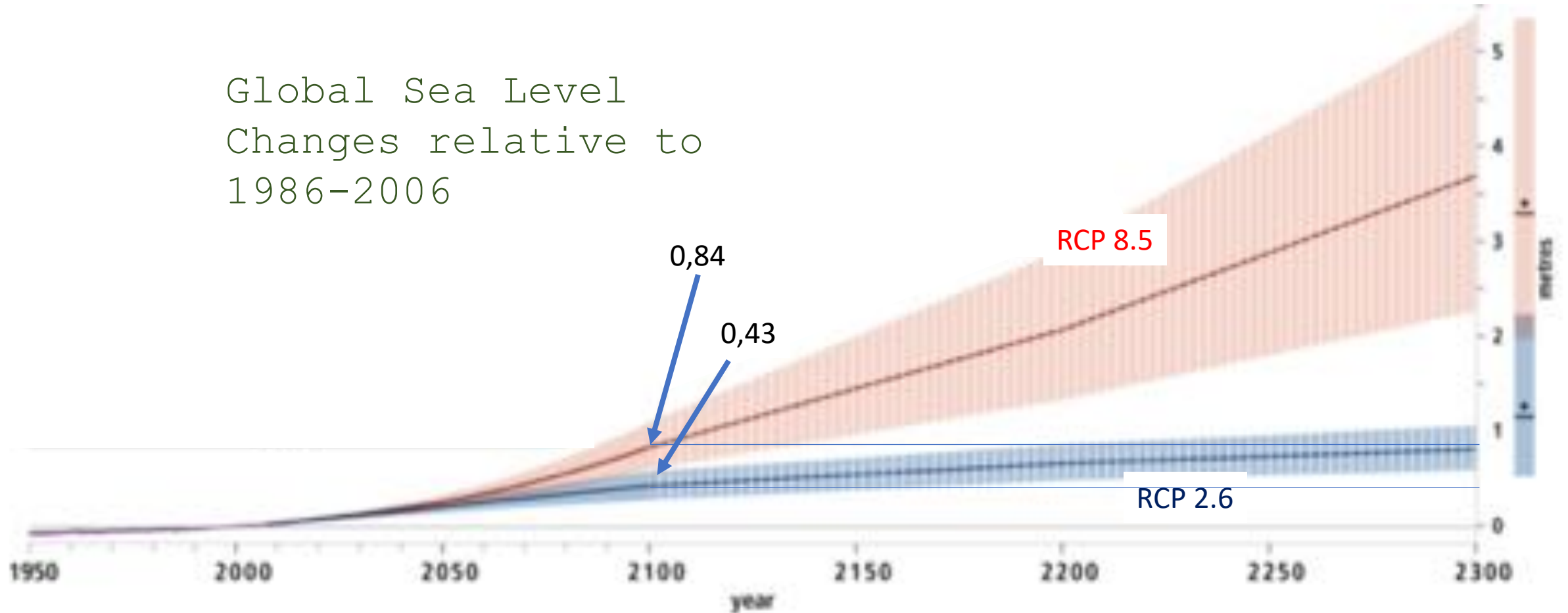


= 3,6 mm / an



Global Sea Level Rise projections

Global Sea Level
Changes relative to
1986-2006



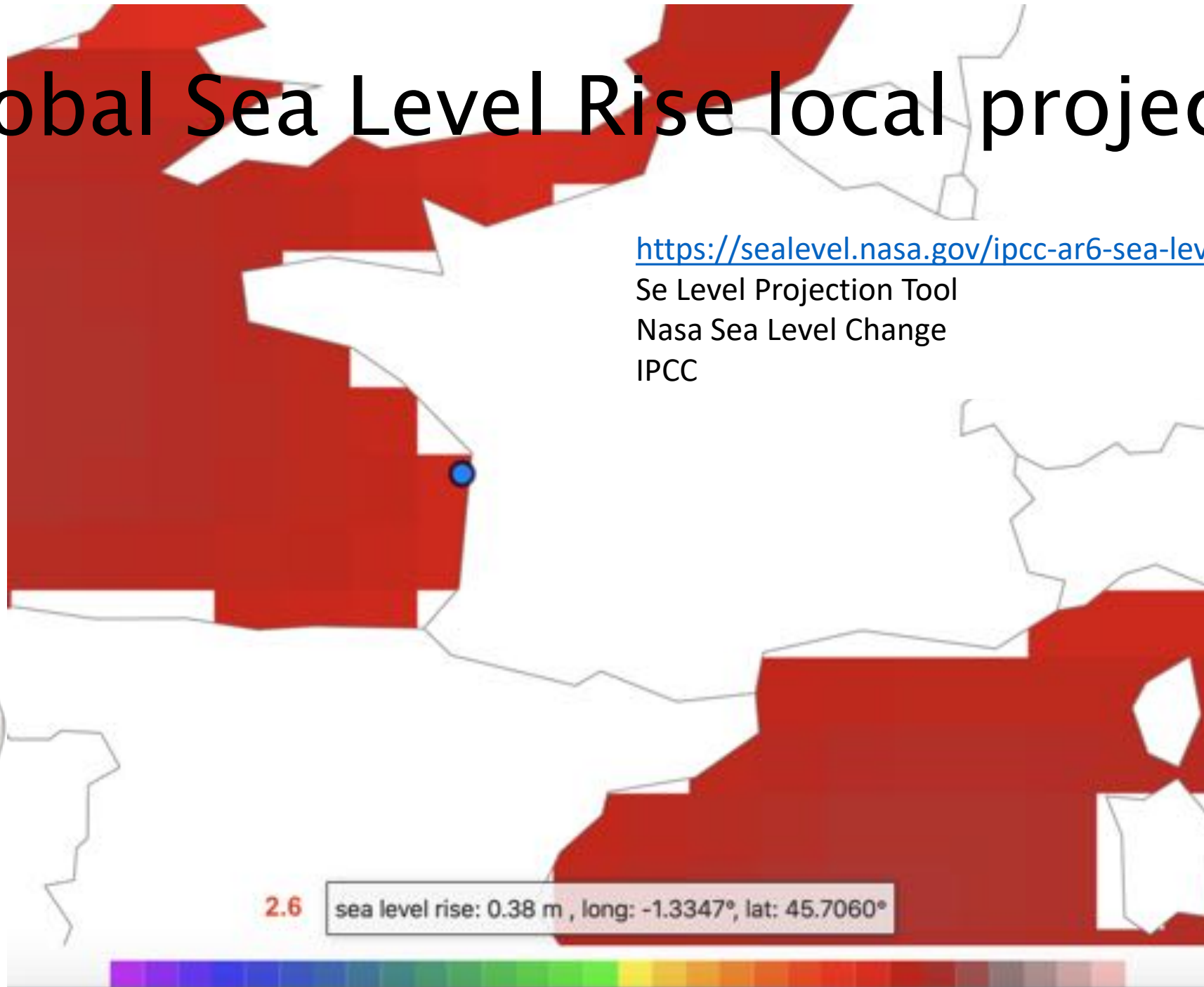
Global Sea Level Rise local projections

<https://sealevel.nasa.gov/ipcc-ar6-sea-level-projection-tool>

Sea Level Projection Tool

Nasa Sea Level Change

IPCC



