Joint European Research Infrastructure network for Coastal Observatory – Novel European eXpertise for coastal observaTories - **JERICO-NEXT**

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1. Executive Summary

This report is related to “Task 5.3: Platform registration and metadata management system” and in particular aims to verify the extent to which the objectives of the activity have been achieved.

The “Coastal Observatory console” developed by Ifremer has been tested by CNR as an independent user.

The results of this test are summarized in the Conclusions where the achievement or non-achievement of the specific targets planned in the Annex 1 of the Grant Agreement and the following documentation is indicated and, where relevant, recommendations for better implementation are reported.

2. Introduction

The main objective of Task 5.3, as stated in the Annex 1 of the Grant Agreement, is to improve the management of the metadata of the deployed observatories by providing their operators with dedicated interfaces to describe their instruments, to monitor them in real-time, to publish and to advertise the work of data acquisition. This will respond to a strong need highlighted during the SeaDataNet and Copernicus MEMS projects, giving also a major role to the observatory operators. Providing metadata publishing tools will also greatly facilitate discovery, visualization and downloading services fully compatible with INSPIRE.

The planned targets to achieve this goal in JERICO-NEXT Annex 1 are:

1. Define core services to be provided to observatory operators and identify which will be the data ingestion systems involved for such an experiment (ROOSes for MyOCean, in datasets indexes-CDI- and EDIOS for SeaDataNet).
2. Define and prioritize with the targeted observatory network operators the services to be developed: data ingestion mode, specific events editions (deployments, calibrations, …), alerts on data availability and thresholds, monitoring dashboards, other publication facilities such as DOI registration.
3. Adapt the existing templates (SeaDatanet, ODIP, JERICO) to ingest SWE information from the targeted observatory networks.
4. Design and implement the data ingestion modules for targeted observatory networks
5. Design and implement the services to observatory operators
6. Design and implement the interface with data managements systems SeaDataNet and MyOcean ROOSes .
7. Provide automated quality control module through the web console applicable on standardized datasets (e.g. in ODV or NetCDF format) and implement them through a Pilot-test Web Service, following the Web Processing Service (WPS) OGC standard. This service could be triggered on real-time and near real-time data flows.

Core services and data ingestion systems to be provided to observatory operators (**target n. 1**) are defined in D5.6 (Loubrieu et al., 2017) and in particular the requirements and design of an online console are identified for both:

- Maintain and document deployments
- Push the resulting datasets for long time preservation and availability for data services, via, for example, Copernicus MEMS and EMODNET.

Despite the original plan in Annex 1, i.e. to implement advanced services for FerryBoxes, fixed moorings and non permanent operational coastal observation networks, D5.6 targets fixed observatories (seabed or moored) and non-permanent operational coastal observation networks, i.e. HF radars deployments and flow cytometry observations. Other type of platforms (for example FerryBoxes) were not considered in the demonstration due to budget limitations.

The proposed architecture is based on open-source solutions (for example owncloud) and open standards (OGC/Sensor Web Enablement). The flexibility and modularity of it allows to adapt the solution to the targeted networks and allows thinking of wider adoption thanks to collaboration with other projects and initiatives, for example for FerryBoxes. The chosen architecture has been proof tested previously with deep-sea observatory and research vessels platforms for deployment documentation and data synchronization and sharing.

The foreseen extensions for the three types of targeted observatories are shown in Table 1, the components identified for the software architecture are in Table 2, and the implementation plan is in Figure 1.

Table 1 : *Foreseen extensions for targeted observation networks (from Loubrieu et al., 2017).*

Core function	**Fixed Platforms**	**HF radars**	**Flow cytometry**
UC1: Describe a deployment (instrument, observatory or a network of observatories) and connected processes	**UC1-1**: describe a fixed platform	**UC1-2**: Describe HF radar site and data post-processing **UC1-3**: Description of geometry of the deployment site and description of processing chain downstream the acquisition should be supported	
UC2: Submit a dataset in real-time or delayed mode	**UC2-1**: submit CSV time-series data files **UC2-2**: submit video data files	**UC2-3**: Submit 3-4D-netCDF data files (time plus spatial grid) and pre-processing	**UC2-5**: Submit images (individual pictures, for example zoo-plankton) **UC2-6**: submit CSV biology sampling
UC3: Discover, Visualize and Analyze equipment and datasets	**UC3-1**: time-series visualization **UC3-2**: visualize video	**UC3-3**: Coverage visualization	**UC3-5**: visualize images (album) **UC3-6**: visualize biology sampling visualization (for example pie-chart).
UC4: Share information and data with colleagues or data with long term preservation and publication infrastructure or data service			

Table 2 : Identified components of the software architecture (from Loubrieu et al., 2017) .

Component	Description
CM1	File sync, share server and plugins to manage datasets in various formats and observatory description files. This is the cornerstone for the users submitting resources to the system (datasets and observatory descriptions)
CM2	Deployment editor
CM3	Indexation engine
CM4	Discovery, visualization and analysis portal

	CM1: File sync and share server and plugins	CM1-2: Observatory editor	CM3: Indexation engine	CM4: Discovery, visualization and analysis portal
UC1: Describe an equipment				
Core	X	X		
UC1-1: fixed platform		X		
UC1-2: Site geometry		X		
UC1-3: Data post-processing		X		
UC2: Submit a dataset				
Core	X		X	
UC2-1: CSV time series	X		X	
UC2-2: videos	X		X	
UC2-3: 3-4D netcdf	X		X	
UC2-4: images *[UC2-5]	X		X	
UC2-5: CSV biology sampling *[UC2-6]	X		X	
UC3: Discover, Visualize and Analyze				
Core				X
UC3-1: CSV time series				X
UC3-2: videos				X
UC3-3: 3-4D netcdf				X
UC2-4: images *[UC3-5]				X
UC2-5: CSV biology sampling *[UC3-6]				X
UC4: Share information				
individuals	X		X	X
functions (long term archive, data service)	X		X	X

***Figure 1** : Implementation plan from D5.6 (Loubrieu et al., 2017). A significant number of functions has been implemented and stabilized for other projects (in green). However a number of developments still need to be done to fulfil the JERICO-NEXT objectives (in red). The numbering of some core functions would appear to be incorrect. The possible correction is indicated in red and square brackets anticipated by the asterisk.*

To finalize **target n. 3**, D5.7 (Loubrieu, 2017) proposed 10 Sensor Web Enablement templates for fixed platforms, HF radars and flow cytometry to be implemented in the observatory operator console. They should allow users to edit, store, explore the observatory descriptions (monitoring facility, platform, instruments) and streamline the publication of their data and metadata to European data services and aggregators (Copernicus, SeaDataNet, and EMODnet).

Sensor Web Enablement standards enable developers to make all types of sensors, transducers and sensor data repositories discoverable, accessible and useable via the web (see http://www.opengeospatial.org/ogc/markets-technologies/swe). Among them the Sensor Model Language (sensorML) and Observations and Measurements (O&M) have been chosen to implement the data model for the observatory operator console, based on Sensor Nanny infrastructure, and developed in JERICO-NEXT (see D5.6). The sensorML is used to describe physical systems (sensor, instruments, platforms and monitoring facilities) and their deployments. The O&M is used to describe the observations.

The necessary attributes for the descriptions have been deduced from the metadata requirements of data services where datasets are published downstream the observatory. Depending on the type of observatory, the metadata requirements definition and expected workflow have various readiness level. Fixed stations have been ingested by SeaDataNet or Copernicus, while HF radar data management standards is being defined in newly published reference documents, including JERICO-NEXT D5.13 (Corgnati et al., 2017), and flow cytometry working groups are currently active to define data standards.

The encoding of the metadata has been defined with three drivers. 1) Re-use previous experience and reference documentation on SWE encoding (OGC, INSPIRE, SWE Marine profile group, SeaDataNet…), 2) Strictly validate the proposed encoding with official XSD schemas, 3) extensively use properly defined terms for metadata properties and values with support of vocabulary services to ensure better interoperability of metadata and possible conversion to alternate Sensor Network standards (e.g. Semantic Sensor Network ontology).

The platform description is composed with a hierarchy of sensorML records. Three hierarchy levels are considered: monitoring facilities, platforms and instruments. The sensors which are embedded in the instruments can be described but no recommendations are proposed for them.

As for the data, an O&M record describes an observation with two specific attributes:

- Result which is the data file;
- Procedure which is a physical component or procedure which has been used to produce the observation.

The data could also be encoded directly in the O&M records. However, the marine community is using and promoting formats for the datasets (ODV, netCDF) which are efficient for the data storage and access and commonly agreed. Then the option called out-of-band of having data as external references has been chosen in D5.7.

