

# Monitoring the impact of coastal storms along the littoral zone of the Gulf of Lions, France

Yann Balouin, Ywenn de La Torre, Maureen Guennegan, Bénédicte Guerinel, Hugues Heurteufeux

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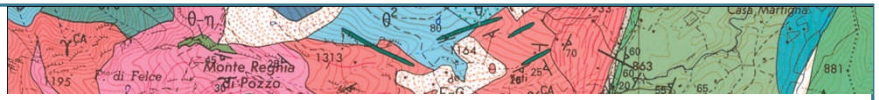
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Contrat de projet Etat/Région
Languedoc-Roussillon
Volet Littoral 2007-2013

7th EUREGEO
Bologna | Italy | June 12th - 15th 2012

EUropean Congress

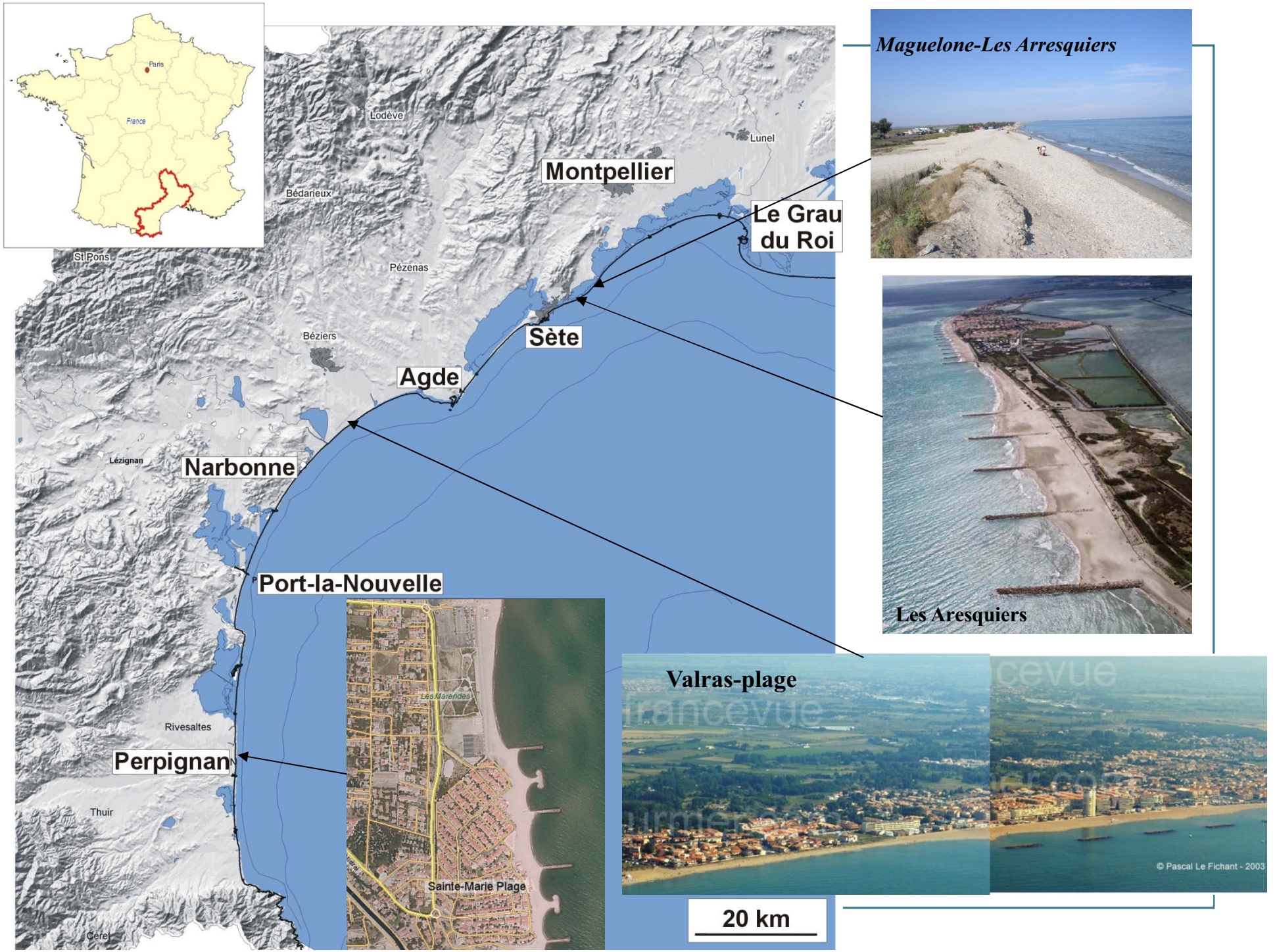
# Monitoring the impact of coastal storms along the littoral zone of the Gulf of Lions, France

*Y. Balouin, Y. De La Torre, M. Guennegan, B. Guerinel and H. Heuteufeux*

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la Région Languedoc Roussillon

