

Software Ecosystem for the Acquisition, Analysis, Processing and Publishing of Marine Observation Data

Artur Rocha (artur.rocha@inesctec.pt)

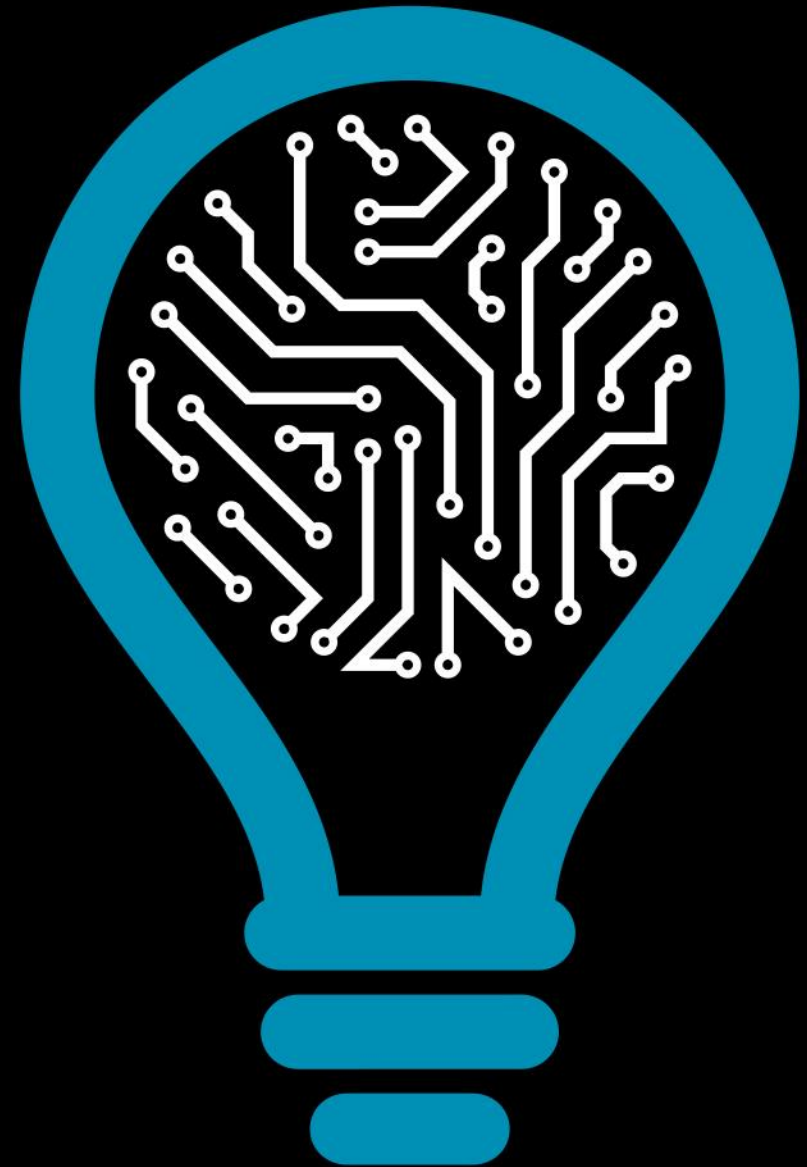
INESC TEC

MARINETECH 2019

November 5th, 2019

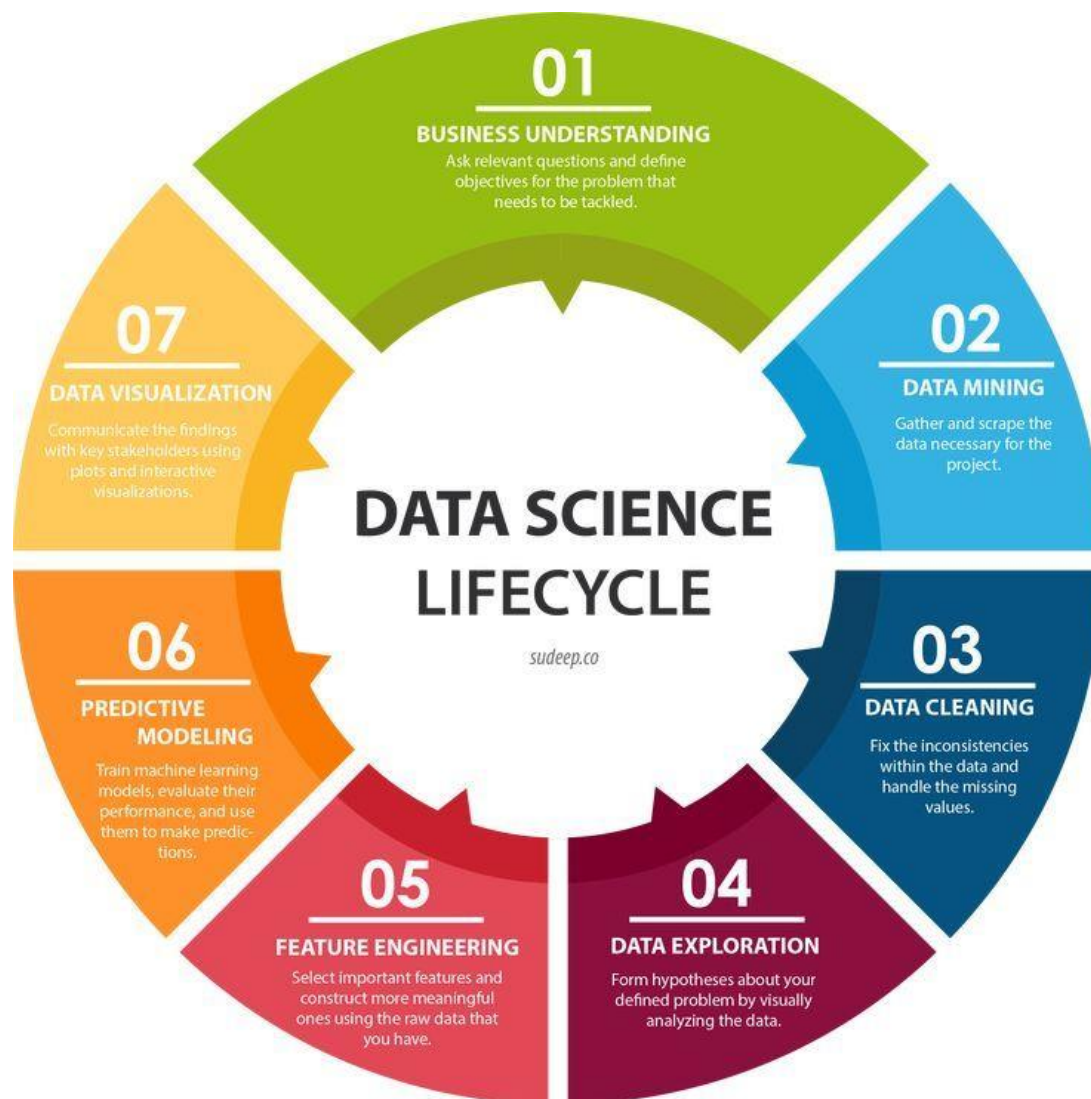


INSTITUTE FOR SYSTEMS
AND COMPUTER ENGINEERING,
TECHNOLOGY AND SCIENCE



- Life Cycle Overview and Projects
- MELOA, the WAVY & the WOS
- Data Acquisition
- Meta-model for Observation Data
- Real-time Data Visualization
- Curation Tools & Exploratory Analysis
- Publishing Data: End of Upstream Cycle
- MarRISK & Coastal Resilience
