

# Significant shoreline erosion in Brittany coast during the winter 2013-14

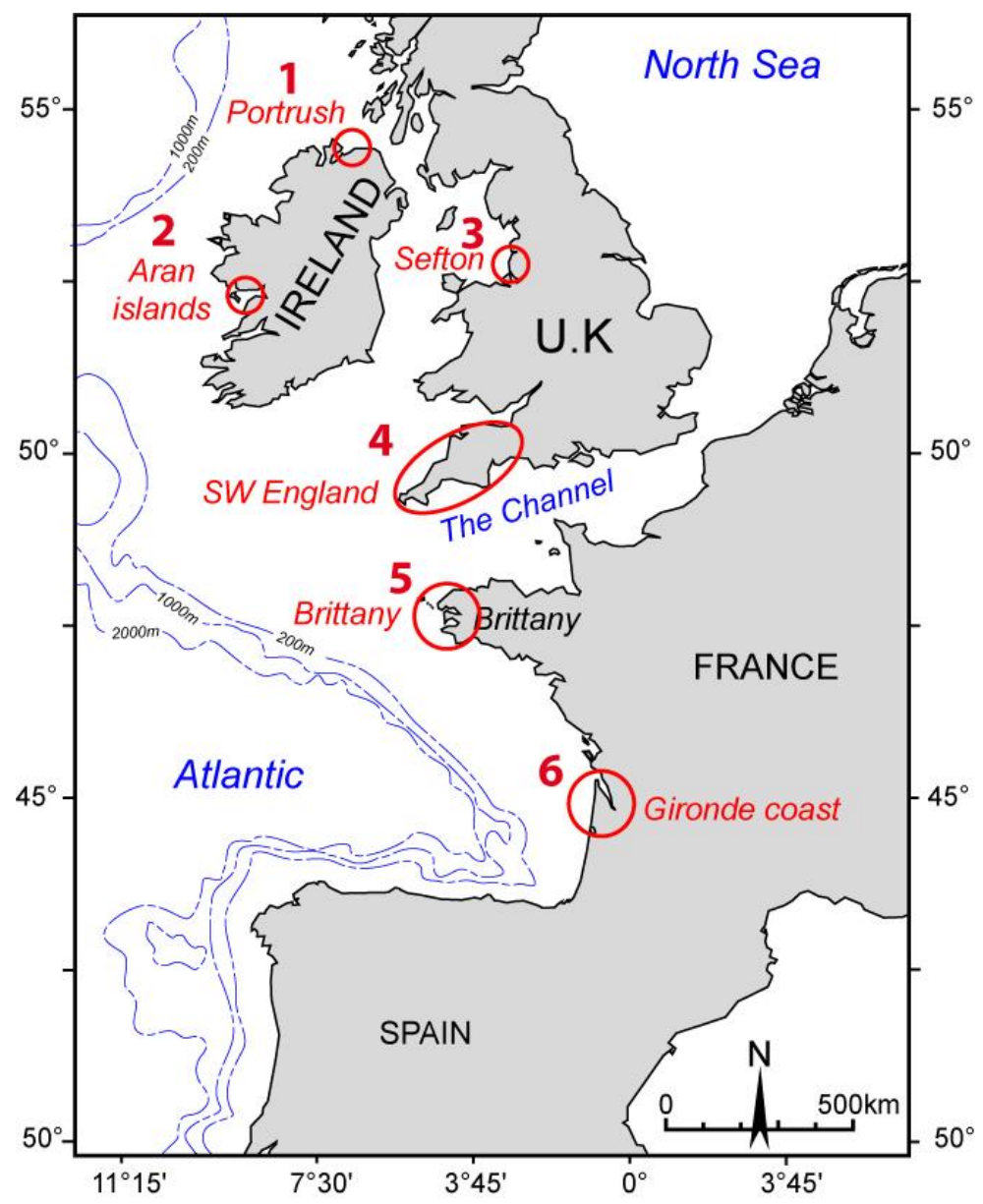
Serge Suanez<sup>1</sup>, Emmanuel Blaise<sup>1</sup>, Pierre Stéphan<sup>1</sup>, Bernard Fichaut<sup>1</sup>, France Floc'h<sup>2</sup>, Véronique Cuq<sup>1</sup>, Fabrice Ardhuin<sup>3</sup>

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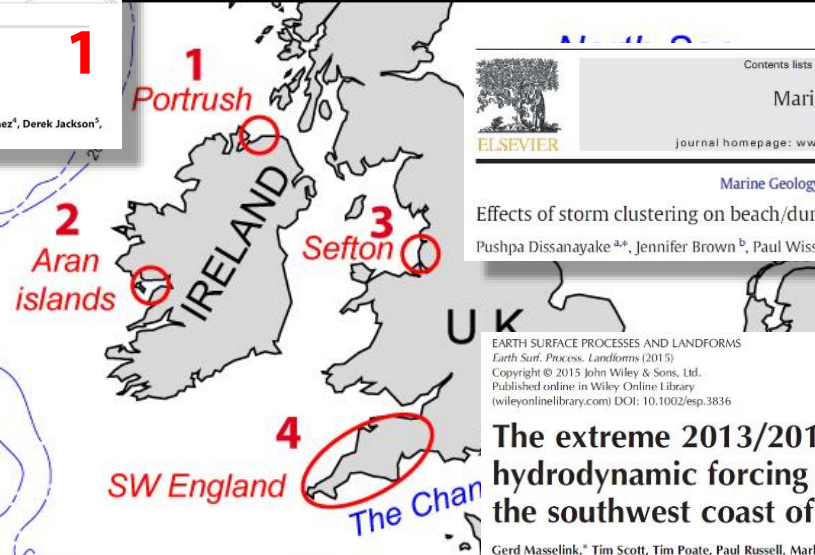
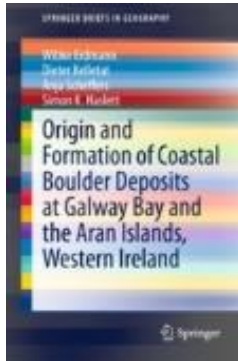
Geophysical Research Letters

**RESEARCH LETTER**  
10.1002/2015JGL067492

**1**

Extreme wave activity during 2013/2014 winter and morphological impacts along the Atlantic coast of Europe

Gerd Masselink<sup>1</sup>, Bruno Castello<sup>2,3</sup>, Tim Scott<sup>1</sup>, Guillaume Dodet<sup>4</sup>, Serge Suanes<sup>2</sup>, Derek Jackson<sup>5</sup>, and France Floch<sup>6</sup>



Contents lists available at ScienceDirect

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Marine Geology

journal homepage: [www.elsevier.com/locate/margeo](http://www.elsevier.com/locate/margeo)

Marine Geology 370 (2015) 63–75

Effects of storm clustering on beach/dune evolution

Pushpa Dissanayake<sup>a,\*</sup>, Jennifer Brown<sup>b</sup>, Paul Wisse<sup>c</sup>, Harshinie Karunaratna<sup>d</sup>

EARTH SURFACE PROCESSES AND LANDFORMS

Earth Surf. Process. Landforms (2015)

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**4**

The extreme 2013/2014 winter storms: hydrodynamic forcing and coastal response along the southwest coast of England

Gerd Masselink<sup>a</sup>, Tim Scott<sup>a</sup>, Tim Poate<sup>a</sup>, Paul Russell<sup>a</sup>, Mark Davidson<sup>a</sup> and Daniel Conley<sup>a</sup>

revis en ligne: <http://geomorphologie.revues.org/>

**5**

Géo morphologie

RELIEF, PROCESSUS, ENVIRONNEMENT

GÉOMORPHOLOGIE, RELIEF, PROCESSUS, ENVIRONNEMENT

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Bilan des tempêtes de l'hiver 2013-2014 sur la dynamique de recul du trait de côte en Bretagne

Emmanuel Blaise<sup>a</sup>, Serge Suanes<sup>a,\*</sup>, Pierre Stéphan<sup>a</sup>, Bernard Fichaut<sup>a</sup>, Laurence David<sup>a</sup>, Véronique Cuq<sup>a</sup>, Ronan Autret<sup>a</sup>, Julien Houron<sup>a</sup>, Mathias Rouan<sup>a</sup>, France Floch<sup>a</sup>, Fabrice Ardhuin<sup>a</sup>, Romain Cancouët<sup>a</sup>, Robert Davidson<sup>a</sup>, Stéphane Costar<sup>a</sup>, Christophe Delacourte<sup>a</sup>

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Marine Geology 382 (2016) 37–55

A comprehensive hydro-geomorphic study of cliff-top storm deposits on Banneg Island during winter 2013–2014