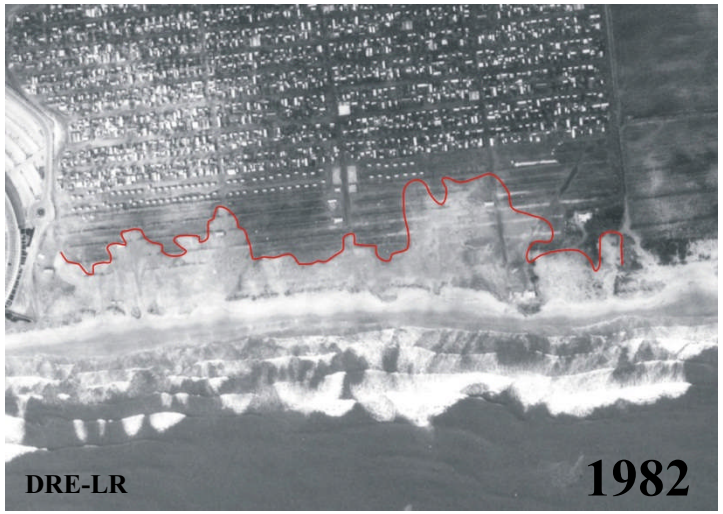
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Céret
Les Marendes
Sainte-Marie Plage
Maguelone-Les Arresquiers
Les Aresquiers
Valras-plage
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20 km

# Motivation

## Storm impacts in Languedoc-Roussillon

- Shoreline evolution
- Nearshore bars evolution
- Beach /dune erosion
- Overwashes/ marine inundation
- Damages to coastal infrastructures
- Socio-economic impacts





















# Motivation

## > Historical review (MICORE FP7 Project)

- All available data on storms and storm impact gathered, backward modeling of wind/waves
- 121 events listed between 1226 and 1868.
- 53 events analyzed between 1940 and 2008




## ➢ Main conclusions

→ Datasets exists for the last 30 years

→ Non-exhaustive information

→ Very often qualitative and difficulty to rely impacts with storm characteristics

→ Not quantitative enough to calibrate morphological models










micore

# Motivation

➢ **Motivation :** Gather an exhaustive information on storm impacts to:

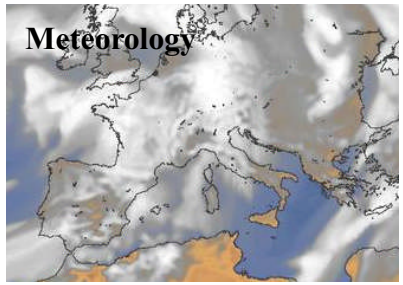
- ➢ **Improve our understanding of storm processes** and validate the existing local and regional cartographies of coastal hazards and coastal risks **;**
- ➢ **Improve the management strategy of coastal hazard**.

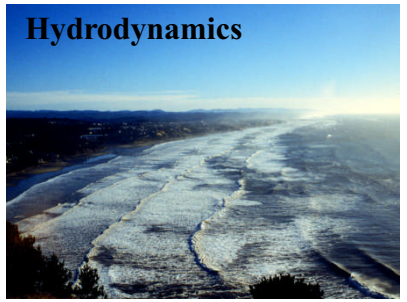
➢ **Double observation :** data and observation exist but

- ➢ **hardly available ;**
- ➢ **very heterogeneous.**

➢ **Objectives**

- ➢ Obtain an homogenous data at the regional scale, and share the various initiatives to monitor storms and storm impacts ;
- ➢ **Capitalize and disseminate the gathered information.**









