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Action Plan
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Convention



**Creating products and knowledge
for the Mediterranean**



MARINOMICA:

EXTRACTION, ANALYSE D'UNE SÉRIE TEMPORELLE, CALCUL DES CARACTÉRISTIQUES DE
HOULES EN FONCTION DES PÉRIODES DE RETOUR

ATELIER DE VALIDATION DE LA PLATEFORME DE DONNEES PAR LES UTILISATEURS ET DE FORMATION A L'OCEANOGRAPHIE OPERATIONNELLE

Mercredi-Jeudi, 2-3 June 2021

Slim GANA on behalf of SPA/RAC

slim.gana@sea-gust.com

Marinomica Lancer la réunion - Zoom

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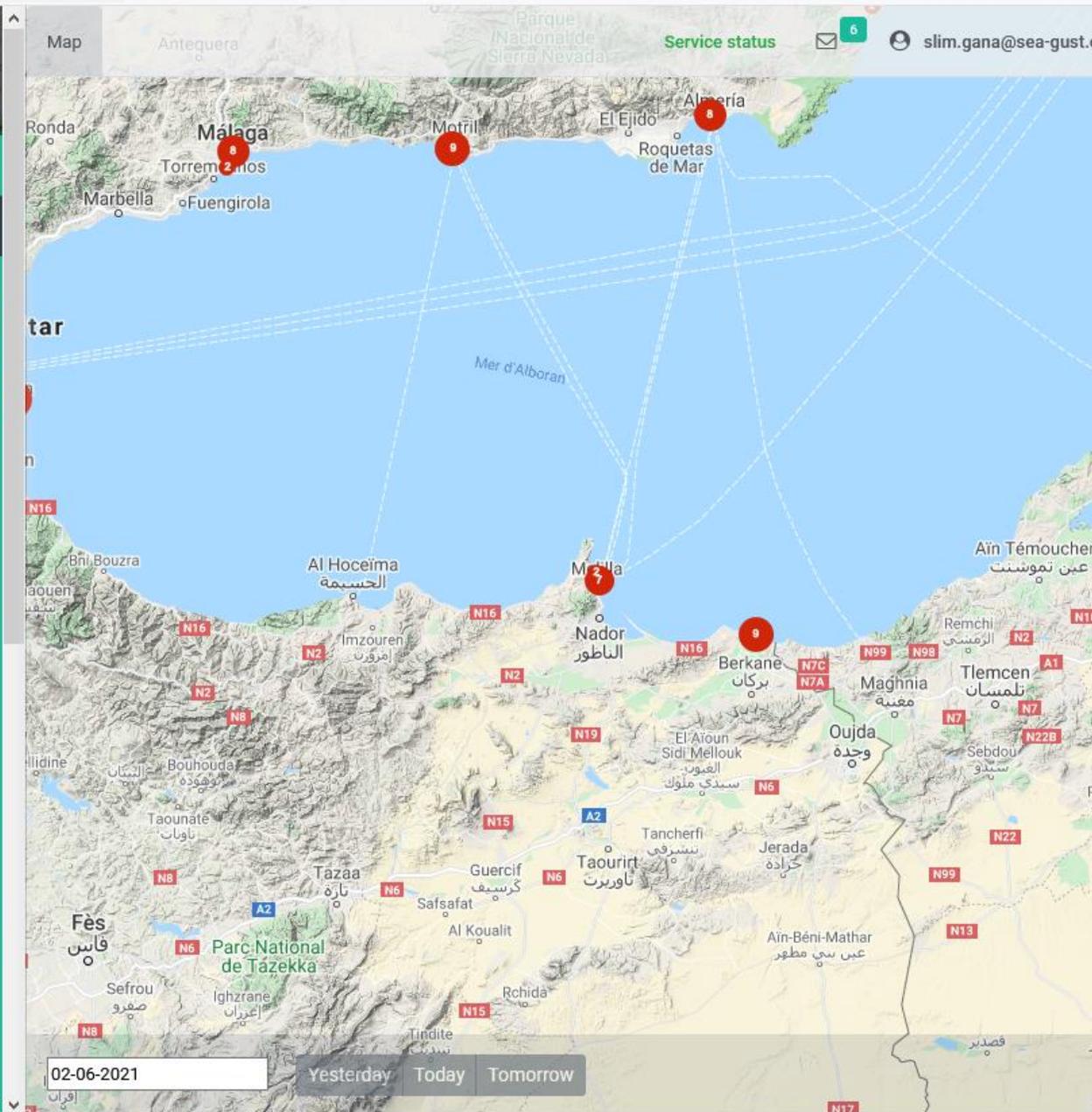
Enter text to filter

Time series data **Tanger**

Map data layers **Unselect all**

Parameters **A1**

- Chlorophyll
- Currents
- Nutrients
- Oxygen
- Phytoplankton
- Salinity
- Sea Level
- Temperature
- Wave
- Waves - Historical, Today and Forecast - CMEMS - Model - Glo



Map Layers Manager

Map Data Layers Unselect all

Select map data layers to view from the catalogue. Drag and drop to re-order layers displayed on the map.

Monitoring Stations

Select to view time series data from the catalogue or the map icons

View location of in situ monitoring stations

Base Layers

Select a base map layer

- Google Maps
- Google Maps (Satellite)
- Ocean Bathymetry Map (ETOP01)
- Mapbox
- OpenStreetMap
- Bing Maps

Grid

Show/Hide grid

View Grid

+ Add to dashboard

Données cartographiques ©2021 Inst. Geogr. Nacional Conditions d'utilisation Signaler une erreur cartographique

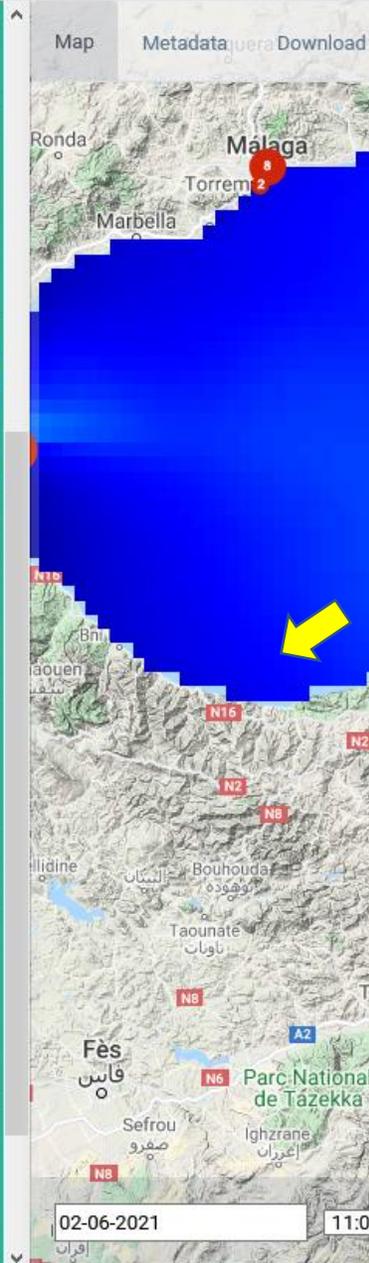
Map Layers Manager

Map Metadata Layers Download

- Nutrients
- Oxygen
- Phytoplankton
- Salinity
- Sea Level
- Temperature
- Wave
 - Waves - Historical, Today and Forecast - CMEMS - Model - Glo
 - Waves - Historical - ECMWF - Model - Glo
 - Waves - Historical - NOAA - Model - Glo
 - Waves - Historical, Today and Forecast - CMEMS - Model - Med
 - Sidi Slimane Waves - Historical - CMEMS - Model - Med