Ronan Autret<sup>a,\*</sup>, Guillaume Dodet<sup>a</sup>, Bernard Fichaut<sup>a</sup>, Serge Suanes<sup>a</sup>, Laurence David<sup>a</sup>, Fabien Lecler<sup>b</sup>, Fabrice Ardhuin<sup>c</sup>, Jérôme Ammann<sup>d</sup>, Philippe Grandjean<sup>e</sup>, Pascal Allemand<sup>e</sup>, Jean-François Filipot<sup>f</sup>

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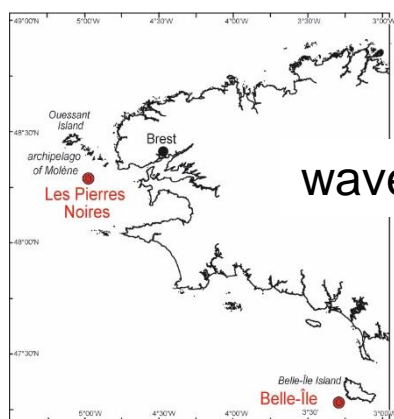
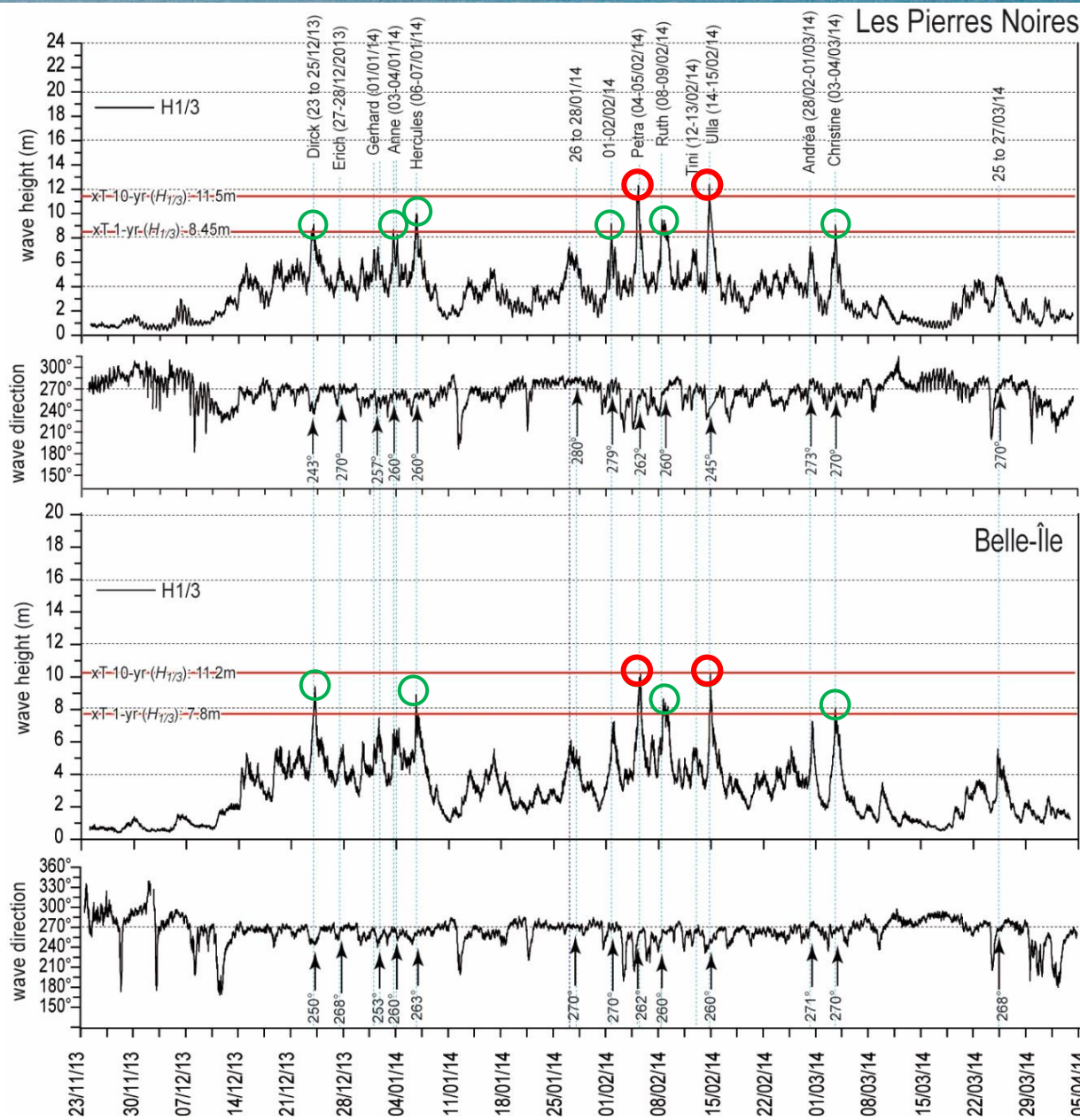
journal homepage: [www.elsevier.com/locate/geomorph](http://www.elsevier.com/locate/geomorph)

Geomorphology 238 (2015) 135–148

Impact of the winter 2013–2014 series of severe Western Europe storms on a double-barred sandy coast: Beach and dune erosion and megacusp embayments

Bruno Castello<sup>a,\*</sup>, Vincent Marieu<sup>a</sup>, Stéphane Bujan<sup>a</sup>, Kristen D. Splinter<sup>b</sup>, Arthur Robinet<sup>a</sup>, Nadia Sénéchal<sup>a</sup>, Sophie Ferreira<sup>a,c</sup>

# 2. Hydrodynamic conditions



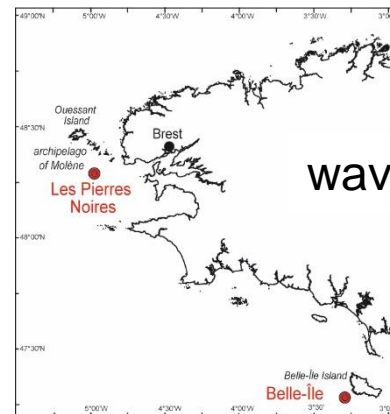
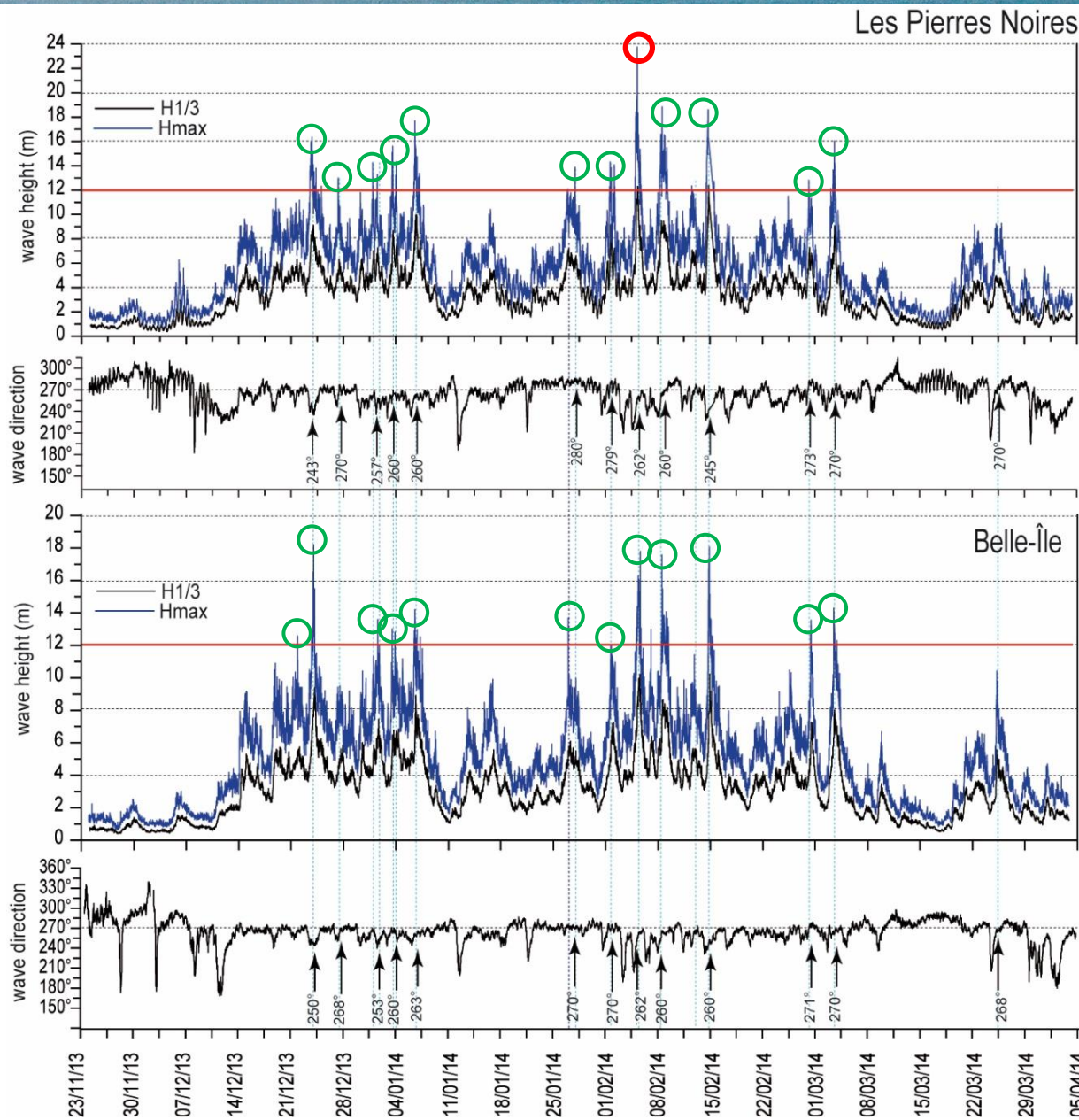
wave conditions

