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

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Hugues Heurteufaux

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



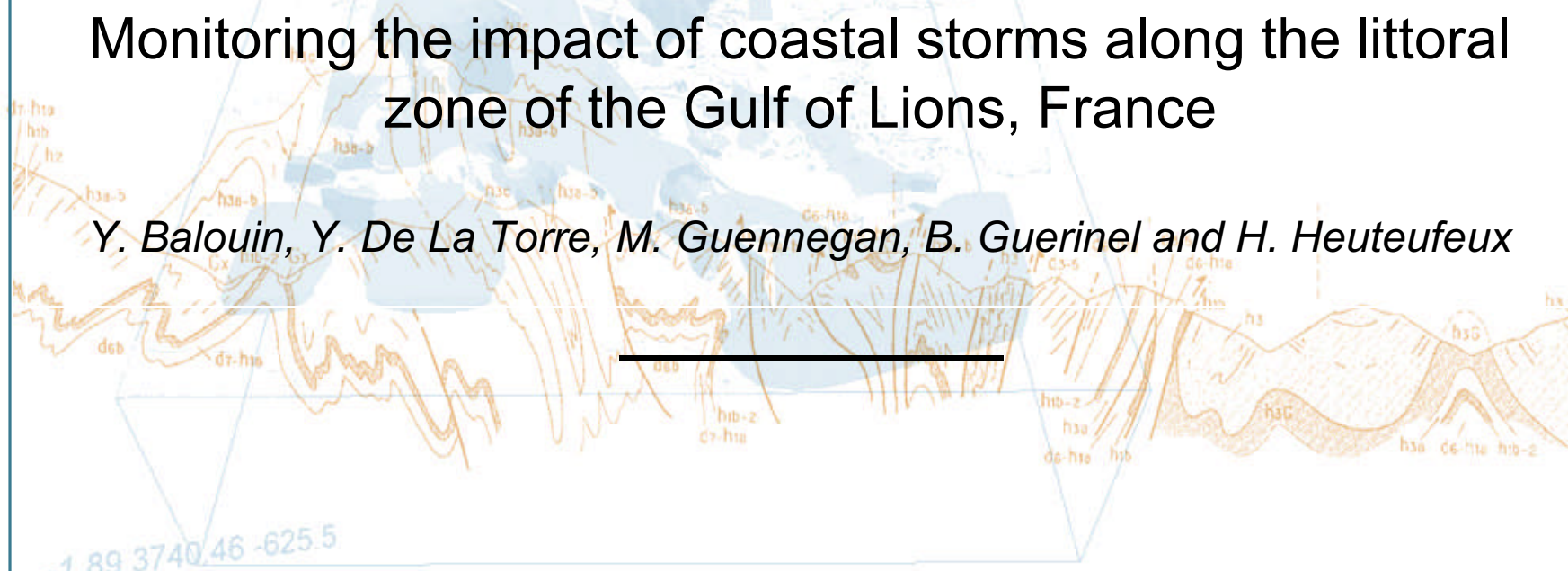
7th EUREGEO

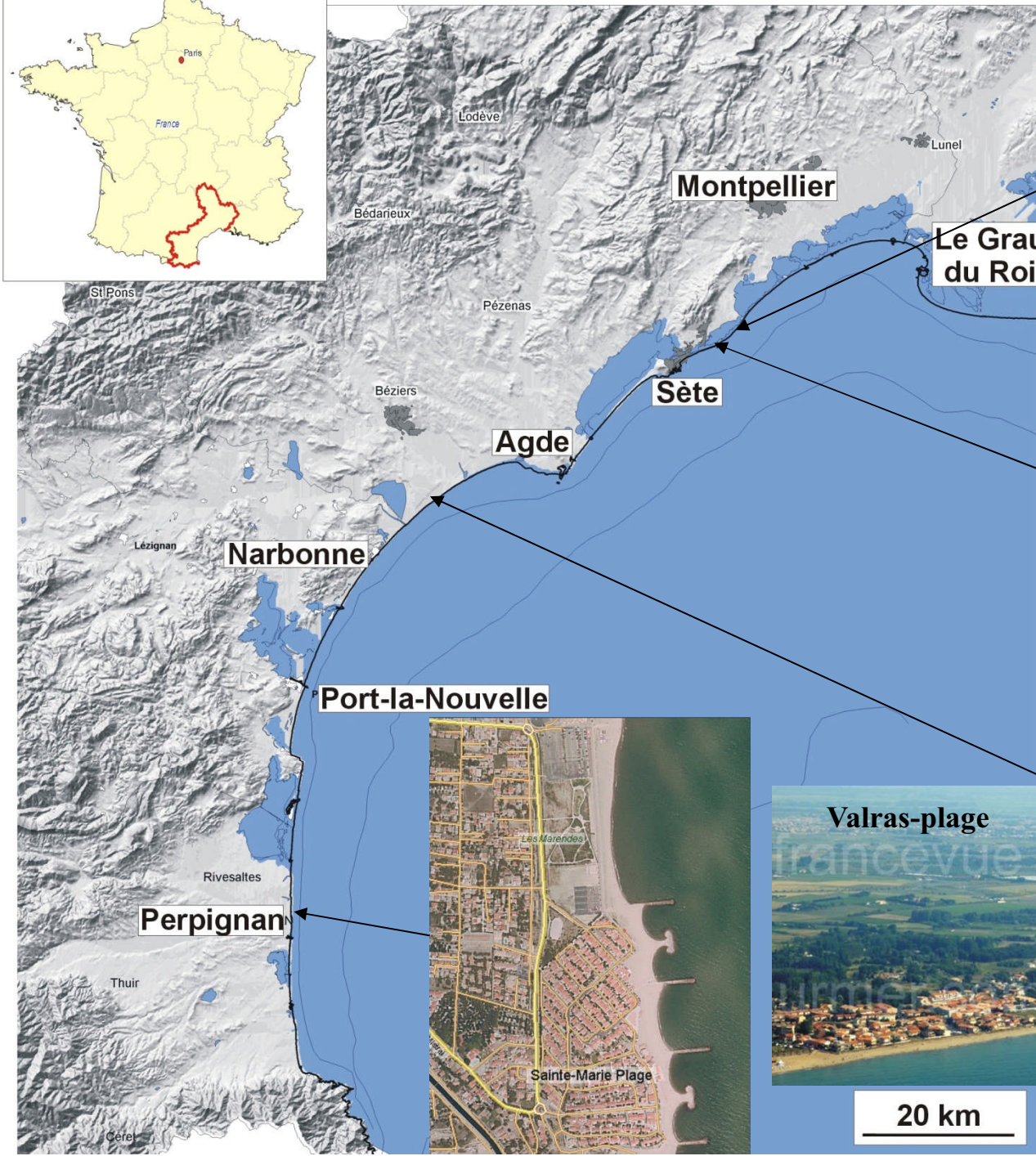
Bologna | Italy | June 12th - 15th 2012



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

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Maguelone-Les Arresquiers



Les Aresquiers