Static Data

02-06-2021 11:00:00.000Z Yesterday Today Tomorrow



Map Layers Manager

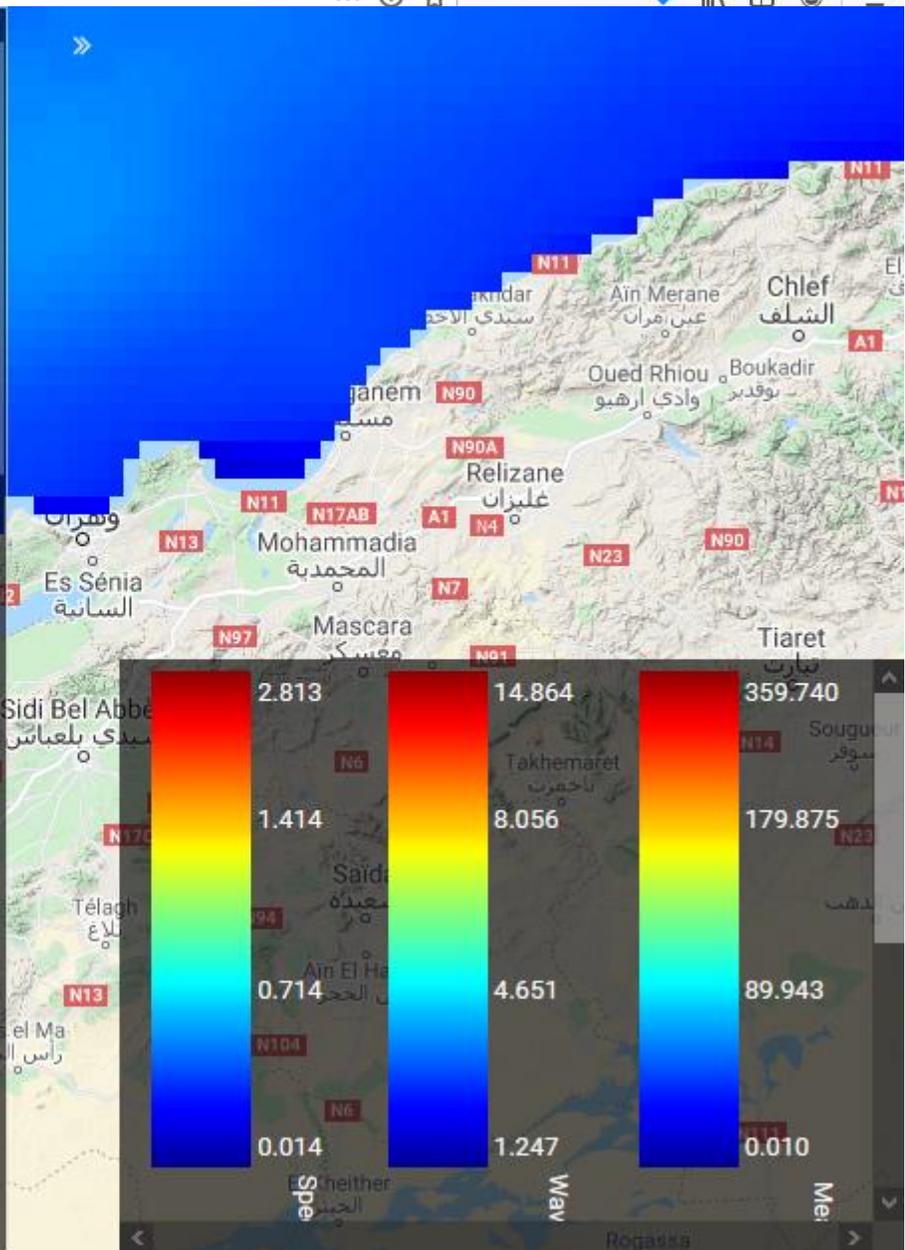
Map Data Layers

Unselect all

Select map data layers to view from the catalogue. Drag and drop to re-order layers displayed on the map.

Waves - Historical, Today and Forecast - CMEMS - Model - Med - med-hcmr-wav-an-fc-h

- 1 - Spectral significant wave height (Hm0) boxfill/rainbow
- 2 - Wave period at spectral peak / peak period (Tp) boxfill/rainbow
- 3 - Spectral moments (-1,0) wave period (Tm-10) -Please select style-
- 4 - Spectral moments (0,2) wave period (Tm02) -Please select style-
- 5 - Mean wave direction from (Mdir) boxfill/rainbow
- 6 - Spectral significant wind wave height -Please select style-
- 7 - Spectral moments (0,1) wind wave period -Please select style-
- 8 - Mean wind wave direction from -Please select style-