- Observation Data: Managing & Searching
- Data Curation: Quality & Availability
- Processing: Extraction of Indicators
- Communicating Risks

Data Science Life Cycle Overview



WAVY Drifters & WAVY Operation Software

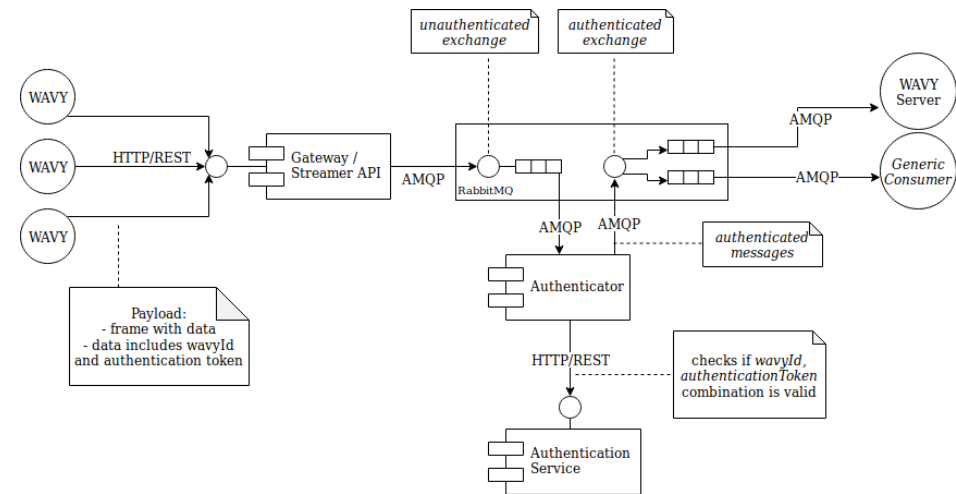
Multi-purpose/Multi-sensor Extra Light Oceanography Apparatus

- WAVY is a surface drifter, developed under the scope of MELOA Project, that acquires marine in-situ measurements.
- WAVY Operation Software is a tool, developed by INESC TEC, supporting users in the process of data acquisition, curation (annotation, cleansing, ...), exploration and sharing.



