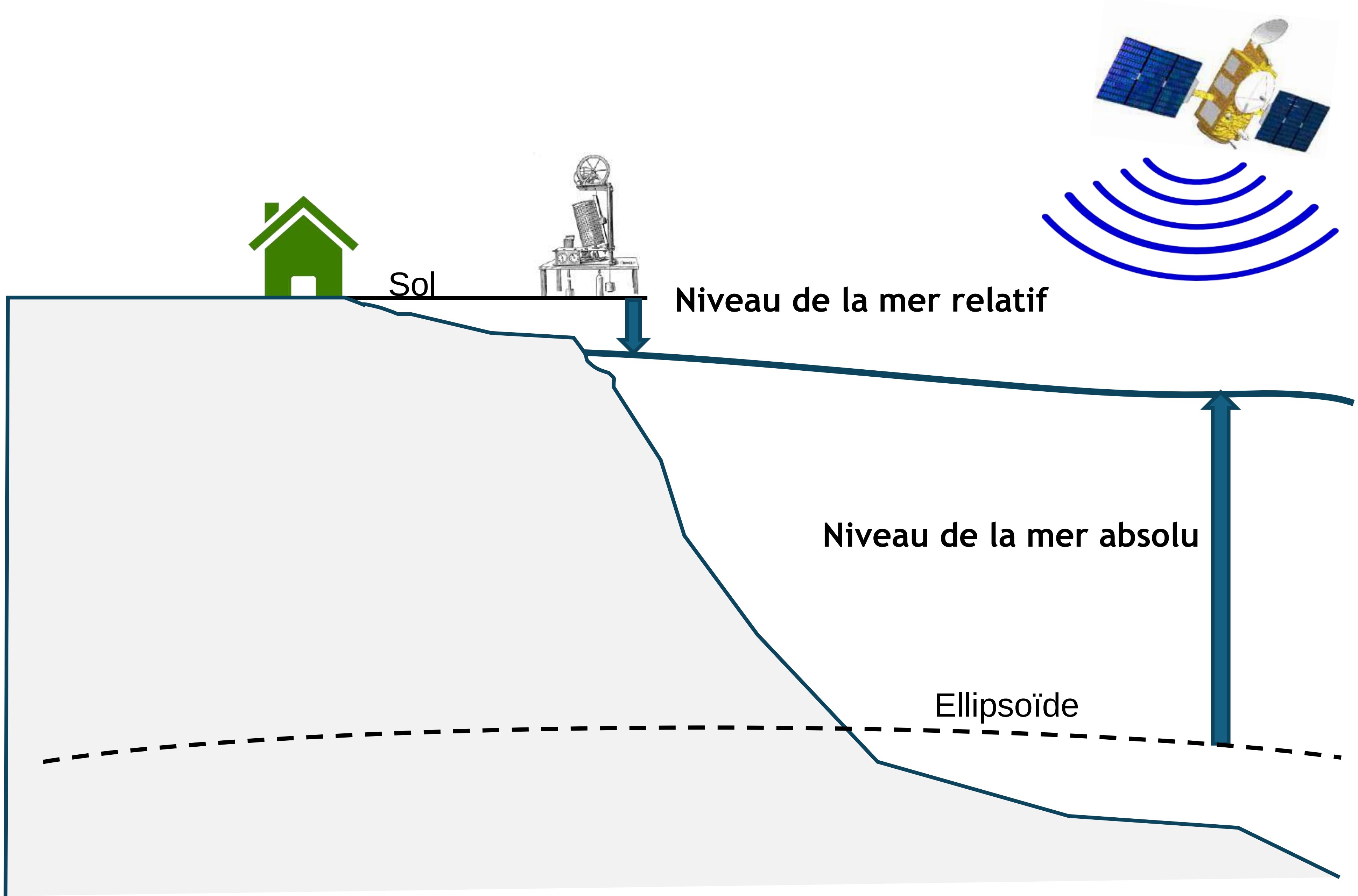
Atelier Littoral
9&10 avril 2024
Lorient