# Partnership

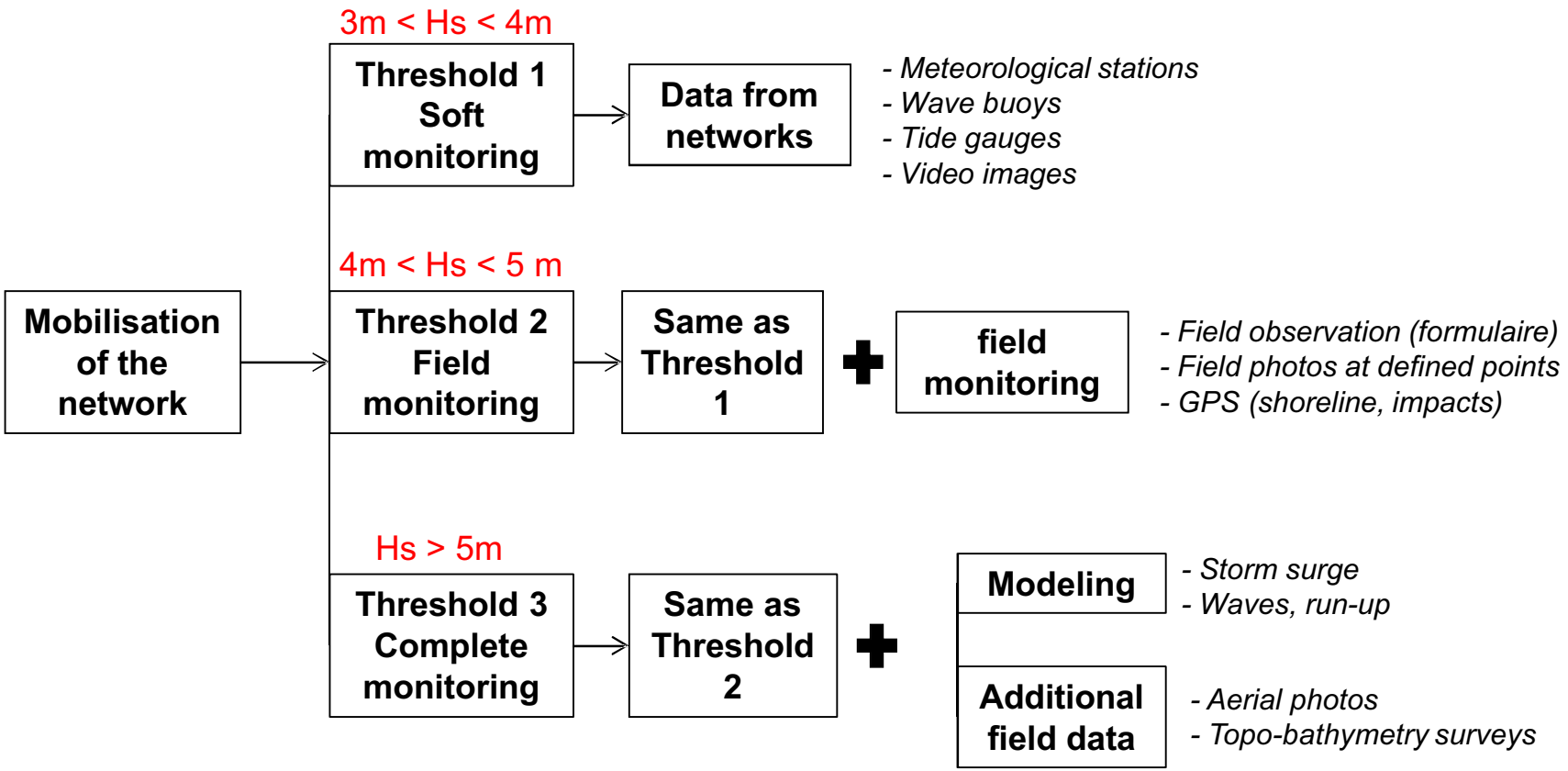
## Partnership agreement

- Participatory network
  - sharing the information from already existing approaches
  - no specific budget;
  - no moral and financial obligation.

- No transfer of intellectual properties

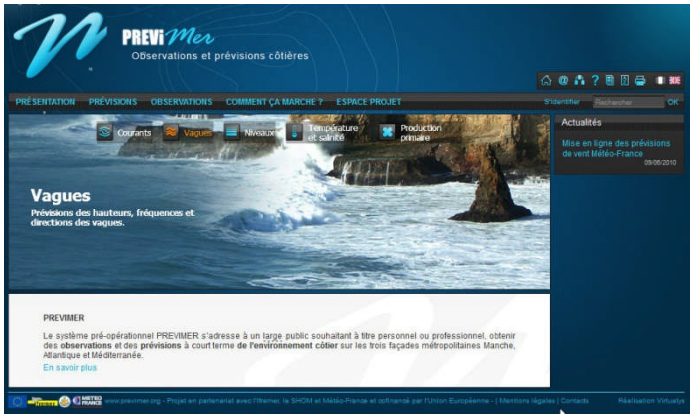
# Monitoring program

- Monitoring of specific places defined by the partners within their own data collection program
- Automatic message sent 3 days before an event
- Storm thresholds based on historical analysis