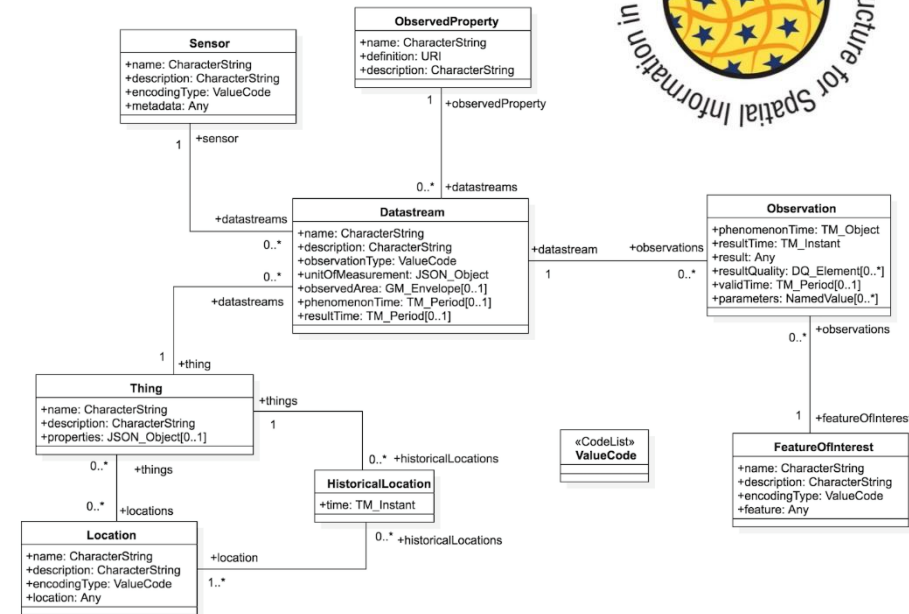
Data Acquisition

- The Real Time Data Streamer is a message broker that allows the WOS to subscribe and consume real-time messages sent by the WAVY drifters with virtually no data loss.
- Even in an unlikely event of server unavailability or maintenance, the Real Time Data Streamer will store the measurements until they are successfully transmitted to the WOS.



Meta-model for Observation Data

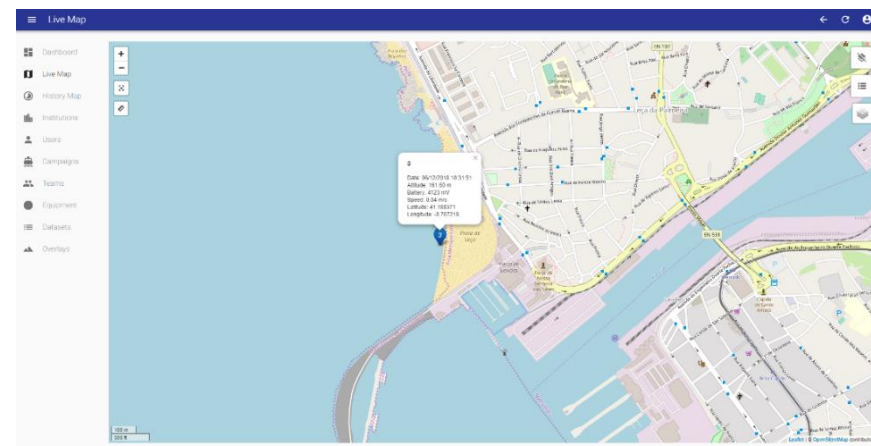
- The WOS leverages on the conceptual model of the Observation & Measurements (O&M) standard.
- The WOS data model was inspired on the OGC SensorThings API data model, with some additions to fulfill the requirements of the MELOA Project.





Real-time Data Visualization

- WOS offers a tool that allow users to see the acquired measurements in real-time in a georeferenced map.
- The real-time operation can also be visualized as a table
- Allows the users to take time referenced notes, in a collaborative way.

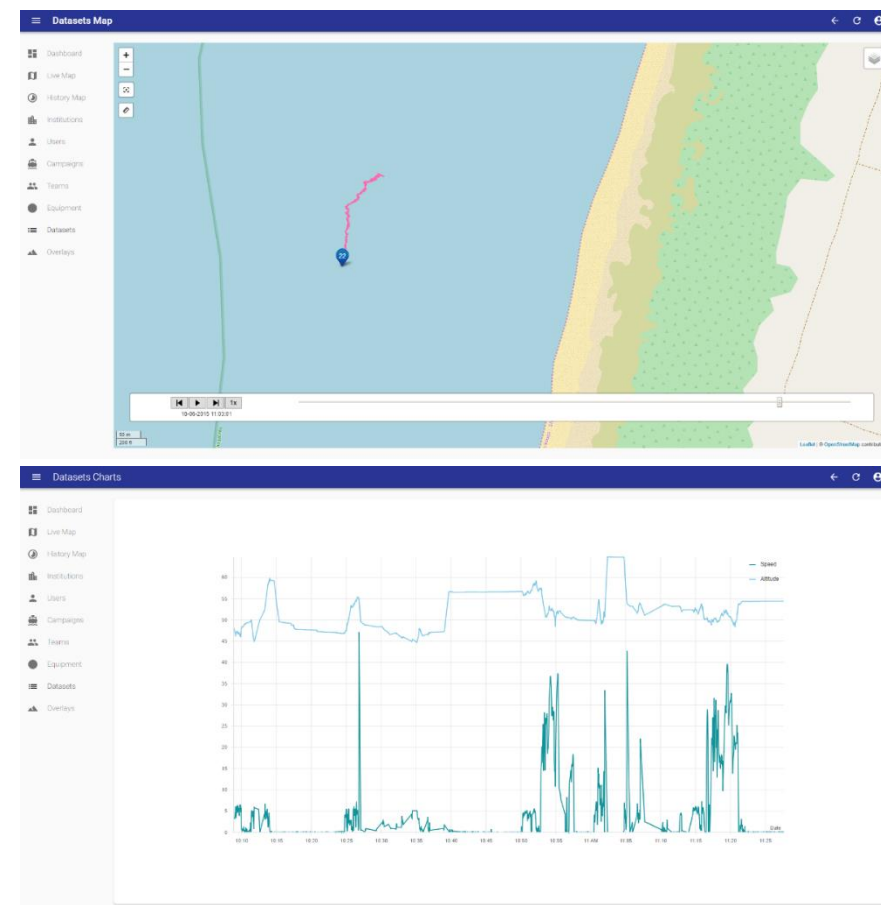


The screenshot shows the same 'Live Map' application with a table overlay titled 'WAVYS'. The table lists 10 data points with their respective coordinates, timestamps, and battery levels.