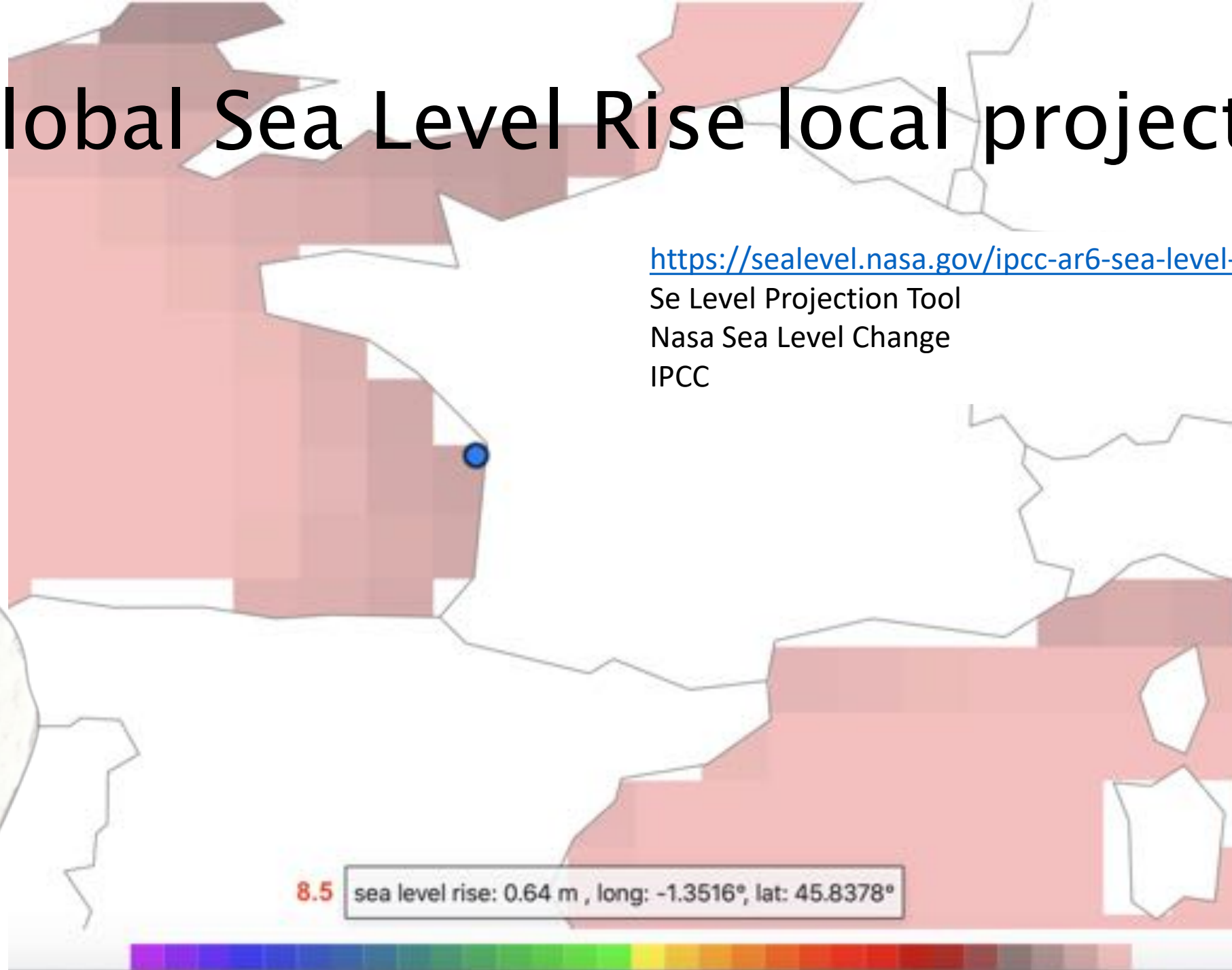
Global Sea Level Rise local projections

<https://sealevel.nasa.gov/ipcc-ar6-sea-level-projection-tool>

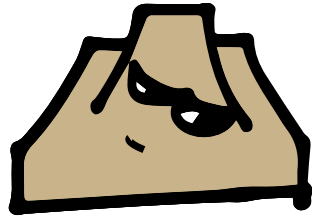
Sea Level Projection Tool

Nasa Sea Level Change

IPCC



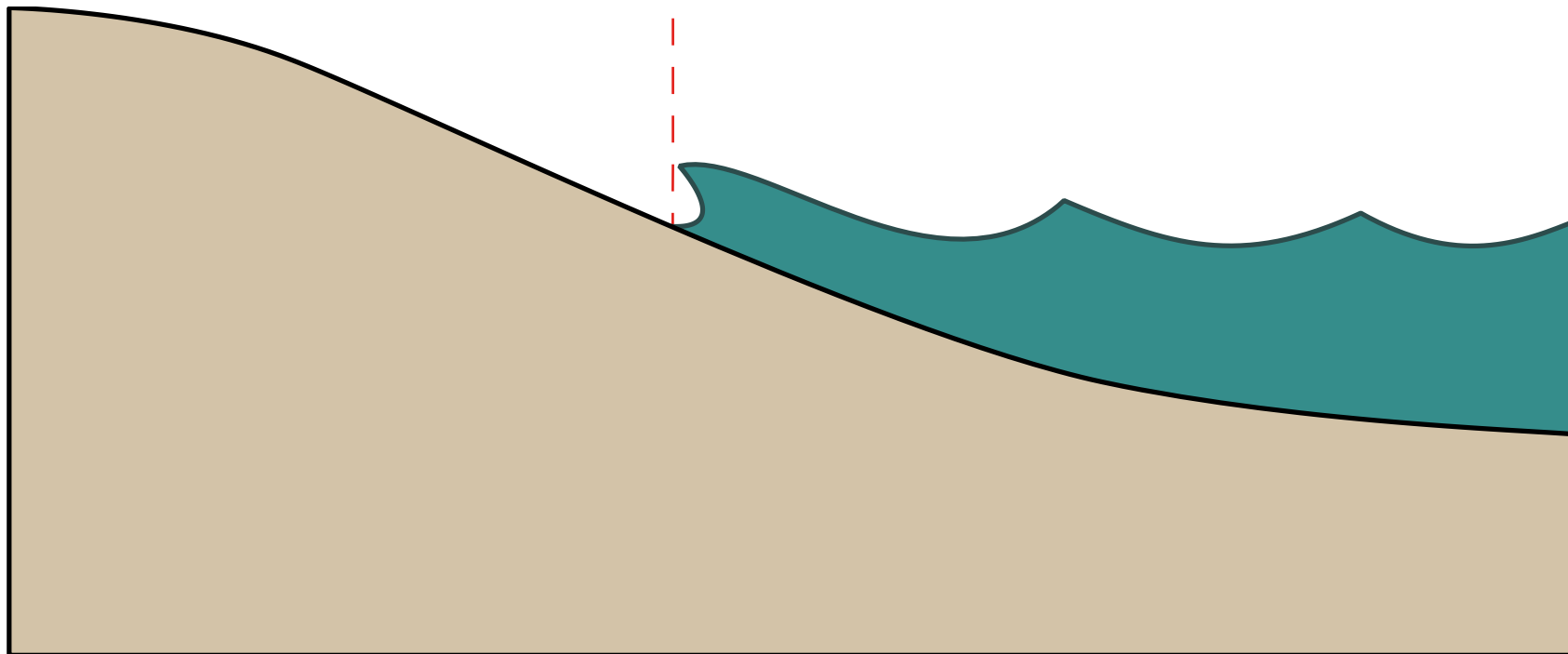
Sea Level Rise & Coastline retreat approximately 100 x SLR