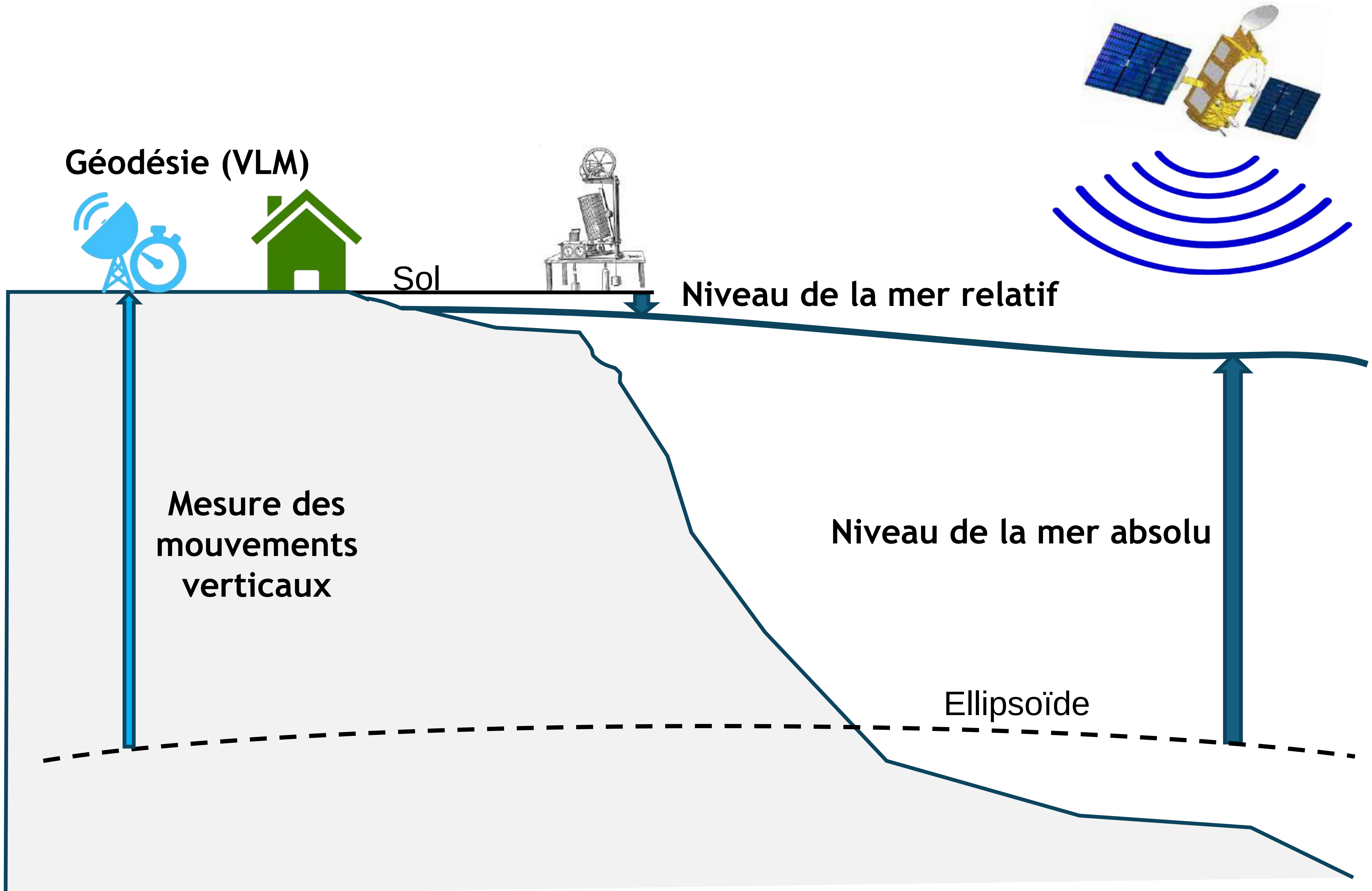
DONNÉES, MÉTHODES & SERVICES POUR LE LITTORAL

# Le service national d'observation du niveau des eaux littorales : Produits et Services

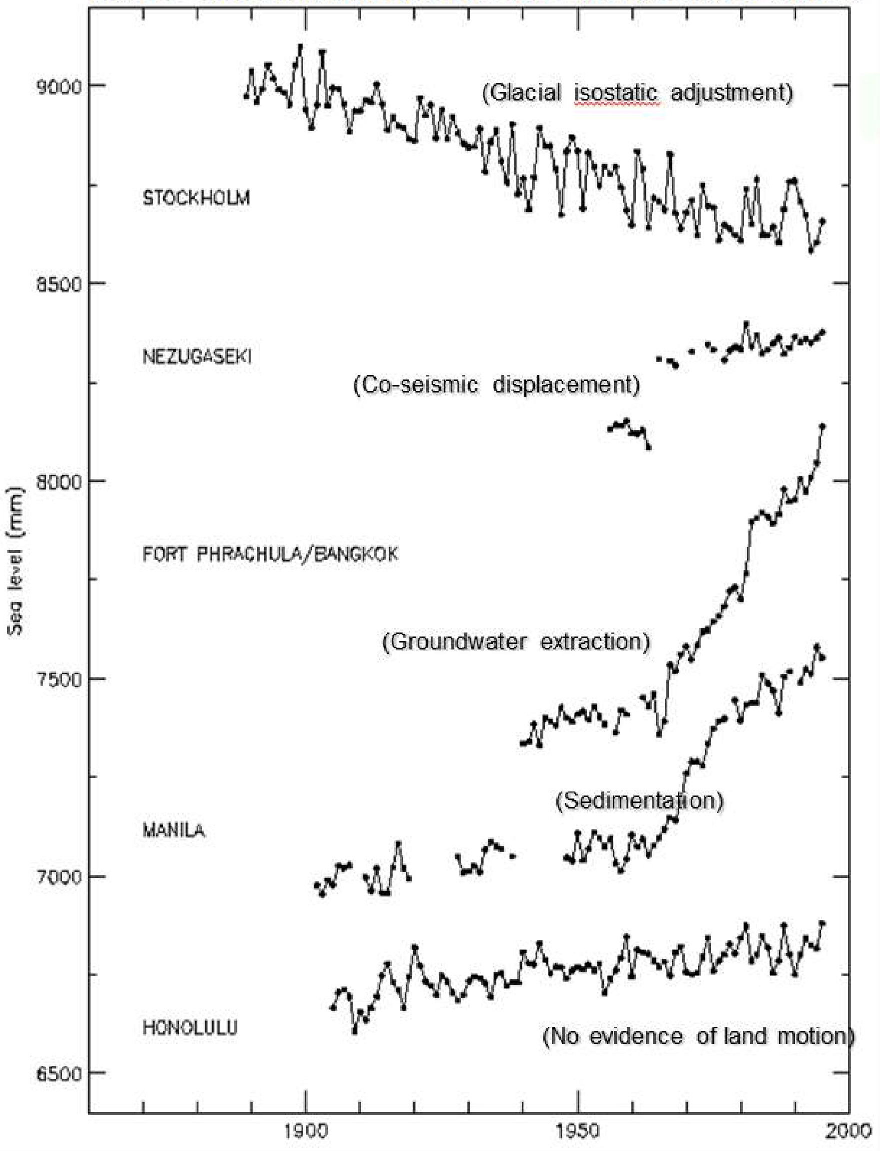
2 observables : Le niveau marin et les mouvements verticaux du sol
2 techniques de mesure : La **marégraphie** et le **Géodésie Spatiale**