8 major storms with  $H_{sig}$  between 1-yr and 5-yr return periods of wave height

February was the most tempestuous

2 major storms with  $H_{sig}$  exceeded 10-yr return period of wave height: *Petra* (4-5 February and *Ulla* 14-15 February)

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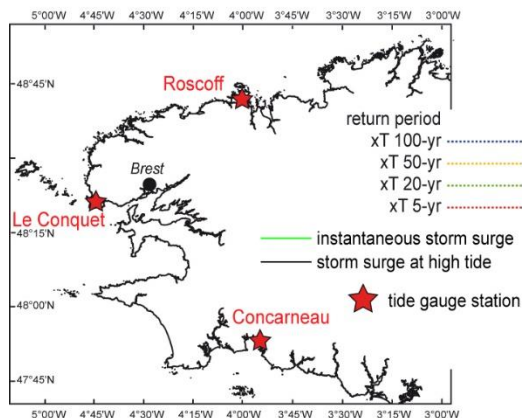
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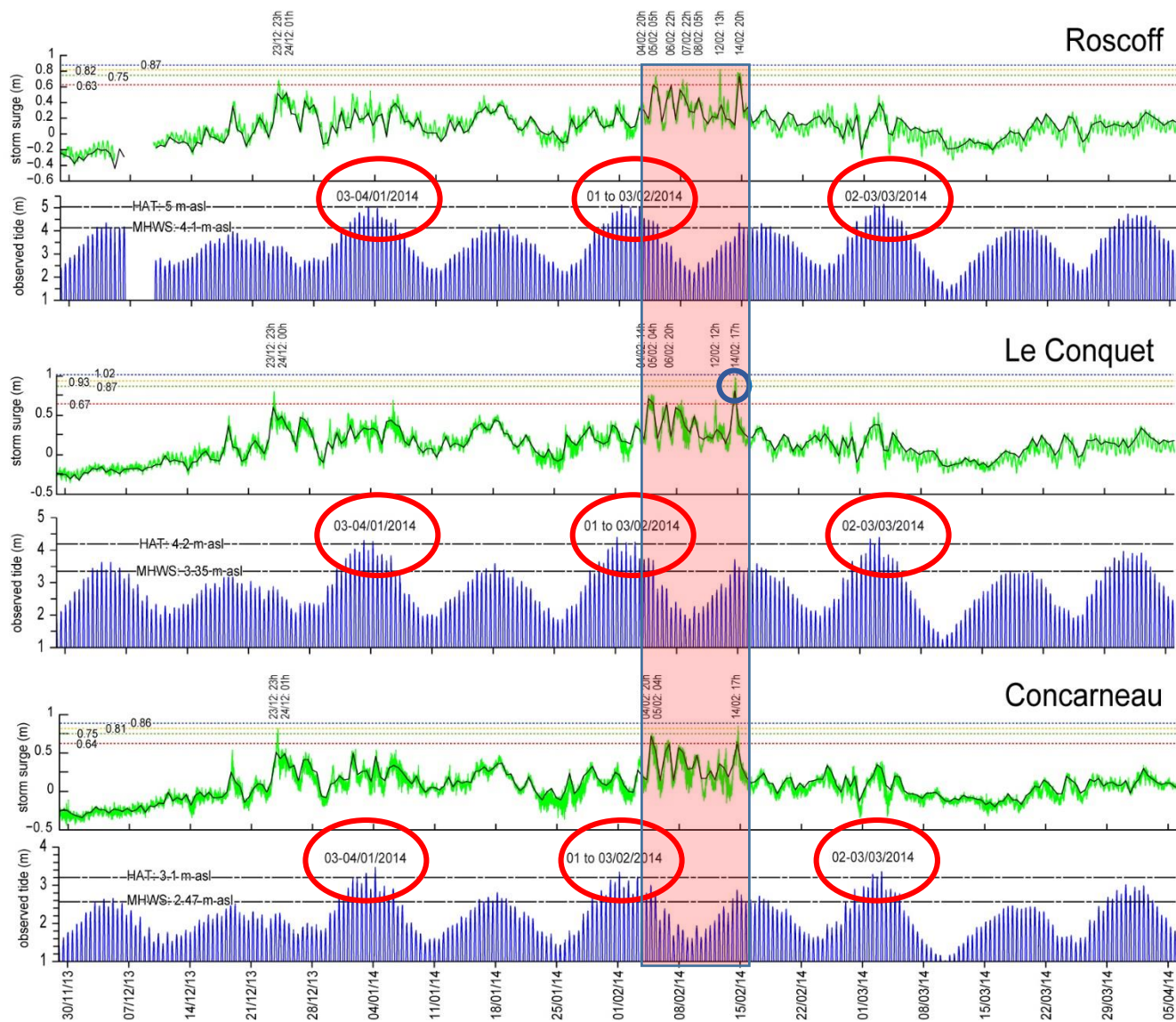
12 major storms with  $H_{max}$  exceeded 12 m

maximum of 23.5 m was reached during the 5 of February at 8:00h a.m. during the *Petra* storm

## water level conditions

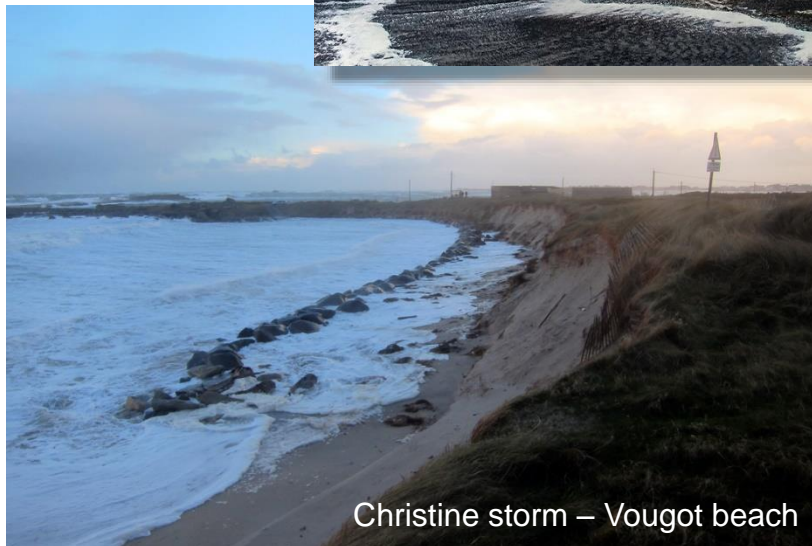


- 3 high spring tide events where observed tide exceeded HAT level
- max surge of 0.97 m (> 100-yr return period) was recorded at Le Conquet during Ulla storm of February 14<sup>th</sup>
- “fortunately” high tide surge and/or maximum instantaneous surge occurred at a time of low tide and/or a neap tide (e.g. in February)



In final, 3 storm events suitable to strong shoreline erosion have been identified:

- beginning of January (storm Anne of 3-4 January 2014)
- beginning of February (storm of 1-2 February 2014)
- beginning of March (storm Christine of 3 March 2014)