ID	Location (lat, lon)	Timestamp	Battery (mV)
WL54	40.111517, -7.706300	2019-10-18 11:15:17	4081
WL51	40.111254, -7.706420	2019-10-18 11:12:54	3969
WL60	40.111418, -7.706470	2019-10-18 11:14:08	4007
WL52	40.111330, -7.706390	2019-10-18 11:13:30	3996
WL56	40.111344, -7.706560	2019-10-18 11:13:44	3916
WL66	40.111343, -7.707100	2019-10-18 15:49:49	3930
WL62	40.1114624, -7.707210	2019-10-18 12:46:24	3978
WL64	40.1114636, -7.707400	2019-10-18 12:46:36	4013
WL65	40.1114610, -7.707100	2019-10-18 12:46:10	4010
WL66	40.1114612, -7.707100	2019-10-18 12:46:02	4008

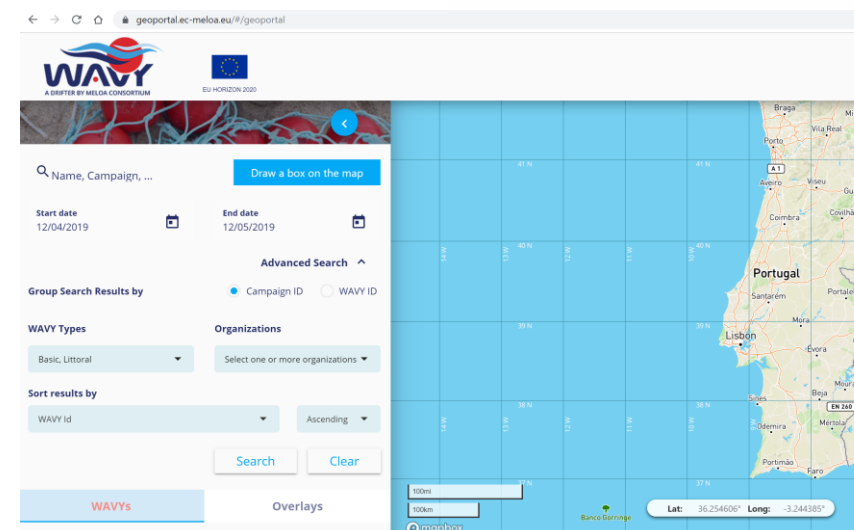
Curation Tools & Exploratory Analysis

- Annotate datasets cooperatively to facilitate data cleansing/curation
- Assist users in creating derived (cleansed) datasets.
- Implement exploratory visualization tools to help the campaign manager to steer operations during the campaign (e.g. identify what and where to focus deployments)



Publishing Data: End of Upstream Cycle

- The WOS has the capability of publishing observation data to a CKAN that feeds a GeoPortal, developed by Deimos.
- Is also capable of publishing data to external O&M/IoT compliant systems such as the Sensor Observation Service, SensorThings API, or even different catalogues such as FIWARE.





MarRISK & Coastal Resilience

“Costal adaptation to climate change: knowing the risks and increasing resilience.”

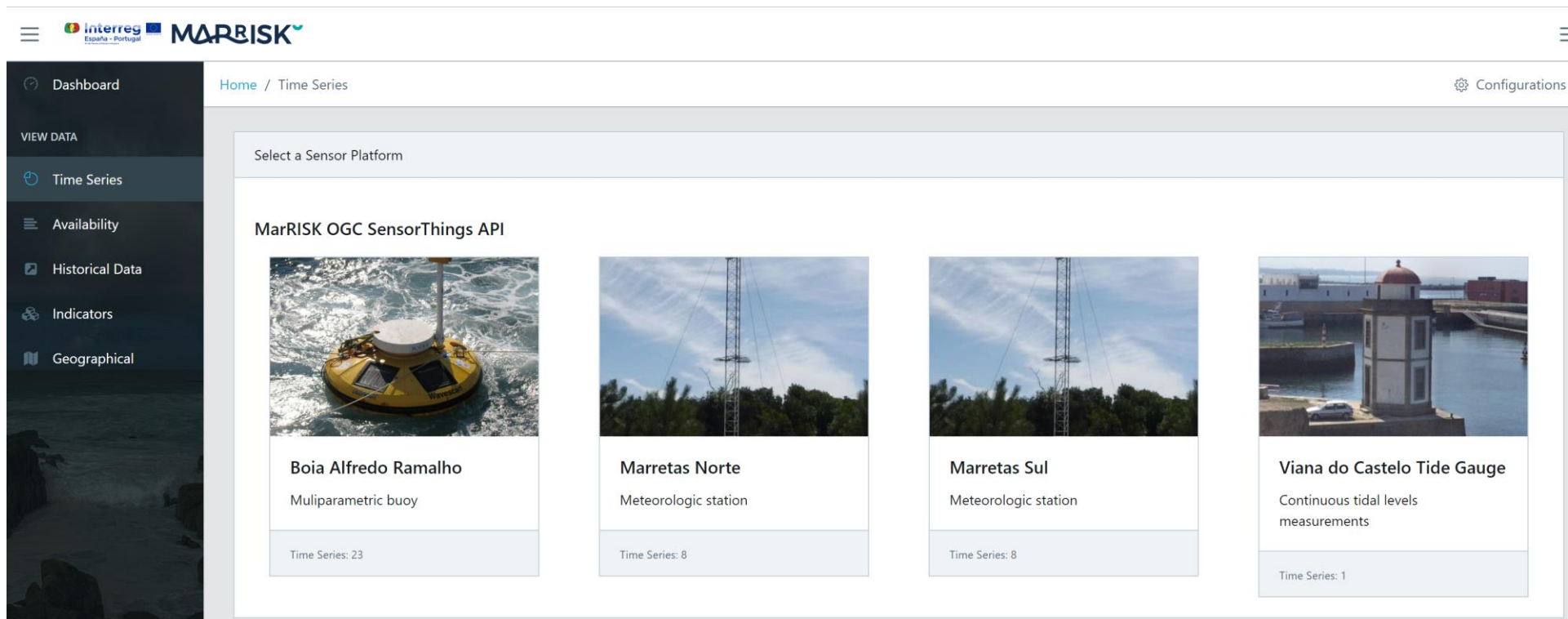
- Combination of Upstream and Downstream Services
- Uses the same Meta-model to store Marine Observation Data
- Data Curation: Overview of Data Quality
- Processing: Extraction of Indicators
- Processed Data Visualization & Outreach: Risks & Resilience