Parque Nacional de Doñana

Oxygen

Phytoplankton Frontera

Salinity

Chiclana de Sea Level

Temperature

Wave

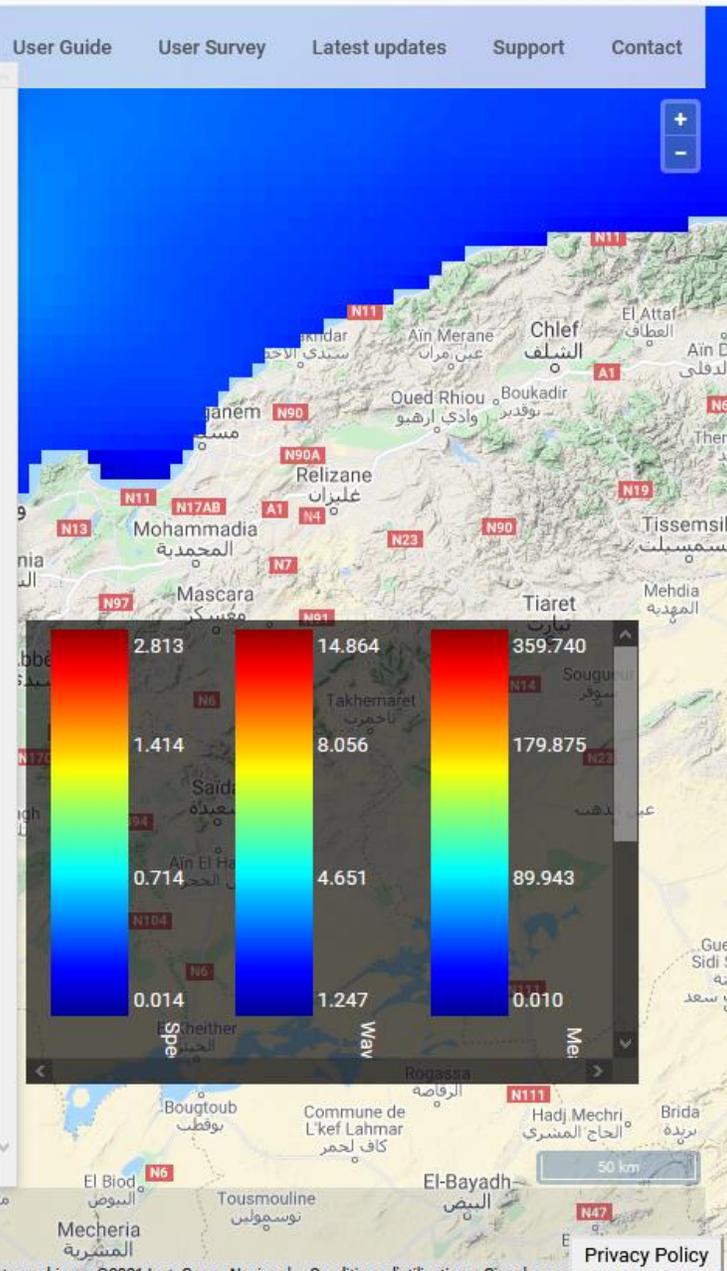
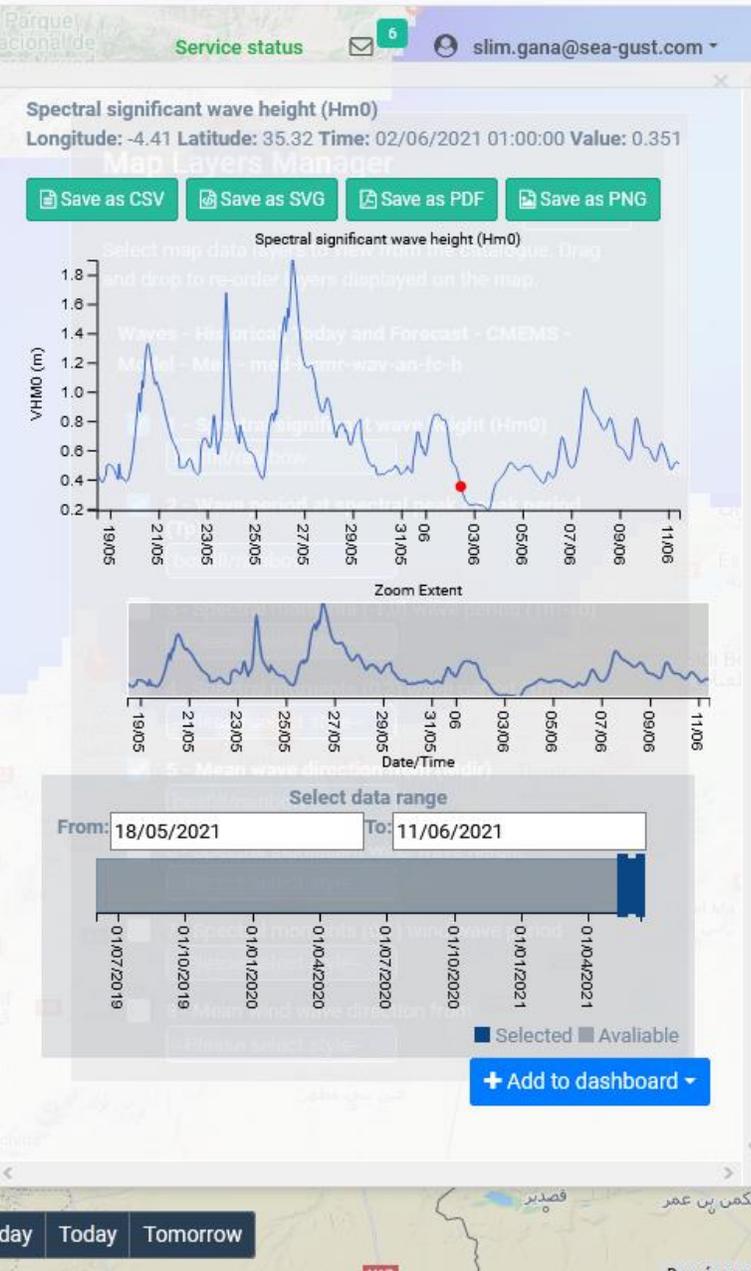
- Waves - Historical, Today and Forecast - CMEMS Model - Glo
- Waves - Historical - ECMWF - Model - Glo
- Waves - Historical - NOAA - Model - Glo
- Waves - Historical, Today and Forecast - CMEMS - Model - Med
- Waves - Sidi Slimane - Historical - CMEMS - Model - Med

Static Data

02-06-2021 11:00:00.00Z

Yesterday Today Tomorrow

Observatories





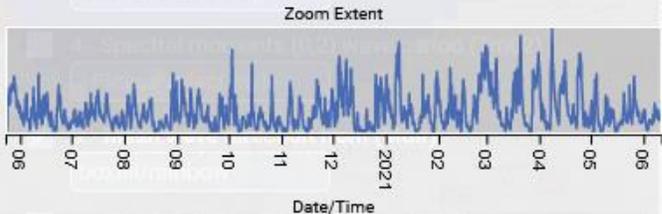
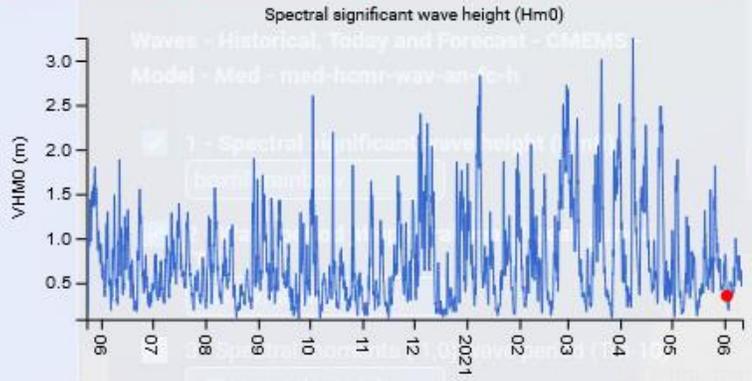
Spectral significant wave height (Hm0)

Longitude: -4.39 Latitude: 35.29 Time: 02/06/2021 01:00:00 Value:

0.35300002 Map Data Layers

Unselect all

- Save as CSV
- Save as SVG
- Save as PDF
- Save as PNG



Select data range

From: 04/06/2020 To: 11/06/2021

01/07/2019 01/10/2019 01/10/2020 01/04/2020 01/07/2020 01/10/2020 01/01/2021 01/04/2021