Following the indications provided by D5.6 and D5.7 a "Coastal observatory console" has been developed (**targets n. 4 and 5**) and described in MS49 (Carval, 2019) and MS50 (Carval and Quéric, 2019). The console allows the user to describe observatories (monitoring facilities, platforms and instruments) in editor GUI environment and export the information as sensor XML files or graphical outputs (a figure depicting the observatory/monitoring facility). Once the observatory is described, data can be uploaded, described and associated to it. According to (Carval, 2019) and (Carval and Quéric, 2019), the observatory data are then automatically synchronized on the user's JupyterHub workplace where the user can apply codes such as quality control procedures, data analysis or data plotting.

Target n. 7 is partially addressed in MS51 (Partescano and Brosich, 2019), where some technical solutions of Web Processing Service (WPS) were analysed and proposed. These include the SOS: 52°North Web Processing Service (https://github.com/52North/WPS, https://52north.org/software/software-projects/wps/) which was finally identified for the JERICO-NEXT web console, but is not yet implemented. As regards the quality control procedures, it is suggested to use the SeaDataNet DATA Quality Control Procedures Version 2.0 (SeaDataNet, 2010) applying the Quality Flags proposed by BODC vocabularies (http://seadatanet.maris2.nl/v_bodc_vocab_v2/search.asp?lib=L20). Even this implementation is not yet done in the web console.

In this report we will evaluate the console and the quality control platform and we will verify to what extent the seven objectives mentioned above and the requirements indicated in D5.6 have been achieved.

The results of this test are summarized in the Conclusions where the achievement or non-achievement of the objective is indicated and, where relevant, recommendations for better implementation are reported.

3. Main report

In the current prototype, access to the console is only possible after identification in the Ifremer system. This requires the user to be assigned the necessary credentials. Two login / password sets are required to access the console and the JupyterHub, one is an extranet login (for both the console and the JupyterHub), the other is an intranet login (for the JupyterHub only).

Once the credentials are obtained, the users must connect to https://datacloud.ifremer.fr using the extranet login and can create their observatory following the steps described in Carval and Balanche (2018).

For the purpose of our assessment, we identified the following tests:

1. Access to the console and description of a diffuse observing system, i.e. a system of observing systems. With this test we aim to verify the basic functionalities of the console: creation of various interconnected components and generation of the respective sensor XML files. No instrument or data is aggregated to the observing system.
2. Description of a HFR system, including data.
3. Description of a fixed platform, with instruments and data.
4. Operations on ingested data (data visualization, quality control procedures, data analysis).

3.1. Access to the console and description of a diffuse observing system

It is possible to create various types of observatory selecting one of the configurations in Figure 2. For this test we have chosen to create a network of systems (last icon in Figure 2), made by two fixed platforms (a mooring and a beacon), a research vessel, a HF radar and a glider. The observatory was created in the root of the user's space directly.

The configuration is started simply drawing the selected icon in the working space (Figure 3) and adding a description in the right panel.

The same is done for each component of the network of systems.

At the end of this test we extracted the plot (Figure 4) and SensorML files of our integrated observatory (Annex 6.1). The connections between the integrated observatory and its components are represented by a *'<!-- components list -->'* section in the SensorML file, which is automatically generated as long as the arrow that links the component to the central icon in Figure 4 has been dragged correctly.

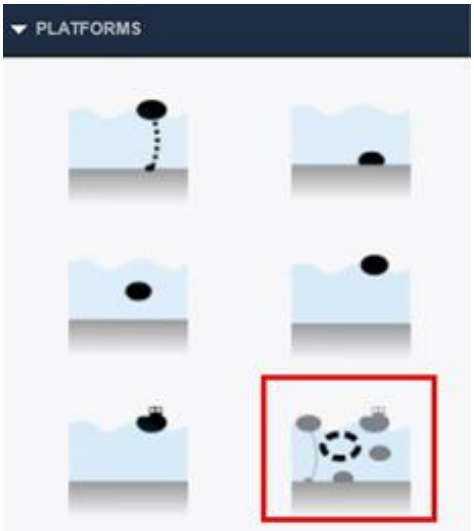

Figure 2 : *Icons that represent the "platforms" available in the console.*

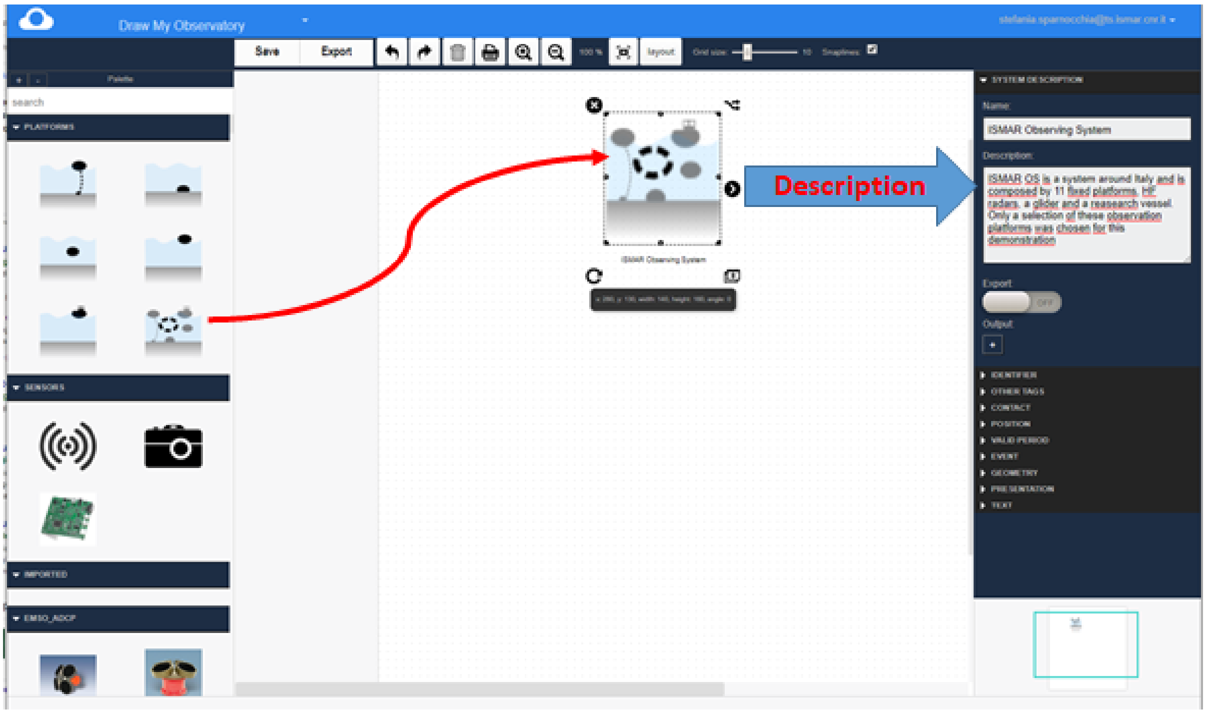

Figure 3 : *How to create and describe the observatory.*

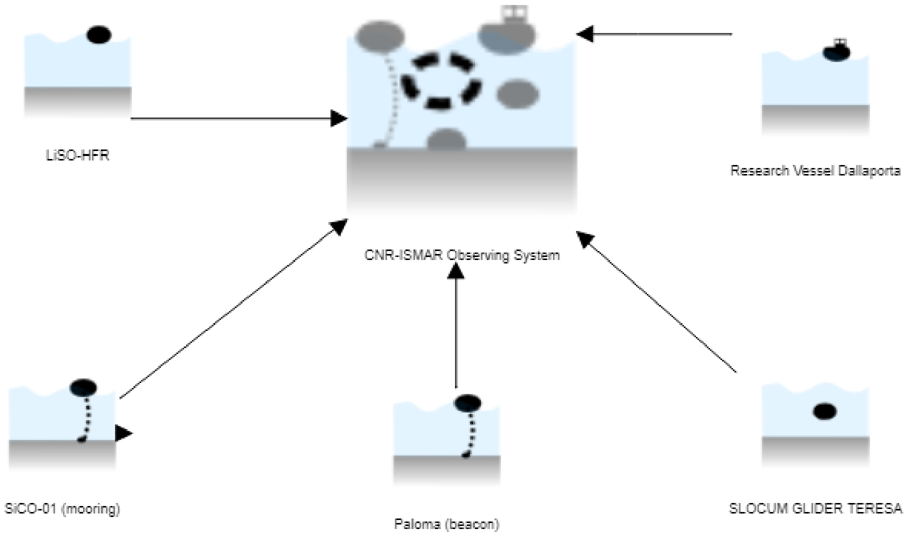

Figure 4 : *Scheme of the CNR-ISMAR Observing system obtained by exporting the *.png file from the console.*

By running this test, we found an error that occurred frequently in subsequent tests. At the first saving operation, performed when the system was described in its entirety, the error *System: undefined Overlap with ...*" occurred. Unfortunately, clicking on the link next to the error brought us back to the last saved version, so all the work done up until then was lost. After this failure, we proceeded to save for each completed component, without receiving any more errors.