On-going: RADAR ON RAIA (HF RADAR)

Managing Observation Data

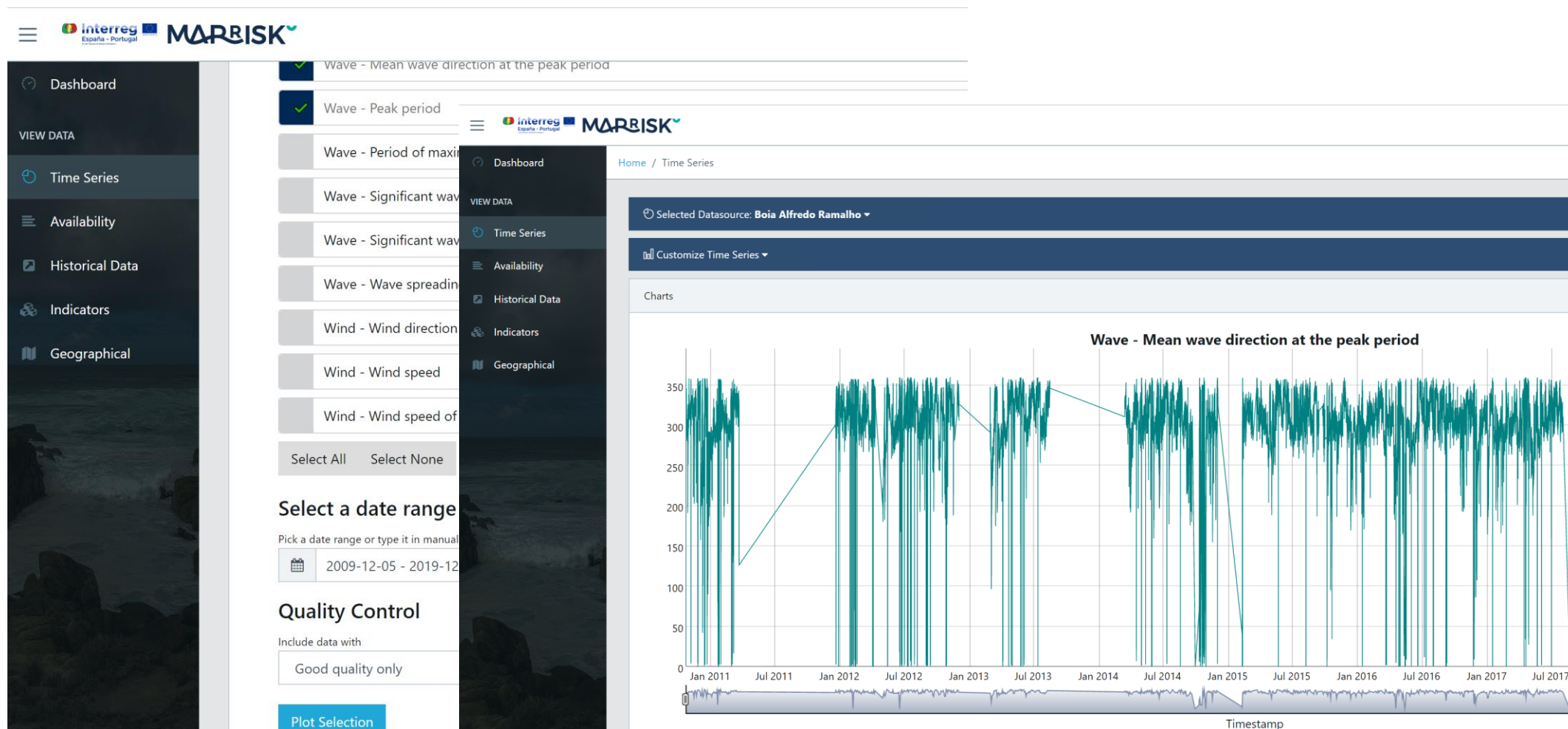
<http://marrisk.inesctec.pt>



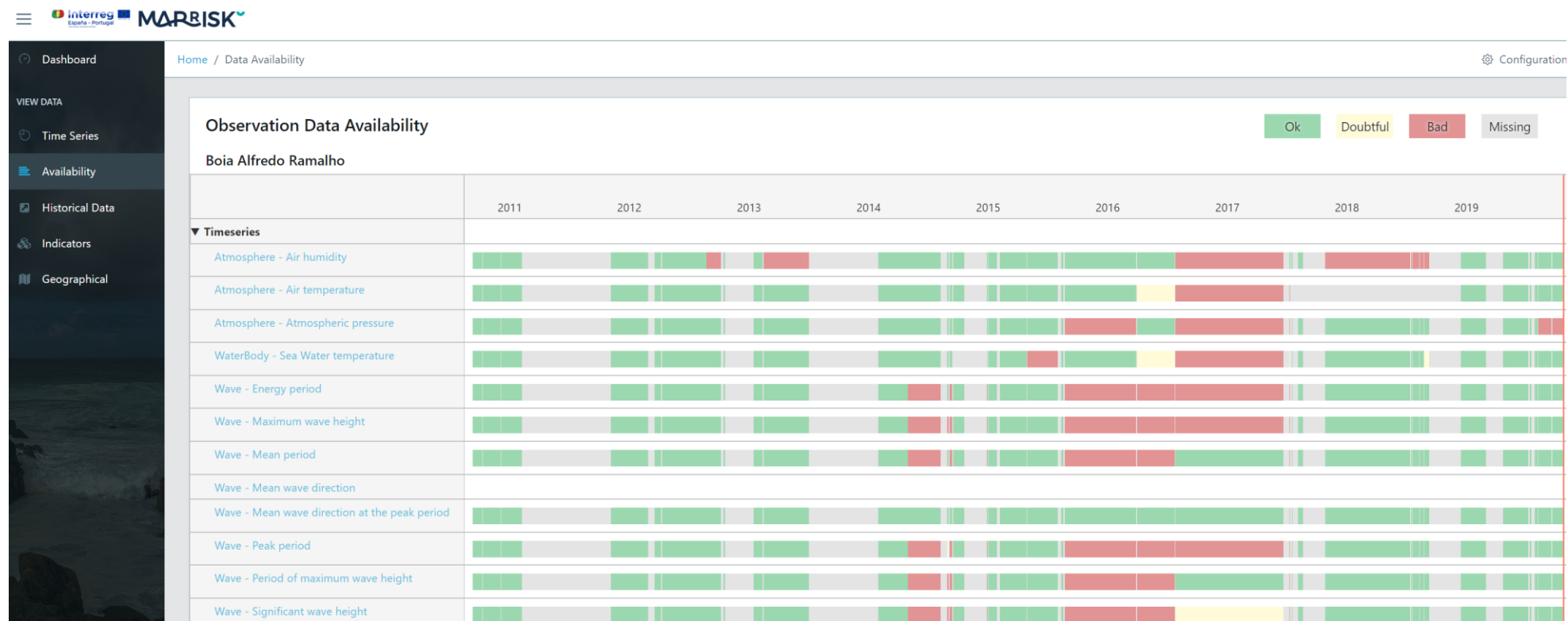
The screenshot displays the Marrisk web application interface. The top navigation bar includes the Interreg logo, the Marrisk logo, and a hamburger menu icon. The left sidebar contains a 'Dashboard' link and a 'VIEW DATA' section with links for 'Time Series', 'Availability', 'Historical Data', 'Indicators', and 'Geographical'. The main content area is titled 'Home / Time Series' and features a 'Select a Sensor Platform' section. Below this, the 'MarRISK OGC SensorThings API' is listed, showing four sensor platforms:

Sensor Platform	Description	Time Series
	Boia Alfredo Ramalho Multiparametric buoy	Time Series: 23
	Marretas Norte Meteorologic station	Time Series: 8
	Marretas Sul Meteorologic station	Time Series: 8
	Viana do Castelo Tide Gauge Continuous tidal levels measurements	Time Series: 1

Searching Observation Data



Data Curation: Quality & Availability



Collection of Indicators

interreg **MARISK**

Home / Indicators

Configurations


Dashboard

VIEW DATA

- Time Series
- Availability
- Historical Data
- Indicators**
- Geographical


Coastal Risks Categories

Coastal Risk Factors



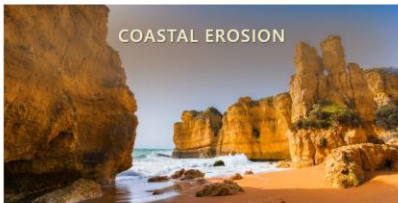
ACIDIFICATION

[View More](#)




ALTERATIONS OF SALINITY

[View More](#)




COASTAL EROSION

[View More](#)




COASTAL FLOODING

[View More](#)




DEOXYGENATION

[View More](#)




EUTROPHICATION

[View More](#)



HYDRODINAMIC ALTERATIONS

[View More](#)