*Testut Laurent*
*LIENSs*

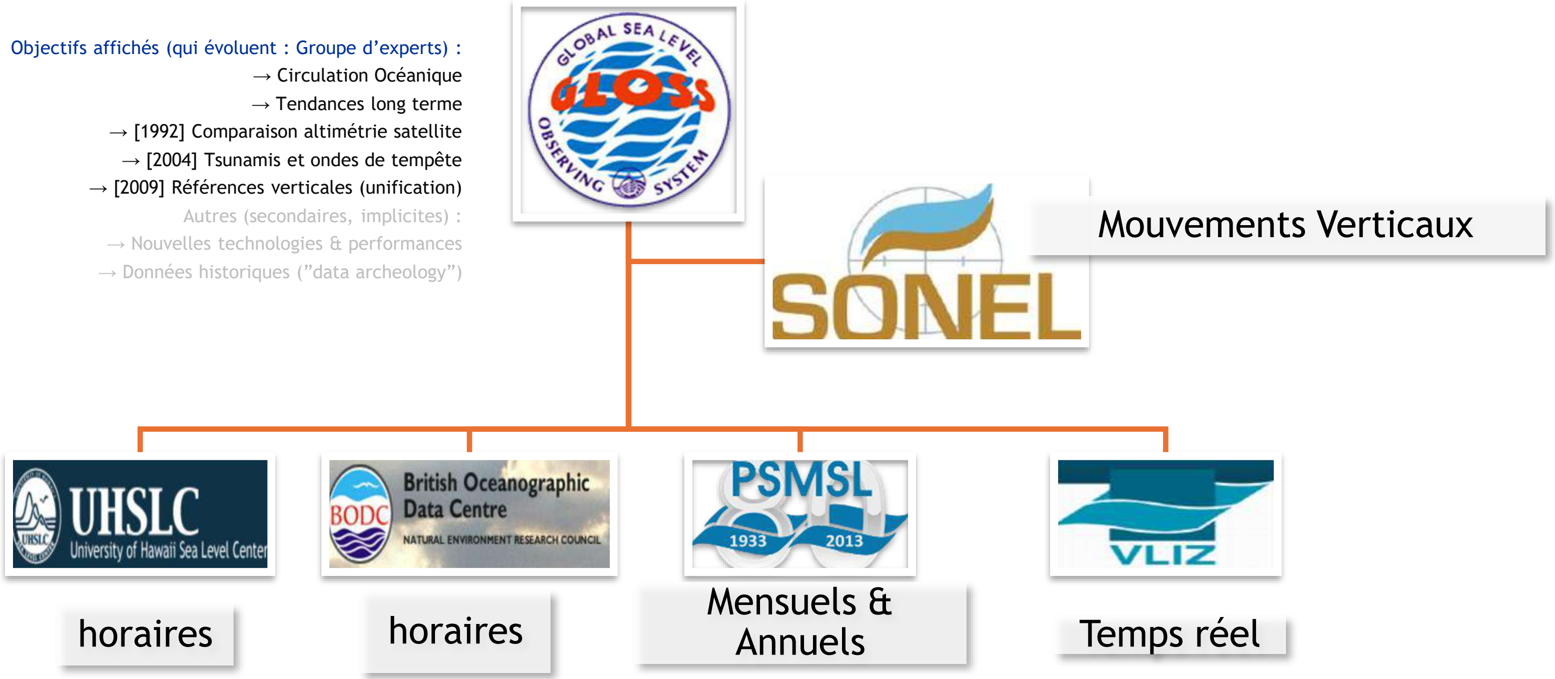

Sol
Niveau de la mer relatif
Niveau de la mer absolu
Ellipsoïde


Géodésie (VLM)
Sol
Niveau de la mer relatif
Mesure des mouvements verticaux
Niveau de la mer absolu
Ellipsoïde

Source PSMSL: http://www.psmsl.org/train_and_info/geo_signals/



Objectifs affichés (qui évoluent : Groupe d'experts) :
→ Circulation Océanique
→ Tendances long terme
→ [1992] Comparaison altimétrie satellite
→ [2004] Tsunamis et ondes de tempête
→ [2009] Références verticales (unification)
Autres (secondaires, implicites) :
→ Nouvelles technologies & performances
→ Données historiques ("data archeology")


GLOBAL SEA LEVEL OBSERVING SYSTEM
GLOSS
SONEL
UHSLC University of Hawaii Sea Level Center
BODC British Oceanographic Data Centre NATURAL ENVIRONMENT RESEARCH COUNCIL
PSMSL 1933 2013
VLIZ