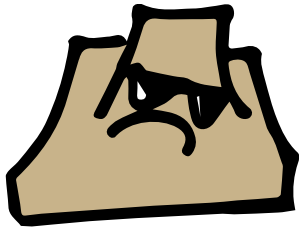
Shoreline



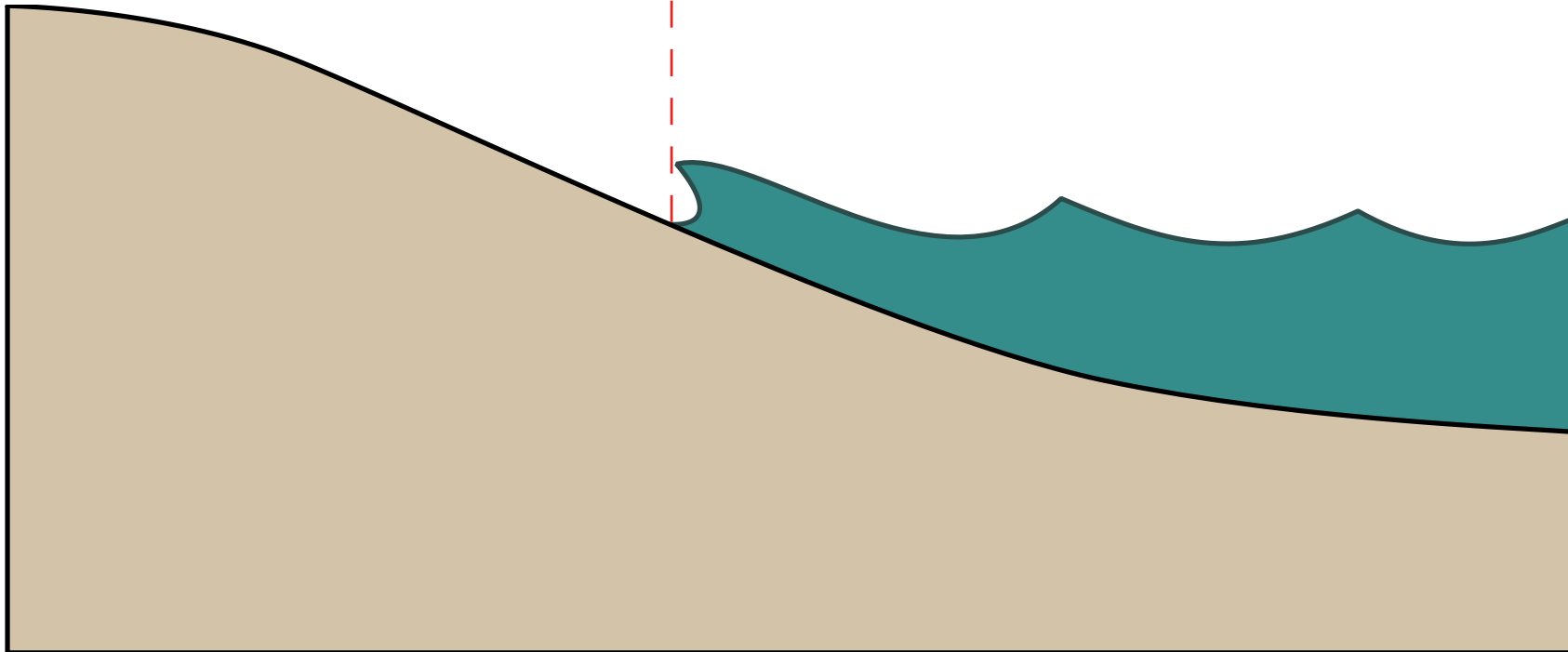
38 m (2.6)
64 m (8.5)



Subsidence



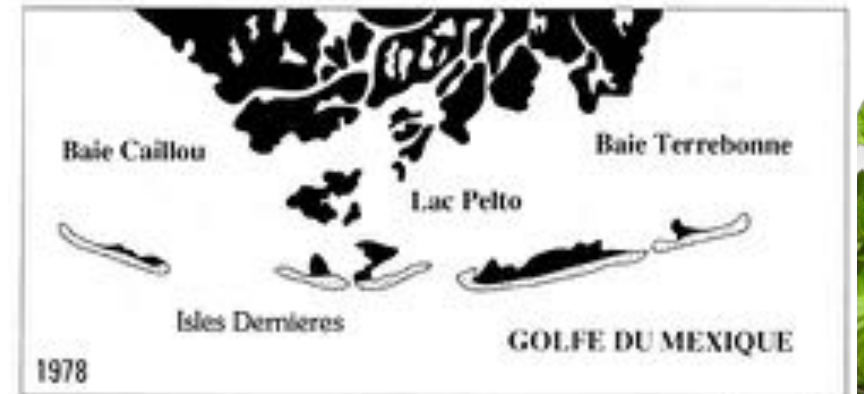
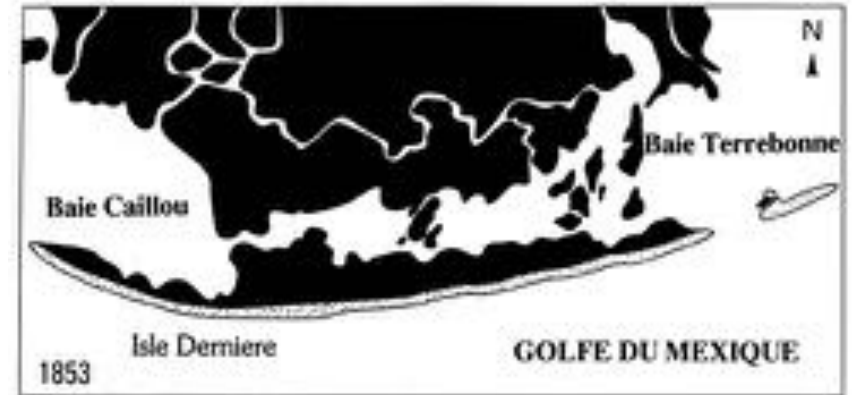
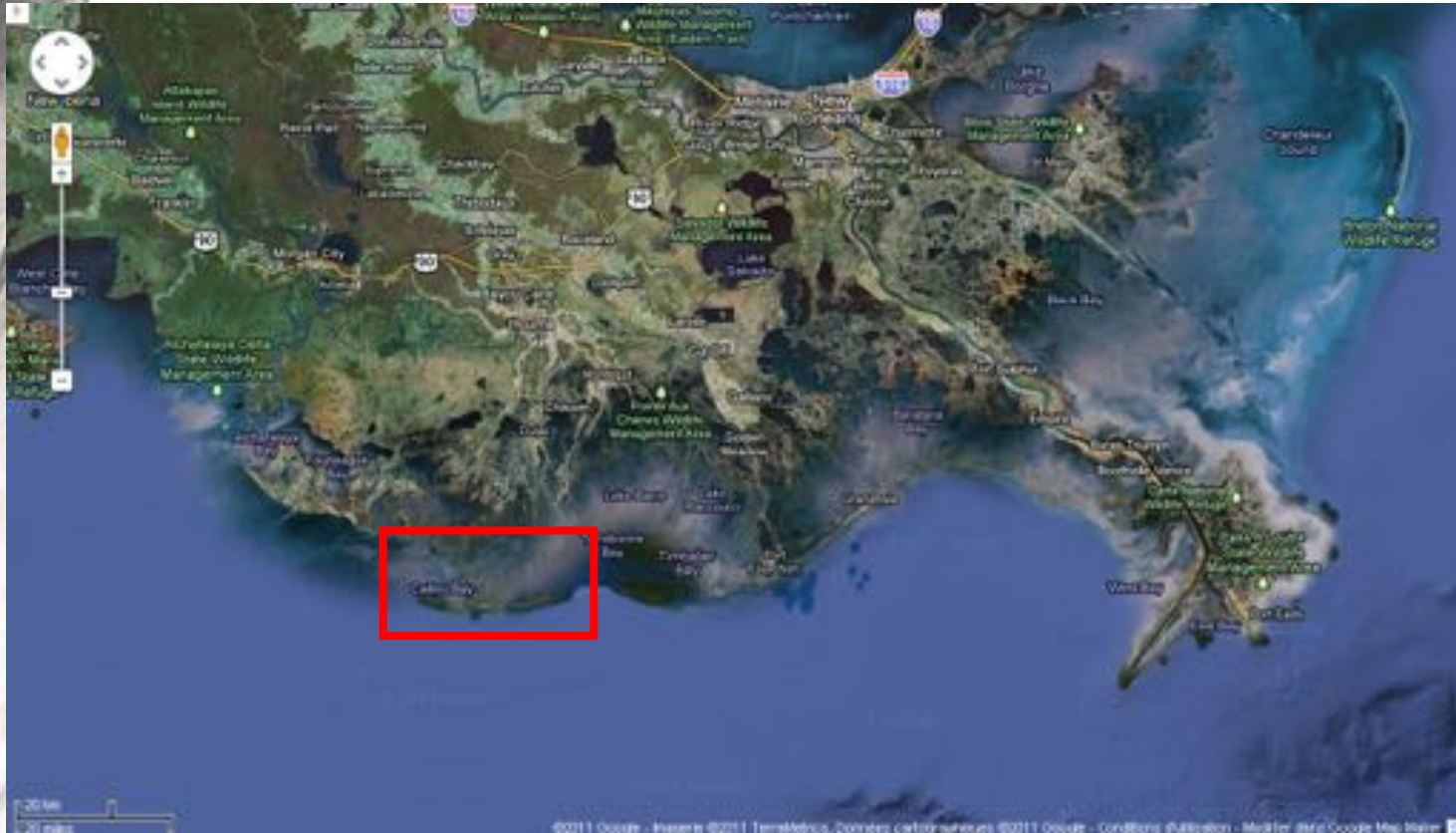
Shoreline