We encountered the same kind of error after leaving and returning to the cloud to update some descriptions. In this case, clicking on the link next to the error, then returning to the last saved version (which in any case was the one from which we started for the changes), and repeating the changes, the work was saved successfully.

→This behavior is rather strange and needs to be analyzed by the developers.

As a first general comment, the platform is easy to use, taking care to save the work done frequently and having in mind the above in the event of errors occurring during the saving phase.

However, the guidelines (Carval and Balanche, 2018) are not very explanatory and should at least be integrated with an explanation of the fields provided in the "System description" menu. The fields listed are:

- Identifier: this would seem to be a parameter automatically assigned by the console, it is not editable and it is not clear why it is indicated in the menu.
- Other tags (name, value): it is not obvious what should be indicated here.
- Contact (role, email, URI): we learned by reading the SensorML files generated in our tests, that there is a reference vocabulary at *http://www.ifremer.fr/tematres/vocab/index.php?tema=67*. A direct reference from the console (help/information tab), or in the manual, would be very useful for the user.

To be noted in this regard, the menu only allow to specify role, email and URI. It is not possible to insert the name (a person or an organization). This reflects in some wrong attributes highlighted in red in the files in Annex 6.1.

- Position (latitude, longitude): self-explanatory.
- Valid period (from, to): it is probably related to the length of the deployment, but should be clarified in the manual.
- Event (date, description): it is not obvious what should be indicated here.
- Geometry (width, height, x, y): it allows to manage the dimension of icons in the plot. It is very useful but this type of information should be listed in a specific space in the menu, distinct from the information used to create the metadata.
- Presentation (image URL): this would seem to be a parameter automatically assigned by the console, it is editable and it is not clear why it is indicated in the menu.
- Text (Font size, Font family, Font weight (400), Fill color, Stroke, Stroke width (0px), Horizontal alignment, Vertical offset (20): it is for the text describing the icons in the plot. See the comment on "Geometry".

3.2. Description of a HFR system, including data

With this test we explored the console further by creating a HF radar system made by three components (Figure 5). It is an independent specialization of the "LiSO-HFR" component of the CNR-ISMAR Observing System in Figure 4.

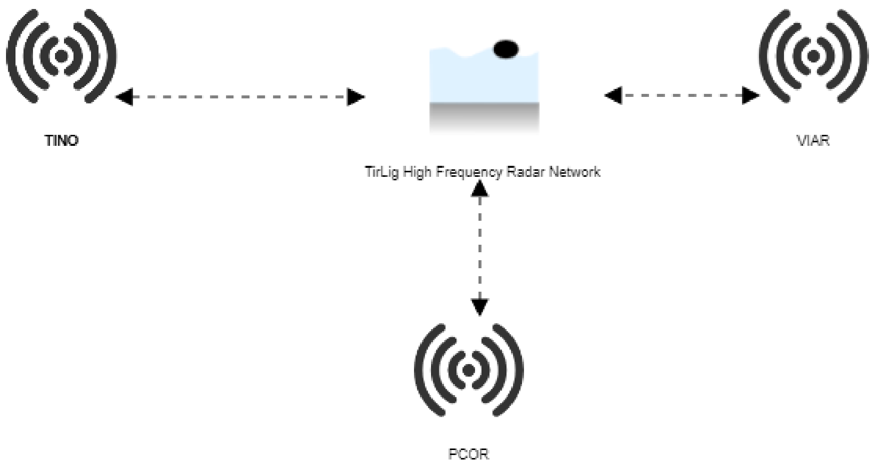

Figure 5 : *Scheme of the TirLig HF Radar Network obtained by exporting the *.png file from the console.*

A directory was created first for this part of the CNR-ISMAR network, with assigned name "HFRadar". Then, the component named TINO was created. An hourly map of radar data (HFR-TirLig-Total_2019_08_05_1200.nc) was uploaded and associated with the platform via the popup window. Finally, the two components VIAR and PCOR were added. Associated SensorML files are in Annex 6.2.

The structure of the directory “HFRadar” is shown in Figure 6. On the right side of the figure one has the information on data associated to the TINO system, UUID=8a36fddc-e89c-42d5-a151-36c2d804838a.

To note,

1. Component PCOR is missing in the sensorML file of the network.
2. We deduce from the TINO’s sensorML file that the map of radar data is probably identified here as a component, although the name of the uploaded file does not explicitly appear *<sml:component xlink:href="https://datacloud.ifremer.fr/owncloud/index.php/apps/snannyowncloudapi/sml/13c000fd-38e0-4211-a223-e0da11ee2841" name="TINO"/>*
3. After subsequent modifications and saves, the associated sensors in the XML file change randomly.
4. The HFR radar network and its associated data file are not visibile in the JupyterHub (Figure 7).

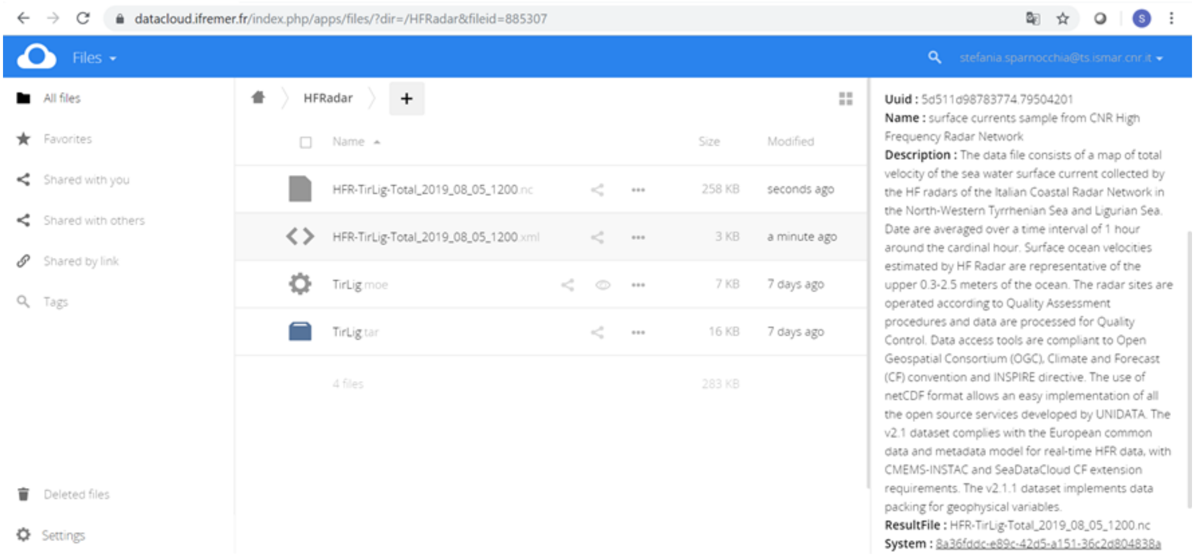

Figure 6 : *Structure of the directory “HFRadar”. On the right side of the figure one has the information on data associated to the TINO system, UUID=8a36fddc-e89c-42d5-a151-36c2d804838a.*

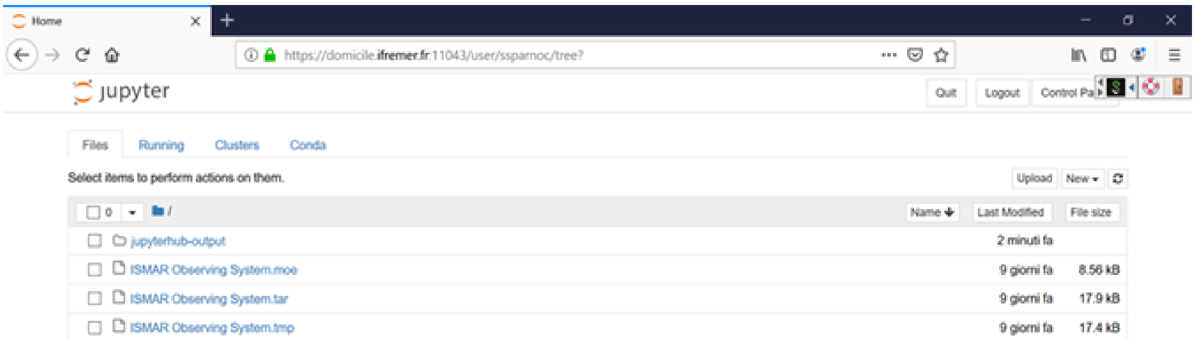

Figure 7 : *Structure visible in the JupyterHub.*

3.3. Description of a fixed platform, with instruments and data

With this test we explored the console further by specializing the “Paloma” component of the CNR-ISMAR Observing System in Figure 4. It is an independent specialization and a dedicated directory was created for this purpose in the Owncloud.