Mouvements Verticaux

horaires

horaires

Mensuels & Annuels

Temps réel

**Missions :**

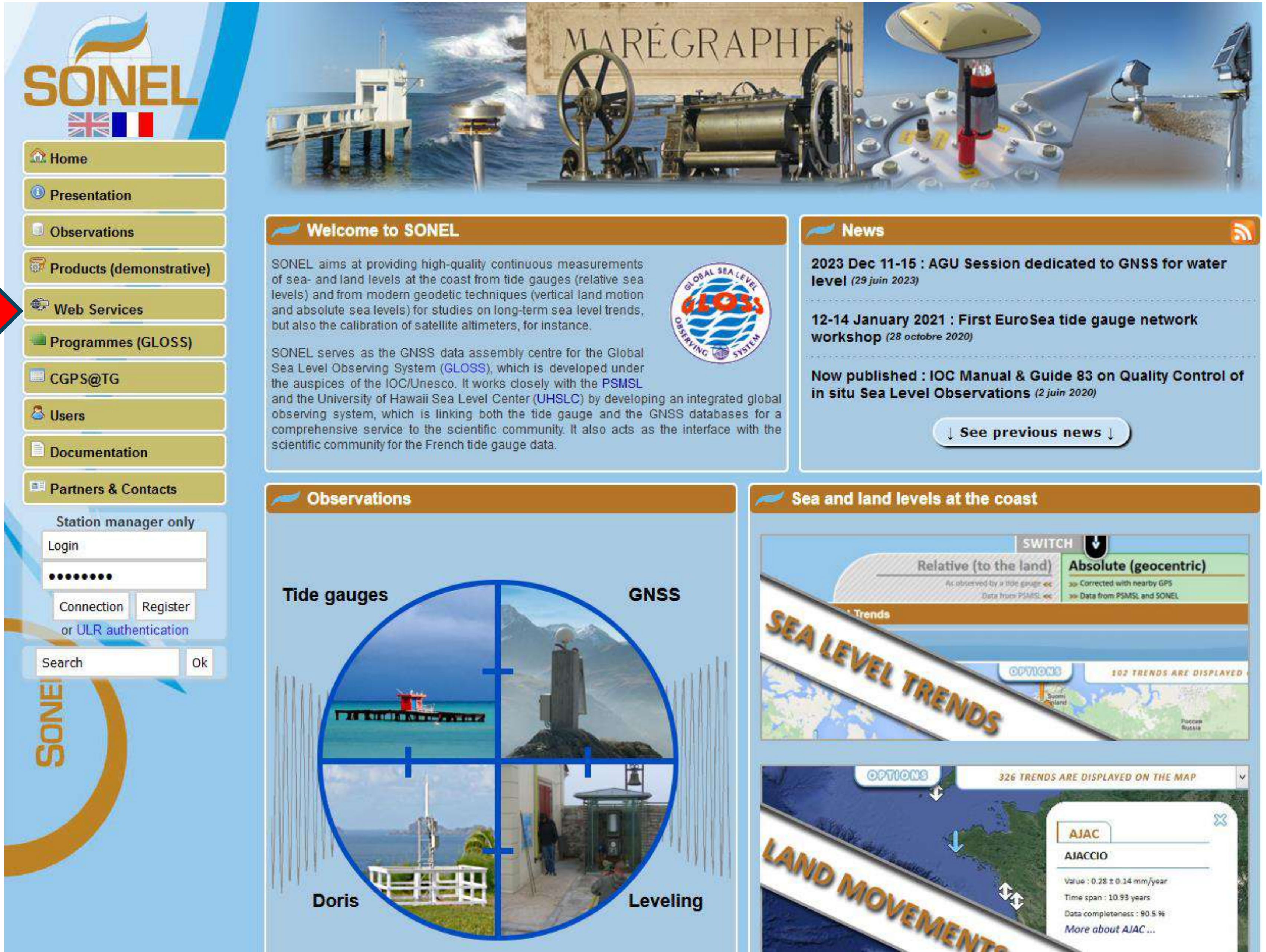
- Diffusion de données de la meilleure qualité (niveau moyen, mouvement du sol)
- Fournir les rattachements GNSS-Marégraphes (calibration des altimètres, unification des références verticales)
- Soutien à la sauvegarde du patrimoine marégraphique (cf présentation du Shom)
- Evaluation des performances des marégraphes (site atelier)

**Système ouvert** :

- Vocation à accueillir d’autres techniques (InSAR, Gravimétrie, Altimétrie, …) et d’autres réseaux

**Plus value SONEL**

- Centralisation de l’information pertinente
    - GPS, marégraphie, nivellement, métadonnée
- Regard expert et critique sur les données avant diffusion
- Produits & services
    - Tendances du niveau marin (relatif & absolu)
    - Vitesses verticales aux marégraphes
    - API
    - outil en ligne ➔ TGCAT


SONEL
MARÉGRAPHE
Home
Presentation
Observations
Products (demonstrative)
Web Services
Programmes (GLOSS)
CGPS@TG
Users
Documentation
Partners & Contacts
Station manager only
Login
••••••••
Connection
Register
or ULR authentication
Search
Ok
SONEL

## Welcome to SONEL

SONEL aims at providing high-quality continuous measurements of sea- and land levels at the coast from tide gauges (relative sea levels) and from modern geodetic techniques (vertical land motion and absolute sea levels) for studies on long-term sea level trends, but also the calibration of satellite altimeters, for instance.

SONEL serves as the GNSS data assembly centre for the Global Sea Level Observing System (GLOSS), which is developed under the auspices of the IOC/Unesco. It works closely with the PSMSL and the University of Hawaii Sea Level Center (UHSLC) by developing an integrated global observing system, which is linking both the tide gauge and the GNSS databases for a comprehensive service to the scientific community. It also acts as the interface with the scientific community for the French tide gauge data.