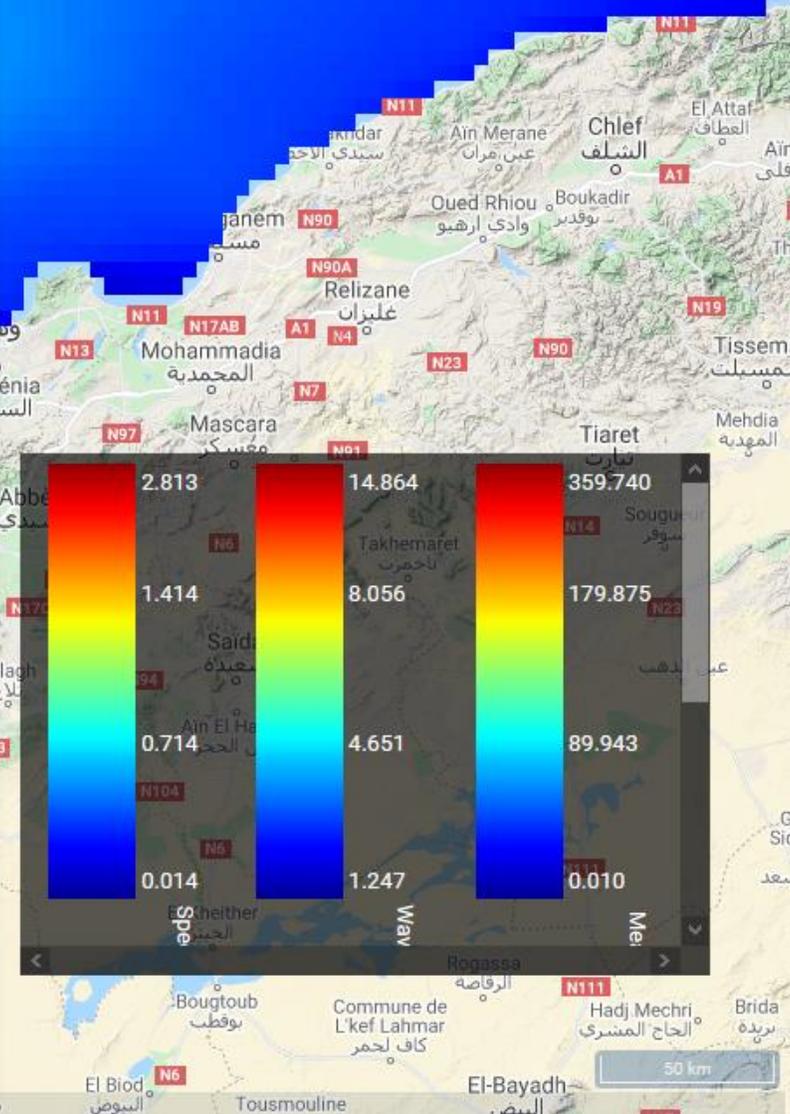
Selected Available

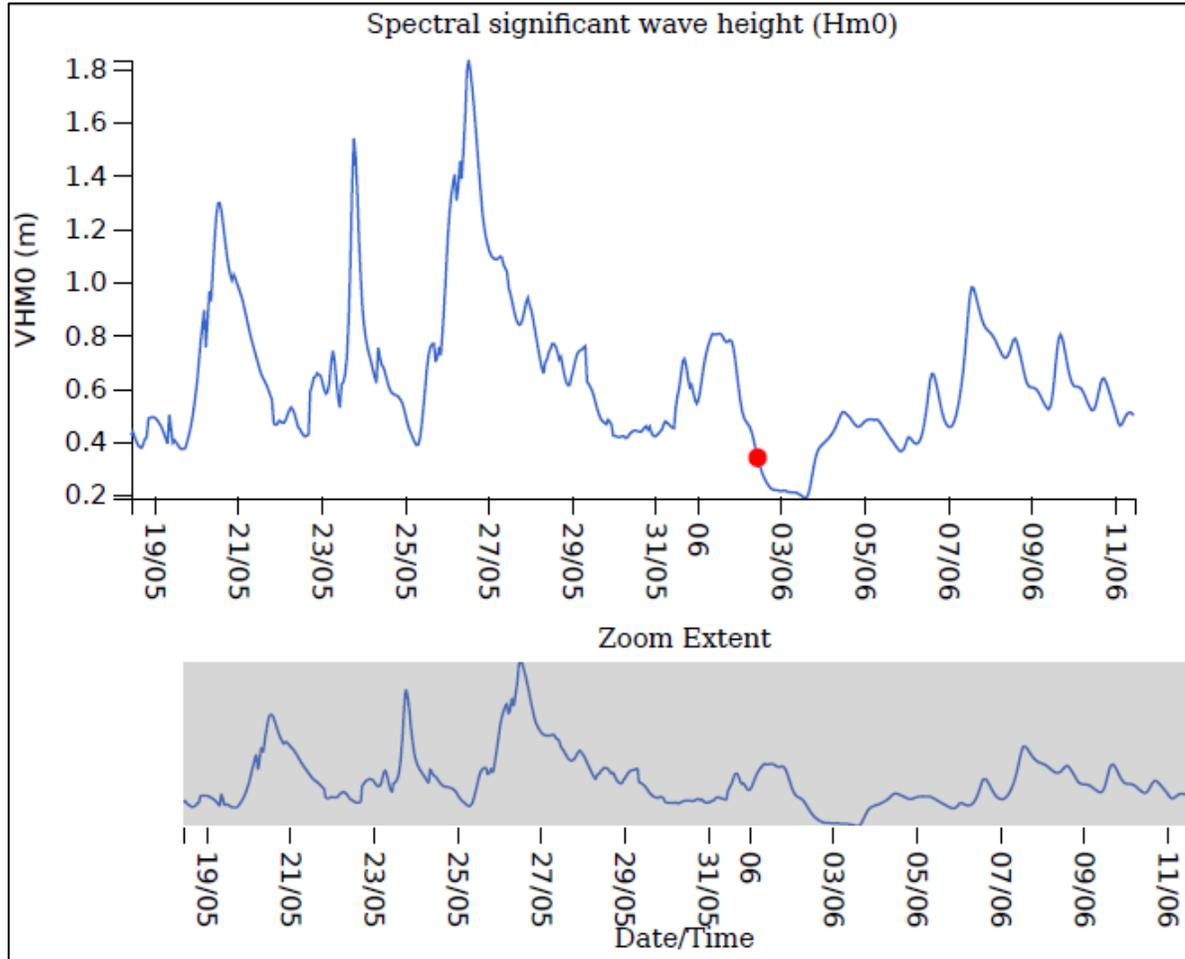
+ Add to dashboard

02-06-2021

11:00:00.000Z

Yesterday Today Tomorrow

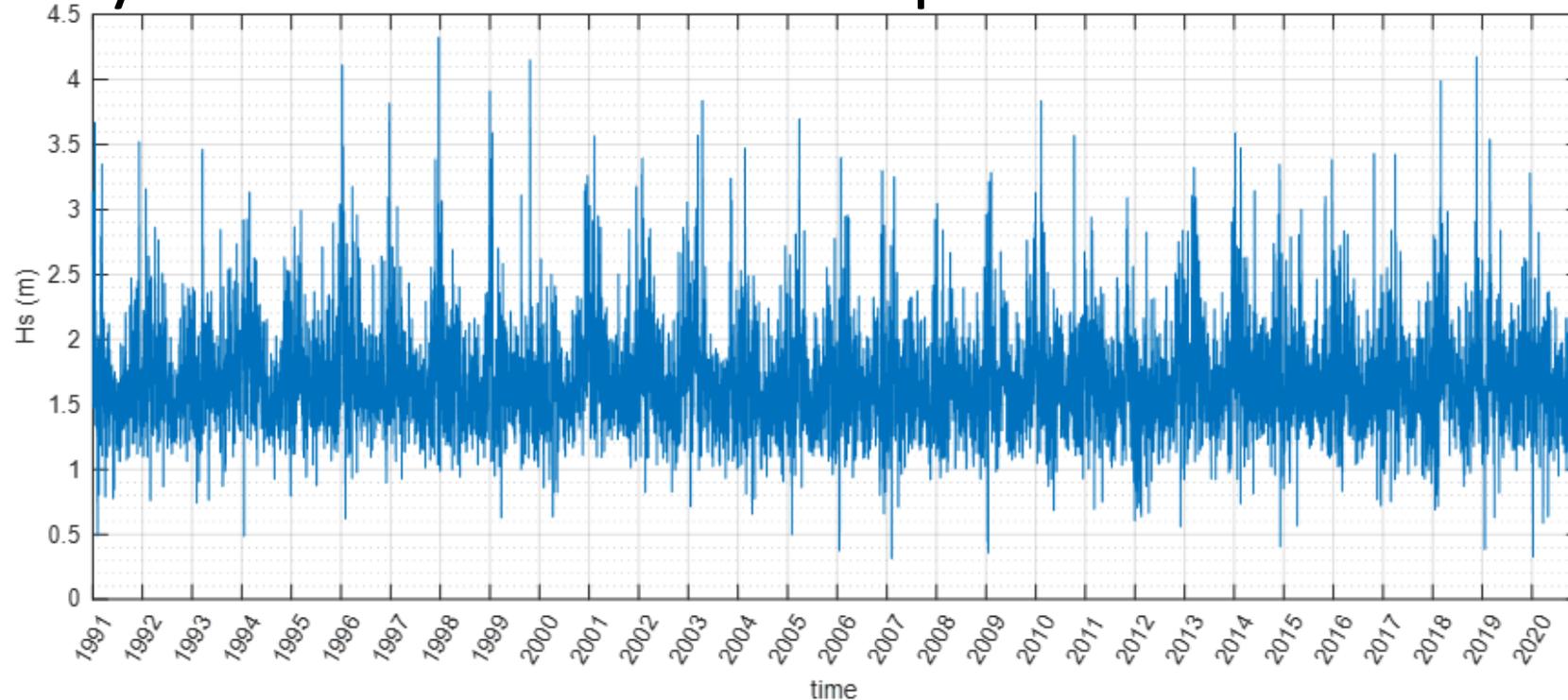




| | A | B | C | D |
|----|--------|--------------------|--------------------|--------------------|
| 1 | time | height | period | Direction |
| 2 | 797688 | 2.6777523453097047 | 15.038600033806974 | 340.17875776092274 |
| 3 | 797691 | 2.7823496890361286 | 15.158934232369427 | 339.35477494367746 |
| 4 | 797694 | 2.89287113010635 | 15.137504854543238 | 339.08560722337734 |
| 5 | 797697 | 3.003515989871234 | 15.024423676168109 | 339.21195125535496 |
| 6 | 797700 | 3.087193864852373 | 14.957827763539026 | 339.6788748517939 |
| 7 | 797703 | 3.126317591060369 | 15.028050186261773 | 339.601969788851 |
| 8 | 797706 | 3.137610401621983 | 15.104701422332376 | 339.21195125535496 |
| 9 | 797709 | 3.11829537590731 | 15.176407417366168 | 338.38247521932794 |
| 10 | 797712 | 3.1264410097550313 | 14.893704471428347 | 337.9375244980155 |
| 11 | 797715 | 3.0974376165093562 | 14.699851022785271 | 337.55849240208266 |
| 12 | 797718 | 3.1015721427805483 | 14.232196062070637 | 338.2781040624769 |
| 13 | 797721 | 3.0699152475996305 | 13.905480470905179 | 338.849398815767 |
| 14 | 797724 | 3.0059226544171516 | 13.692999947690105 | 339.0526479106875 |
| 15 | 797727 | 2.9401404901620674 | 13.446232419953127 | 339.49759863199995 |
| 16 | 797730 | 2.8418374998634284 | 13.36677888062833 | 339.030675035561 |
| 17 | 797733 | 2.7146545350137763 | 13.436506779247395 | 338.01992277974 |
| 18 | 797736 | 2.6183262438297366 | 13.249082143952176 | 337.01466374270075 |
| 19 | 797739 | 2.5637134714416034 | 12.793790285829575 | 337.4980669954847 |
| 20 | 797742 | 2.5029914736676795 | 12.41036926410866 | 338.3110633751667 |
| 21 | 797745 | 2.424373765167701 | 12.120413297983513 | 339.08560722337734 |
| 22 | 797748 | 2.337795550861994 | 11.876448073500729 | 339.8656442903696 |
| 23 | 797751 | 2.236653930586119 | 11.7183652016906 | 339.88761716549607 |