Paloma is a beacon located in the center of the Gulf of Trieste, on a depth of 25 m, between the coastal resorts of Piran (Slovenia) and Grado. Distant about 8 nautical miles from the coast of Trieste it was installed by ISMAR in July 2002. Beginning mainly as a weather station, over the years the instrumental equipment has been expanded with the addition of temperature measurements along the water column, at 3, 15 and 24 m depth. Starting in 2012, the station has been specialized to study the carbonate system. In the current configuration it hosts a sensor for high precision automatic CO2 measurements (Hydro CO2 II - Contros) and a probe for temperature, salinity, pressure and dissolved oxygen measurements (SBE 37-SMP-ODO) at 3 meters below sea surface; temperature sensors (SBE 39) at 15 and 24 meters depth; a station for measurements of CO2 concentration in the air (LI-840 Licor) about 10 m above the sea surface. The data, acquired with frequencies ranging from 15 minutes to 2 hours are transmitted in near real time to a dedicated server at the ISMAR headquarters in Trieste and are immediately available in Ascii format.

For this test we have specified the SBE 37/39 instrumentation only (Figure 8 and Annex 6.3).

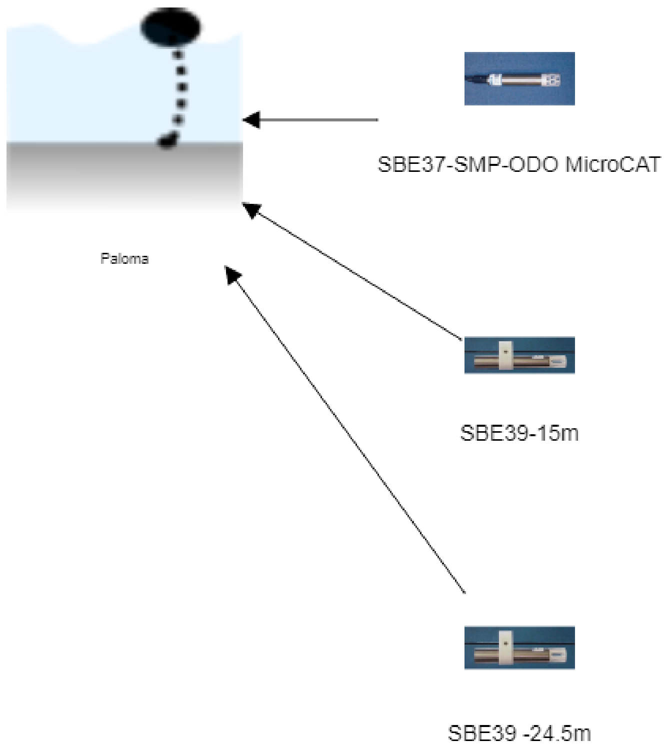

***Figure 8** : Scheme of the Paloma fixed platform obtained by exporting the *.png file from the console.*

Defining the two levels of Temperature measurement with SBE 39 probes was easy, as a template was found among those available (EMSO_TEMPERATURE set). We did not find a model for any SBE37 configuration and we did not find any way to create a new sensor in the console and no information is provided in the documentation available (deliverables and milestones). So we had to select one of the existing models and modify it to represent our SBE 37-SMP-ODO. Note that the image you see in Figure 8 is not that of a MicroCAT SBE 37-SMP-ODO, but that of the probe from which we started for our modifications.

→ Furthermore, although we specified the sensors of this instrument in the "Other tags" field, we do not find them in its XML file because it automatically refers to the original template we have modified.

The only value we find, even in the XML files of the other two instruments, is the one related to the installation depth, we also have inserted in the "Other tags" field:

<!-- Classification -->
…
<sml:label>depth of deployment</sml:label>
<sml:value>3 m</sml:value>

After the observatory was created, with the 3 instruments, we uploaded a data file in CSV format (SBE37SMP-ODO-RS232_03710886_2016_03_30.csv) and associated it with the instrument called "SBE37-SMP-ODO MicroCAT" (Figure 9). No evidence of this association is found in the respective XML file (6.3.2).

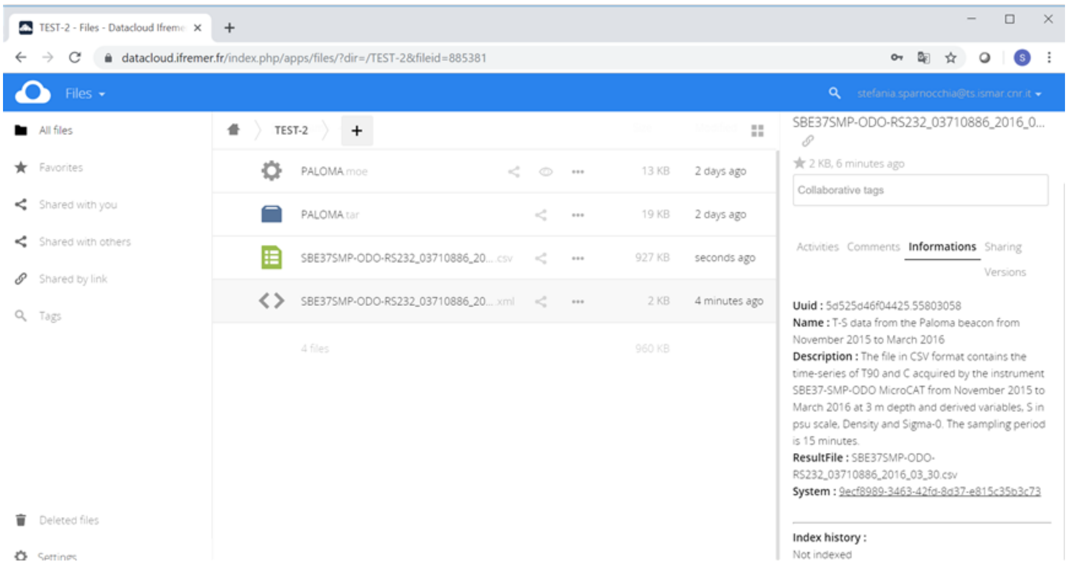

Figure 9 : *Structure of the directory "TEST-2 (Paloma)". On the right side of the figure one has the information on data associated to the SBE37-SMP-ODO MicroCAT instrument, UUID= 9ecf8989-3463-42fd-8d37-e815c35b3c73.*

→ As already happened for the radar data, when we enter the JupyterHub we do not find them, and the screen that appears is exactly that of Figure 7, where the two systems HFR radar and Paloma do not appear.

In conclusion, performing the operation of creating an observatory, with data uploads from the console is possible and relatively easy, but the subsequent operations in the JupyterHub (module 2 in D50), are not feasible with the information provided to the user.

3.4. Operations on ingested data

This part of our evaluation was not possible due to the problems already reported with the visualization of the uploaded data (see sections 3.2 and 3.3). These problems also persisted by associating the data with the first observatory created and described in section 3.1, which is the only one visible in the JupyterHub (Figure 7).

Regarding access to the JupyterHub, we encountered various problems that were solved thanks to the interaction with Assistance Informatique at Ifremer. Working on a laptop running Windows 10 OS, a basic problem was the impossibility of access with Google Crome, which was solved by switching to FireFox. Errors we found are:

<u>with Google Crome</u>

- *503 : Service Unavailable. Your server appears to be down. Try restarting it from the hub.* Clicking on "*Try restarting it from the hub*" ones has 2 options: *STOP MY SERVER* and *MY SERVER*. 1) *STOP MY SERVER* produces this error message: *API request failed (400): useraccount is not running*; 2) *MY SERVER* returns the user to the starting error (*503: Service Unavailable*).
- A previously started session is still active (Figure 10).

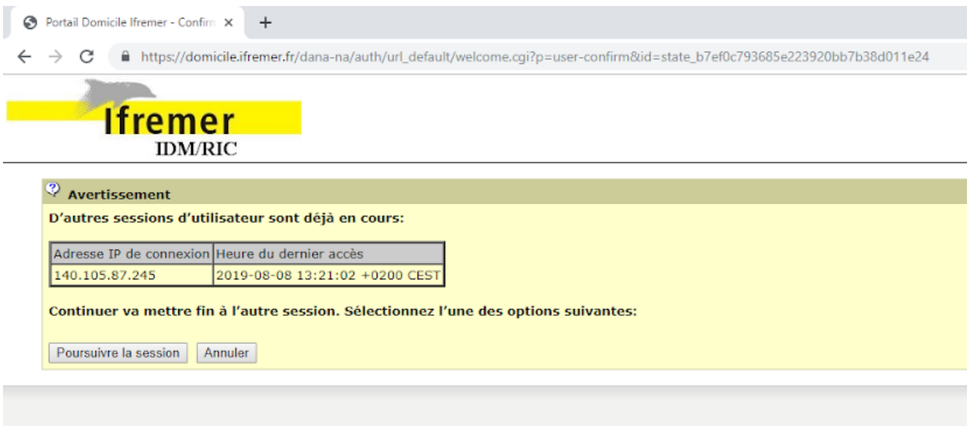

Figure 10 : *One of the error messages that have been encountered with access via Google Crome.*

Both "*Poursuivre la session*" and "*Anuller*" redirect to *https://domicile.ifremer.fr*, and after inserting the login and password the user is again to Figure 10.