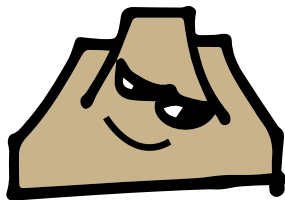
Subsidence

Worst places : Deltas

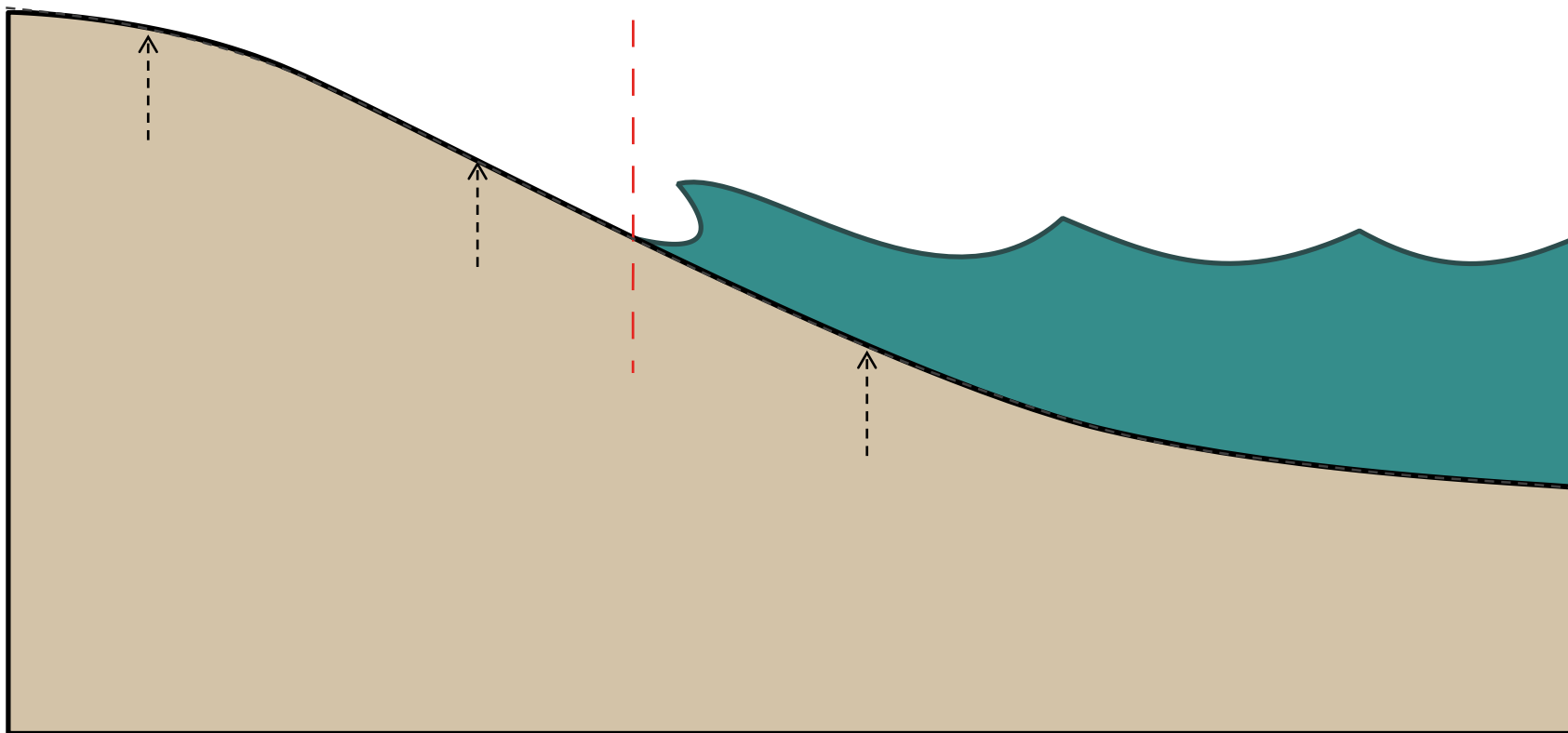
SLR + Subsidence + Dams



Uplift



Trait
de côte



Uplift



Turakirae Head, North Island (NZ)