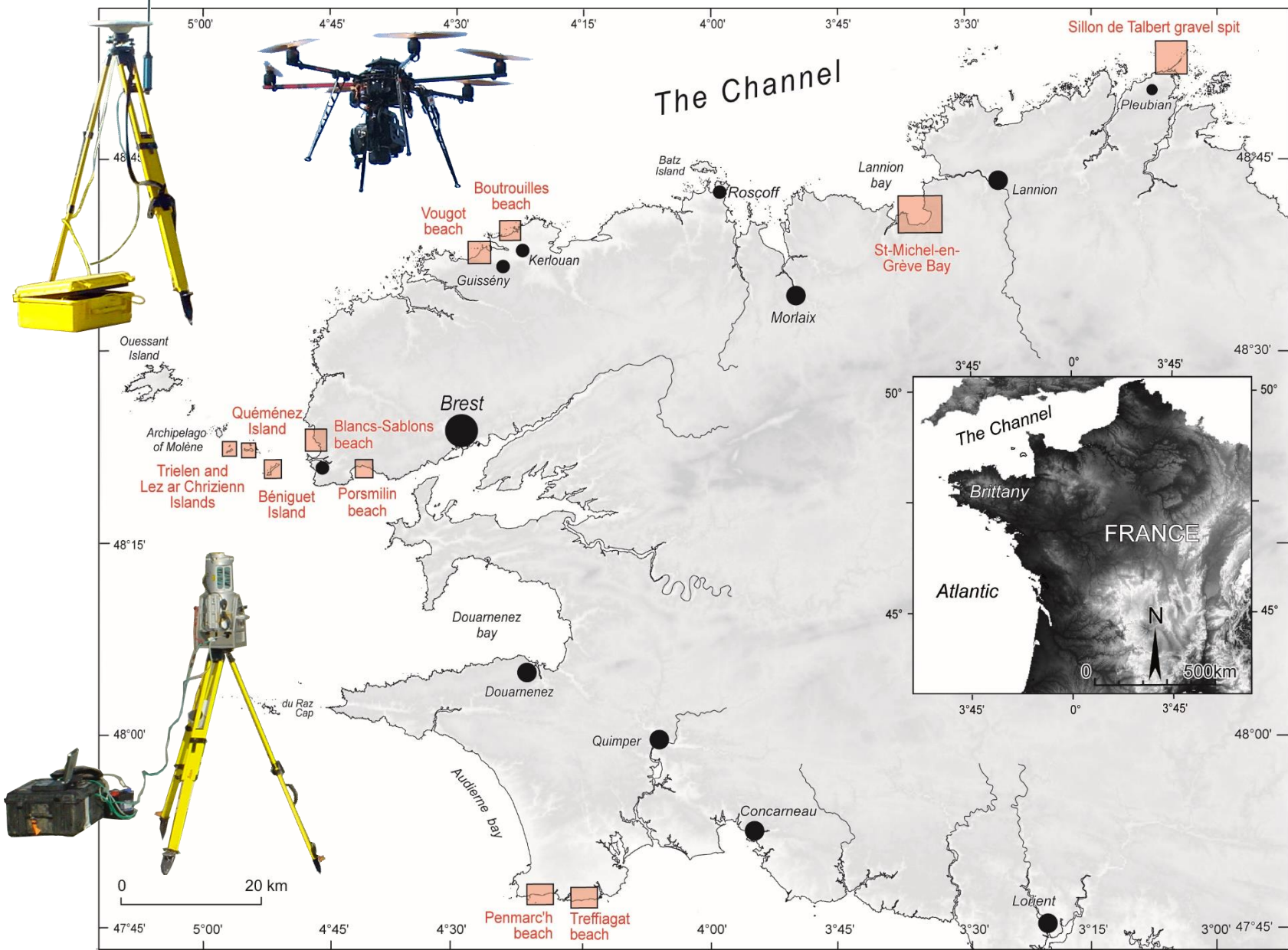


Christine storm – Vougot beach



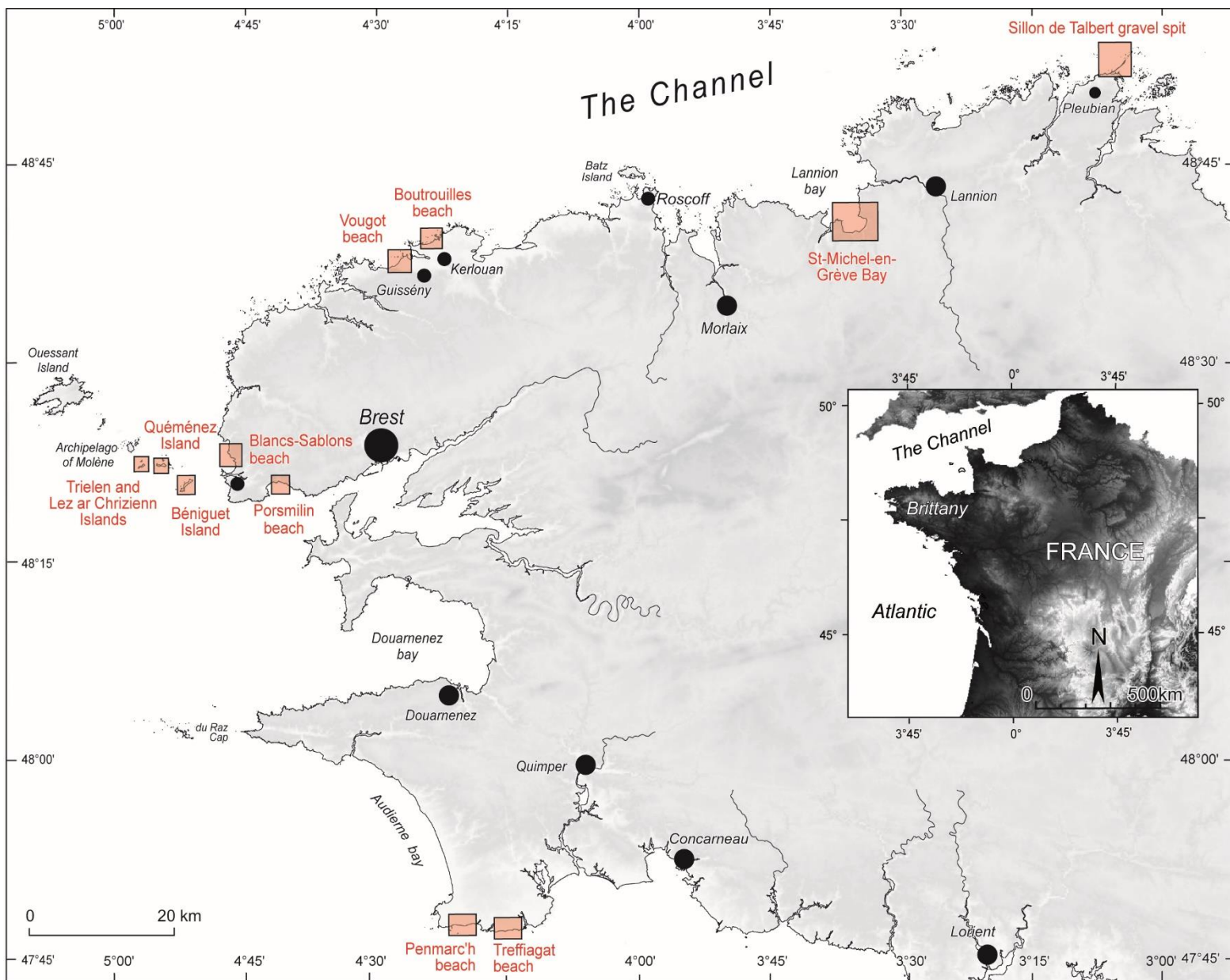
photo © Philip Plisson

# 3. Morphological survey



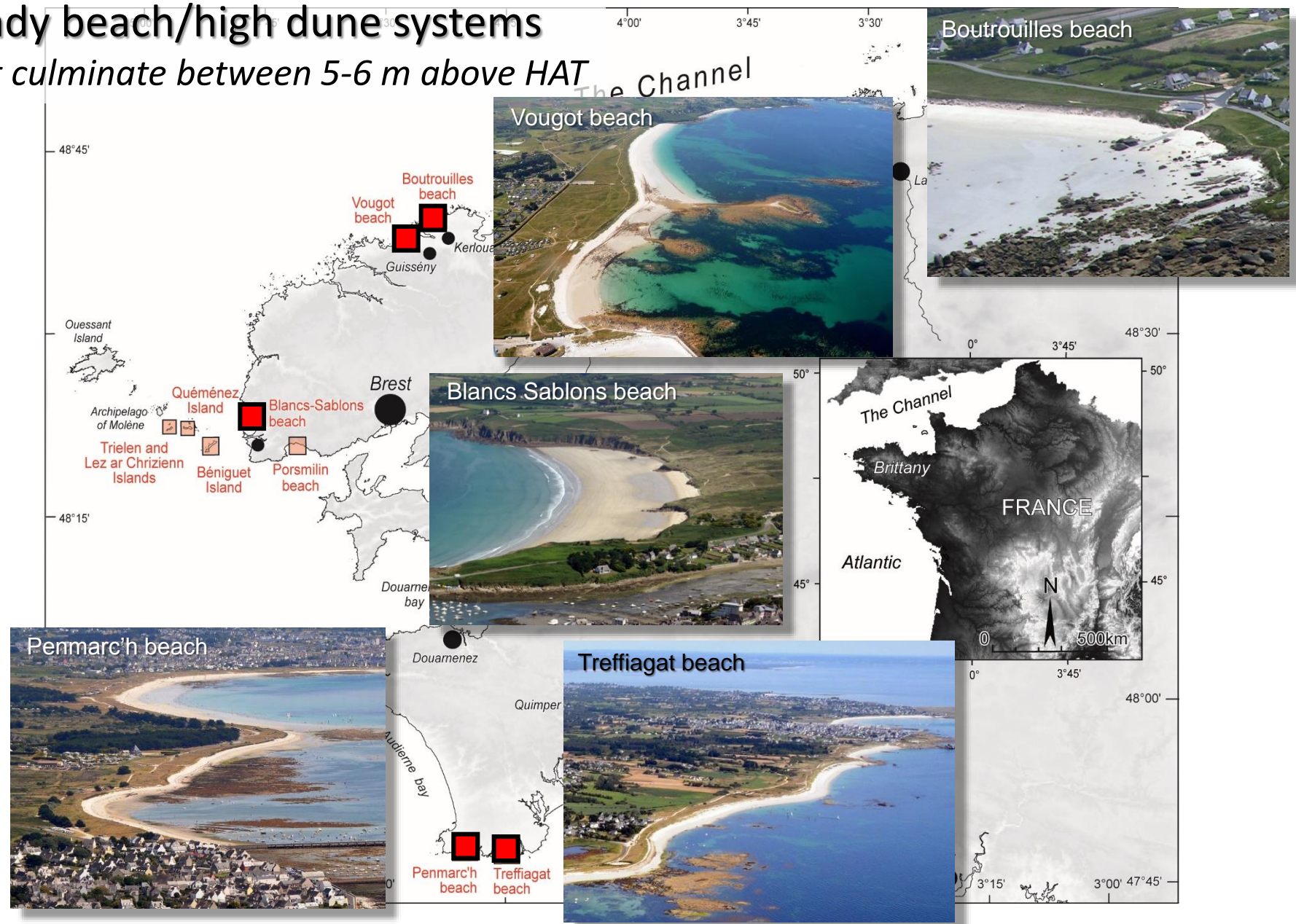


