

JOHANNA project

Analysis of insured structural damages due to waves and marine flooding hazards (storms Johanna - 2008 and Xynthia - 2010)

The damages evaluations of storms carried on by the insurers are usually made by linking directly the costs of damages to the wind speeds. Indeed, the wind force hazard is causing the most important part of the damages on the path of the storm.

However, wind is also the triggering factor of secondary forcings, in generating storm surges and waves that hit the coastal areas. During the storms Johanna (10-12 March 2008) and Xynthia (27-28 February 2010), these surges induced by very strong winds and atmospheric conditions, were combined with swell and spring high tides, which generated coastal marine flooding that caused significant damages on French Atlantic coasts.

In the present-day context of rising sea level, the coastal hazards research is in real expansion. Many studies focuses on the coastline erosion and marine flooding hazards, mainly on a geomorphological aspect, but most of them do not develop the aspect of damages they induce in urban areas, places of human assets.

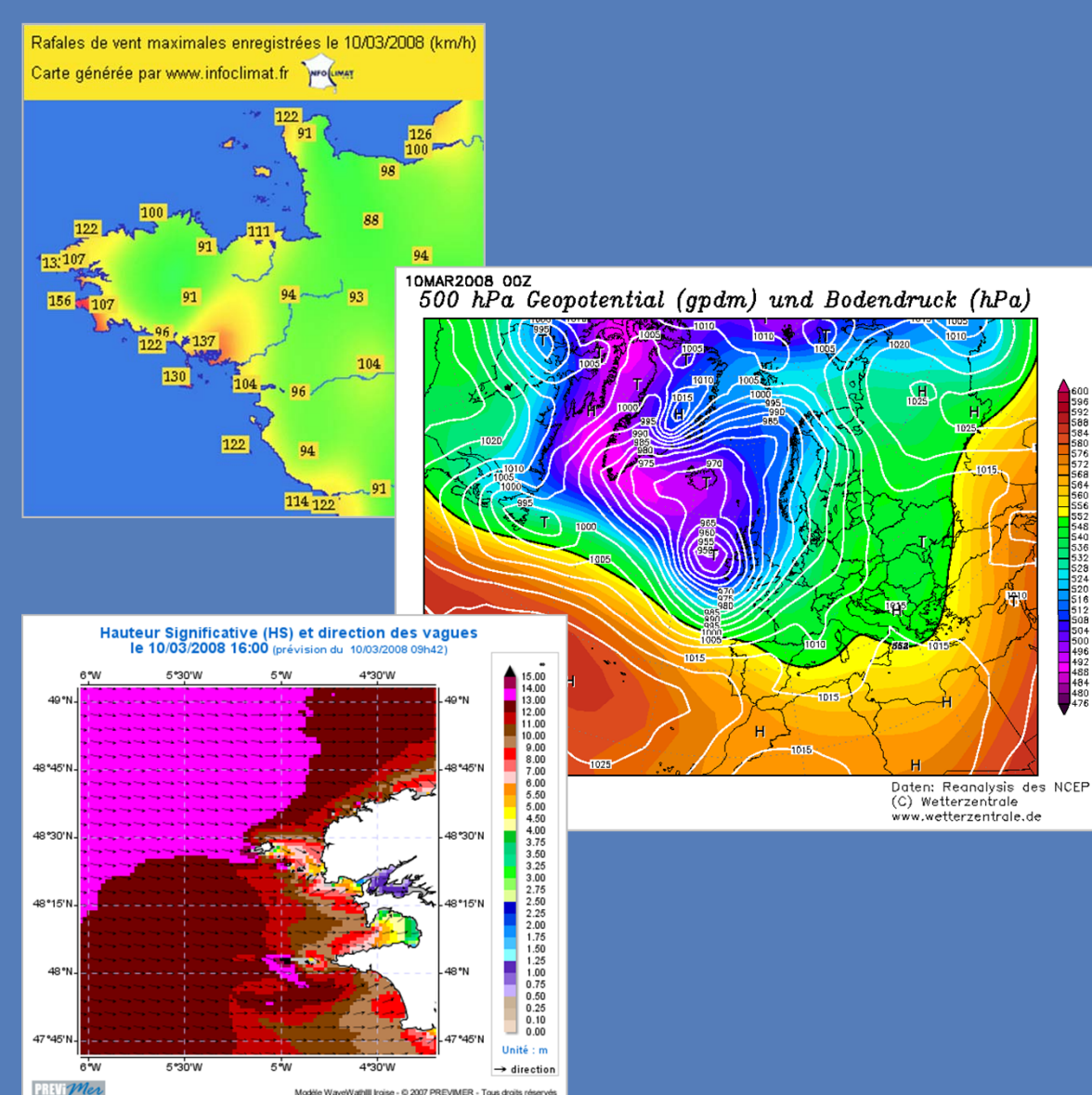
The JOHANNA project and associated Ph.D aims, in the objective of preventing and reducing the risk associated with coastal storms, to analyse the marine flooding hazards, in order to:

- Better understand their propagation and damage processes of the human assets at the coast
- Distinguish the different types of structural damage they induce linked to different hazard parameters (flooding, sea front shocks, erosion, impact of floating debris,...)
- Develop a **methodology of vulnerability assessment** for the built coastal areas facing this hazard.