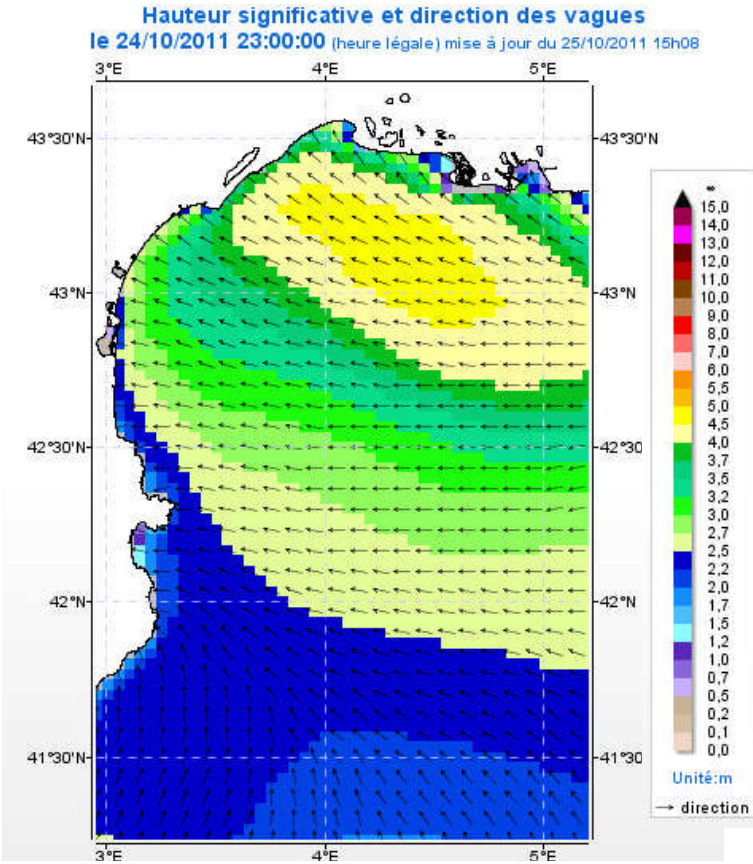


## ➢ Automatic procedure

➢Based on the operational wave forecast model WW3 (www.previmer.org, IFREMER)




➢Procedure to evaluate threshold and send automatically information messages to the partnership (BRGM's servers)




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## ➢ message sent to ~ 50 persons

********** **MESSAGE D'INFORMATION TEMPETE**********

Ce message s'applique au littoral du Languedoc-Roussillon. Il est a vocation informative uni embres du réseau tempête du Languedoc-Roussillon.

**Disclaimer**

**ATTENTION, CE MESSAGE NE SE SUBSTITUE PAS AU BULLETIN METEO-FRANCE, SEULE REFERENCE EN MATIERE D'ALERTE.**

Une tempête est prévue à partir du 24/10/11 selon les caractéristiques (hauteur de vague) suivantes :

Sète : 4.15 m le 03/11/11 a 18H30

Banyuls : 2.21 m le 03/11/11 a 18H30

Leucate : 3.28 m le 03/11/11 a 18H30

Espiguette : 3.86 m le 03/11/11 a 19H