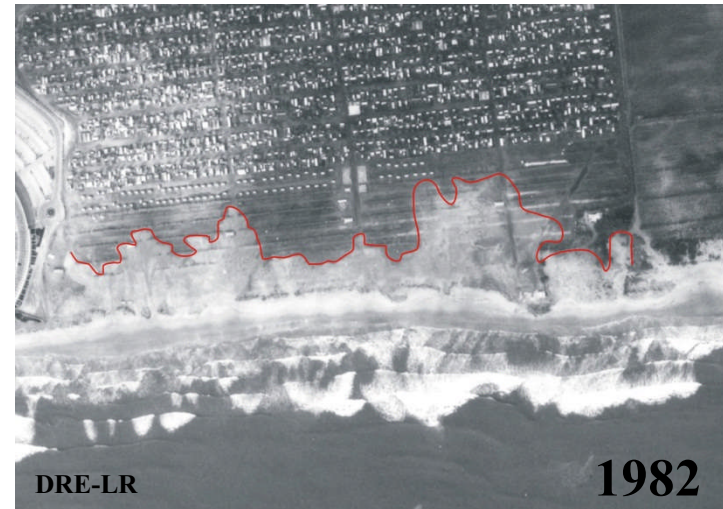
Valras-plage

© Pascal Le Fichant - 2003

20 km

Storm impacts in Languedoc-Roussillon

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



> Historical review (MICORE FP7 Project)

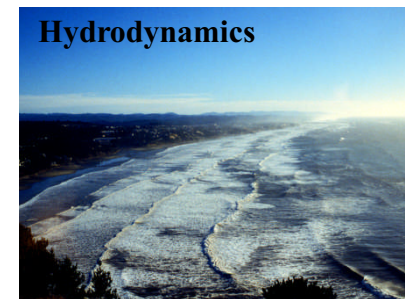
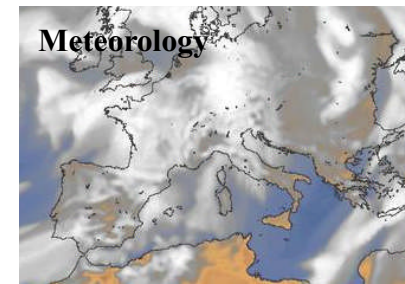
- All available data on storms and storm impact gathered, backward modeling of wind/waves
- 121 events listed between 1226 and 1868.
- 53 events analyzed between 1940 and 2008