# 3. Morphological survey



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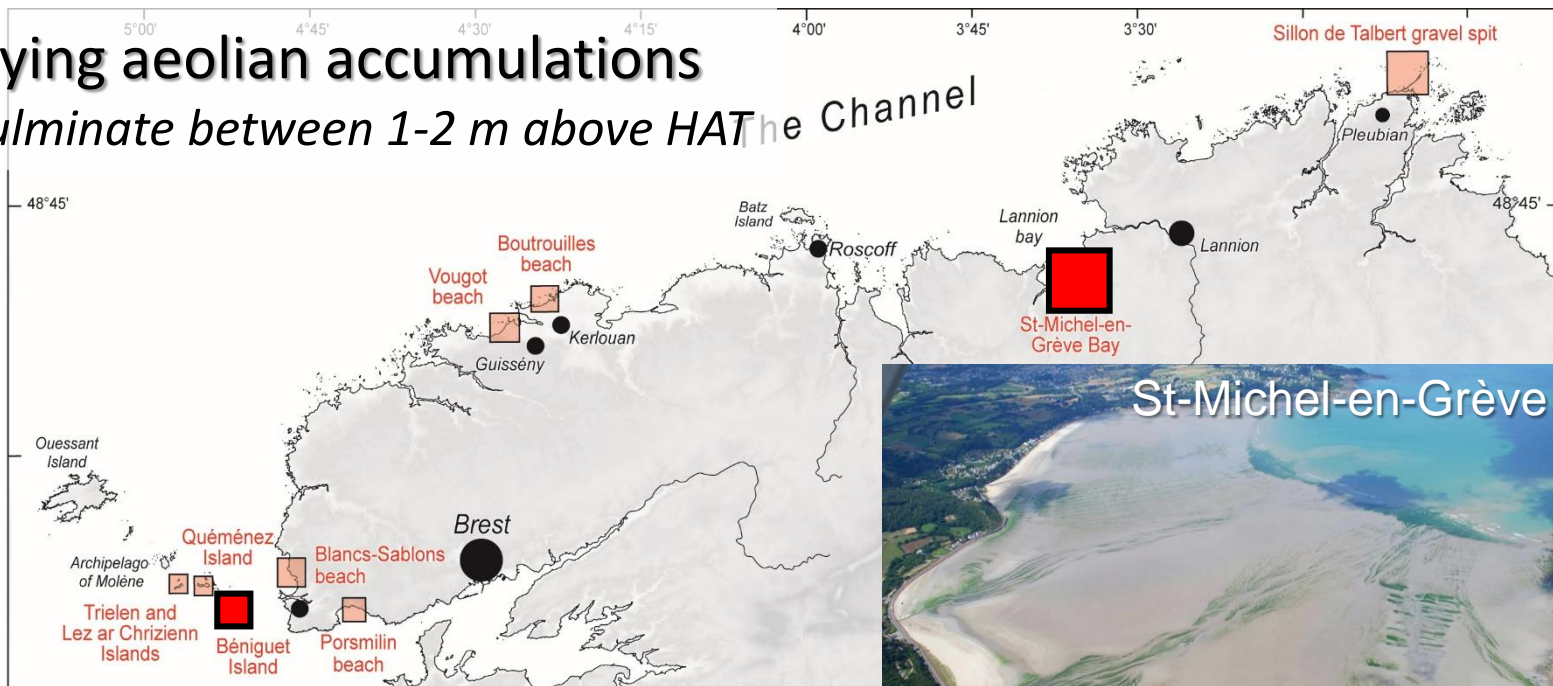
## Sandy beach/high dune systems that culminate between 5-6 m above HAT