<u>with FireFox</u>

- a proxy error may occur. It is solved by re-loading the page.

4. Conclusions

Below we provide the assessment resulting from the analysis of the documentation available and the tests performed on the Coastal Observatory console in relation to the general objectives of Task 5.3, the functionality of the console and the planned implementation plan. Recommendations are proposed to implement the console.

4.1. Assessment of the general targets of Task 5.3

Target n.	Activity	State of achievement
1	Define core services to be provided to observatory operators and identify which will be the data ingestion systems involved for such an experiment (ROOSes for MyOCean, in datasets indexes-CDI- and EDIOS for SeaDataNet).	Done in D5.6 (Loubrieu et al., 2017)
2	Define and prioritize with the targeted observatory network operators the services to be developed: data ingestion mode, specific events editions (deployments, calibrations, …), alerts on data availability and thresholds, monitoring dashboards, other publication facilities such as DOI registration	Not implemented
3	Adapt the existing templates (SeaDatanet, ODIP, JERICO) to ingest SWE information from the targeted observatory networks.	Done in D5.7 (Loubrieu, 2017)
4	Design and implement the data ingestion modules for targeted observatory networks	Partially done in D5.6 (Loubrieu et al., 2017), MS49 (Carval, 2019) and MS50 (Carval and Quéric, 2019)
5	Design and implement the services to observatory operators	
6	Design and implement the interface with data managements systems SeaDataNet and MyOcean ROOSes.	Not implemented: No information was found in the deliverables and milestones of Task 5.3. No evidence from the console.
7	Provide automated quality control module through the web console applicable on standardized datasets (e.g. in ODV or NetCDF format) and implemented them through a Pilot-test Web Service, following the Web Processing Service (WPS) OGC standard. This service could be triggered on real-time and near real-time data flows	Some technical solutions are proposed in MS51 (Partescano and Brosich, 2019) but none of them is implemented in the web console.

4.2. Assessment of the Coastal Observatory console

Topic	Problem	Recommendation
Access	Access to the console is only possible after identification in the Ifremer system. This limits the ease of access of the generic user.	Move the platform to a space where access is easier, after identification.
Information	The "Coastal observatory console user manual" is lacking in providing information on the use of the platform, and in particular on filling in the fields necessary for the production of XML files.	Integrate the manual providing all the necessary information for the generic user. See also the comments at the end of section 3.1.
Saving the observatory from the console	Error in the procedure for saving the work done in the console is reported in section 3.1.	Verify the system to solve this error.
XML templates for instruments and sensors	Even if a catalog is available in the console, some instruments / sensors are not included. Moreover, including all the equipment on the market would be a huge and endless job.	Implement a tool allowing the users to create a new sensor in their console with the sharing option.
Data upload	Data uploaded in the console are not automatically found in the JupyterHub. Furthermore, switching from console to JupyterHub is cumbersome and time-consuming.	Implement JupyterHub functions directly in the console.
Browser problems	Browser problems occurred by accessing the JupyterHub (see section 3.4).	Do your best to make the final console independent of the way the user logs in.

4.3. Assessment of the implementation plan

The assessment of the implementation plan indicated in D5.6 and reported in Figure 1 is summarized below. Note that the functions related to flow cytometry have not been tested and appear not to be implemented in the console. Even the full satisfaction of the CM3 requirement was not evaluated because it is not feasible for a generic user (which was the CNR doing this work). Consequently both the flow cytometry and CM3 requirement are not reported in the table below.

	CM1	CM2	CM4
UC1: Describe an equipment			
UC1-1: Fixed Platforms			
UC1-2: Site Geometry (HFR)			
UC1-3: Data post-processing (HFR)			
UC2: Submit a dataset			
UC2-1: CSV time series (Fixed Platforms)			
UC2-2: videos (Fixed Platforms)			
UC2-3: 3-4D NetCDF (HFR)			
UC3: Discover, Visualize and Analyze			
UC3-1: CSV time series (Fixed Platforms)			
UC3-2: videos (Fixed Platforms)			
UC23-3: 3-4D NetCDF (HFR)			
UC4: Share information			
individuals			
functions (long term archive, data service)			

5. References

Carval, T. (2019). Console with core services for observatory operators and automated publication towards data management system. JERICO-NEXT MS49, v1.0, 18/03/2019.

Carval, T., Quéric, A. (2019). Console with specific services for targeted observatory network operators. JERICO-NEXT MS50, v1.0, 24/06/2019.

Carval, T., Romain, B. (2018). JERICO-NEXT Coastal observatory console user manual. https://doi.org/10.13155/61634.

Corgnati, L., Mantovani, C., Novellino, A., Rubio, A., Mader, J. (2017). Recommendation Report 1 for HFR data implementation in European marine data infrastructures. JERICO-NEXT D5.13, v1.0, 06/03/2017.

Loubrieu, T., Petit De La Villéon, L., Perivoliotis, L. (2017). Requirements specifications for the observatory operator console. JERICO-NEXT D5.6, v1.0, 25/04/2017.

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Partescano, E., Brosich, A. (2019). Modules for data Quality Check, including WPS service. JERICO-NEXT MS51, v1.0, 17/04/2019.

SeaDataNet (2010). Data Quality Control Procedures. Version 2.0, May 2010. https://www.seadatanet.org/content/download/596/file/SeaDataNet_QC_procedures_V2_%28May_2010%29.pdf

6. Annexes

6.1. SensorML files of the integrated observatory in Figure 4

The fields that have been filled in are highlighted in green. Those automatically assigned by the console, but wrong are highlighted in red.

6.1.1. Description of CNR-ISMAR Observing System


```
<?xml version="1.0" encoding="UTF-8"?>
<sml:PhysicalSystem xsi:schemaLocation="http://www.opengis.net/sensorml/2.0
http://schemas.opengis.net/sensorML/2.0/sensorML.xsd" gml:id="top"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:swe="http://www.opengis.net/swe/2.0" xmlns:gml="http://www.opengis.net/gml/3.2"
xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns:sml="http://www.opengis.net/sensorml/2.0">
        <!-- Description -->
    <gml:description> ISMAR OS is a system around Italy and is composed by 11 fixed platforms, HF radars, a
    glider, a research vessel. Only a part of them is selected for this demonstration. </gml:description>
        <!-- Name -->
    <gml:name> CNR-ISMAR Observing System </gml:name>
        <!-- keywords-->1
        <sml:keywords>
      <sml:KeywordList>
        <sml:keyword>Oceanography</sml:keyword>
        <sml:keyword>Observatory</sml:keyword>
      </sml:KeywordList>
    </sml:keywords>
        <!-- Identification-->1
    <sml:identification>
      <sml:IdentifierList>
        <sml:identifier>
          <sml:Term definition="http://www.ifremer.fr/tematres/vocab/index.php?tema=66">
            <sml:label>UUID</sml:label>
            <sml:value>605ffaa4-a1e0-4a46-bd5c-4001548575cb</sml:value>
          </sml:Term>
        </sml:identifier>
      </sml:IdentifierList>
    </sml:identification>
        <!-- Classification -->1
    <sml:classification>
      <sml:ClassifierList>
        <sml:classifier>
          <sml:Term>
            <sml:label/>
```


[1] This field cannot be edited from the console.

```
          <sml:value/>
        </sml:Term>
      </sml:classifier>
    </sml:ClassifierList>
  </sml:classification>
      <!-- Contacts -->
  <sml:contacts>
    <sml:ContactList>
      <sml:contact>
        <gmd:CI_ResponsibleParty uuid="http://www.ismar.cnr.it/">
          <gmd:organisationName>
            <gco:CharacterString>IFREMER</gco:CharacterString>[2]
          </gmd:organisationName>
          <gmd:contactInfo>
            <gmd:CI_Contact>
              <gmd:address>
                <gmd:CI_Address>
                  <gmd:electronicMailAddress>
                    <gco:CharacterString/>
                  </gmd:electronicMailAddress>
                </gmd:CI_Address>
              </gmd:address>
            </gmd:CI_Contact>
          </gmd:contactInfo>
          <gmd:role>
            <gmd:CI_RoleCode codeListValue="Owner"
            codeList="http://www.ifremer.fr/tematres/vocab/index.php?tema=67"/>
          </gmd:role>
        </gmd:CI_ResponsibleParty>
      </sml:contact>
      <sml:contact>
        <gmd:CI_ResponsibleParty uuid="http://www.ismar.cnr.it/">
          <gmd:organisationName>
            <gco:CharacterString>IFREMER</gco:CharacterString>[2]
          </gmd:organisationName>
          <gmd:contactInfo>
            <gmd:CI_Contact>
              <gmd:address>
                <gmd:CI_Address>
                  <gmd:electronicMailAddress>
                    <gco:CharacterString/>
                  </gmd:electronicMailAddress>
                </gmd:CI_Address>
              </gmd:address>
            </gmd:CI_Contact>
          </gmd:contactInfo>
          <gmd:role>
            <gmd:CI_RoleCode codeListValue="Operator"
            codeList="http://www.ifremer.fr/tematres/vocab/index.php?tema=67"/>
          </gmd:role>
```