GLOBAL SEA LEVEL OBSERVING SYSTEM
GLOSS

## News

**2023 Dec 11-15 : AGU Session dedicated to GNSS for water level** *(29 juin 2023)*

**12-14 January 2021 : First EuroSea tide gauge network workshop** *(28 octobre 2020)*

**Now published : IOC Manual & Guide 83 on Quality Control of in situ Sea Level Observations** *(2 juin 2020)*

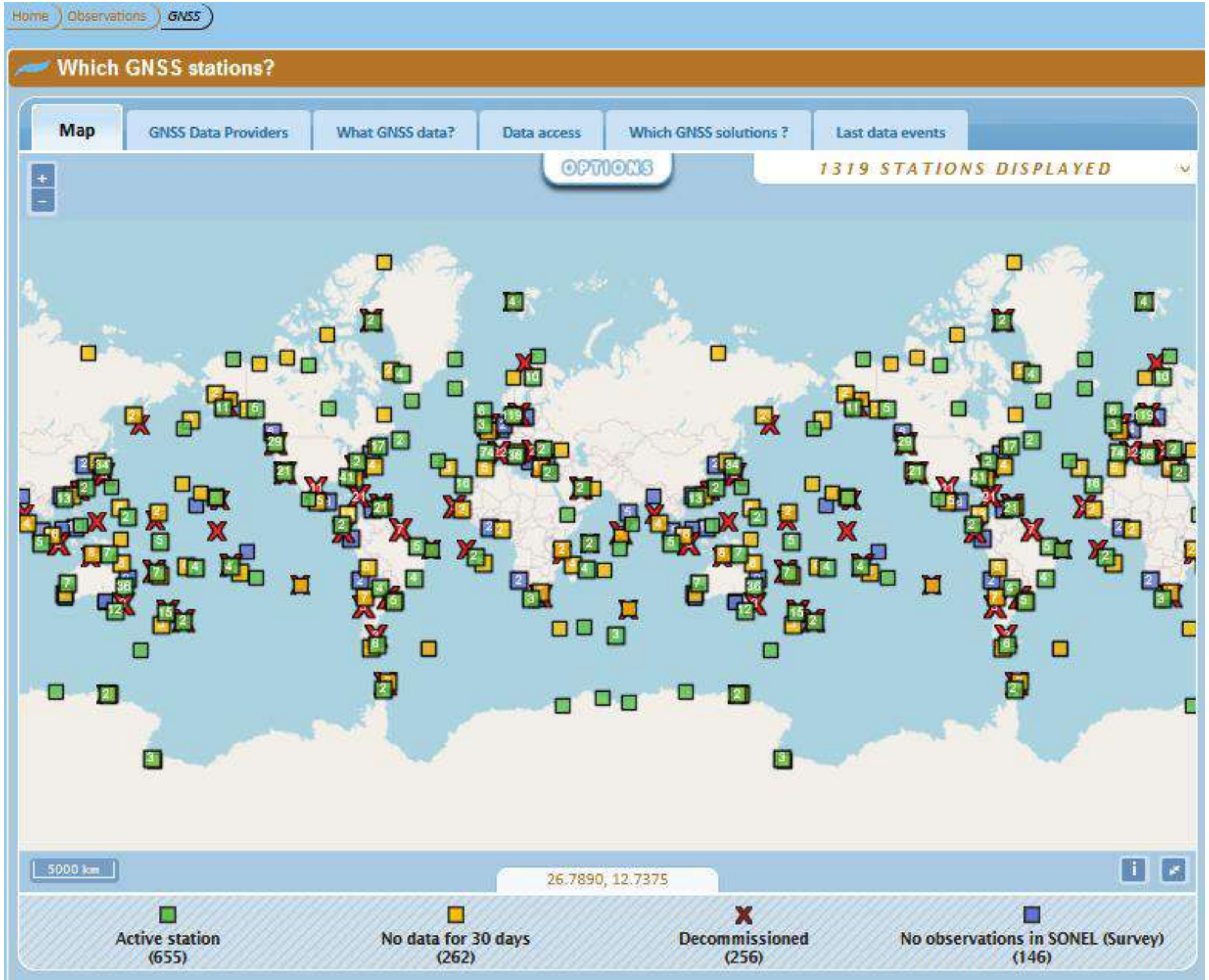
↓ See previous news ↓

## Observations

Tide gauges
GNSS
Doris
Leveling

## Sea and land levels at the coast

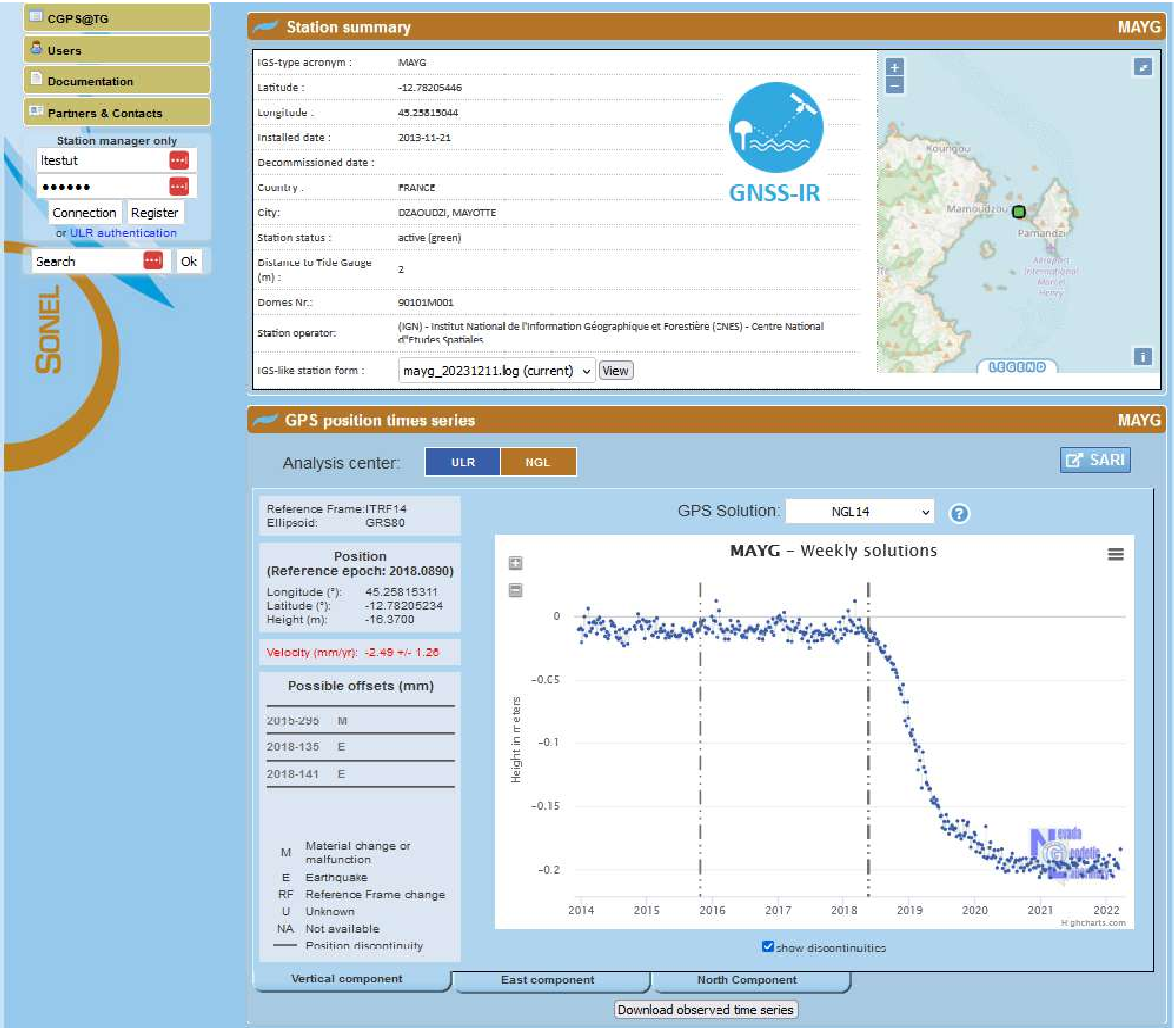
SWITCH
Relative (to the land)
As observed by a tide gauge
Data from PSMSL
Absolute (geocentric)
Corrected with nearby GPS
Data from PSMSL and SONEL
Trends
SEA LEVEL TRENDS
OPTIONS
102 TRENDS ARE DISPLAYED
OPTIONS
326 TRENDS ARE DISPLAYED ON THE MAP
LAND MOVEMENTS
AJAC
AJACCIO
Value : 0.28 ± 0.14 mm/year
Time span : 10.93 years
Data completeness : 90.5 %
More about AJAC ...