1855
Mw=8.2
+6,4 m

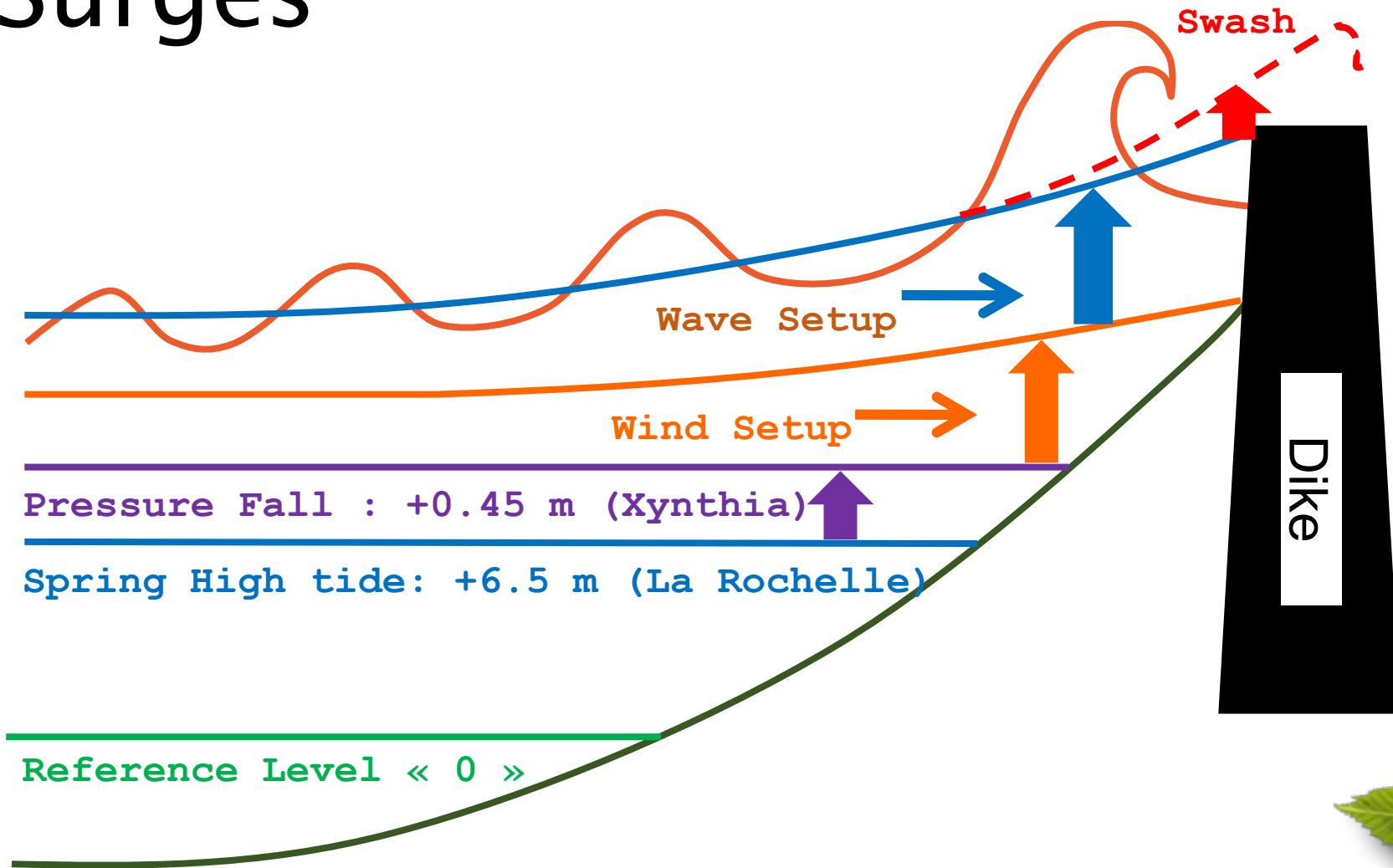


Local Sea Level Rise Storm Surges

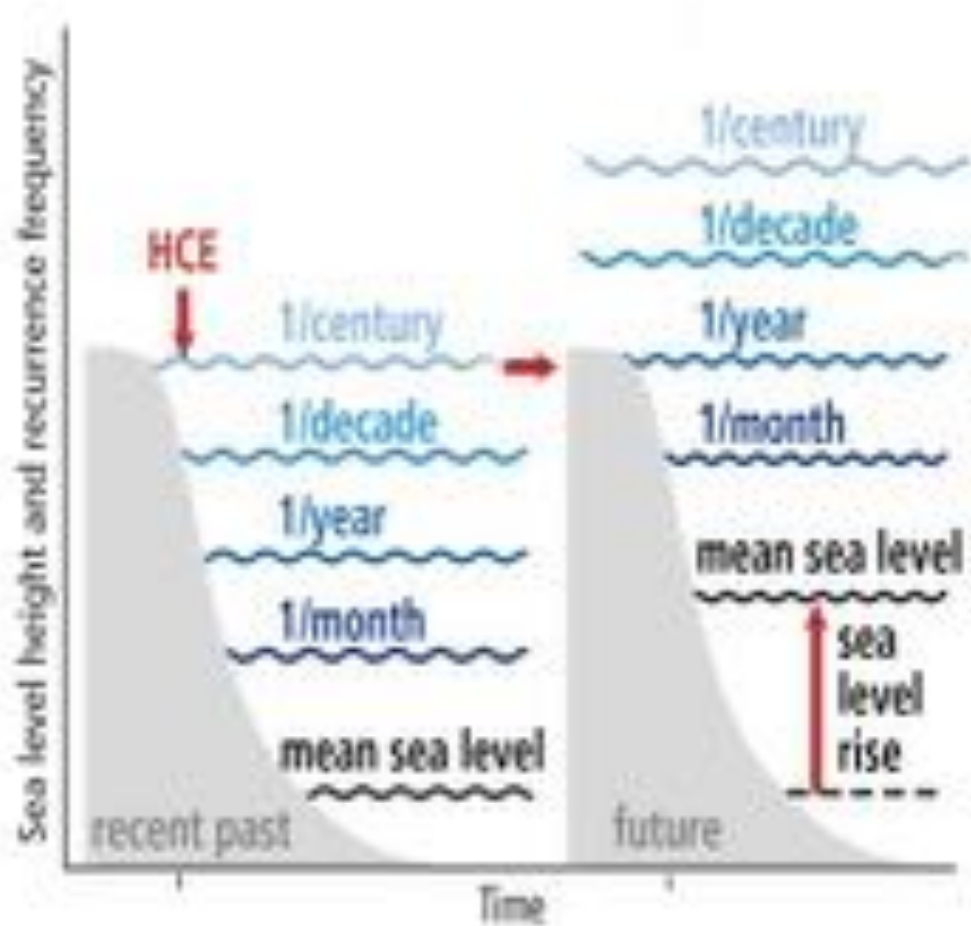


Storm Surges

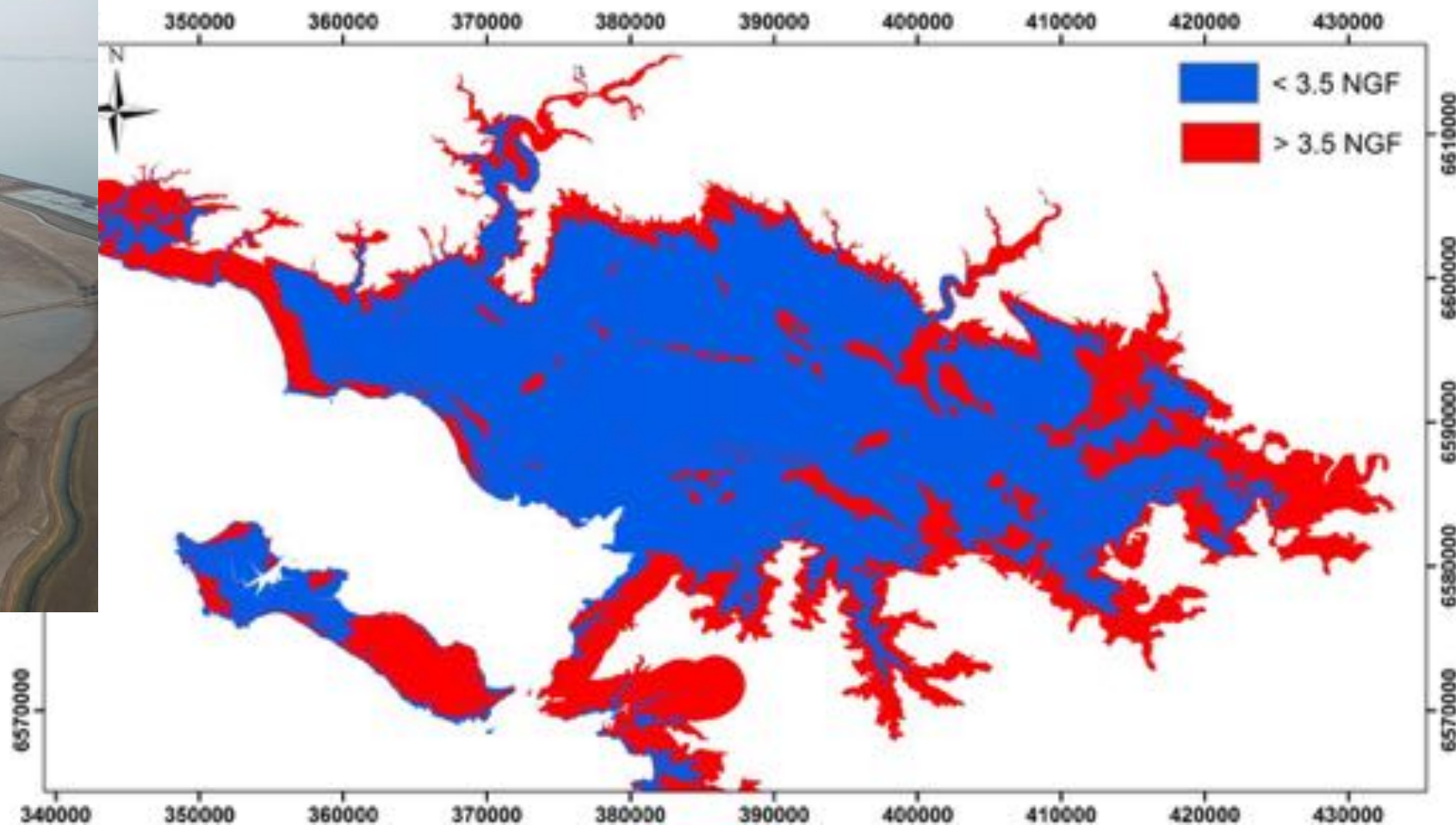
Wave setup
About 10%
of Wave
height at the
breaking
point



Global Sea Level Rise = Increase in frequency of extreme sea levels



Human-induced Vulnerability



Adaptation

(a) No response



(b) Advance



(c) Protection



(d) Retreat



(e) Accommodation



(f) Ecosystem-based adaptation