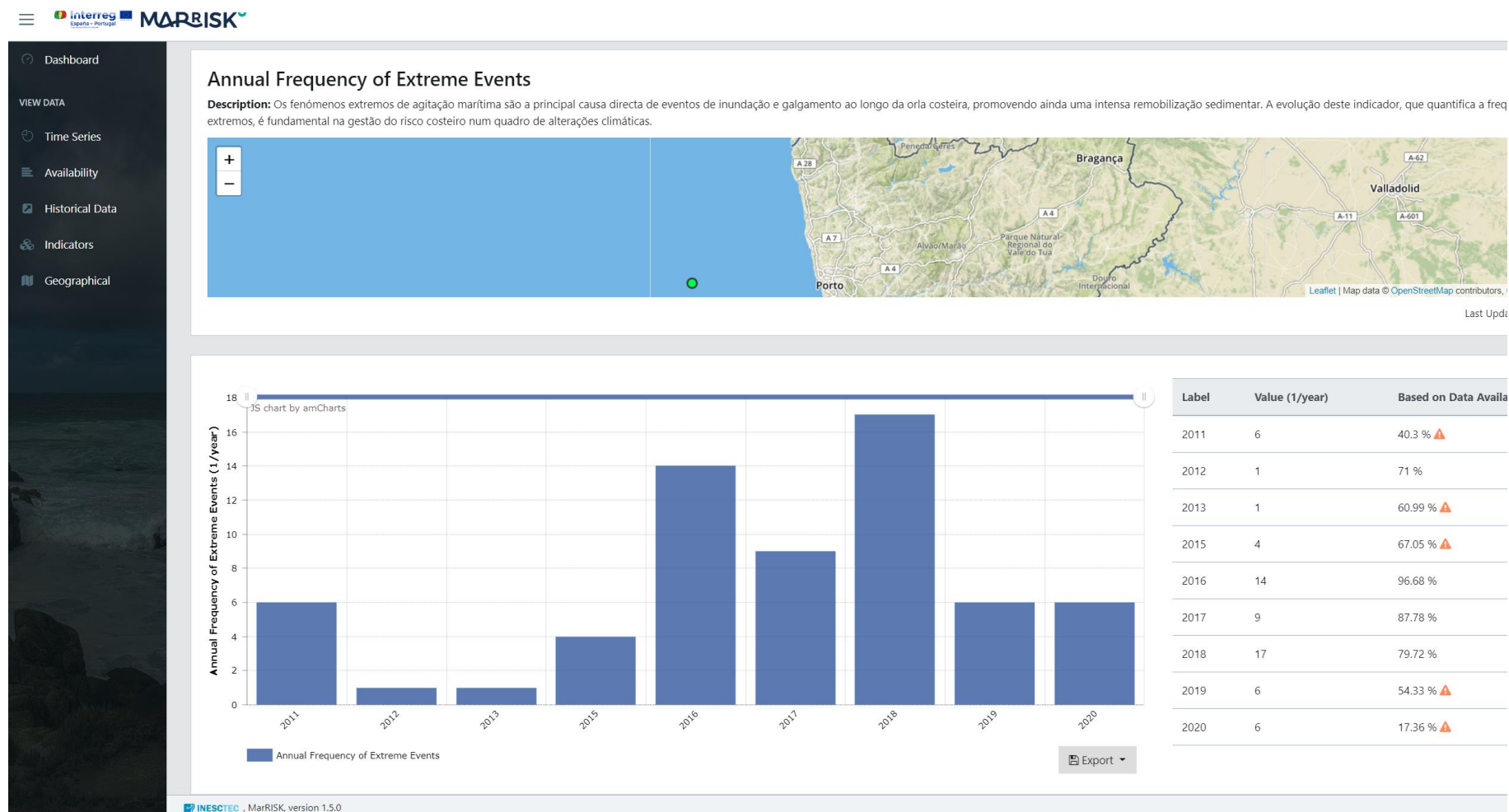


LOSS OF GENETIC DIVERSITY

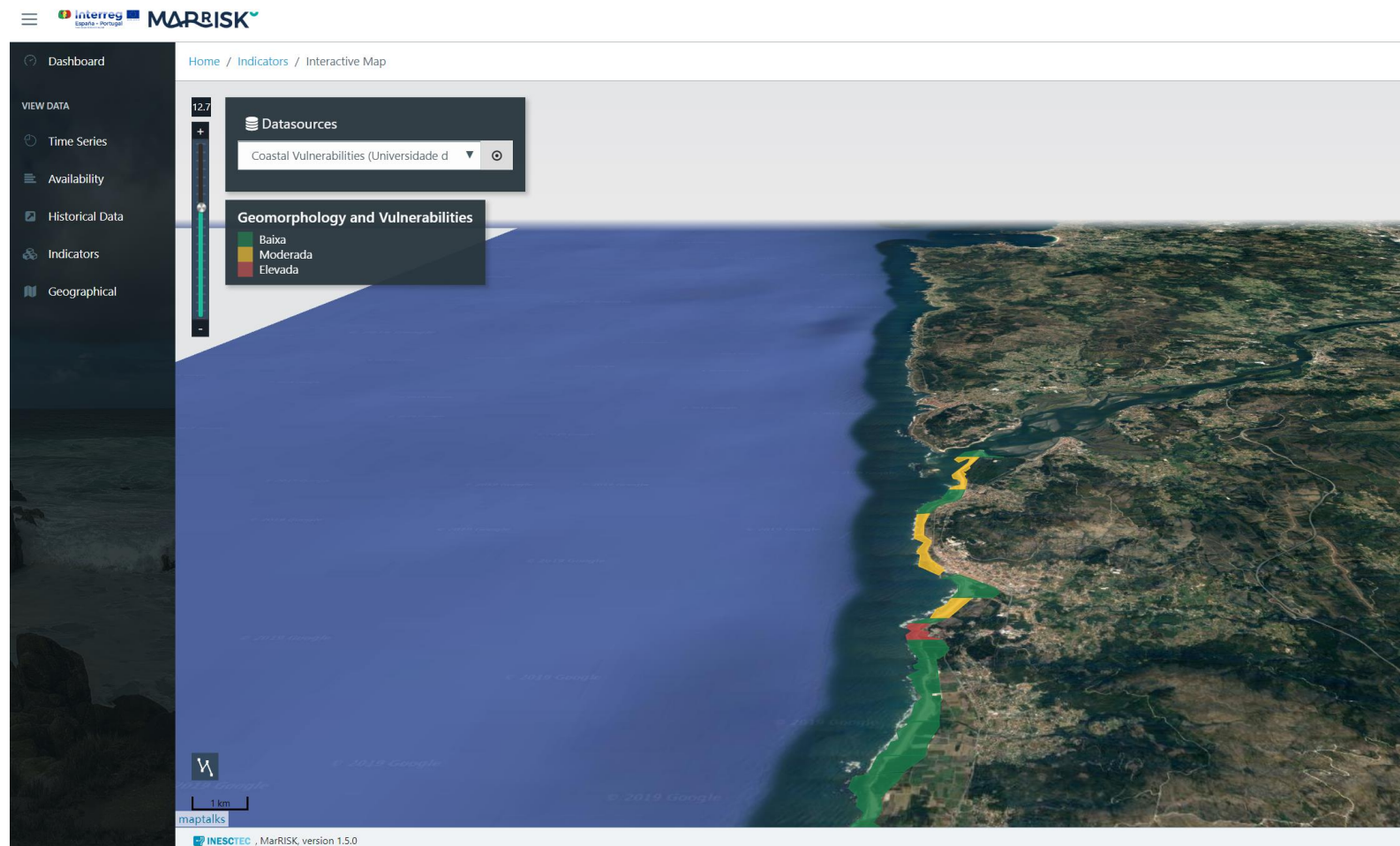
[View More](#)