# 3. Morphological survey

## Low-lying aeolian accumulations

that culminate between 1-2 m above HAT<sub>the Channel</sub>



Beniguet Island



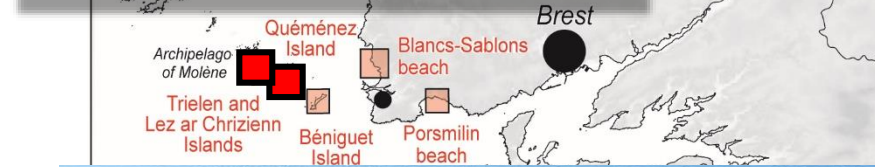
St-Michel-en-Grève bay



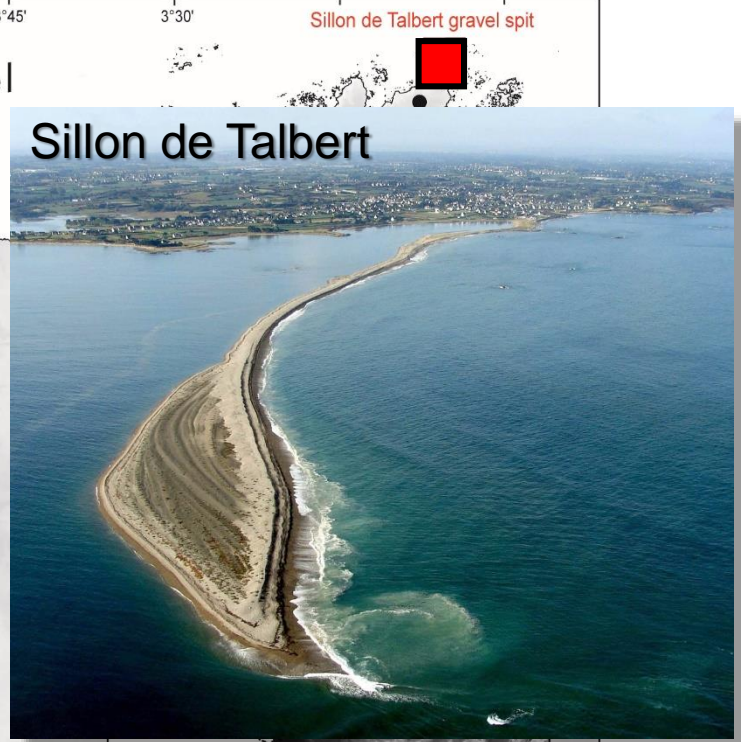
## Shingle beaches and gravel barriers



Quéménez Island

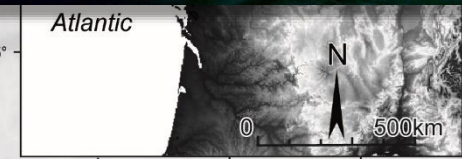


The Channel



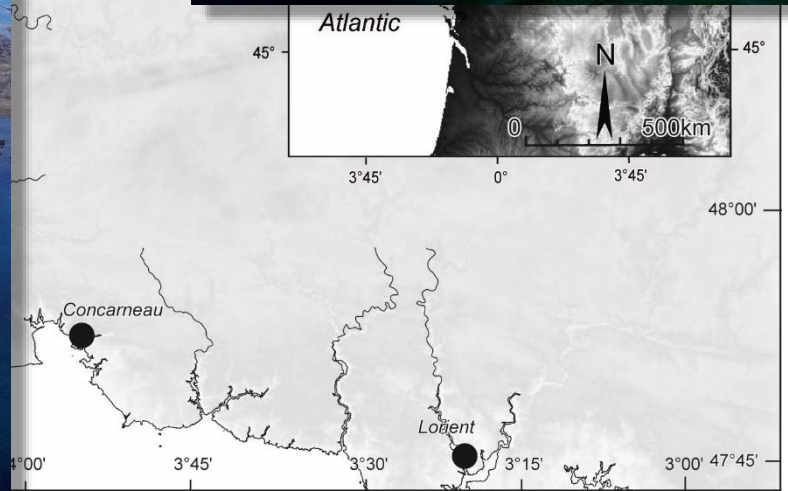
Sillon de Talbert

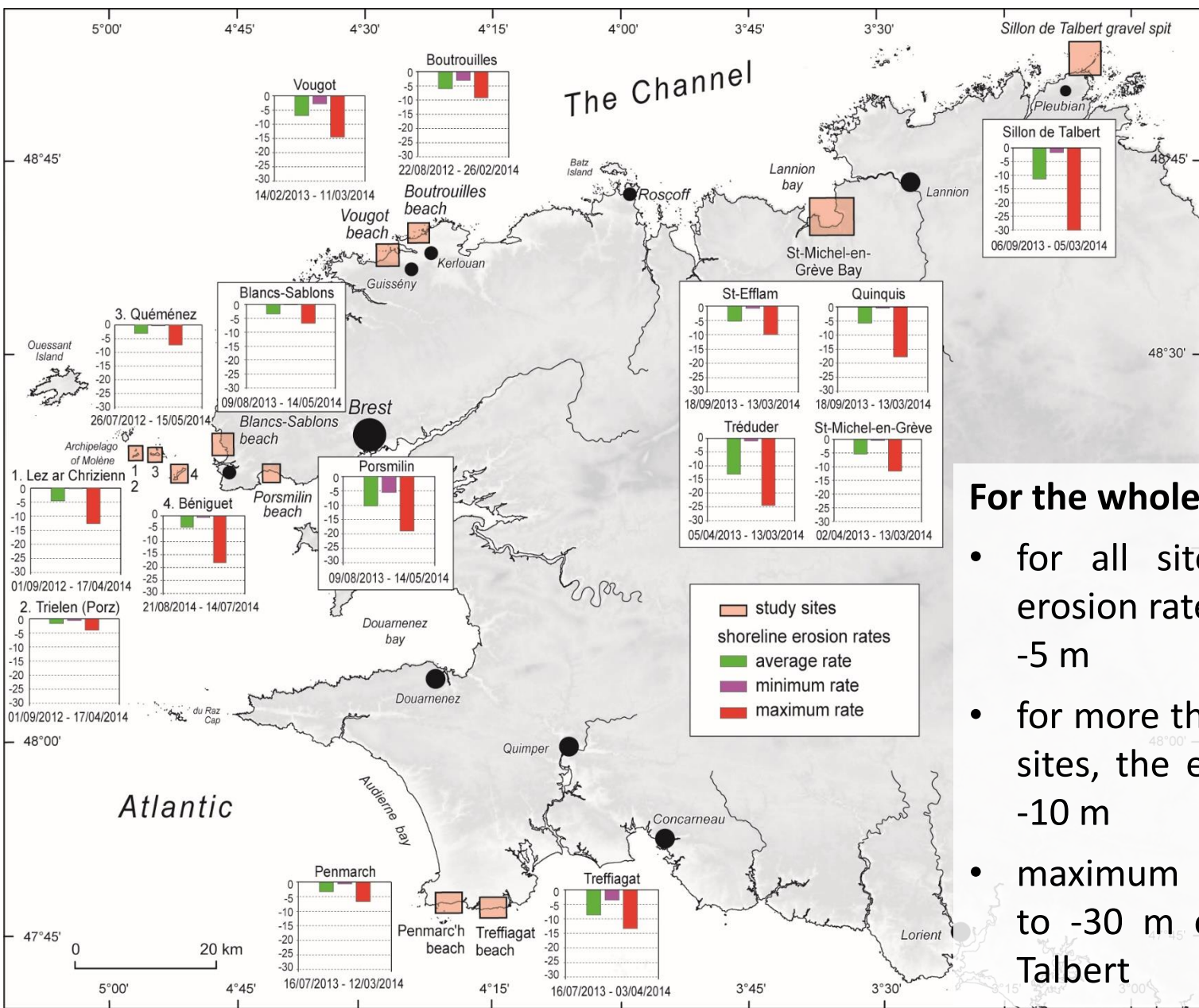
Sillon de Talbert gravel spit



Trielen Island

Lez ar Chrizienn

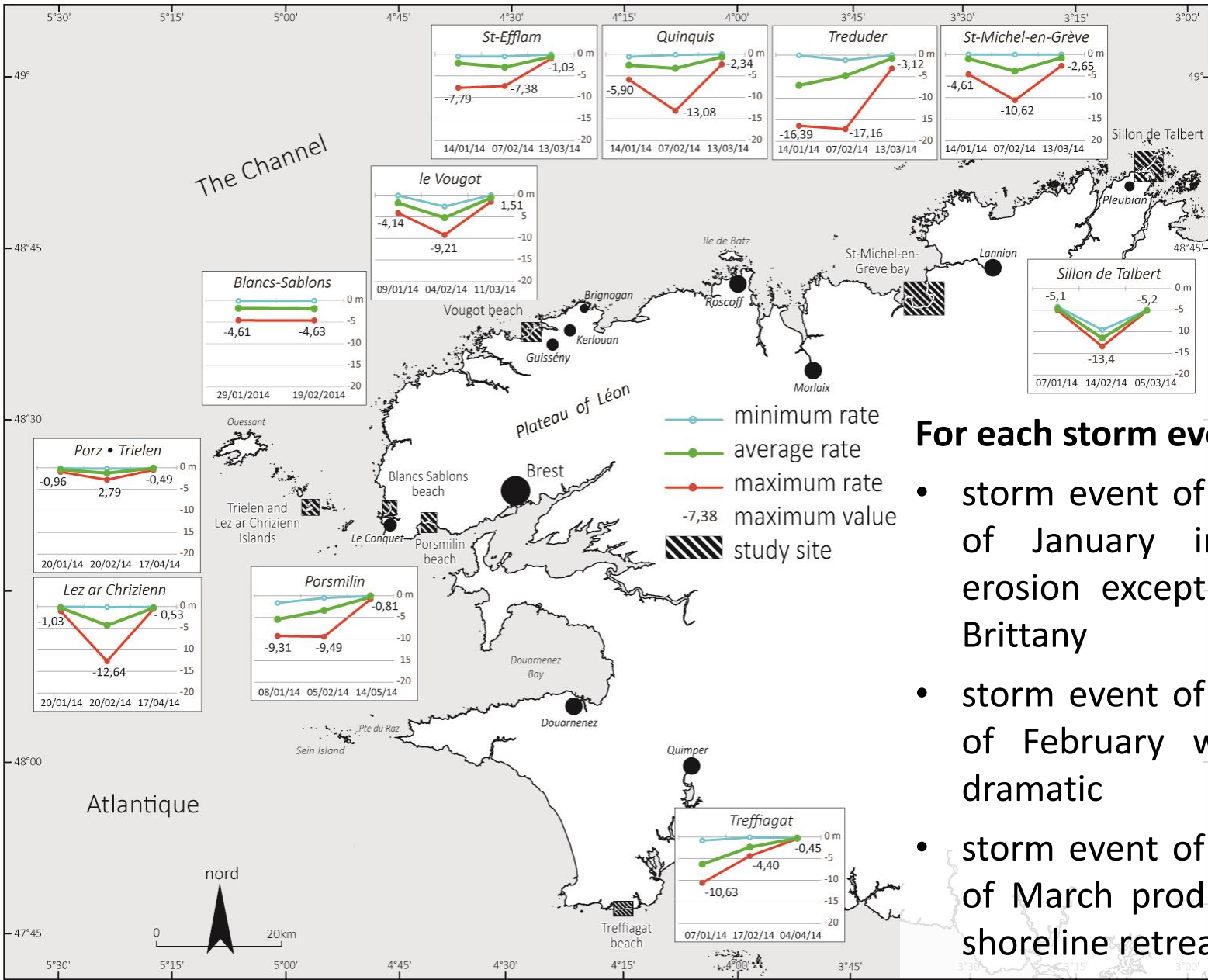




### For the whole winter period

- for all sites, the average erosion rates were at least  $\geq -5$  m
- for more than 50 % of study sites, the erosion exceeded  $-10$  m
- maximum rate reached up to  $-30$  m on the Sillon de Talbert