https://www.ipcc.ch/site/assets/uploads/sites/3/2019/10/IPCC-SROCC-CH_4_Box_4_3_figure_1-3000x1124.jpg

Adaptation

Hard defenses : Biarritz Example (20 millions €)



Adaptation

Soft Defenses : Sand Motor Example near Rotterdam (70 M€)
(working with Nature)



Adaptation

Depolderisation :
Mortagne-sur-
Gironde example
after the Martin
Storm

Before 1999 :

Farmed Fields -90 cm

Below highest astronomical tide



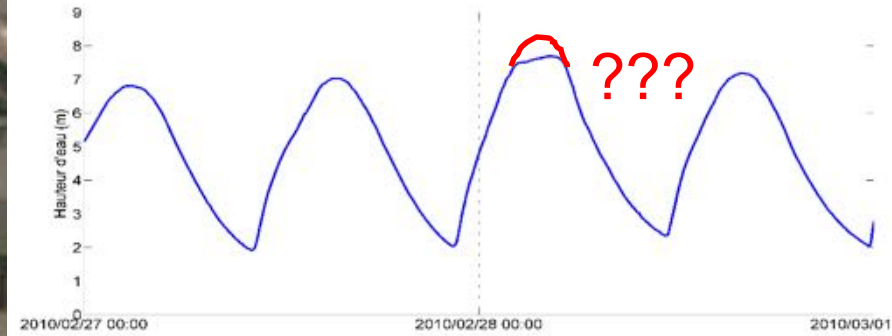
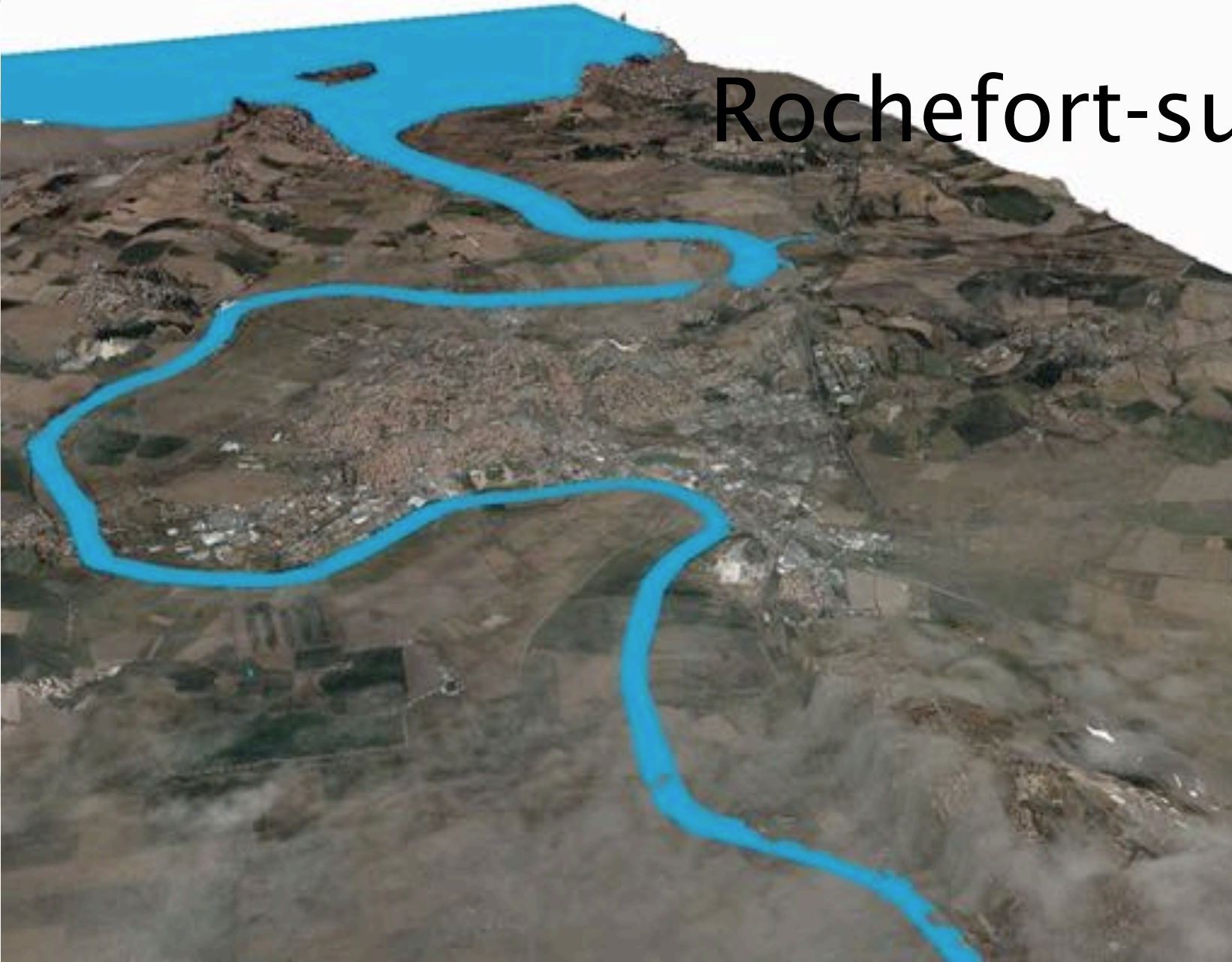
1999 : Breach