➤ 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



- **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.**





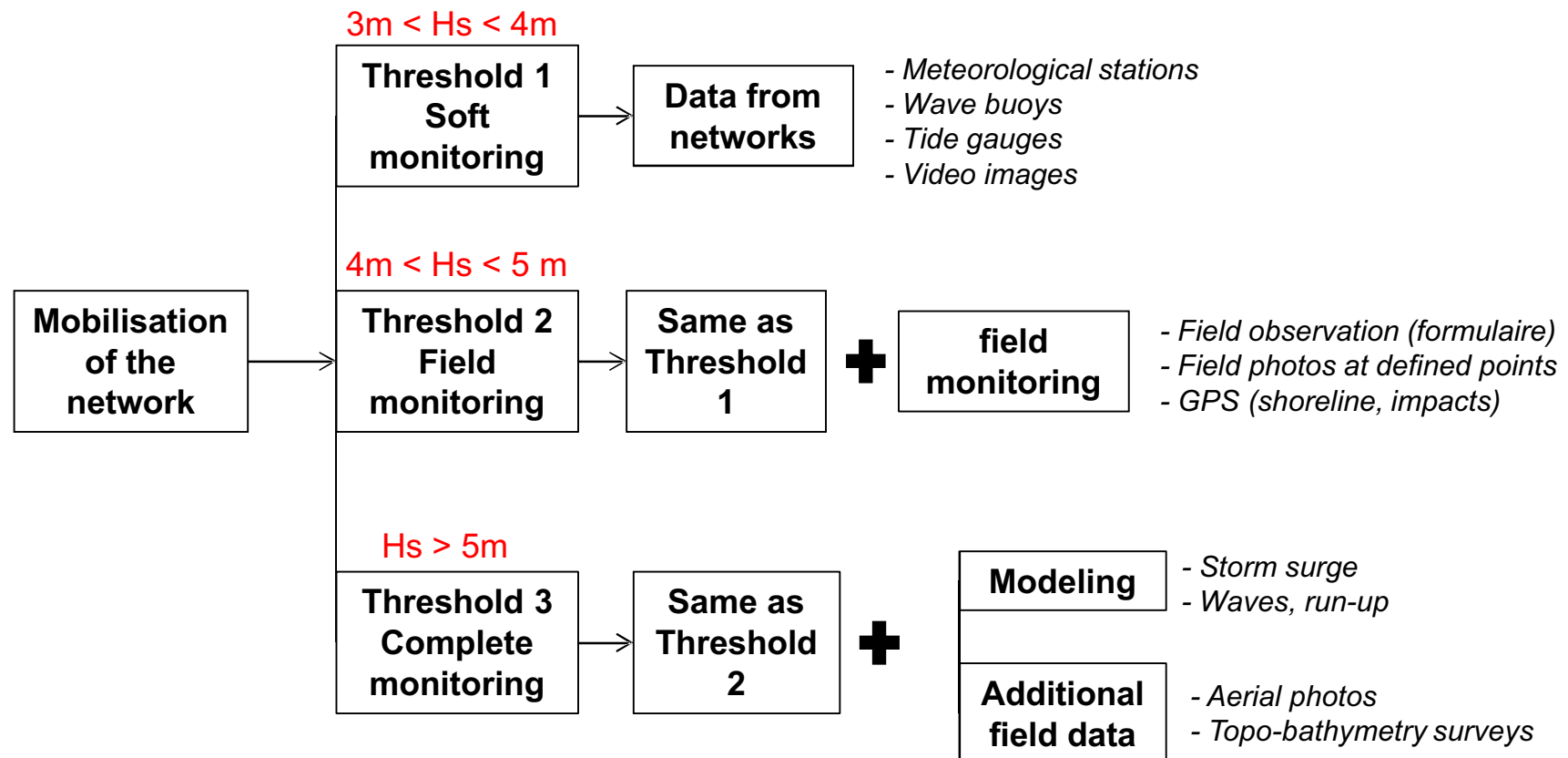
➤ Partnership agreement

- Participatory network
 - sharing the information from already existing approaches
 - no specific budget;
 - no moral and financial obligation.
- No transfer of intellectual properties



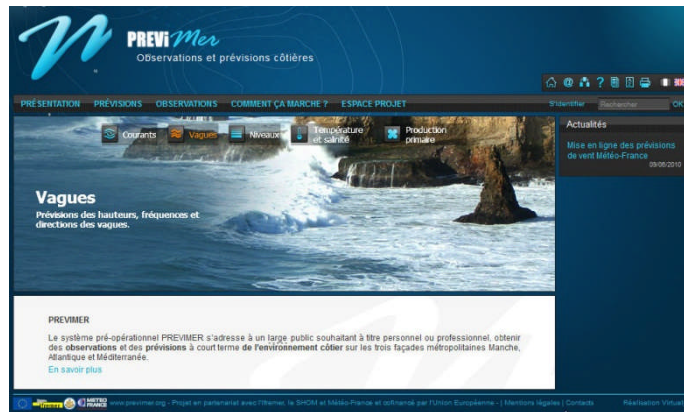
Monitoring program

- 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

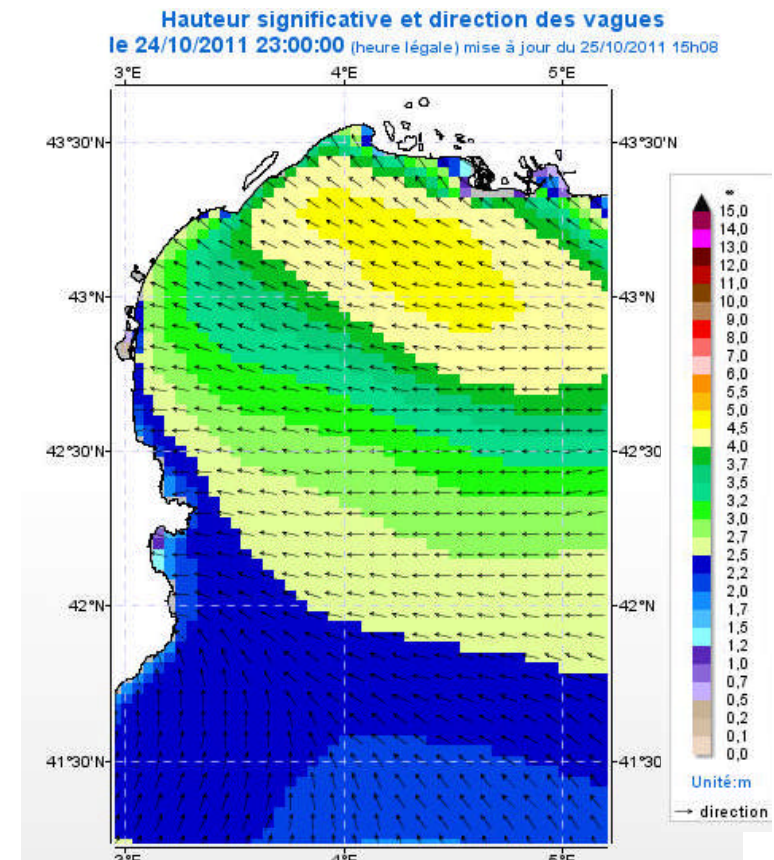


➤ Automatic procedure

- 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)