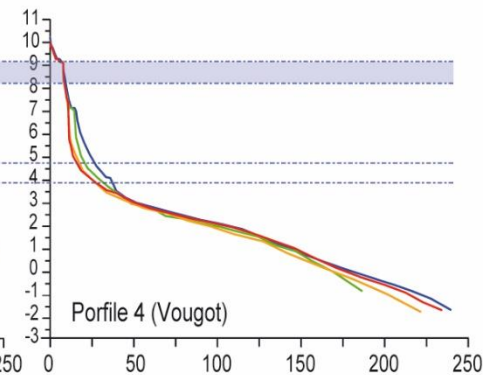
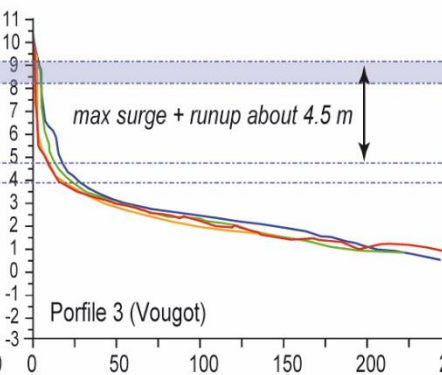
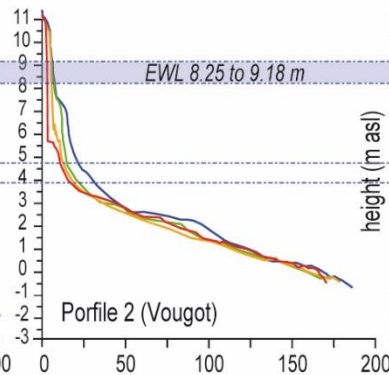
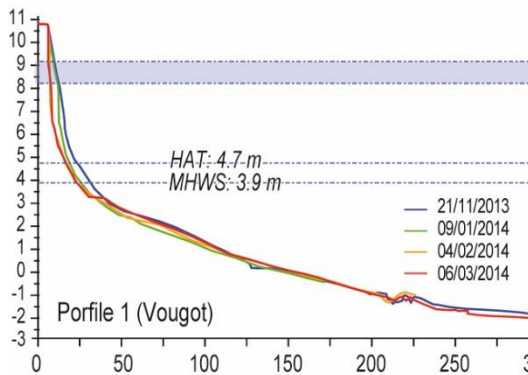
# 4. Shoreline erosion



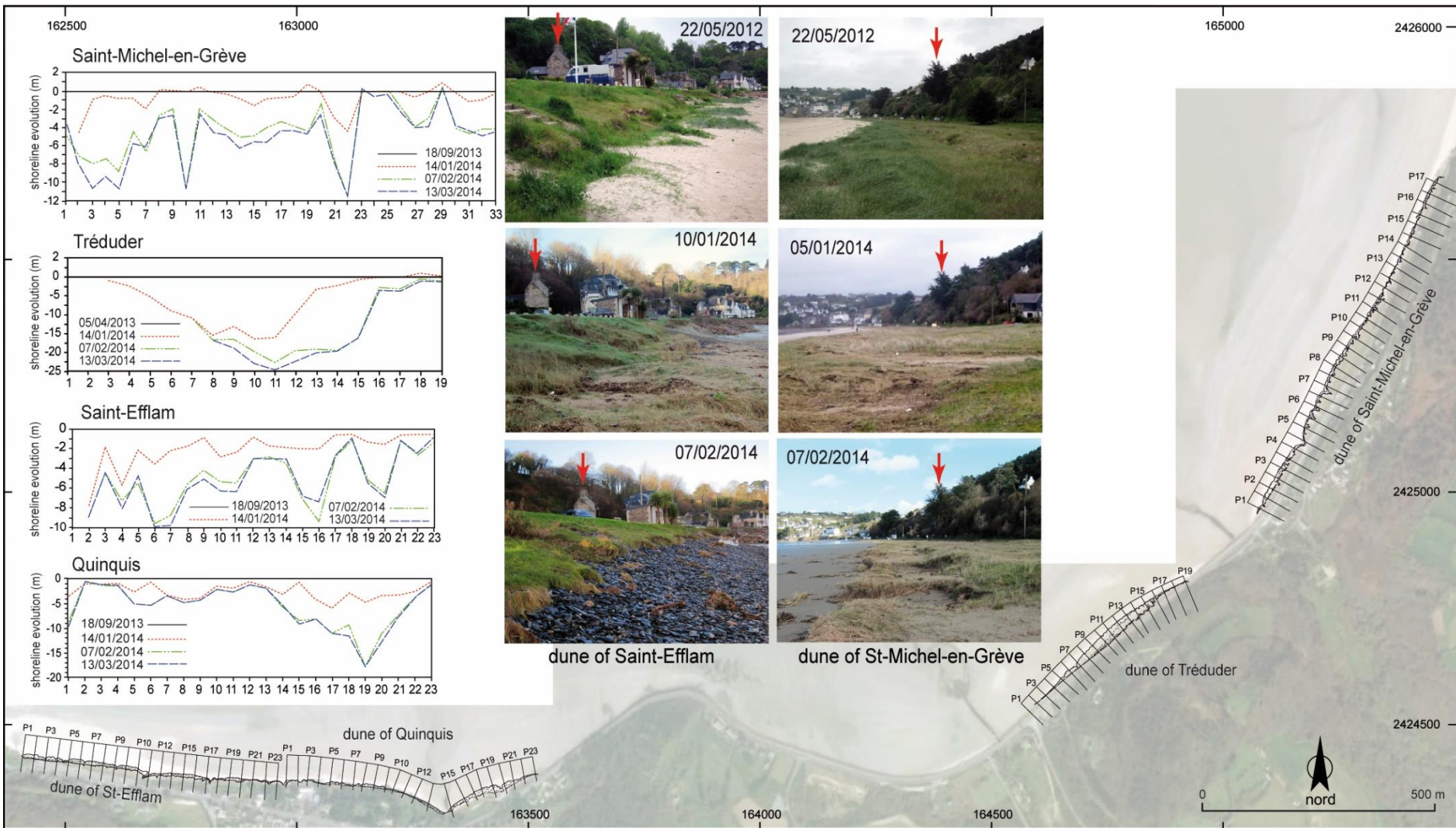
## For each storm event

- storm event of the beginning of January induced small erosion except in the South Brittany
- storm event of the beginning of February was the most dramatic
- storm event of the beginning of March produced very low shoreline retreat

## Impacting regime: sandy beach/high dune systems

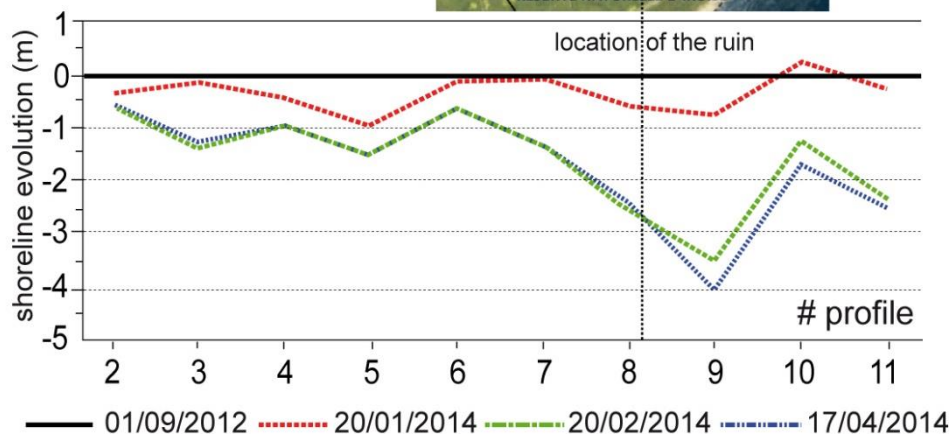
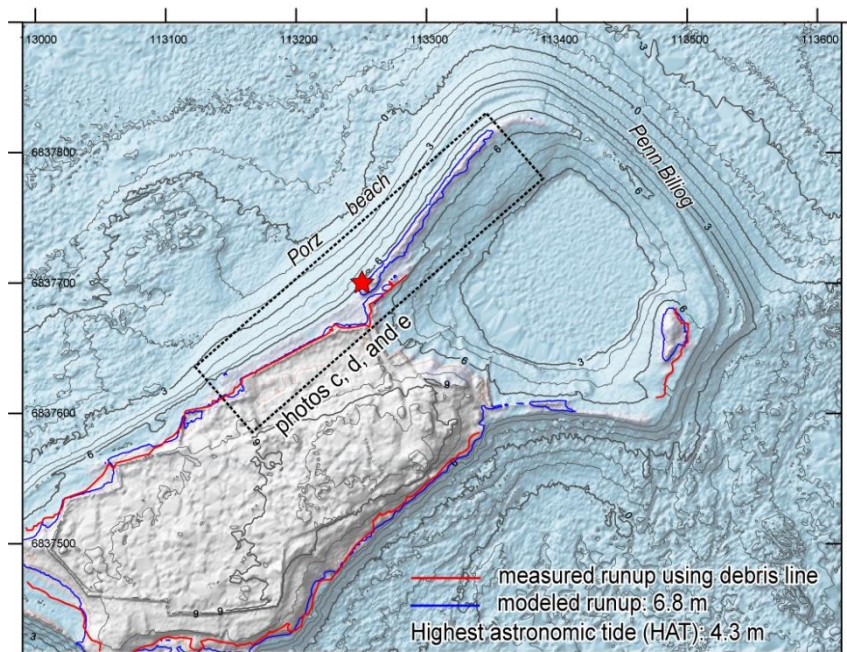