**Hydrodynamic conditions at the storm peak and date**

Sur la base des connaissances historiques, une tempête de ce type peut occasionner des impacts sur le littoral et un suivi de la tempête peut être mis en œuvre selon le protocole défini dans le cadre du réseau tempête.

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Pour rappel, les suivis suivants sont préconisés (pour plus de détails se référer au protocole) :
- 3m < Hs < 4m : suivi léger avec relevé des réseaux de mesures (station météo ; bouées, mar déplacement sur le terrain ;
- 4m < Hs < 5 m : suivi amélioré avec en sus des observations de terrain simples (formulaire, p
- Hs > 5m : suivi complet avec en sus des levés complémentaires sur le terrain (photographies triques) et des sorties de modèle.

**Monitoring procedure**

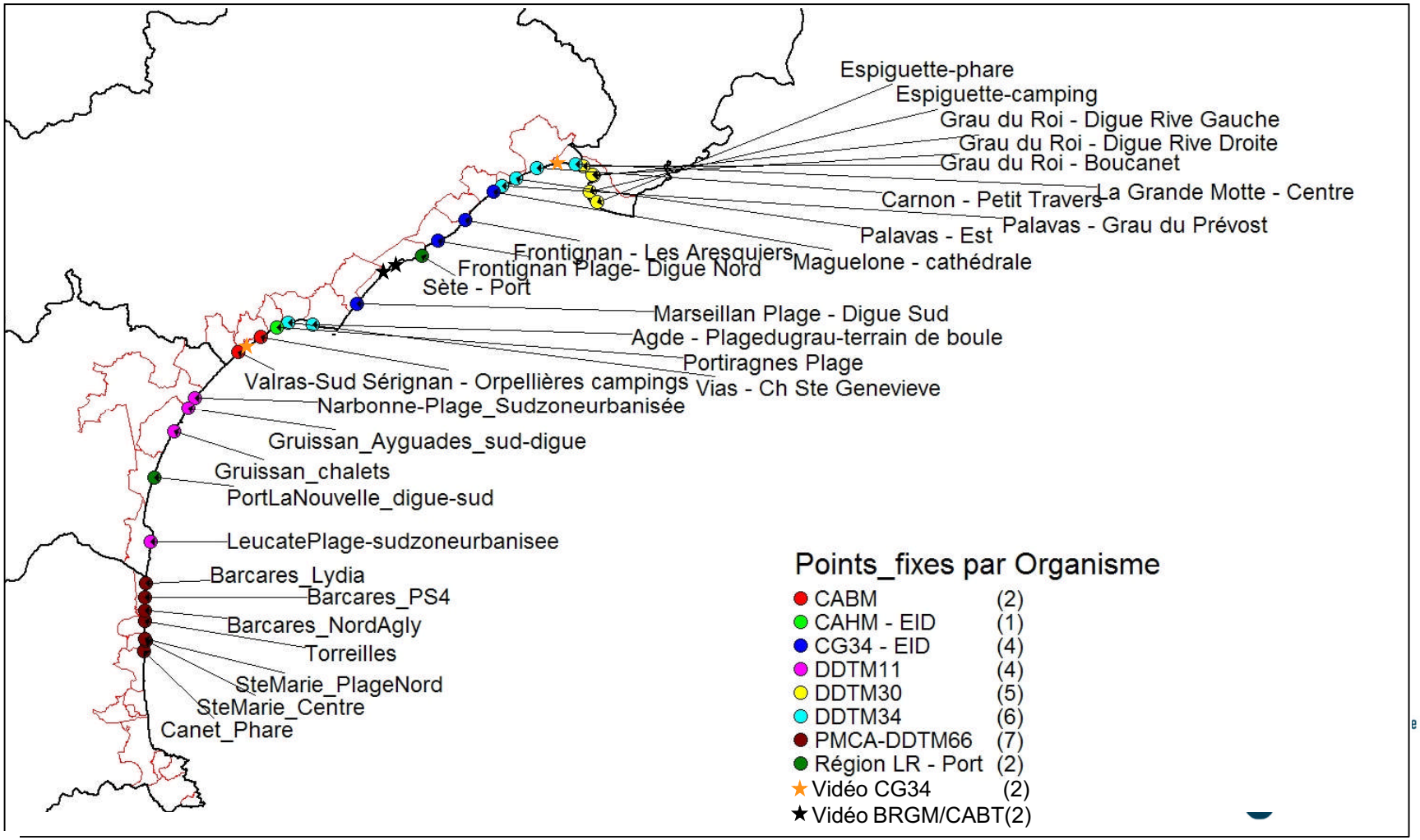
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s il ne vous est pas possible de mobiliser un suivi, merci de prendre contact avec l'équipe d'anima (y.balouin@brgm.fr et y.delatorre@brgm.fr ).