Home
Observations
GNSS
Map
GNSS Data Providers
What GNSS data?
Data access
Which GNSS solutions ?
Last data events
OPTIONS
+
−
5000 km
26.7890, 12.7375

**Which GNSS stations?**

1319 STATIONS DISPLAYED

| 🟩 | 🟨 | ✗ | 🟦 |
|---|---|---|---|
| Active station (655) | No data for 30 days (262) | Decommissioned (256) | No observations in SONEL (Survey) (146) |


CGPS@TG
Users
Documentation
Partners & Contacts
Station manager only
ltestut
Connection
Register
or ULR authentication
Search
Ok
SONEL
GNSS-IR
Koungou
Mamoudzou
Pamandzi
Aéroport International Marcel Henry
LEGEND
Analysis center:
ULR
NGL
SARI
GPS Solution:
NGL14
MAYG – Weekly solutions
Height in meters
0
-0.05
-0.1
-0.15
-0.2
2014
2015
2016
2017
2018
2019
2020
2021
2022
Highcharts.com
Nevada Geodetic Laboratory
Vertical component
East component
North Component
Download observed time series

## Station summary — MAYG

| | |
|---|---|
| IGS-type acronym : | MAYG |
| Latitude : | -12.78205446 |
| Longitude : | 45.25815044 |
| Installed date : | 2013-11-21 |
| Decommissioned date : | |
| Country : | FRANCE |
| City: | DZAOUDZI, MAYOTTE |
| Station status : | active (green) |
| Distance to Tide Gauge (m) : | 2 |
| Domes Nr.: | 90101M001 |
| Station operator: | (IGN) - Institut National de l'Information Géographique et Forestière (CNES) - Centre National d''Etudes Spatiales |
| IGS-like station form : | mayg_20231211.log (current) |

## GPS position times series — MAYG

Reference Frame:ITRF14
Ellipsoid: GRS80

**Position**
**(Reference epoch: 2018.0890)**

| | |
|---|---|
| Longitude (°): | 45.25815311 |
| Latitude (°): | -12.78205234 |
| Height (m): | -16.3700 |