| 24 | 797754 | 2.122183091286699 | 11.671385411840875 | 339.1130733172855 |

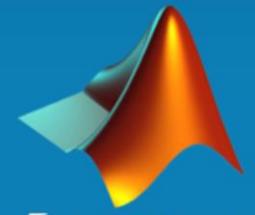
Feuil2 Feuil1 (+)

Analyse des séries temporelles de Houles

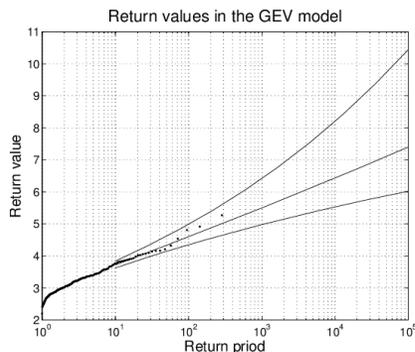
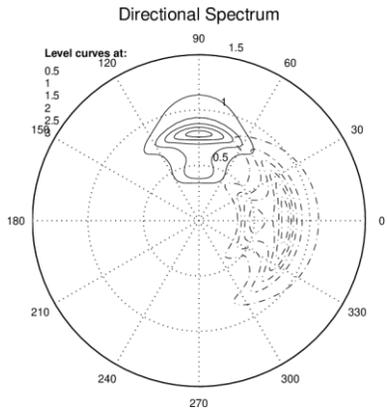
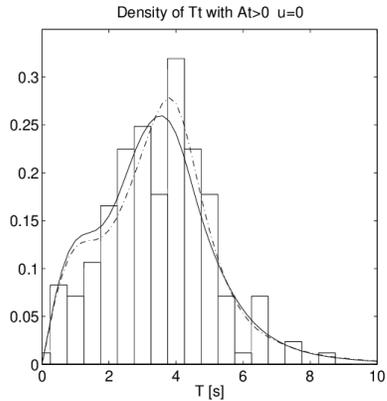


- **Dimensionnement et fatigue des ouvrages côtiers:** digues portuaires, appontements, ouvrages de protection contre l'érosion
- **Etude de l'agitation** et de la navigabilité à l'approche ou à l'intérieur d'un bassin portuaire
- **Dimensionnement des structures en mer:** Plateformes pétrolières, éoliennes en mer, les tours de captage de l'eau de mer pour les unités de dessalement, les émissaires et les crépines de rejet des eaux usées traités
- **Conception des dispositifs de production d'énergie à partir de la houle**
- **L'estimation du transit littoral** et l'étude de la dynamique hydrosédimentaire afin de prédire et anticiper l'érosion des côtes

WAFO (Wave Analysis for Fatigue and Oceanography)



MATLAB®



← → × 🏠 www.maths.lth.se/matstat/wafo/index.html

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WAFO

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Main features

WAFO is a toolbox of Matlab routines for statistical analysis and simulation of random waves and random loads. WAFO is freely redistributable software, see [WAFO licence](#), cf. the GNU General Public License (GPL). It is available on this website and it is included in the [wafo-project](#) on GitHub, where also support for Octave is available, as well as a Python version. WAFO contain tools for:

Fatigue Analysis

- Fatigue life prediction for random loads
- Theoretical density of rainflow cycles

Sea modelling

- Simulation of linear and non-linear Gaussian and non-Gaussian waves
- Estimation of seamodels (spectrums)
- Joint wave height, wave steepness, wave period distributions

Statistics

- Extreme value analysis
- Kernel density estimation
- Hidden markov models

For more information, see the page [about WAFO](#).