**Contacts**

# Defined stations

**40 Points** selected by field surveyers to characterise impacts, water levels, erosion, marine flooding, …



# Defined stations

## Espiguette – Lighthouse
## DDTM30



**X = 746 239 ; Y = 1 833 455 (Lambert93)**



**West**



**East**

# Frontignan – Les Aresquiers
# CG34/EID

Suivi photographique terrestre du littoral de l'Hérault




Photographie : x : 720 400 ; y : 1 830 100

Analyse comparative :

Le trait de côte a reculé d'une dizaine de mètres environ et la plage est davantage creusée en falaise.

EID MÉDITERRANÉE



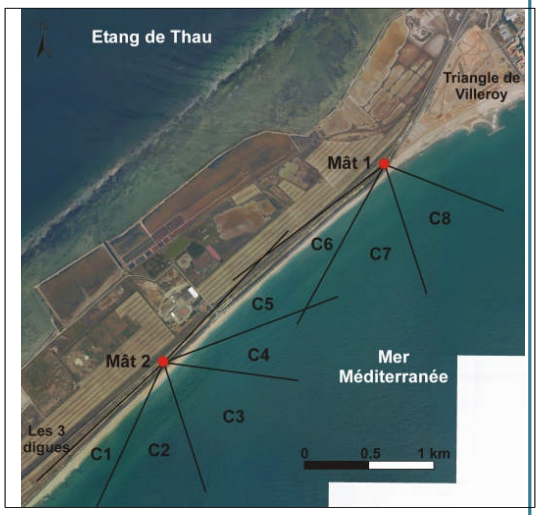


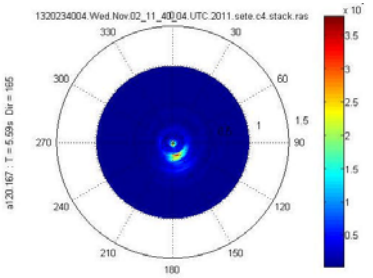

# Defined stations

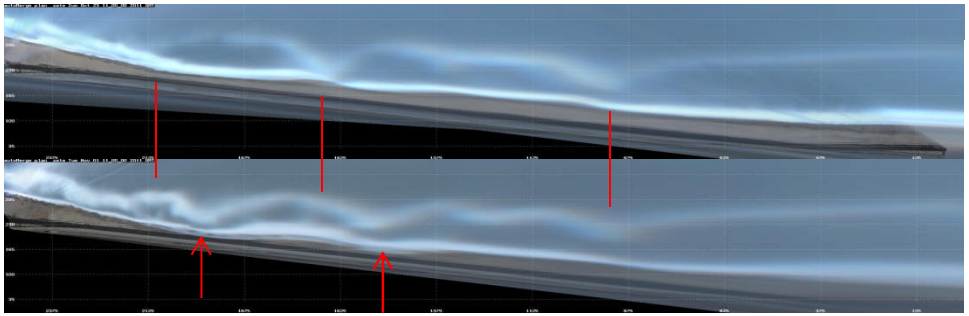
Lido de Sète
BRGM/Thau Agglo







**23/10/2011**

**01/11/2011**

# Defined stations

## Gruissan – Chalets
## DDTM11





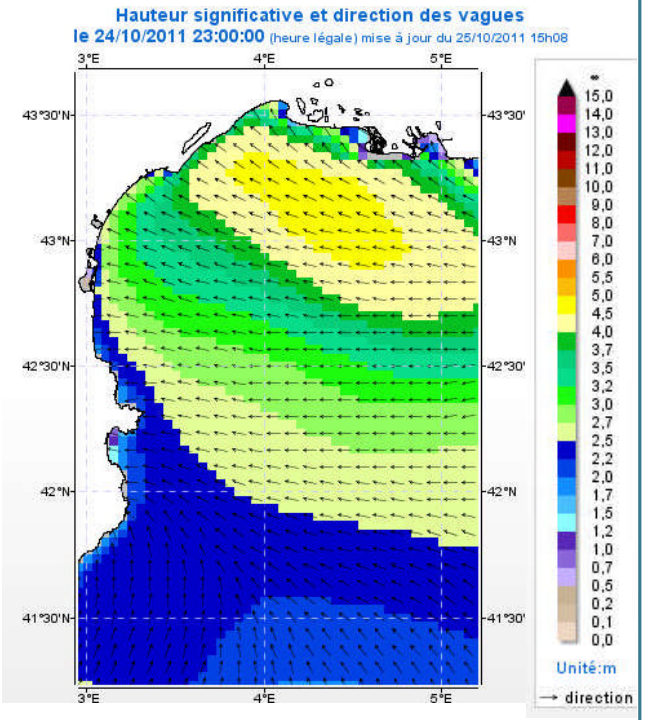




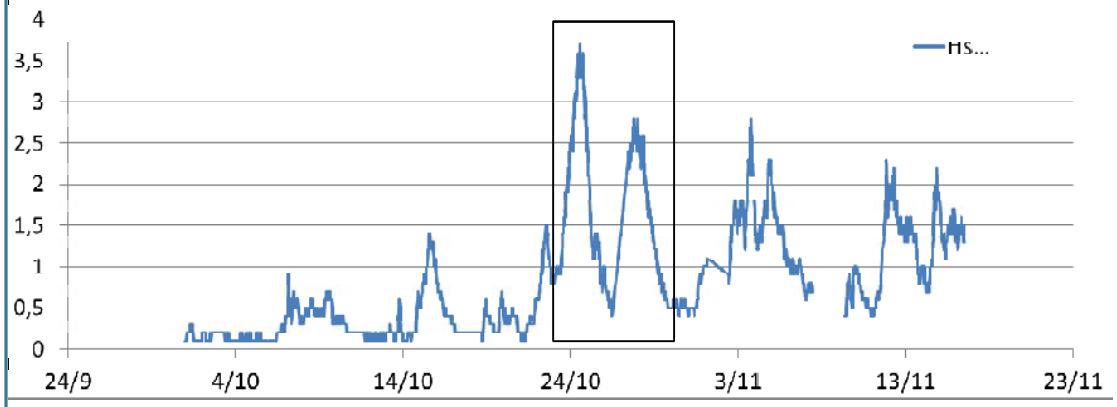

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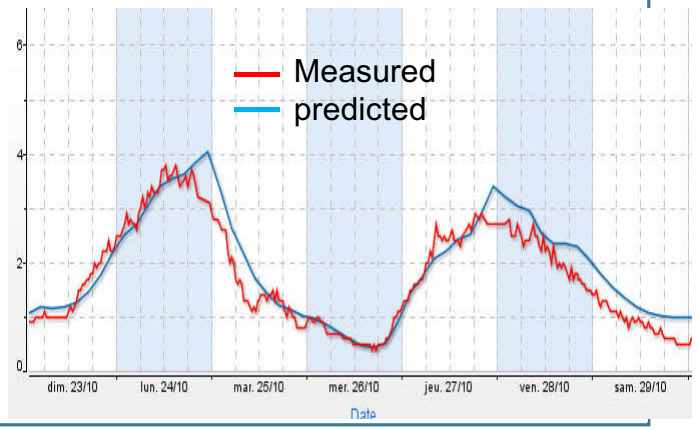
# Results – Storm group of Oct-Nov 2011

- **Storm group from Oct 24th to Nov 4th**
  - Message sent to all partners Oct 22nd
  - Storm thresholds reached for ¾ of the region
  - Hs ~ 4 m → Procedure 2 – Field monitoring




Significant wave heights at Sète (DREAL)



# *Results – Storm group of Oct-Nov 2011*

## Evaluation of the procedure

- All partners have received the message indicating a possible event
- 27 defined stations were visited: more than 100 observations
- Data and observations: state of the beach, water levels, wave conditions, impacts, shoreline retreat
  - Formulaires + photos + GPS points