Velocity (mm/yr): -2.49 +/- 1.26

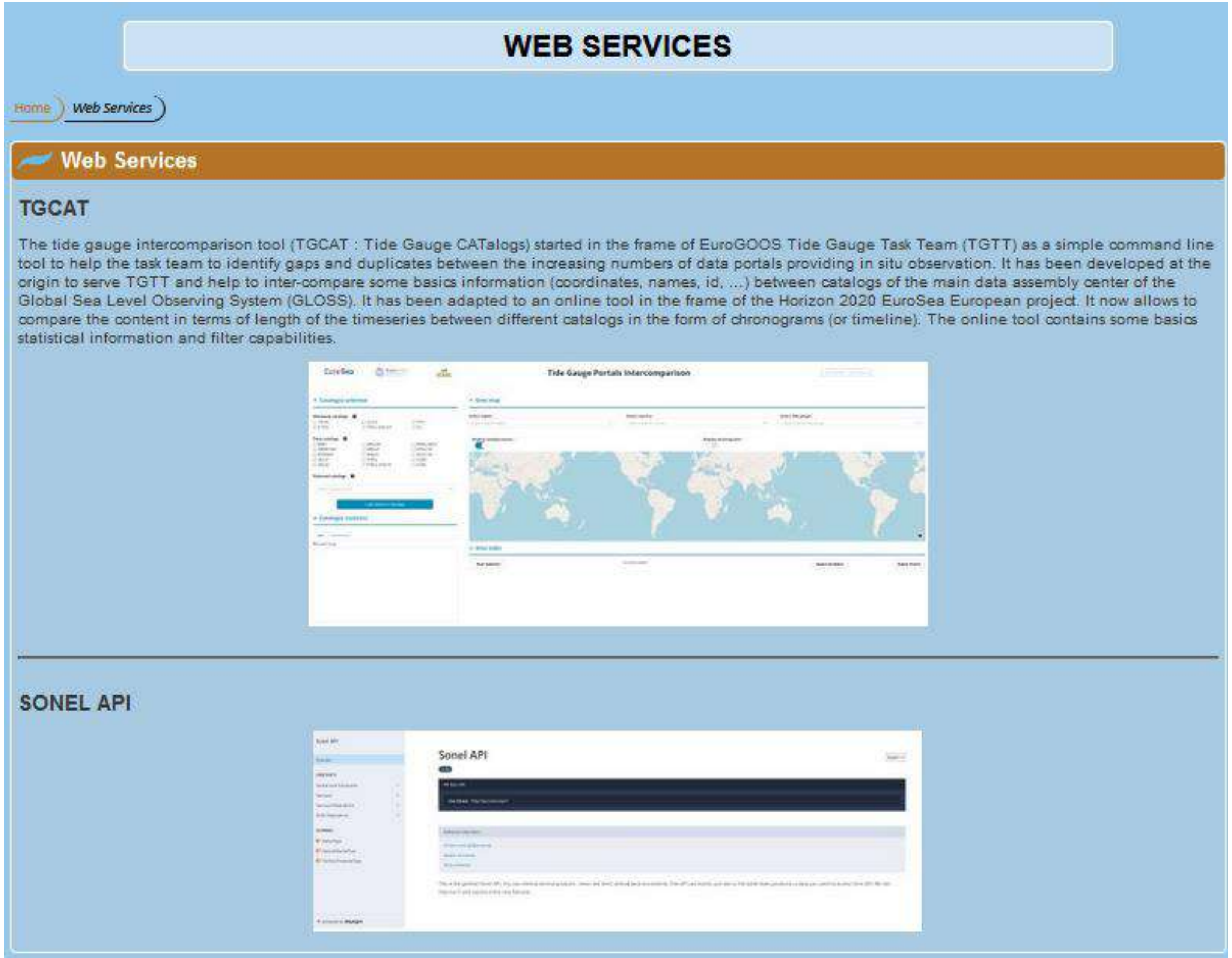
**Possible offsets (mm)**

| | |
|---|---|
| 2015-295 | M |
| 2018-135 | E |
| 2018-141 | E |

| | |
|---|---|
| M | Material change or malfunction |
| E | Earthquake |
| RF | Reference Frame change |
| U | Unknown |
| NA | Not available |
| — | Position discontinuity |

☑ show discontinuities

# DONNÉES, MÉTHODES & SERVICES POUR LE LITTORAL



## WEB SERVICES

Home Web Services

### Web Services

#### TGCAT

The tide gauge intercomparison tool (TGCAT : Tide Gauge CATalogs) started in the frame of EuroGOOS Tide Gauge Task Team (TGTT) as a simple command line tool to help the task team to identify gaps and duplicates between the increasing numbers of data portals providing in situ observation. It has been developed at the origin to serve TGTT and help to inter-compare some basics information (coordinates, names, id, ...) between catalogs of the main data assembly center of the Global Sea Level Observing System (GLOSS). It has been adapted to an online tool in the frame of the Horizon 2020 EuroSea European project. It now allows to compare the content in terms of length of the timeseries between different catalogs in the form of chronograms (or timeline). The online tool contains some basics statistical information and filter capabilities.

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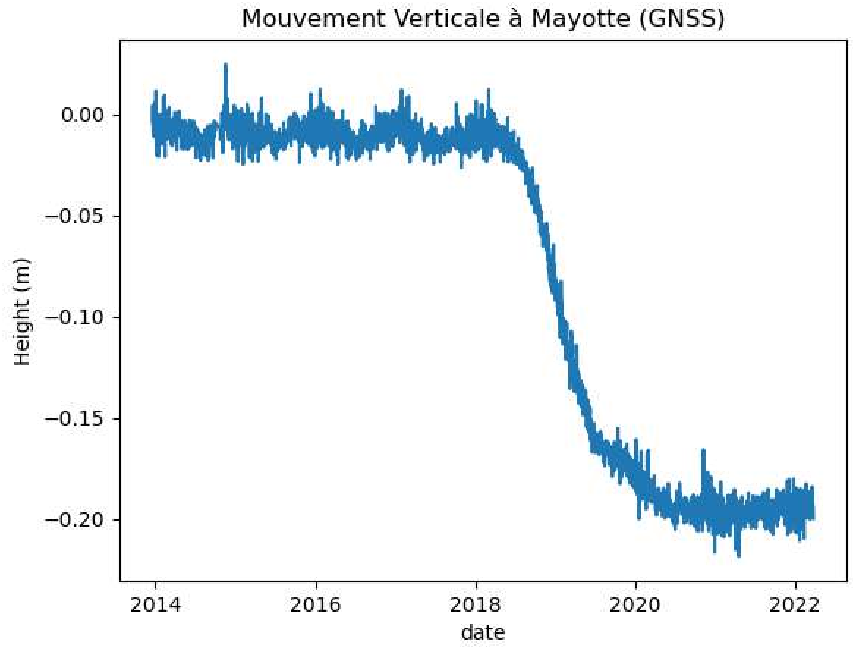
#### SONEL API

# La nouvelle api SONEL : https://api.sonel.org/v1/doc/index.html#

```
import pandas as pd
import matplotlib.pyplot as plt

# recuperation des données GNSS de Mayotte
data_url = r'https://api.sonel.org/v1/products/vlm/gnss/timeseries?solution=NGL14&acro=MAYG&format=json&sampling=daily'
data = pd.read_json(data_url,orient='index')
vlm = pd.DataFrame(index=data.loc['dates',0],data={'up':data.loc['du',0]})

#plot
plt.plot(vlm.index,vlm.up)
plt.title('Mouvement Verticale à Mayotte (GNSS)')
plt.xlabel('date')
plt.ylabel('Height (m)')
plt.show()
```



Remerciement à l’équipe SONEL

(LIENSs) Adrien Laval, Médéric Gravelle, Mikaël Guichard, Sarah Baizeau, Guy Wöppelmann, Elizabeth Prouteau, …