➤ message sent to ~ 50 persons

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

Ce message s'applique au littoral du Languedoc-Roussillon. Il est a vocation informative uniquement pour les membres 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.

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, marégraphe, déplacement sur le terrain ;
- 4m < Hs < 5 m : suivi amélioré avec en sus des observations de terrain simples (formulaire, photos, vidéos)
- Hs > 5m : suivi complet avec en sus des levés complémentaires sur le terrain (photographies, vidéos, mesures de marées, etc.)

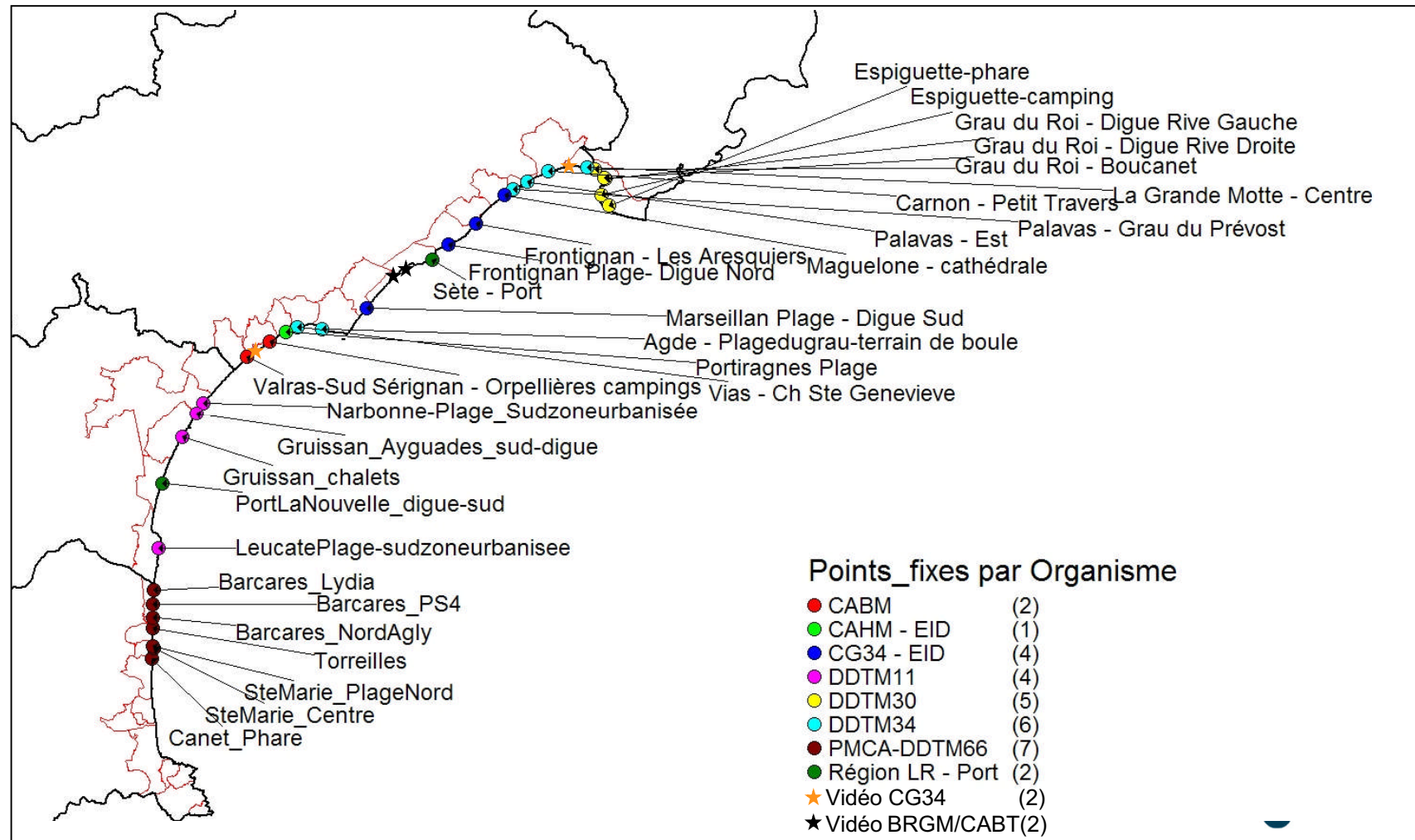
**Monitoring
procedure**

s il ne vous est pas possible de mobiliser un suivi, merci de prendre contact avec l'équipe d'animation (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
Observatoire National de Zones Atteintes