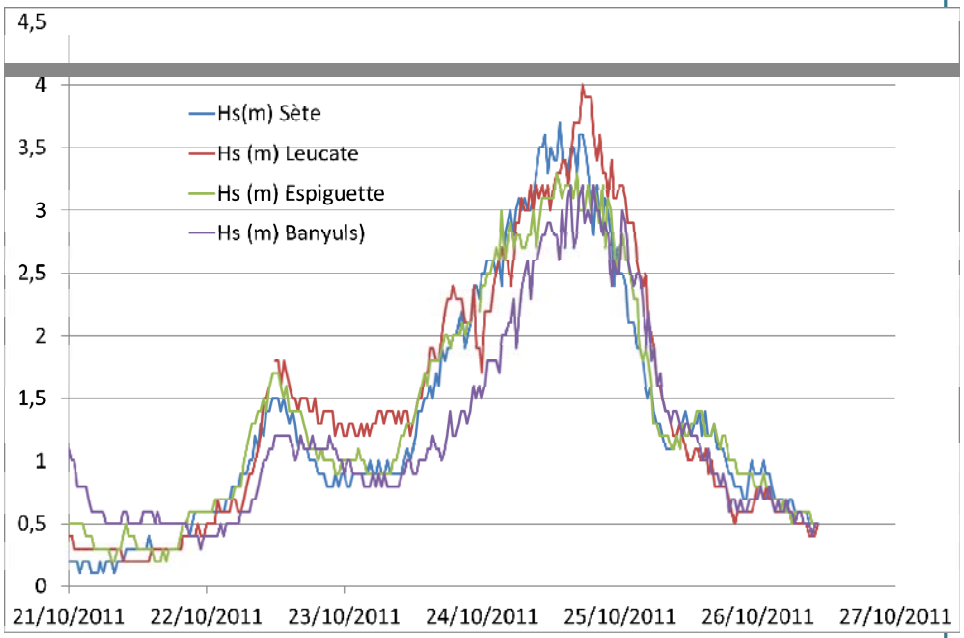
## Evaluation of the storm event

- Wave under the 1y RT, and moderate storm surge
- Impacts increased by the storm group
- Moderate impact: erosion of beach and dune fronts, damage on coastal defenses
- 1 death at Argelès

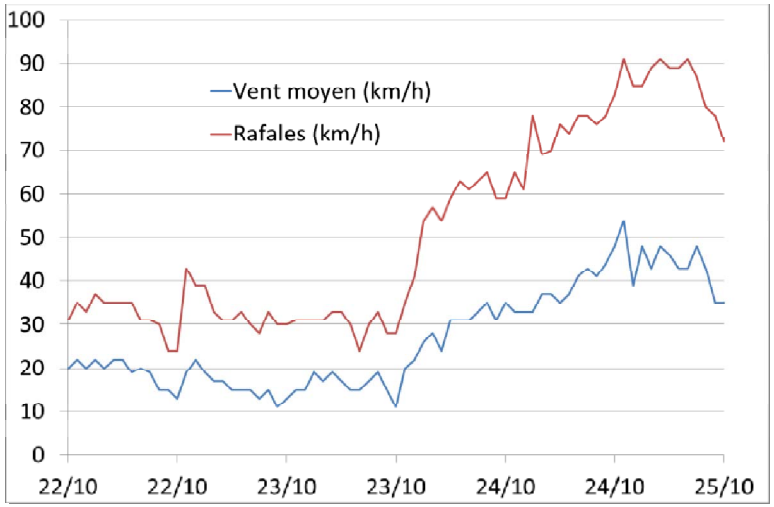
# Results – Storm group of Oct-Nov 2011

## ➢ Storm event October 24-25

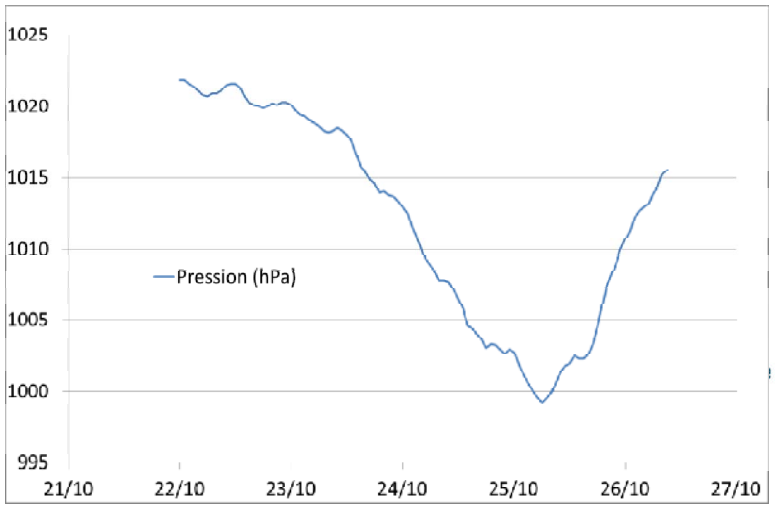
| Wave buoys DREAL | Significant Heights | Maximum heights |
|---|---|---|
| Espiguette | 3,4 m | 5,7 m |
| Sète | 3,8 m | 6,6 m |
| Leucate | 4 m | 7,5 m |
| Banyuls | 3,2 m | 5,4 m |