## Inondation regime: low-lying aeolian accumulations (Saint-Michel-en-Grève bay)

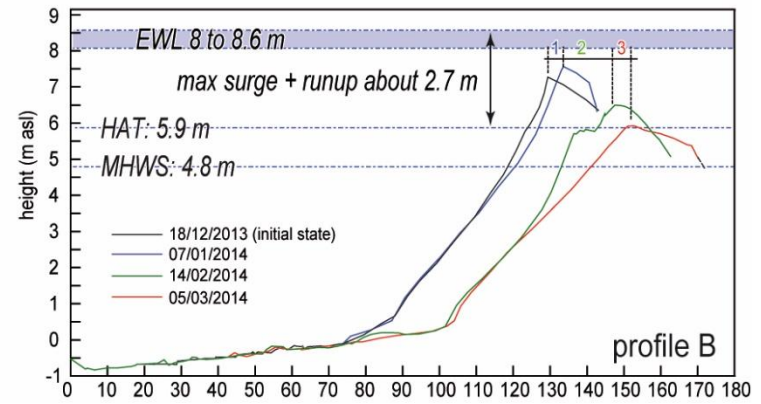
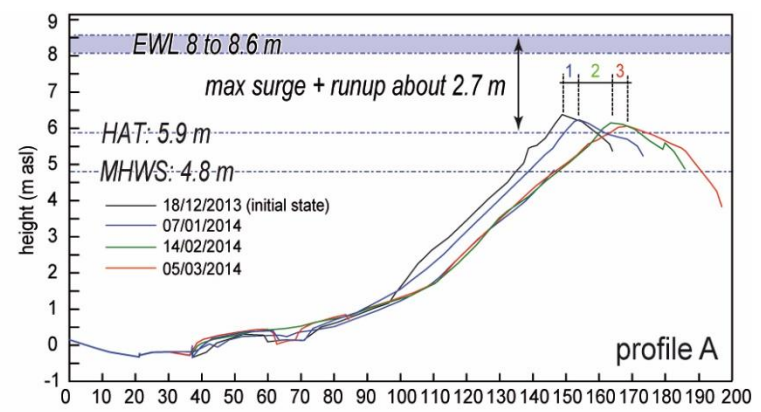




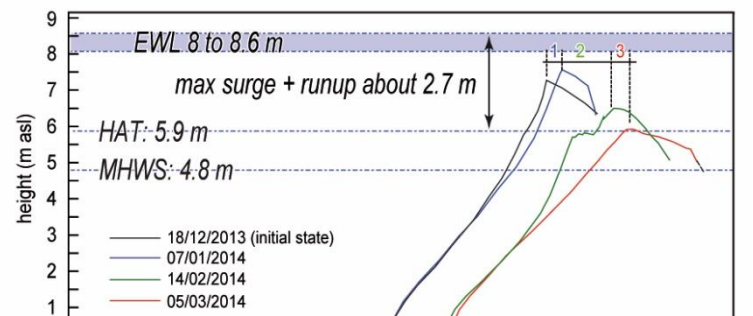
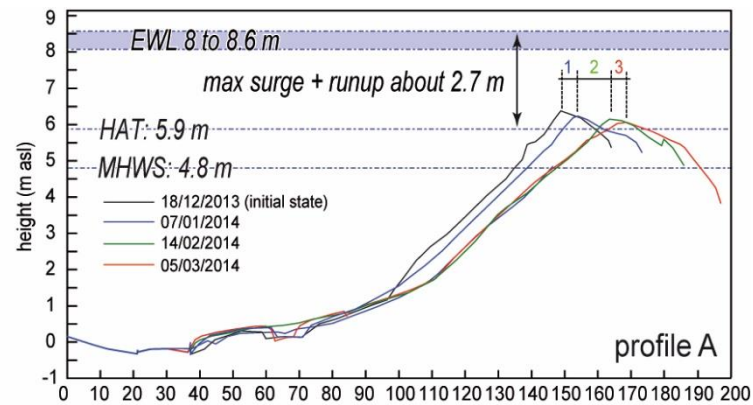
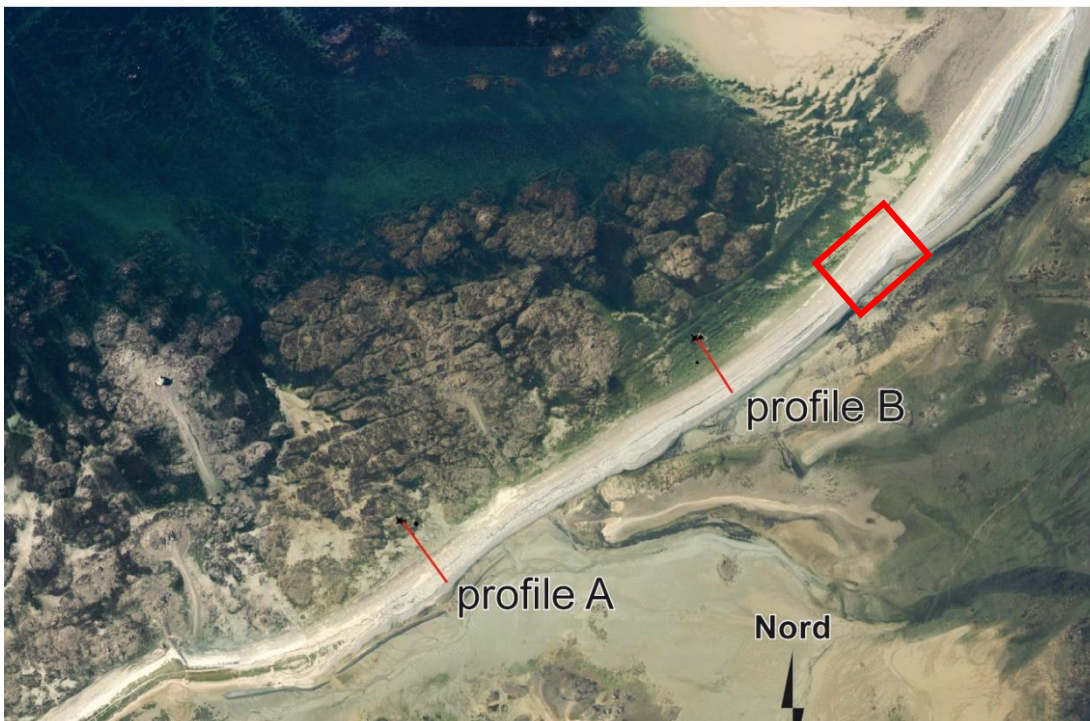
## Overtop to inundation regime: Trielen Island



## Inondation regime: gravel barrier (Sillon de Talbert)



## Inondation regime: gravel barrier (Sillon de Talbert)



- 1 - the exceptional nature of this winter in terms of erosion of the coastline is confirmed
- 2 - such frequency and intensity of stormy events had not been recorded since the winter 1989-1990
- 3 - 23.5 m of maximum wave height is almost the same order of magnitude as those recorded off Shetland: 24.3 m (Hall et al., 2006), or in west of Scotland: 29.1 m (Holliday et al., 2006)
- 4 - inondation regime induced largest shoreline retreat
- 5 - the last dramatic episode in terms of shoreline erosion was the storm of 10 March 2008  $\Rightarrow$  but it was a single storm
- 6 – dune recover is possible  $\Rightarrow$  that was the case after the storm of 10 March 2008





Littoral 2016  
Biarritz, 25-29 octobre

**Thank you for your attention**

Christine storm event  
of 3 March, 2014