<http://www.maths.lth.se/matstat/wafo/about.html>



– a Matlab Toolbox for Analysis
of Random Waves and Loads

Tutorial for WAFO version 2.5

by the WAFO group

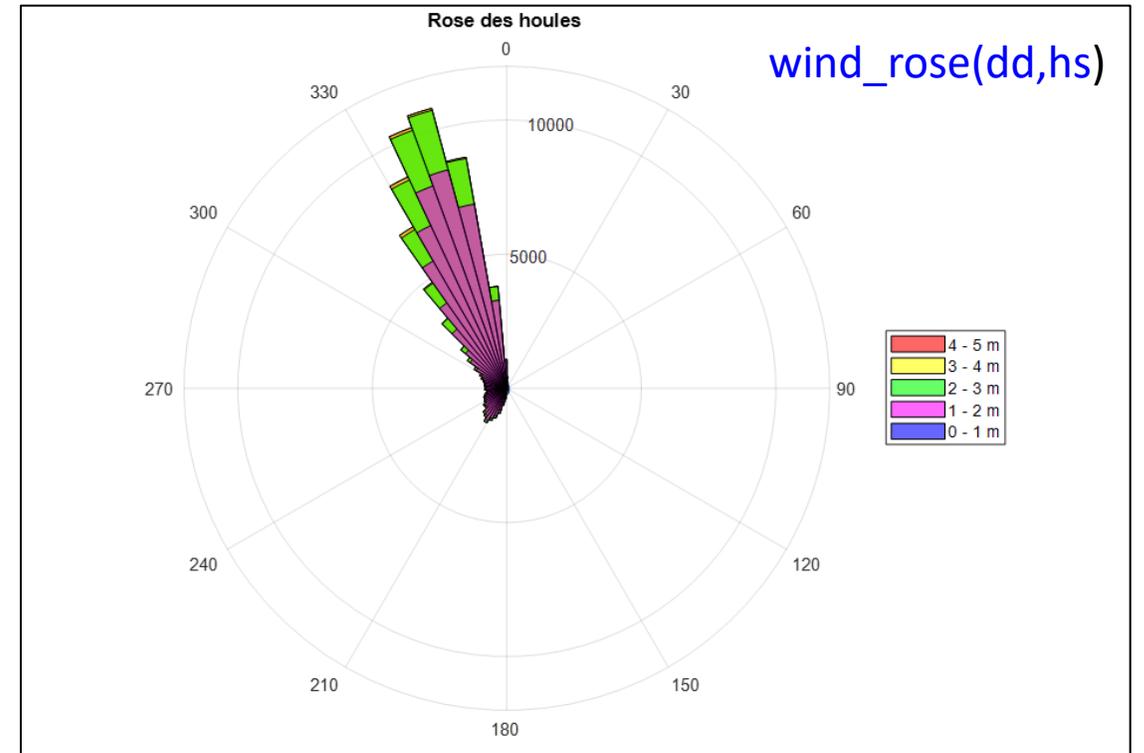
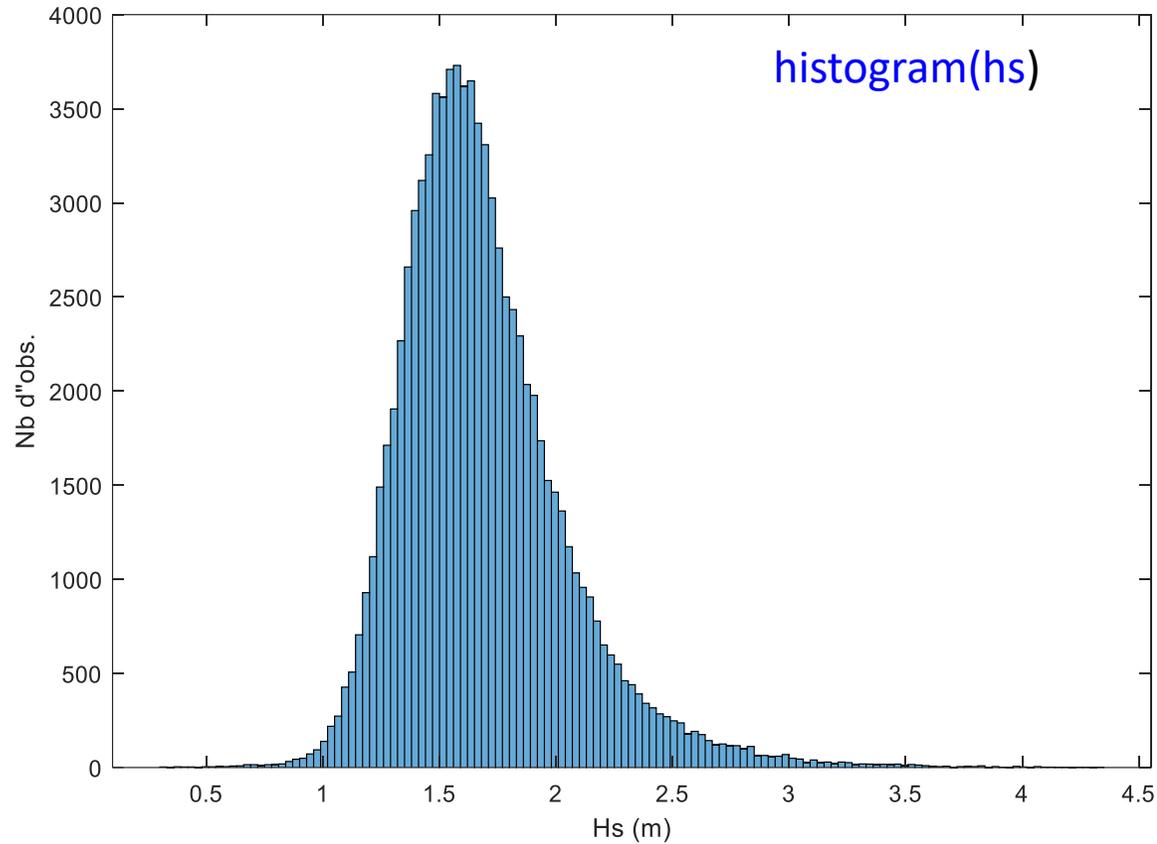
Lund, March 2011



LUND UNIVERSITY

Mathematical Statistics Lund University
Box 118SE-221 00 Lund Sweden
<http://www.maths.lth.se>

Histogramme de répartition, Rose Hs/direction

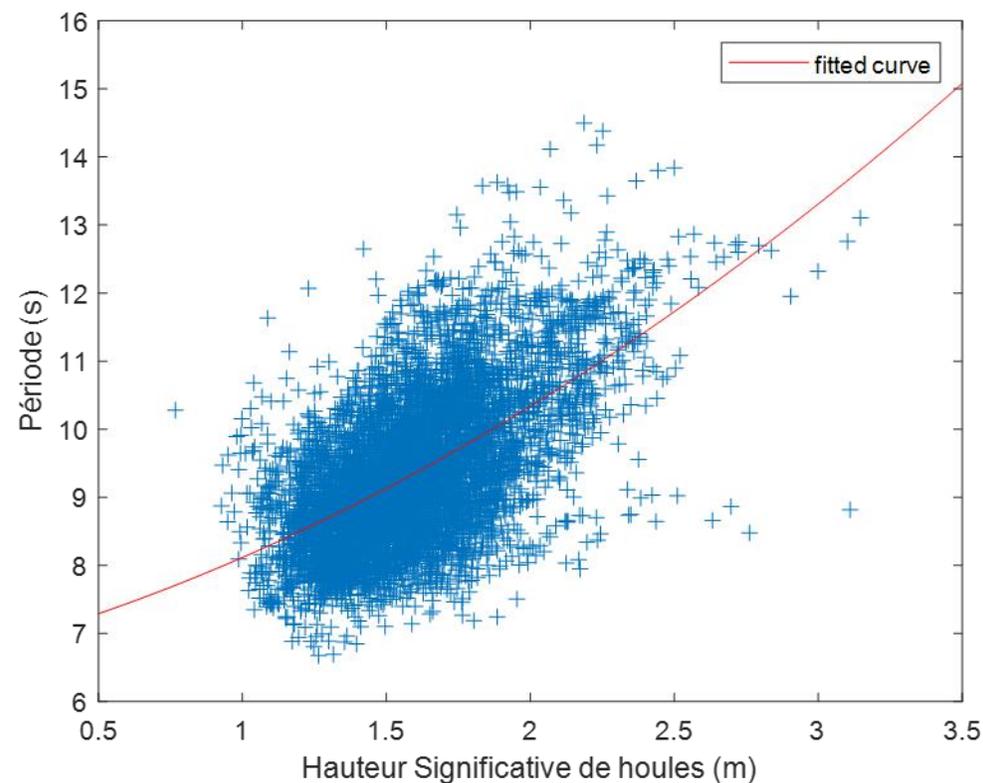
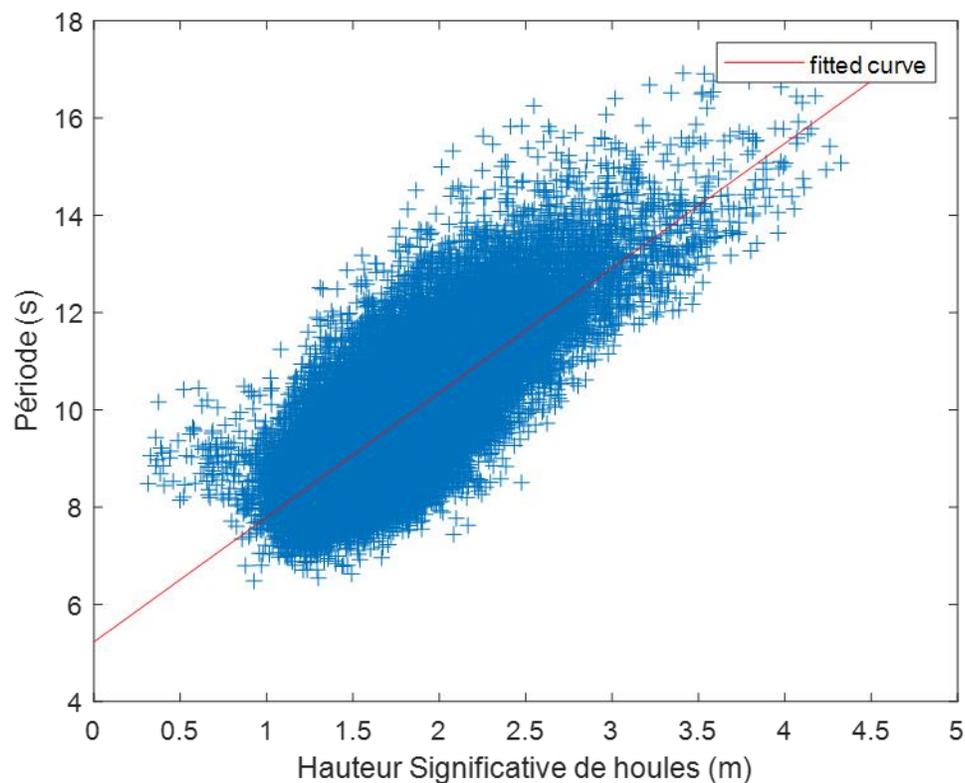