This methodology will try to find out **indicators, qualitative and if possible quantitative**, in the view of characterizing the hazards and damages, depending of storm conditions.

Analysis of meteorological forcings

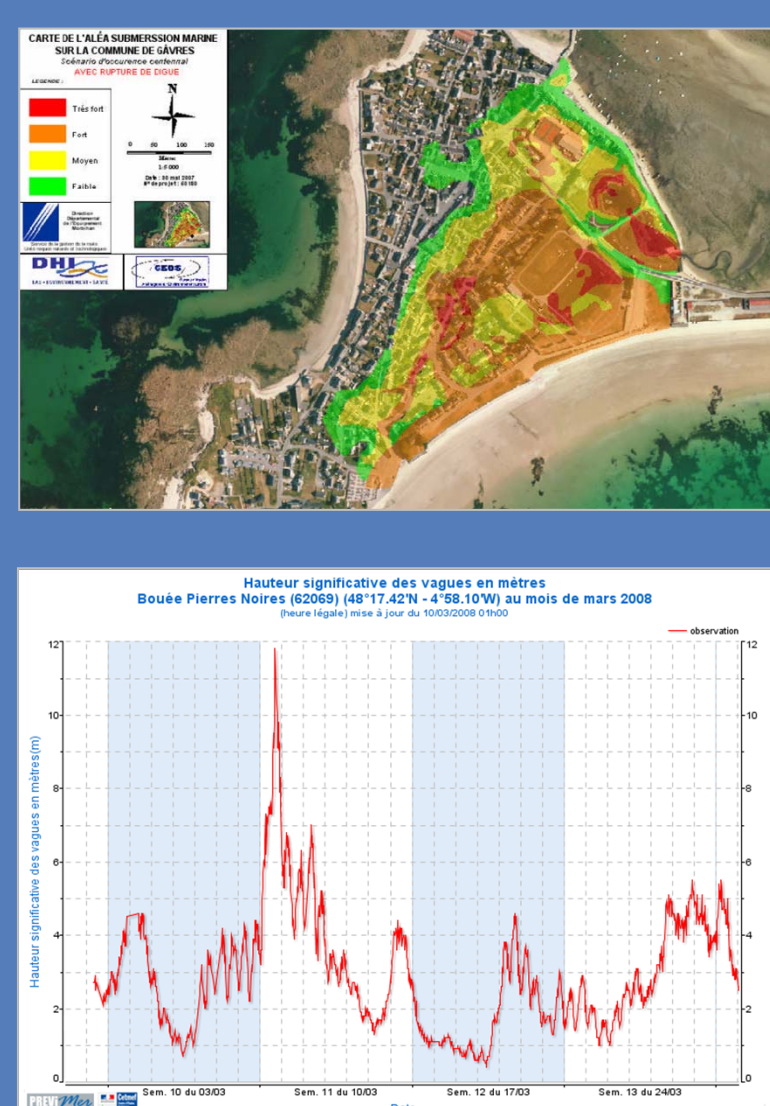
- Storm surges, swell and tides propagation modelling
- Validation by field observations



- Definition of indicators characterizing the forcing (wind speed and direction, atmospheric pressure, swell parameters, tides,...)

Analysis of marine flooding hazard

- Flood extension, height, speed and duration modelling



- Definition of indicators characterizing the hazard (flood parameters, waves shocks, erosion,...)

Analysis of damages

- Inventory and classification of structural damages (by damage typology and damage mechanism)
- Definition of damage processes by an approach combining the analysis of hazards and damages: transfer of methods already used in other natural hazards (earthquakes, tsunamis, river floods)
- Costs analysis of insured damages
- Setting up of a methodology for damages and costs evaluation



- Definition of indicators characterizing the damages

Partnership

Project implemented through a financial and scientific partnership between the MAIF Research Fund (Fondation MAIF), the French Geological Survey (BRGM) and the University of Western Brittany (UBO)

University of Western Brittany

- Coastal geomorphology, coastal risks and vulnerability
- Field observations and interview of witnesses following the storm Johanna

French Geological Survey

- Natural hazards, modelling tools
- Structural vulnerability, risk economics
- Field observations and reports following the storm Xynthia

MAIF Research Fund

- Funding of the project and the Ph.D
- Link with French insurance groups for providing data on damages (typology, costs,...)

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Port Navalo, Alzon, © Dan Glard



Saint-Malo, © Alain Haye



Douarnenez, © Aqua Club

The JOHANNA project proposes an innovative approach based on the analysis of links between hazard parameters and damages related to storm waves and marine flooding in built coastal areas. The specificity and originality of this study also reside in the interaction of scientific (multidisciplinary) approaches and data from the insurance companies.

The development of a methodology for the damages evaluation *a priori* from the study of observed marine flooding damages *a posteriori* will allow to better define future risks and the associated vulnerability.

The results of this project should provide tools to risk managers and insurers to anticipate the impacts and prevent and reduce costs of future coastal storm events in a context of rising sea level linked to climate change.