26 Novembre 2008

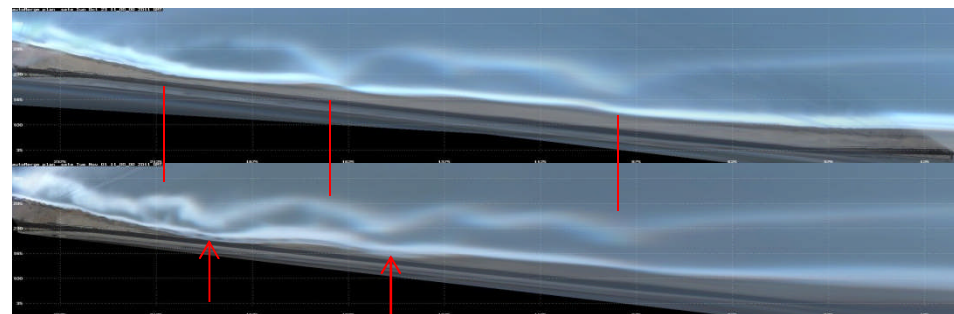
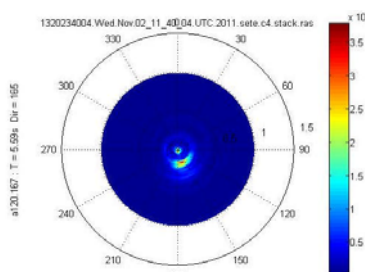
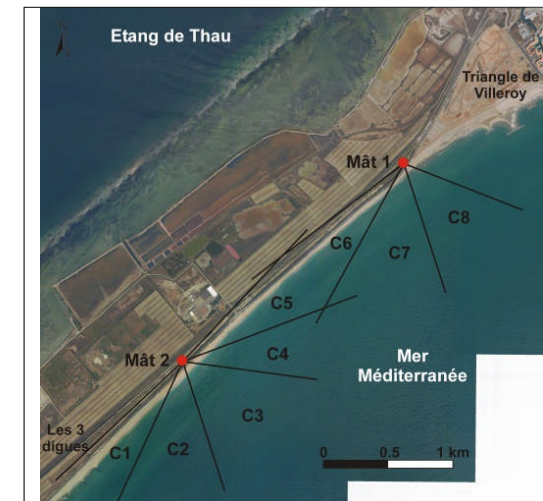


04 Février 2009



Defined stations

Lido de Sète
BRGM/Thau Agglo



23/10/2011

01/11/2011

Defined stations

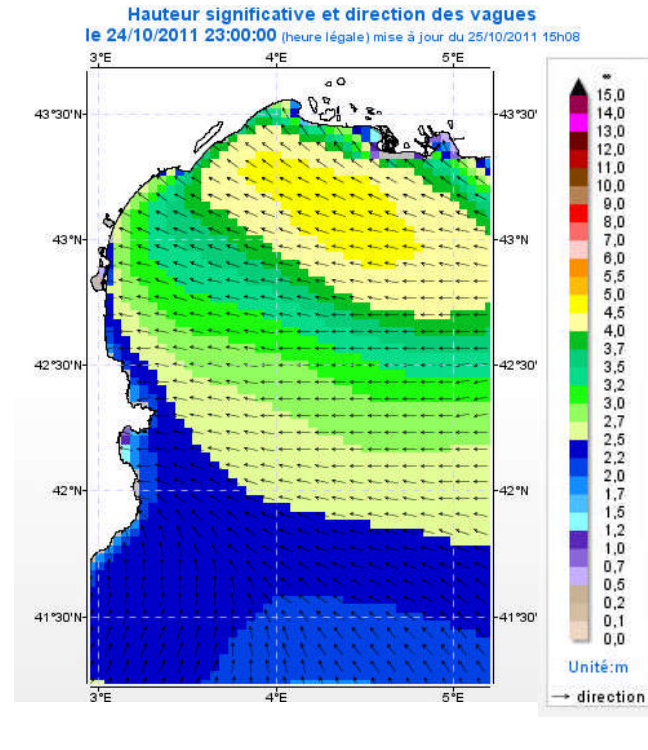
Gruissan – Chalets
DDTM11



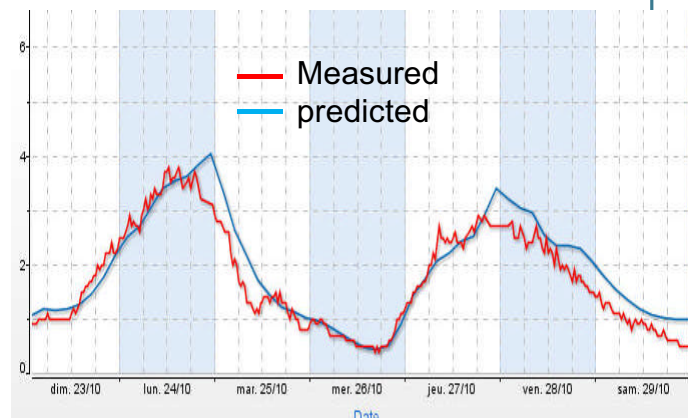
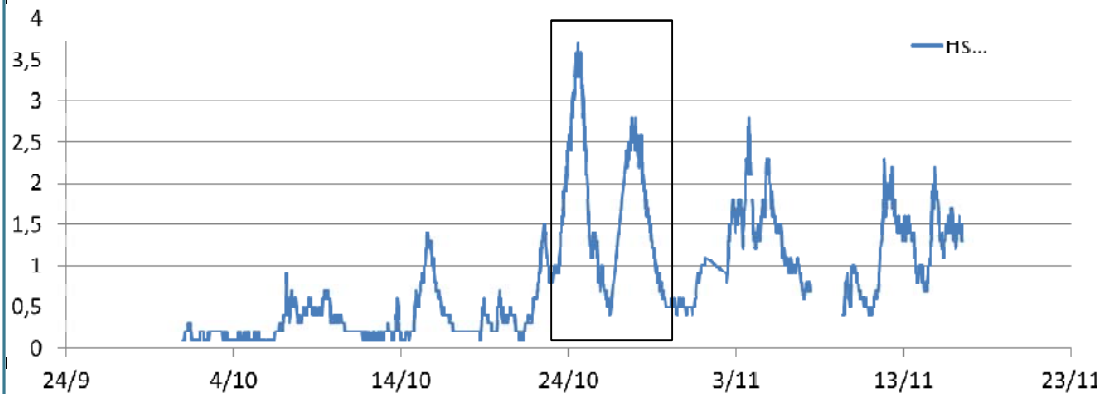
durable