| | S : | SSW : | WSW : | W : | WNW : | NNW : | N : |
|---------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Secteur de provenance | 165°N à 195°N | 195°N à 225°N | 225°N à 255°N | 255°N à 285°N | 285°N à 315°N | 315°N à 345°N | 345°N à 015°N |
| nb d'occurrence sur un total de 87664 | 1321 | 7539 | 5775 | 4840 | 8456 | 45024 | 14398 |
| % d'occurrence | 1,51% | 8,60% | 6,59% | 5,52% | 9,65% | 51,36% | 16,42% |

Relation Hauteur/période de la Houle

fo = fit(Hs,Tp,'poly1')

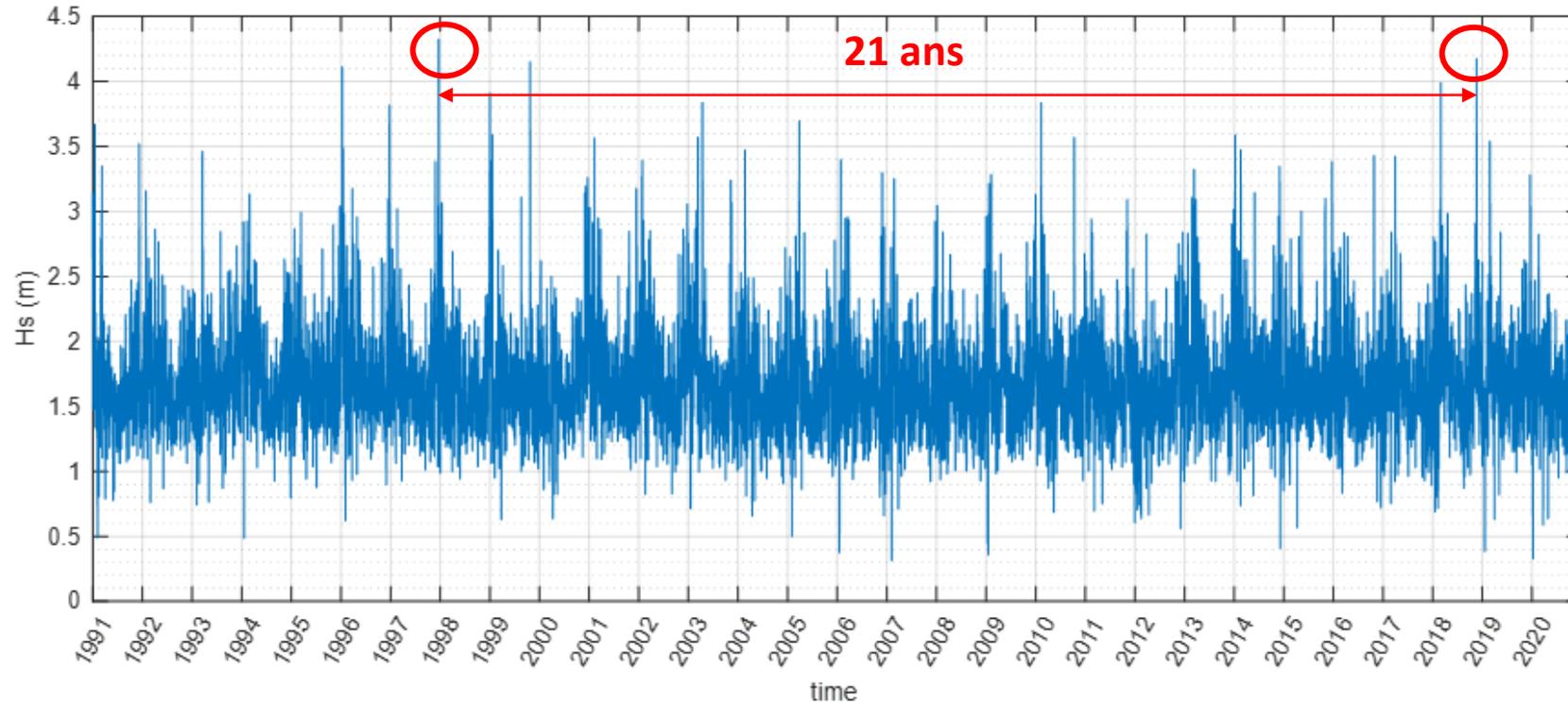
fo = fit(Hs,Tp,'poly2')



$fo(x) = p1*x + p2$
Coefficients (with 95% confidence bounds):
p1 = 2.563 (2.542, 2.584)
p2 = 5.226 (5.189, 5.263)

$fo(x) = p1*x^2 + p2*x + p3$
Coefficients (with 95% confidence bounds):
p1 = 0.3776 (0.2078, 0.5475)
p2 = 1.086 (0.5086, 1.663)
p3 = 6.653 (6.17, 7.137)