Sedimentation rate = +9 cm / year

Huge increase in biodiversity

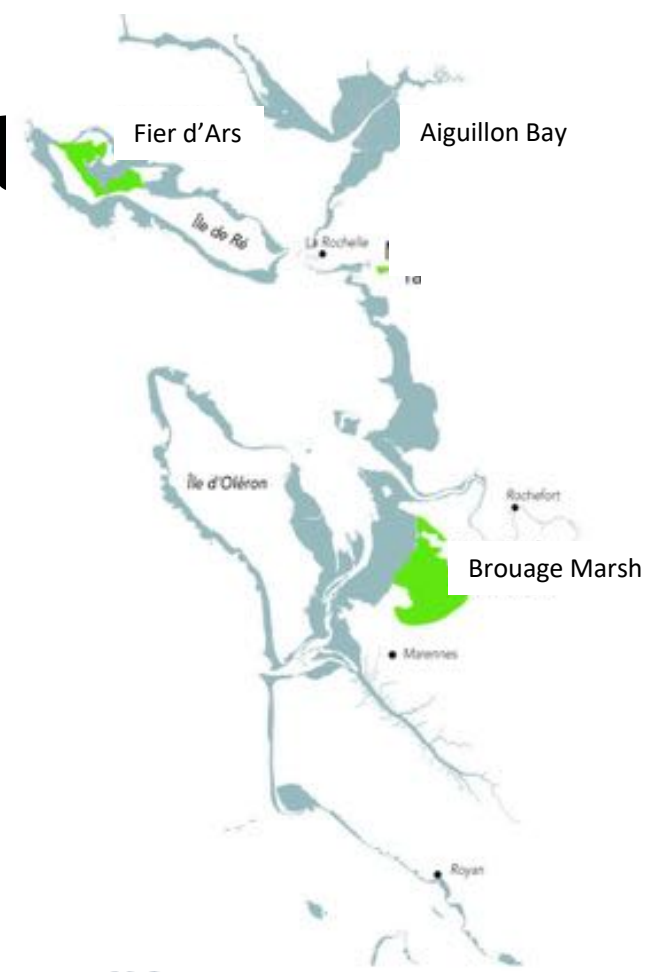
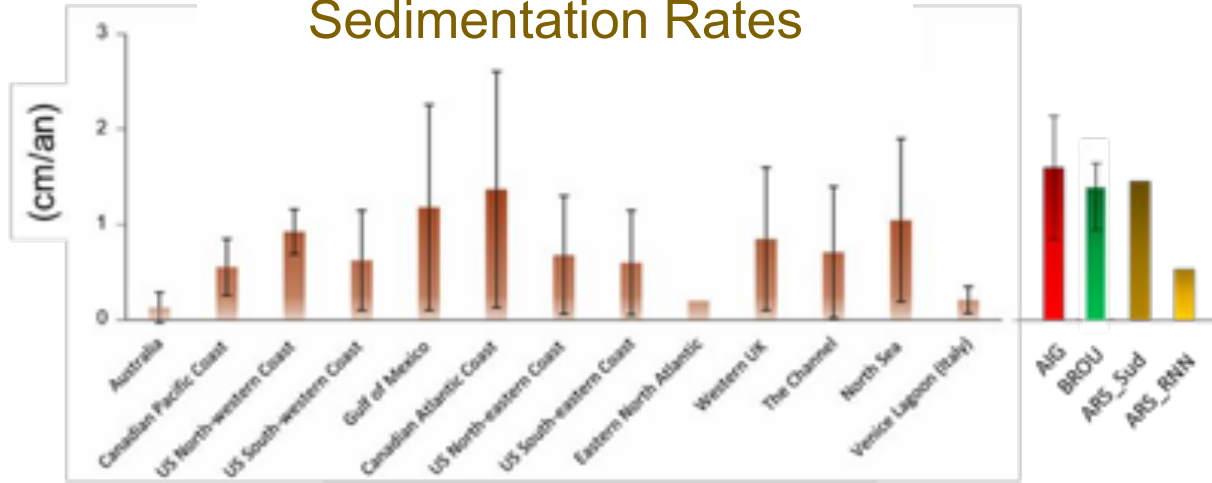


Extreme Sea Level Limitation Rochefort-sur-mer example during Xynthia

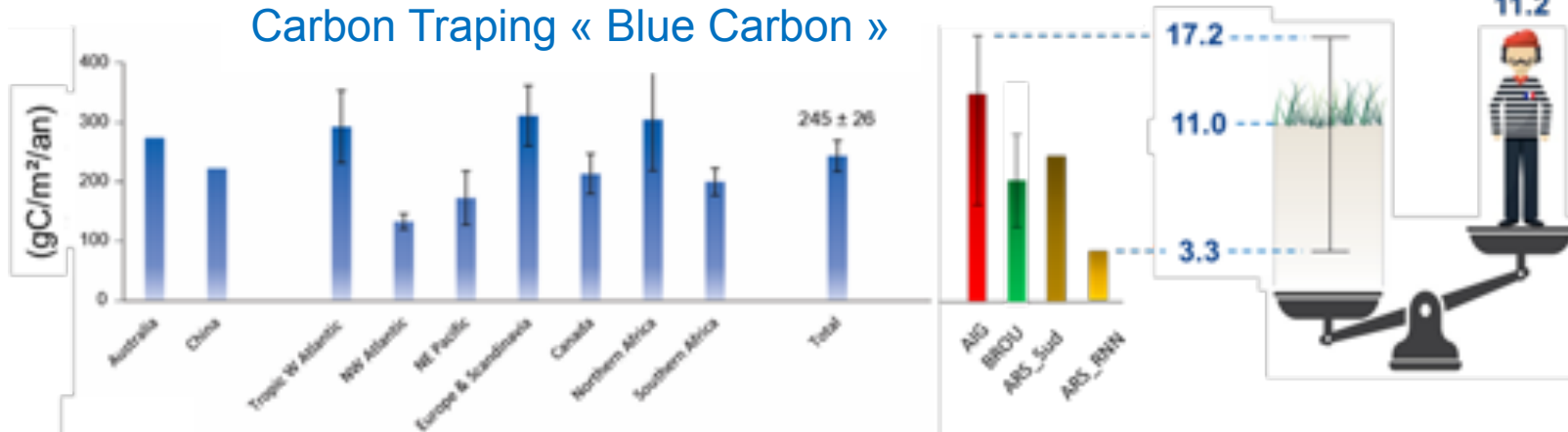


Sedimentation : Barrier effect and Carbon Trapping

Sedimentation Rates



Carbon Trapping « Blue Carbon »