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 $\frac{3}{4}$ of the region
 - $H_s \sim 4$ m \rightarrow 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

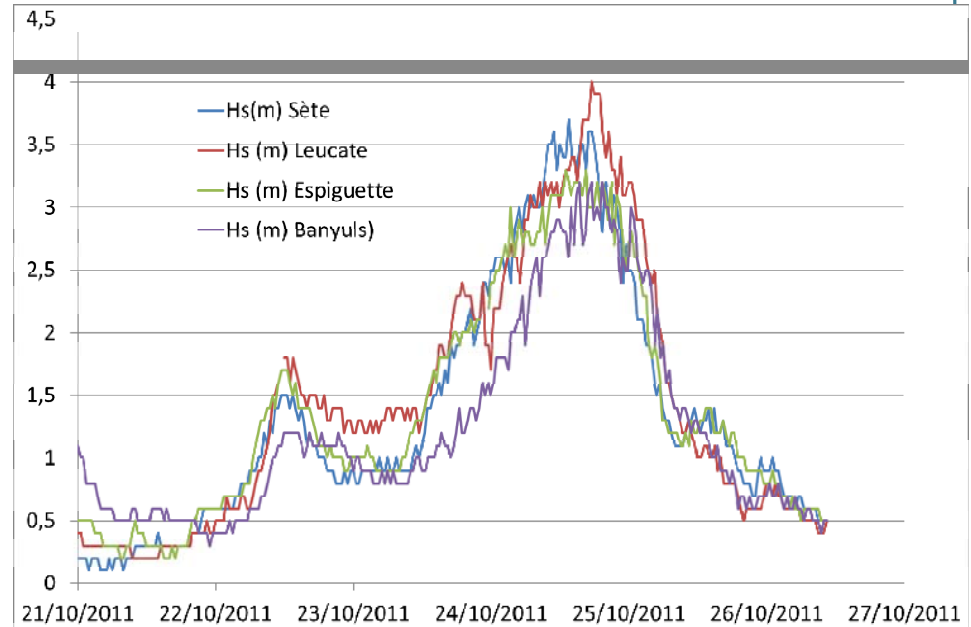
- Wave under the 1y RT, and moderate storm surge
- Impacts increased by the storm group
- Moderate impact: erosion of beach and dune fronts, damage on coastal defenses
- 1 death at Argelès