Analyse des valeurs extrêmes



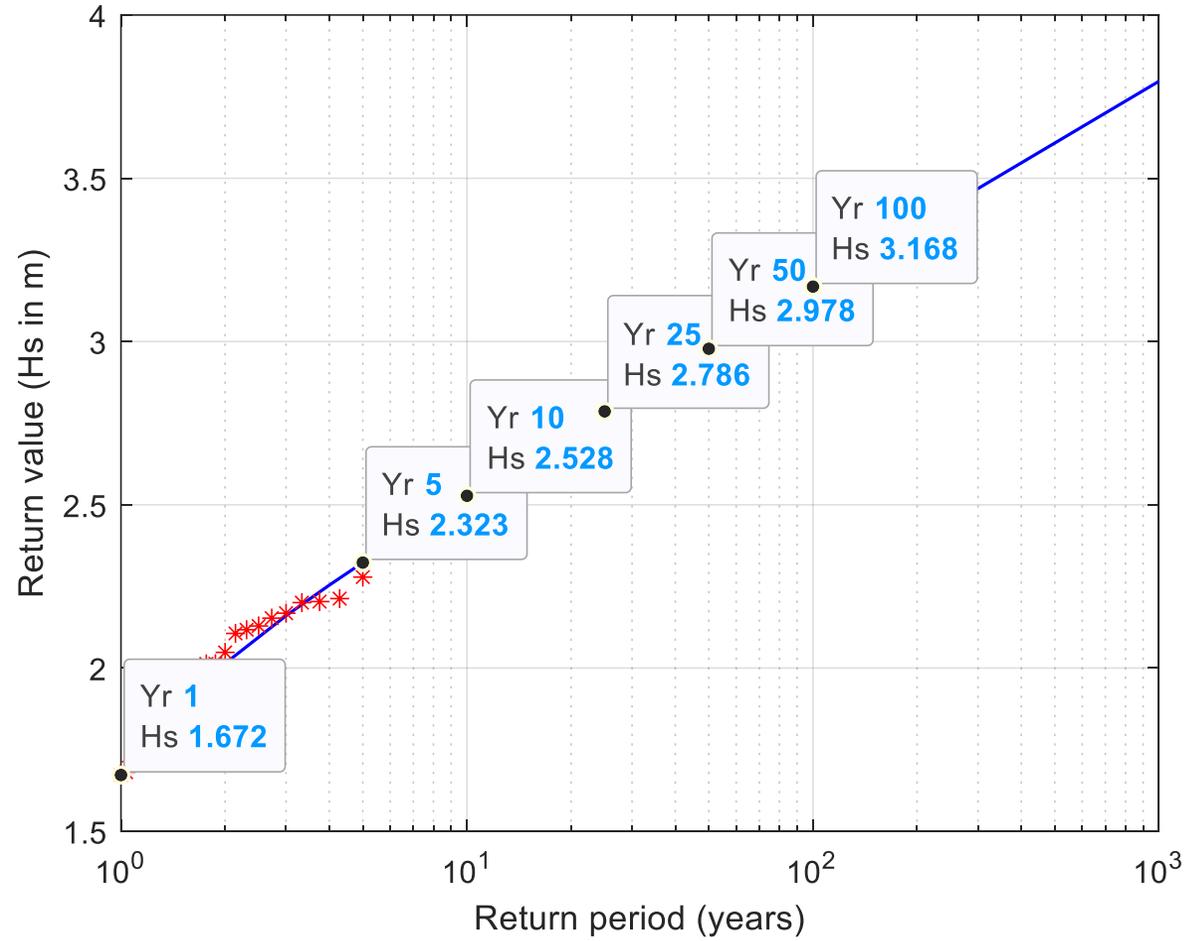
- Les valeurs extrêmes des caractéristiques des vagues sont une préoccupation majeure dans la conception des structures côtières et des plates-formes offshore, des brise-lames, digues et autres développement portuaires, pour la gestion de la navigation, la gestion et la protection du littoral, l'architecture navale, l'élaboration des normes de sécurité navale, etc.
- Les divers modèles de valeurs extrêmes peuvent être utilisés en fonction de l'application spécifique, de l'échelle de temps de la variable examinée et de la disponibilité des données.

- Il est particulièrement intéressant de déterminer pour les applications précédemment citées quelles sont les valeurs significatives extrêmes pour une série de houles afin de tenir compte dans la conception du projet.
- Cela implique qu'il faut prédire, à partir d'un nombre limité d'observations, qu'elles peuvent être les valeurs extrêmes de paramètres caractéristiques de la houle, comme la hauteur, la période de la houle,...
- Une telle analyse est généralement connue sous le nom d'analyse de Weibull ou d'analyse de Gumbel, à partir des noms de deux distributions de probabilité d'occurrence de valeurs extrêmes. Ces deux distributions font partie d'une famille générale de distributions de valeurs extrêmes, connues comme la distribution généralisée des valeurs extrêmes (GEV).

$$\text{Weibull: } F_W(x; a, c) = 1 - e^{-(x/a)^c}, \quad x > 0,$$

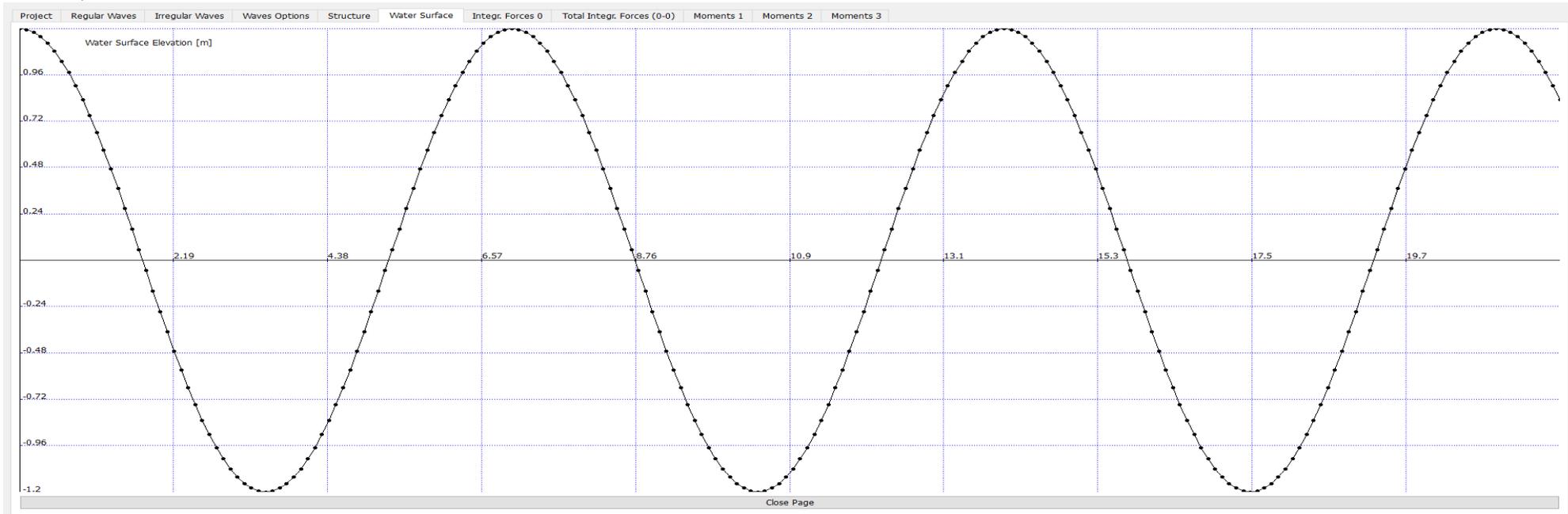
$$\text{Gumbel: } F_G(x; a, b) = \exp\left(-e^{-(x-b)/a}\right), \quad -\infty < x < \infty.$$

Return values in the Gumbel model



`gum = plotgumb(Hs)`

| Période de retour | 1 an | 5 ans | 10 ans | 25 ans | 50 ans | 100 ans |
|-------------------|-------|-------|--------|--------|--------|---------|
| Hs (m) | 1.672 | 2.323 | 2.528 | 2.786 | 2.978 | 3.168 |



WaveLoads GUI 1.1.57.R1 - wl2.dll 2.03.03



File Work Options Info