Amann et al. *in prep* ECSS



ECOSYSTEM-BASED SOLUTIONS

Barrier

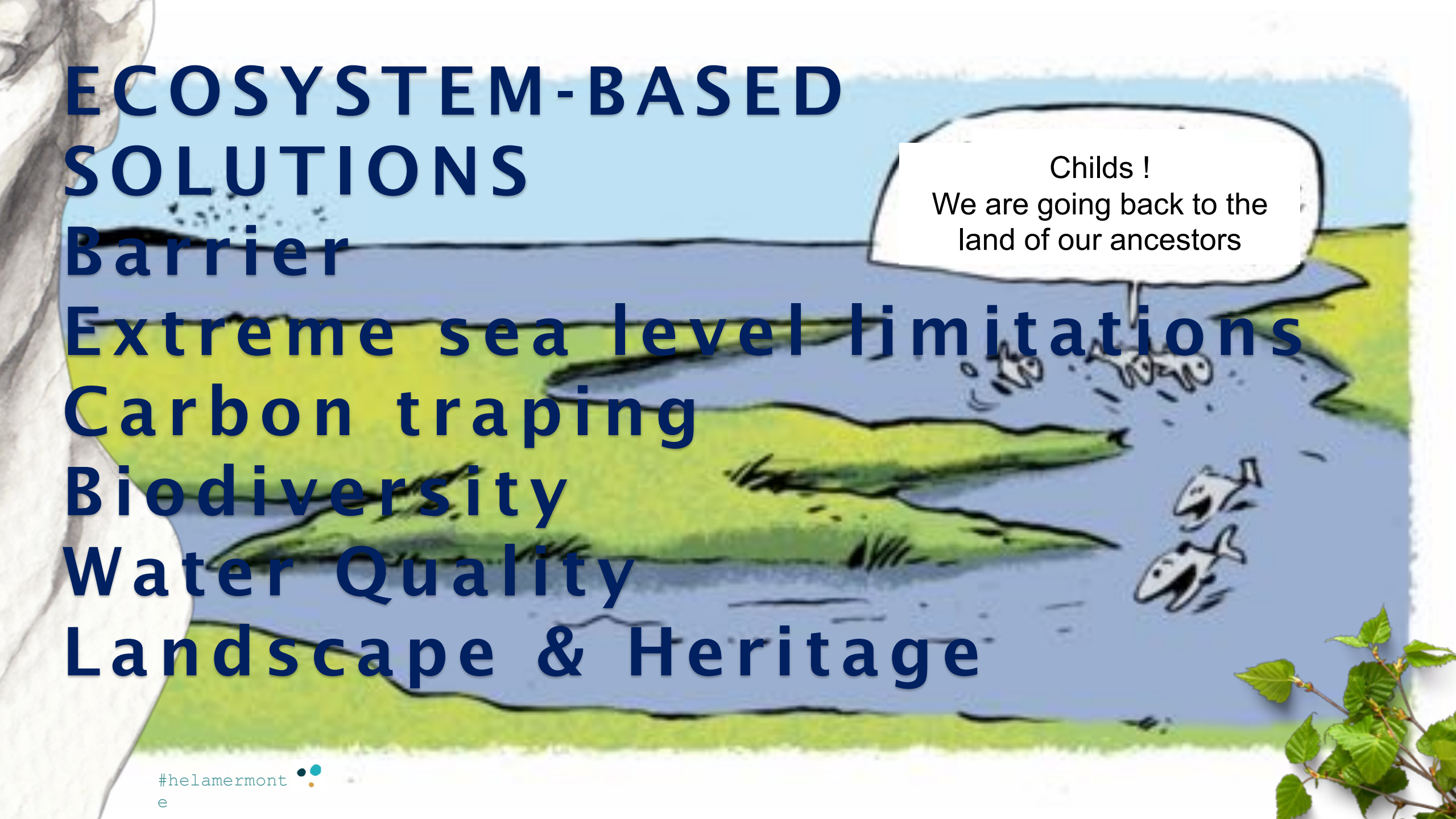
Extreme sea level limitations

Carbon trapping

Biodiversity

Water Quality

Landscape & Heritage

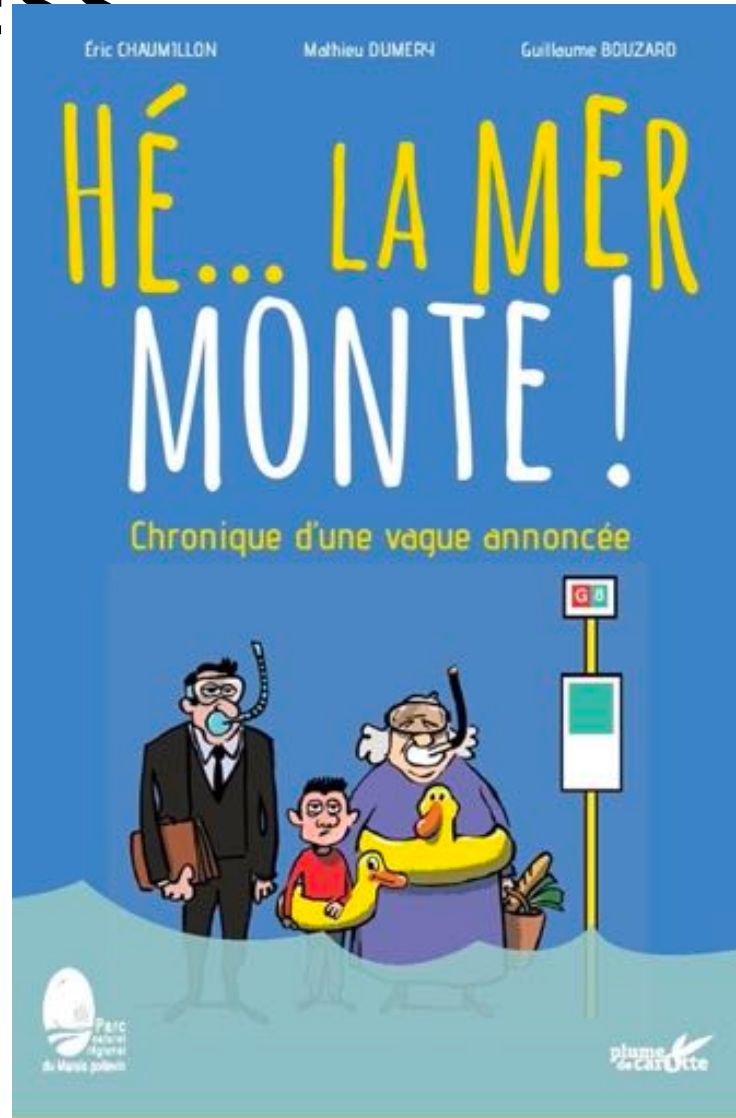


Childs !
We are going back to the
land of our ancestors

A great need for education and awareness



A great need for education and awareness



Thanks for your attention!

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