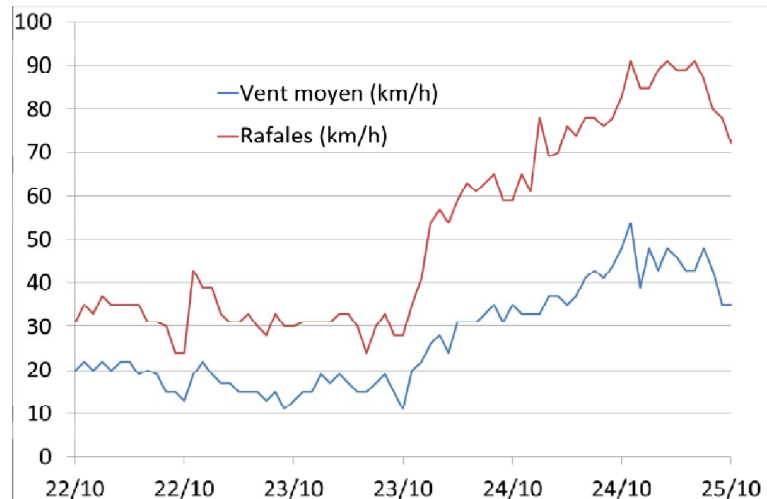
Results – Storm group of Oct-Nov 2011

➤ Storm event October 24-25

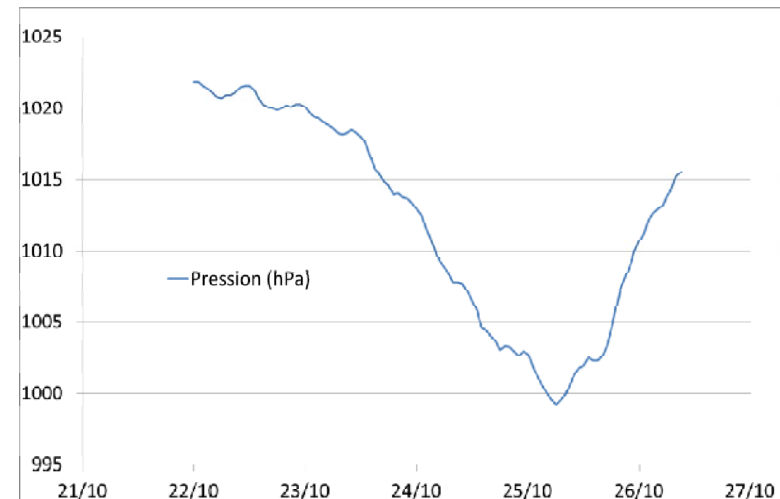
Wave buoys DREAL	Significant Heights	Maximum heights
Espiguette	3,4 m	5,7 m
Sète	3,8 m	6,6 m
Leucate	4 m	7,5 m
Banyuls	3,2 m	5,4 m



Wind velocities at Sète (SYNOP)



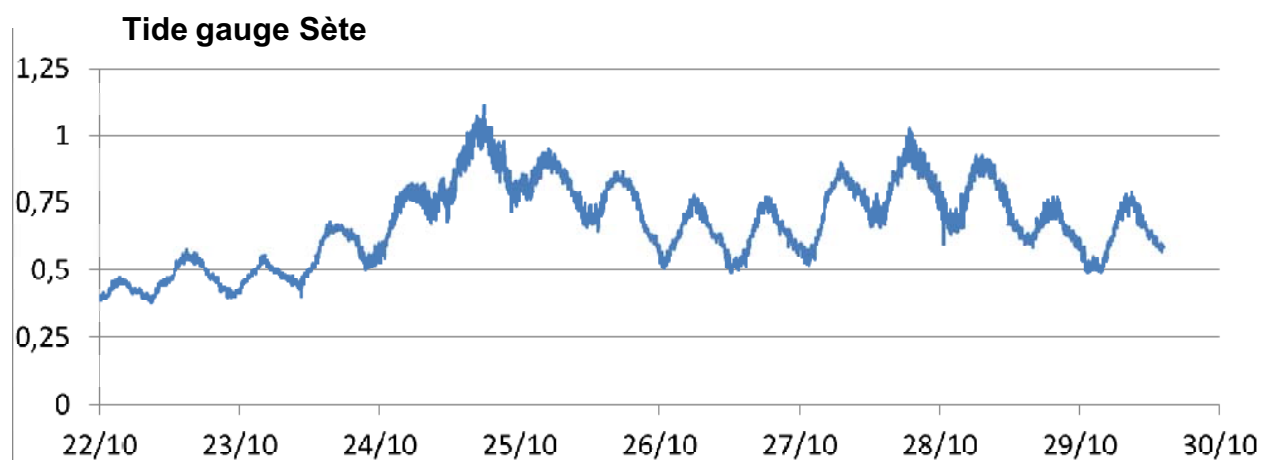
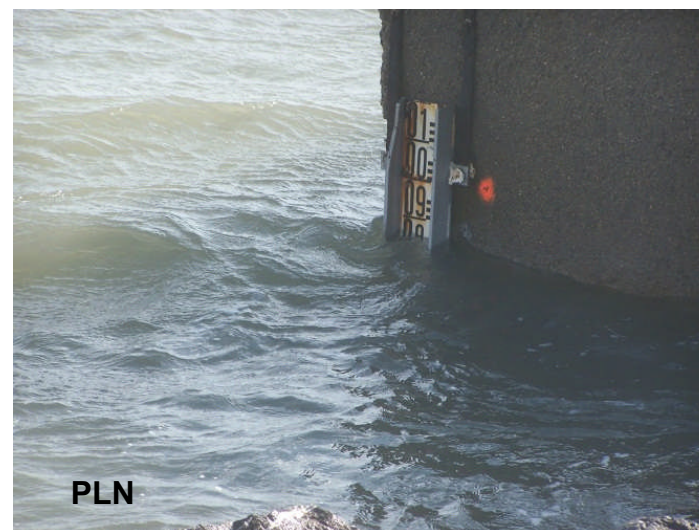
Atmosphérique pressure at Sète (SYNOP)