**Wind velocities at Sète (SYNOP)**




**Atmosphérique pressure at Sète (SYNOP)**



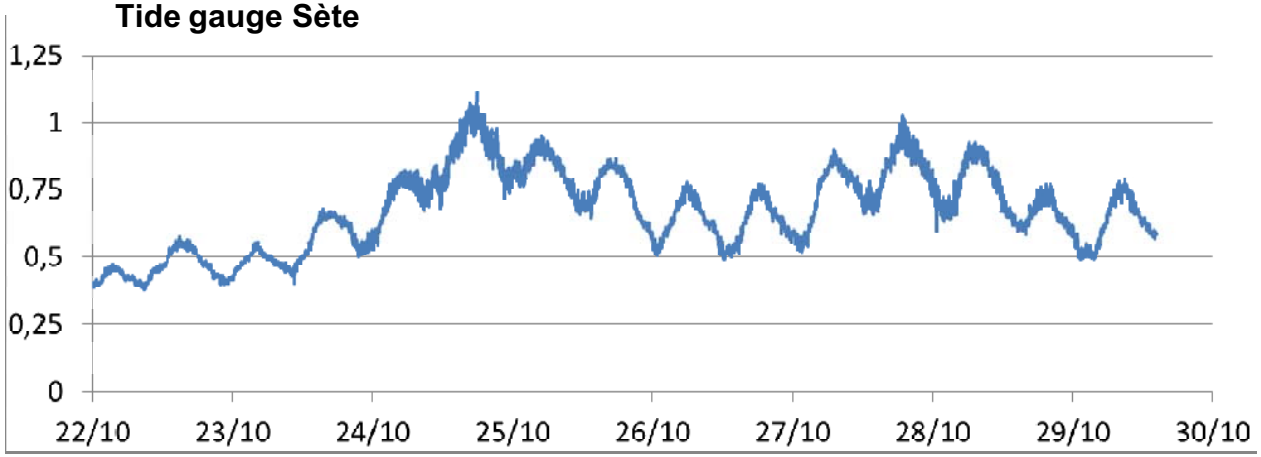
# Results – Storm group of Oct-Nov 2011

## ➢ Observed water levels / storm surge

| Sites | Observed water levels | source |
|---|---|---|
| Port de Carnon | 0,55 NGF | DDTM34 Est |
| Petit Travers (plage) | ~ 0,90 NGF | DDTM34 Est |
| La Grande Motte port | 0,60 NGF | DDTM34 Ouest |
| Cap d'Agde | 0,50 NGF | DDTM34 Ouest |
| Valras | 0,70 NGF (25/11) | DDTM34 Ouest |
| Port-La-Nouvelle | 0,85 NGF | Port PLN |
| Sète | 1,12 ZH ~ 0,85 NGF | Marégraphe SHOM |




**Tide gauge Sète**



# Results – Storm group of Oct-Nov 2011

- **Observed overtopping and overwashes**



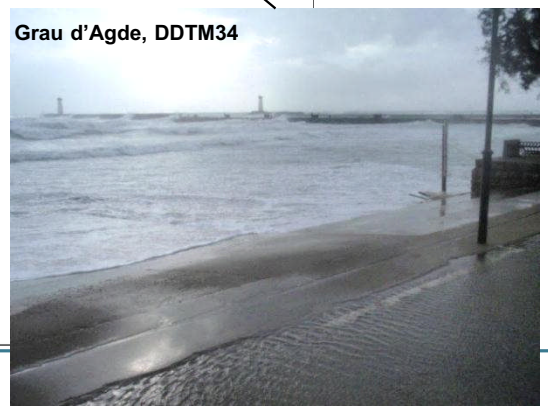












# Results – Storm group of Oct-Nov 2011

## ➢ Observed erosion spots















# Results – Storm group of Oct-Nov 2011

- **Observed impacts on sea defenses**


Portiragnes, EID


Palavas, BRGM


Lido de Sète, BRGM


Leucate, EID


Cap d'Agde, EID

# Conclusion




## ➢ Regional Storm network

- ➢ Sharing human and technical effort to obtain an exhaustive and quantitative information on storms and storm impacts
- ➢ Operational procedure successful
- ➢ Datasets, photos, formularies shared in an online web server (restricted to the partnership)

## ➢ Perspectives

- ➢ Implementation of an on-line tool for data transfer
- ➢ WebGis and automatic edition of storm reports
- ➢ Implementation of the historical database
- ➢ Use of datasets for calibration of models

http://littoral.languedocroussillon.fr

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