[2] The organisation Name is automatically assigned as IFREMER.

```xml
        </gmd:CI_ResponsibleParty>
      </sml:contact>
    </sml:ContactList>
  </sml:contacts>
      <!-- history -->
      <!-- type OF -->
  <sml:typeOf xlink:href="http://www.ifremer.fr/isi/sensorNanny/emso-yp-sml/basic.Platform.xml"/>
      <!-- output -->
      <!-- position -->
  <sml:position>
    <gml:Point gml:id="stationLocation" srsName="http://www.opengis.net/def/crs/EPSG/0/4326">
      <gml:coordinates> </gml:coordinates>
    </gml:Point>
  </sml:position>
      <!-- components list -->
  <sml:components>
    <sml:ComponentList>[3]
      <sml:component
      xlink:href="https://datacloud.ifremer.fr/owncloud/index.php/apps/snannyowncloudapi/sml/24de2c7e-c043-4351-8726-45393e721e00" name="Research_Vessel_Dallaporta"/>
      <sml:component
      xlink:href="https://datacloud.ifremer.fr/owncloud/index.php/apps/snannyowncloudapi/sml/1587b8b5-4b99-4952-895e-ba7195dd9058" name="LiSO-HFR"/>
      <sml:component
      xlink:href="https://datacloud.ifremer.fr/owncloud/index.php/apps/snannyowncloudapi/sml/d4d0688b-d3c6-4a6c-a916-a2d62e4bf255" name="SiCO-01__mooring_"/>
      <sml:component
      xlink:href="https://datacloud.ifremer.fr/owncloud/index.php/apps/snannyowncloudapi/sml/c5d68ede-2a91-4f40-87f2-d2fdabebefc5" name="Paloma__beacon_"/>
      <sml:component
      xlink:href="https://datacloud.ifremer.fr/owncloud/index.php/apps/snannyowncloudapi/sml/5609dea3-fe8f-44da-9620-6618de5d3c4c" name="SLOCUM_GLIDER_TERESA"/>
    </sml:ComponentList>
  </sml:components>
</sml:PhysicalSystem>
```

6.1.2. Description of R/V Dallaporta

```xml
<?xml version="1.0" encoding="UTF-8"?>
<sml:PhysicalSystem xsi:schemaLocation="http://www.opengis.net/sensorml/2.0
http://schemas.opengis.net/sensorML/2.0/sensorML.xsd" gml:id="top"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:swe="http://www.opengis.net/swe/2.0" xmlns:gml="http://www.opengis.net/gml/3.2"
xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns:sml="http://www.opengis.net/sensorml/2.0">
      <!-- Description -->
  <gml:description> The research vessel Dallaporta carries out advanced studies in the field of fishery and
  marine biology and the marine environment in general. It has a length of 35 meters and reaches a
  maximum speed of 14 knots. The ship, capable of accommodating up to 8 crew members and 12
```

[3] Automatically generated as long as the arrow that links the component to the central icon in Fig. 4 has been dragged correctly.

```xml
researchers, has on board all the most modern scientific and dashboard equipment for the study of sea fishing and marine environmental conditions: depth sounders of various frequencies, eco-integrator, torque meter, underwater camera, "CTD" probe equipped with numerous sensors for measuring various environmental parameters, "Rosette Multisampler" for taking samples of sea water at various depths, current meters, winches for fishing and other equipment. In the laboratories hosted on board it is possible to immediately analyse biological and seawater samples taken during oceanographic and fishing campaigns. </gml:description>
    <!-- Name -->
<gml:name> Research Vessel Dallaporta </gml:name>
    <!-- keywords-->
<sml:keywords>
  <sml:KeywordList>
    <sml:keyword>Oceanography</sml:keyword>
    <sml:keyword>Observatory</sml:keyword>
  </sml:KeywordList>
</sml:keywords>
    <!-- Identification-->
<sml:identification>
  <sml:IdentifierList>
    <sml:identifier>
      <sml:Term definition="http://www.ifremer.fr/tematres/vocab/index.php?tema=66">
        <sml:label>UUID</sml:label>
        <sml:value>24de2c7e-c043-4351-8726-45393e721e00</sml:value>
      </sml:Term>
    </sml:identifier>
  </sml:IdentifierList>
</sml:identification>
    <!-- Classification -->
    <!-- Contacts -->
<sml:contacts>
  <sml:ContactList>
    <sml:contact>
      <gmd:CI_ResponsibleParty uuid="www.cnr.it">
        <gmd:organisationName>
          <gco:CharacterString>IFREMER</gco:CharacterString>
        </gmd:organisationName>
        <gmd:contactInfo>
          <gmd:CI_Contact>
            <gmd:address>
              <gmd:CI_Address>
                <gmd:electronicMailAddress>
                  <gco:CharacterString/>
                </gmd:electronicMailAddress>
              </gmd:CI_Address>
            </gmd:address>
          </gmd:CI_Contact>
        </gmd:contactInfo>
        <gmd:role>
          <gmd:CI_RoleCode codeListValue="Owner"
          codeList="http://www.ifremer.fr/tematres/vocab/index.php?tema=67"/>
        </gmd:role>
      </gmd:CI_ResponsibleParty>
```

```xml
          </sml:contact>
          <sml:contact>
            <gmd:CI_ResponsibleParty uuid="https://www.cnr.it/it/dallaporta">
              <gmd:organisationName>
                <gco:CharacterString>IFREMER</gco:CharacterString>
              </gmd:organisationName>
              <gmd:contactInfo>
                <gmd:CI_Contact>
                  <gmd:address>
                    <gmd:CI_Address>
                      <gmd:electronicMailAddress>
                        <gco:CharacterString/>
                      </gmd:electronicMailAddress>
                    </gmd:CI_Address>
                  </gmd:address>
                </gmd:CI_Contact>
              </gmd:contactInfo>
              <gmd:role>
                <gmd:CI_RoleCode codeListValue="Operator"
                codeList="http://www.ifremer.fr/tematres/vocab/index.php?tema=67"/>
              </gmd:role>
            </gmd:CI_ResponsibleParty>
          </sml:contact>
        </sml:ContactList>
      </sml:contacts>
          <!-- history -->
          <!-- type OF -->
      <sml:typeOf xlink:href="http://www.ifremer.fr/isi/sensorNanny/emso-yp-sml/basic.Platform.xml"/>
          <!-- output -->
          <!-- position -->
      <sml:position>
        <gml:Point gml:id="stationLocation" srsName="http://www.opengis.net/def/crs/EPSG/0/4326">
          <gml:coordinates> </gml:coordinates>
        </gml:Point>
      </sml:position>
          <!-- components list -->
</sml:PhysicalSystem>
```