Results – Storm group of Oct-Nov 2011

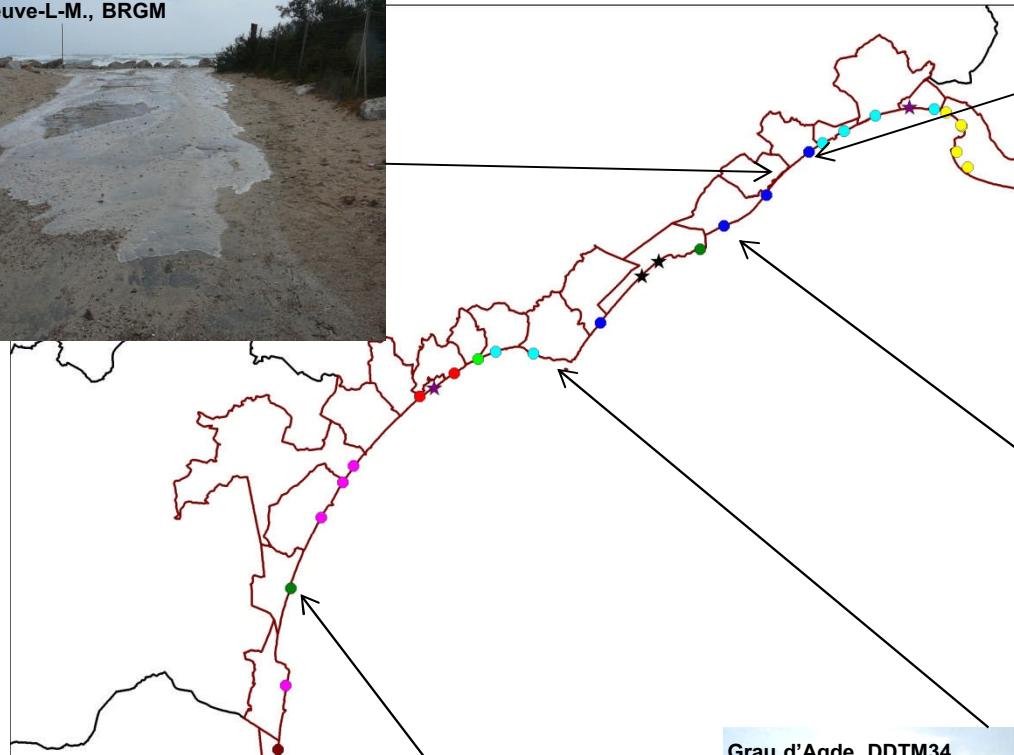
➤ Observed water levels / storm surge

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



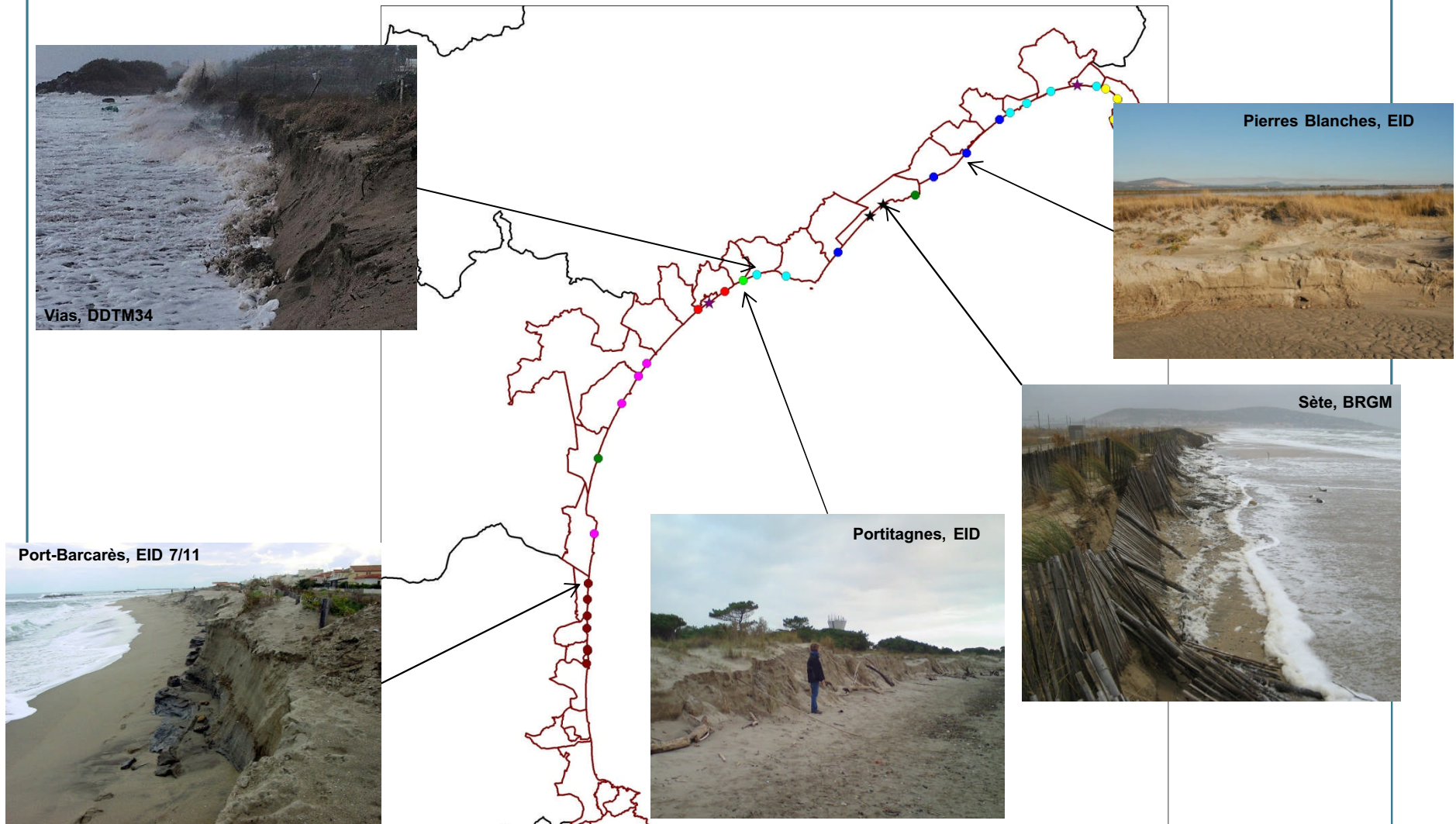
Results – Storm group of Oct-Nov 2011

➤ 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



➤ 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>