(Shom) Claire Fraboul, Nathalie Giloy, Alexa Latapy, Nicolas Pouvreau, …

(IGN) Thomas Donal, Tanguy Garmond, Sébastien Saur, Bruno Garayt,…

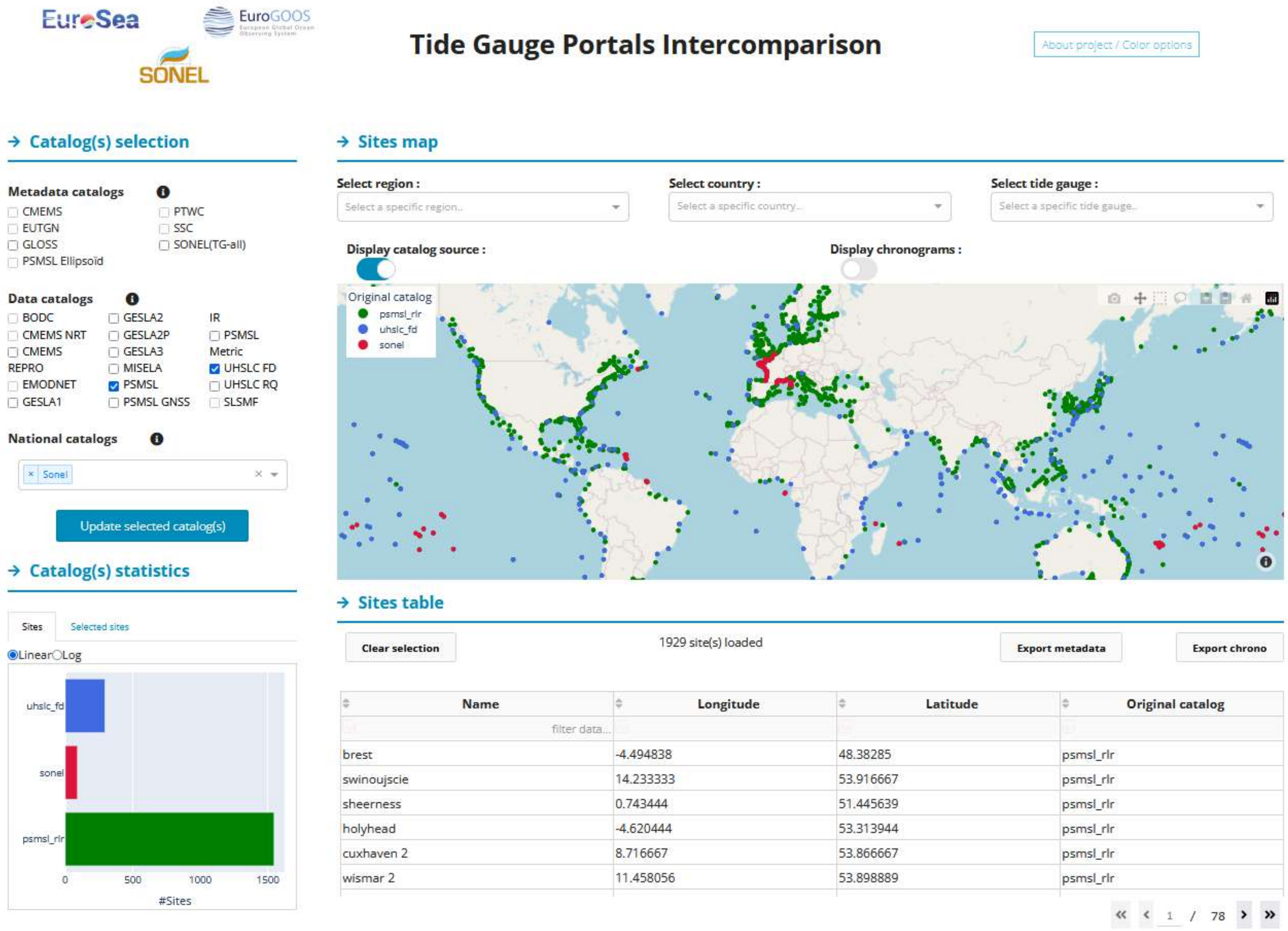
(LEGOS) Philippe Téchiné

## Retrouvez toutes les présentations de l’atelier

**DONNÉES, MÉTHODES & SERVICES POUR LE LITTORAL**

Sur **https://www.theia-land.fr/littoral/littoral2024**
et sur **https://www.odatis-ocean.fr/?id=617**

**www.sonel.org/tgcat**



# Tide Gauge Portals Intercomparison

EuroSea
EuroGOOS
SONEL
About project / Color options

## → Catalog(s) selection

**Metadata catalogs**

☐ CMEMS
☐ EUTGN
☐ GLOSS
☐ PSMSL Ellipsoïd
☐ PTWC
☐ SSC
☐ SONEL(TG-all)

**Data catalogs**

☐ BODC
☐ CMEMS NRT
☐ CMEMS REPRO
☐ EMODNET
☐ GESLA1
☐ GESLA2
☐ GESLA2P
☐ GESLA3
☐ MISELA
☑ PSMSL
☐ PSMSL GNSS
IR
☐ PSMSL Metric
☑ UHSLC FD
☐ UHSLC RQ
☐ SLSMF

**National catalogs**

Sonel

Update selected catalog(s)

## → Catalog(s) statistics

Sites
Selected sites
● Linear ○ Log
uhslc_fd
sonel
psmsl_rlr
0
500
1000
1500
#Sites

## → Sites map

Select region : Select a specific region..

Select country : Select a specific country..

Select tide gauge : Select a specific tide gauge..

Display catalog source :

Display chronograms :

Original catalog
psmsl_rlr
uhslc_fd
sonel

## → Sites table

Clear selection
Export metadata
Export chrono

1929 site(s) loaded

| Name | Longitude | Latitude | Original catalog |
|---|---|---|---|
| filter data... | | | |
| brest | -4.494838 | 48.38285 | psmsl_rlr |
| swinoujscie | 14.233333 | 53.916667 | psmsl_rlr |
| sheerness | 0.743444 | 51.445639 | psmsl_rlr |
| holyhead | -4.620444 | 53.313944 | psmsl_rlr |
| cuxhaven 2 | 8.716667 | 53.866667 | psmsl_rlr |
| wismar 2 | 11.458056 | 53.898889 | psmsl_rlr |

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