6.1.3. Description of LiSO-HFR

```xml
<?xml version="1.0" encoding="UTF-8"?>
<sml:PhysicalSystem xsi:schemaLocation="http://www.opengis.net/sensorml/2.0
http://schemas.opengis.net/sensorML/2.0/sensorML.xsd" gml:id="top"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:swe="http://www.opengis.net/swe/2.0" xmlns:gml="http://www.opengis.net/gml/3.2"
xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns:sml="http://www.opengis.net/sensorml/2.0">
          <!-- Description -->
      <gml:description> CNR-ISMAR HF Radar Network has been deployed along the coast of Eastern Liguria,
      near to La Spezia and Cinque Terre, between June and August 2016. At the moment it is composed by two
      HF radar stations operating in the frequency band of 25MHz. Acquisition settings: frequency band: 26MHz
```

```
radial coverage: 35-45Km; radial range cutoff: 45Km; radial resolution: 1km; angular resolution: 5 deg
</gml:description>
    <!-- Name -->
<gml:name> LiSO-HFR </gml:name>
    <!-- keywords-->
<sml:keywords>
  <sml:KeywordList>
    <sml:keyword>Oceanography</sml:keyword>
    <sml:keyword>Observatory</sml:keyword>
  </sml:KeywordList>
</sml:keywords>
    <!-- Identification-->
<sml:identification>
  <sml:IdentifierList>
    <sml:identifier>
      <sml:Term definition="http://www.ifremer.fr/tematres/vocab/index.php?tema=66">
        <sml:label>UUID</sml:label>
        <sml:value>1587b8b5-4b99-4952-895e-ba7195dd9058</sml:value>
      </sml:Term>
    </sml:identifier>
  </sml:IdentifierList>
</sml:identification>
    <!-- Classification -->
    <!-- Contacts -->
<sml:contacts>
  <sml:ContactList>
    <sml:contact>
      <gmd:CI_ResponsibleParty uuid="http://www.ismar.cnr.it/">
        <gmd:organisationName>
          <gco:CharacterString>IFREMER</gco:CharacterString>
        </gmd:organisationName>
        <gmd:contactInfo>
          <gmd:CI_Contact>
            <gmd:address>
              <gmd:CI_Address>
                <gmd:electronicMailAddress>
                  <gco:CharacterString/>
                </gmd:electronicMailAddress>
              </gmd:CI_Address>
            </gmd:address>
          </gmd:CI_Contact>
        </gmd:contactInfo>
        <gmd:role>
          <gmd:CI_RoleCode codeListValue="Owner"
          codeList="http://www.ifremer.fr/tematres/vocab/index.php?tema=67"/>
        </gmd:role>
      </gmd:CI_ResponsibleParty>
    </sml:contact>
    <sml:contact>
      <gmd:CI_ResponsibleParty uuid="http://www.ismar.cnr.it/organizzazione/sedi-
      secondarie/pozzuolo-di-lerici-sp">
        <gmd:organisationName>
```

```
            <gco:CharacterString>IFREMER</gco:CharacterString>
          </gmd:organisationName>
          <gmd:contactInfo>
            <gmd:CI_Contact>
              <gmd:address>
                <gmd:CI_Address>
                  <gmd:electronicMailAddress>
                    <gco:CharacterString/>
                  </gmd:electronicMailAddress>
                </gmd:CI_Address>
              </gmd:address>
            </gmd:CI_Contact>
          </gmd:contactInfo>
          <gmd:role>
            <gmd:CI_RoleCode codeListValue="Operator"
            codeList="http://www.ifremer.fr/tematres/vocab/index.php?tema=67"/>
          </gmd:role>
        </gmd:CI_ResponsibleParty>
      </sml:contact>
    </sml:ContactList>
  </sml:contacts>
      <!-- history -->
      <!-- type OF -->
  <sml:typeOf xlink:href="http://www.ifremer.fr/isi/sensorNanny/emso-yp-sml/basic.Platform.xml"/>
      <!-- output -->
      <!-- position -->
  <sml:position>
    <gml:Point gml:id="stationLocation" srsName="http://www.opengis.net/def/crs/EPSG/0/4326">
      <gml:coordinates> </gml:coordinates>
    </gml:Point>
  </sml:position>
      <!-- components list -->
</sml:PhysicalSystem>
```


6.1.4. Description of Paloma


```
<?xml version="1.0" encoding="UTF-8"?>
<sml:PhysicalSystem xsi:schemaLocation="http://www.opengis.net/sensorml/2.0
http://schemas.opengis.net/sensorML/2.0/sensorML.xsd" gml:id="top"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:swe="http://www.opengis.net/swe/2.0" xmlns:gml="http://www.opengis.net/gml/3.2"
xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns:sml="http://www.opengis.net/sensorml/2.0">
      <!-- Description -->
  <gml:description> Starting in 2012, the PALOMA platform (Piattaforma Avanzata LabOratorio Mare
  Adriatico), located on a 25 m depth seafloor in the offshore area of the Gulf of Trieste, in the northernmost
  area of the Adriatic sea, is collecting continuous dissolved pCO2 measurements 3 m below sea surface
  and air pCO2 (9 m above the sea level). Automatic measurements also include Temperature, Salinity and
  Dissolved Oxygen at the same depth. Moreover, time series of the main physical and biogeochemical
  parameters (T, S, DO, nutrients, pH, TA, TOC) started being collected in the station every month starting in
  2008. Paloma is one of the marine stations labelled by ICOS-RI. </gml:description>
      <!-- Name -->
```

```xml
<gml:name> Paloma (beacon) </gml:name>
    <!-- keywords-->
<sml:keywords>
  <sml:KeywordList>
    <sml:keyword>Oceanography</sml:keyword>
    <sml:keyword>Observatory</sml:keyword>
  </sml:KeywordList>
</sml:keywords>
    <!-- Identification-->
<sml:identification>
  <sml:IdentifierList>
    <sml:identifier>
      <sml:Term definition="http://www.ifremer.fr/tematres/vocab/index.php?tema=66">
        <sml:label>UUID</sml:label>
        <sml:value>c5d68ede-2a91-4f40-87f2-d2fdabebefc5</sml:value>
      </sml:Term>
    </sml:identifier>
  </sml:IdentifierList>
</sml:identification>
    <!-- Classification -->
    <!-- Contacts -->
<sml:contacts>
  <sml:ContactList>
    <sml:contact>
      <gmd:CI_ResponsibleParty uuid="http://www.ismar.cnr.it/">
        <gmd:organisationName>
          <gco:CharacterString>IFREMER</gco:CharacterString>
        </gmd:organisationName>
        <gmd:contactInfo>
          <gmd:CI_Contact>
            <gmd:address>
              <gmd:CI_Address>
                <gmd:electronicMailAddress>
                  <gco:CharacterString/>
                </gmd:electronicMailAddress>
              </gmd:CI_Address>
            </gmd:address>
          </gmd:CI_Contact>
        </gmd:contactInfo>
        <gmd:role>
          <gmd:CI_RoleCode codeListValue="Owner"
          codeList="http://www.ifremer.fr/tematres/vocab/index.php?tema=67"/>
        </gmd:role>
      </gmd:CI_ResponsibleParty>
    </sml:contact>
    <sml:contact>
      <gmd:CI_ResponsibleParty uuid="http://www.ismar.cnr.it/organizzazione/sedi-
      secondarie/trieste">
        <gmd:organisationName>
          <gco:CharacterString>IFREMER</gco:CharacterString>
        </gmd:organisationName>
        <gmd:contactInfo>
```

```
            <gmd:CI_Contact>
              <gmd:address>
                <gmd:CI_Address>
                  <gmd:electronicMailAddress>
                    <gco:CharacterString/>
                  </gmd:electronicMailAddress>
                </gmd:CI_Address>
              </gmd:address>
            </gmd:CI_Contact>
          </gmd:contactInfo>
          <gmd:role>
            <gmd:CI_RoleCode codeListValue="Operator"
            codeList="http://www.ifremer.fr/tematres/vocab/index.php?tema=67"/>
          </gmd:role>
        </gmd:CI_ResponsibleParty>
      </sml:contact>
    </sml:ContactList>
  </sml:contacts>
      <!-- history -->
      <!-- type OF -->
  <sml:typeOf xlink:href="http://www.ifremer.fr/isi/sensorNanny/emso-yp-sml/basic.Platform.xml"/>
      <!-- output -->
      <!-- position -->
  <sml:position>
    <gml:Point gml:id="stationLocation" srsName="http://www.opengis.net/def/crs/EPSG/0/4326">
      <gml:coordinates>45.6204° N 13.5658° E</gml:coordinates>
    </gml:Point>
  </sml:position>
      <!-- components list -->
</sml:PhysicalSystem>
```