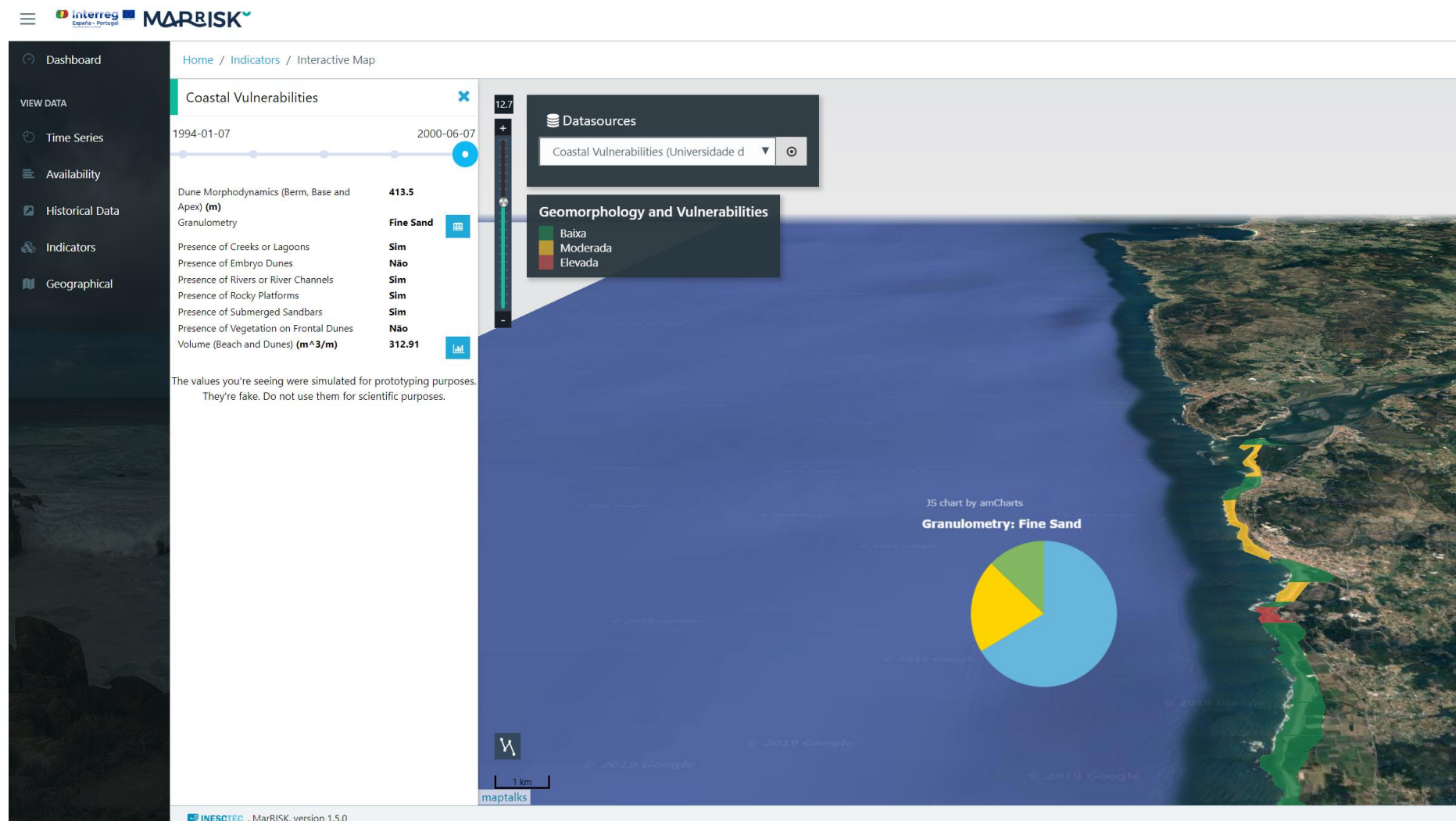
Processing: Automatic Extraction of Indicators



Communicating Risks I



Communicating Risks II



Questions?



Artur Rocha: artur.rocha@inesctec.pt

INESC TEC

Porto, Portugal