6.1.5. Description of SiCO-01


```
<?xml version="1.0" encoding="UTF-8"?>
<sml:PhysicalSystem xsi:schemaLocation="http://www.opengis.net/sensorml/2.0
http://schemas.opengis.net/sensorML/2.0/sensorML.xsd" gml:id="top"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:swe="http://www.opengis.net/swe/2.0" xmlns:gml="http://www.opengis.net/gml/3.2"
xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns:sml="http://www.opengis.net/sensorml/2.0">
      <!-- Description -->
  <gml:description> SiCO is a twin-mooring system placed is in a key area connecting the Eastern and
  Western Mediterranean Sea. Equipped with current profilers and CTD probes, it continuously monitor
  surface and intermediate exchange of water masses and properties between the basins. The site is part of
  the CIESM Hydro-Changes Programme. The SiCO-1 mooring is located between Sicily and Tunisia at a
  depth of about 450 m, off the wide continental shelf and at the western sill of the Sicilian Channel. Active
  since 1993 and originally equipped with traditional current meters, it currently profiles the currents in the
  entire water column with ADCP. In depth it is equipped with high precision CTD probes for the continuous
  measurement of the hydrological characteristics of the water masses. </gml:description>
      <!-- Name -->
  <gml:name> SiCO-01 (mooring) </gml:name>
      <!-- keywords-->
```

```
<sml:keywords>
  <sml:KeywordList>
    <sml:keyword>Oceanography</sml:keyword>
    <sml:keyword>Observatory</sml:keyword>
  </sml:KeywordList>
</sml:keywords>
    <!-- Identification-->
<sml:identification>
  <sml:IdentifierList>
    <sml:identifier>
      <sml:Term definition="http://www.ifremer.fr/tematres/vocab/index.php?tema=66">
        <sml:label>UUID</sml:label>
        <sml:value>d4d0688b-d3c6-4a6c-a916-a2d62e4bf255</sml:value>
      </sml:Term>
    </sml:identifier>
  </sml:IdentifierList>
</sml:identification>
    <!-- Classification -->
    <!-- Contacts -->
<sml:contacts>
  <sml:ContactList>
    <sml:contact>
      <gmd:CI_ResponsibleParty uuid="http://www.ismar.cnr.it/">
        <gmd:organisationName>
          <gco:CharacterString>IFREMER</gco:CharacterString>
        </gmd:organisationName>
        <gmd:contactInfo>
          <gmd:CI_Contact>
            <gmd:address>
              <gmd:CI_Address>
                <gmd:electronicMailAddress>
                  <gco:CharacterString/>
                </gmd:electronicMailAddress>
              </gmd:CI_Address>
            </gmd:address>
          </gmd:CI_Contact>
        </gmd:contactInfo>
        <gmd:role>
          <gmd:CI_RoleCode codeListValue="Owner"
          codeList="http://www.ifremer.fr/tematres/vocab/index.php?tema=67"/>
        </gmd:role>
      </gmd:CI_ResponsibleParty>
    </sml:contact>
    <sml:contact>
      <gmd:CI_ResponsibleParty uuid="mireno.borghini@sp.ismar.cnr.it">
        <gmd:organisationName>
          <gco:CharacterString>IFREMER</gco:CharacterString>
        </gmd:organisationName>
        <gmd:contactInfo>
          <gmd:CI_Contact>
            <gmd:address>
              <gmd:CI_Address>
```

```
                <gmd:electronicMailAddress>
                  <gco:CharacterString/>
                </gmd:electronicMailAddress>
              </gmd:CI_Address>
            </gmd:address>
          </gmd:CI_Contact>
        </gmd:contactInfo>
        <gmd:role>
          <gmd:CI_RoleCode codeListValue="technical coordinator"
          codeList="http://www.ifremer.fr/tematres/vocab/index.php?tema=67"/>
        </gmd:role>
      </gmd:CI_ResponsibleParty>
    </sml:contact>
  </sml:ContactList>
</sml:contacts>
    <!-- history -->
    <!-- type OF -->
<sml:typeOf xlink:href="http://www.ifremer.fr/isi/sensorNanny/emso-yp-sml/basic.Platform.xml"/>
    <!-- output -->
    <!-- position -->
<sml:position>
  <gml:Point gml:id="stationLocation" srsName="http://www.opengis.net/def/crs/EPSG/0/4326">
    <gml:coordinates>37.380° N 11.591° E</gml:coordinates>
  </gml:Point>
</sml:position>
    <!-- components list -->
</sml:PhysicalSystem>
```

6.1.6. *Description of SLOCUM GLIDER TERESA*

```
<?xml version="1.0" encoding="UTF-8"?>
<sml:PhysicalSystem xsi:schemaLocation="http://www.opengis.net/sensorml/2.0
http://schemas.opengis.net/sensorML/2.0/sensorML.xsd" gml:id="top"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:swe="http://www.opengis.net/swe/2.0" xmlns:gml="http://www.opengis.net/gml/3.2"
xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns:sml="http://www.opengis.net/sensorml/2.0">
    <!-- Description -->
<gml:description> Glider “Teresa” is an autonomous underwater vehicle free of propulsion, operating along
vertical sections to monitor the water column up to 1000 deep by up-and-down sawtooth-like cycles. It
moves both horizontally and vertically only thanks to density variations (floating and sinking) and center of
mass displacement (inclination). Equipped with CTD probe, dissolved oxygen and fine-structure sensors, it
moves through the water column recording vertical profiles of hydrological properties and turbulence. Its
vertical movement is particularly favorable for turbulence measurements. The fast-response shear probes
and thermistors allow the glider to obtain turbulence measurements from two independent methods on the
same platform. During the mission, data can be transmitted via satellite to data center, when the glider
comes to the surface for positioning. “Teresa”, as most of the Glider vehicle, is modular, allowing for rapid
sensor reconfiguration to respond to emergency conditions. </gml:description>
    <!-- Name -->
<gml:name> SLOCUM GLIDER TERESA </gml:name>
    <!-- keywords-->
<sml:keywords>
```

```xml
  <sml:KeywordList>
    <sml:keyword>Oceanography</sml:keyword>
    <sml:keyword>Observatory</sml:keyword>
  </sml:KeywordList>
</sml:keywords>
    <!-- Identification-->
<sml:identification>
  <sml:IdentifierList>
    <sml:identifier>
      <sml:Term definition="http://www.ifremer.fr/tematres/vocab/index.php?tema=66">
        <sml:label>UUID</sml:label>
        <sml:value>5609dea3-fe8f-44da-9620-6618de5d3c4c</sml:value>
      </sml:Term>
    </sml:identifier>
  </sml:IdentifierList>
</sml:identification>
    <!-- Classification -->
    <!-- Contacts -->
<sml:contacts>
  <sml:ContactList>
    <sml:contact>
      <gmd:CI_ResponsibleParty uuid="http://www.ismar.cnr.it/">
        <gmd:organisationName>
          <gco:CharacterString>IFREMER</gco:CharacterString>
        </gmd:organisationName>
        <gmd:contactInfo>
          <gmd:CI_Contact>
            <gmd:address>
              <gmd:CI_Address>
                <gmd:electronicMailAddress>
                  <gco:CharacterString/>
                </gmd:electronicMailAddress>
              </gmd:CI_Address>
            </gmd:address>
          </gmd:CI_Contact>
        </gmd:contactInfo>
        <gmd:role>
          <gmd:CI_RoleCode codeListValue="owner"
          codeList="http://www.ifremer.fr/tematres/vocab/index.php?tema=67"/>
        </gmd:role>
      </gmd:CI_ResponsibleParty>
    </sml:contact>
    <sml:contact>
      <gmd:CI_ResponsibleParty uuid="">
        <gmd:organisationName>
          <gco:CharacterString>IFREMER</gco:CharacterString>
        </gmd:organisationName>
        <gmd:contactInfo>
          <gmd:CI_Contact>
            <gmd:address>
              <gmd:CI_Address>
                <gmd:electronicMailAddress>
```

```
                        <gco:CharacterString>mireno.borghini@sp.ismar.cnr.it</gco:CharacterString>
                      </gmd:electronicMailAddress>
                    </gmd:CI_Address>
                  </gmd:address>
                </gmd:CI_Contact>
              </gmd:contactInfo>
              <gmd:role>
                <gmd:CI_RoleCode codeListValue="technical coordinator"
                codeList="http://www.ifremer.fr/tematres/vocab/index.php?tema=67"/>
              </gmd:role>
            </gmd:CI_ResponsibleParty>
          </sml:contact>
        </sml:ContactList>
      </sml:contacts>
          <!-- history -->
          <!-- type OF -->
      <sml:typeOf xlink:href="http://www.ifremer.fr/isi/sensorNanny/emso-yp-sml/basic.Platform.xml"/>
          <!-- output -->
          <!-- position -->
      <sml:position>
        <gml:Point gml:id="stationLocation" srsName="http://www.opengis.net/def/crs/EPSG/0/4326">
          <gml:coordinates> </gml:coordinates>
        </gml:Point>
      </sml:position>
          <!-- components list -->
</sml:PhysicalSystem>
```

6.2. SensorML files of the HF radar network in Figure 5

The fields that have been filled in are highlighted in green. Those automatically assigned by the console, but wrong are highlighted in red.

6.2.1. Description of TirLig High Frequency Radar Network

```
<?xml version="1.0" encoding="UTF-8"?>
<sml:PhysicalSystem xsi:schemaLocation="http://www.opengis.net/sensorml/2.0
http://schemas.opengis.net/sensorML/2.0/sensorML.xsd" gml:id="top"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:swe="http://www.opengis.net/swe/2.0" xmlns:gml="http://www.opengis.net/gml/3.2"
xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns:sml="http://www.opengis.net/sensorml/2.0">
      <!-- Description -->
    <gml:description> High Frequency (HF) Radar Network for sea water surface current velocity measurement
    in the North-Western Tyrrhenian Sea and Ligurian Sea </gml:description>
      <!-- Name -->
    <gml:name> TirLig High Frequency Radar Network </gml:name>
      <!-- keywords-->
    <sml:keywords>
      <sml:KeywordList>
        <sml:keyword>Oceanography</sml:keyword>
        <sml:keyword>Observatory</sml:keyword>
      </sml:KeywordList>
    </sml:keywords>
      <!-- Identification-->
    <sml:identification>
      <sml:IdentifierList>
        <sml:identifier>
          <sml:Term definition="http://www.ifremer.fr/tematres/vocab/index.php?tema=66">
            <sml:label>UUID</sml:label>
            <sml:value>876b6b83-ffb9-45ae-8c6c-821c226f922f</sml:value>
          </sml:Term>
        </sml:identifier>
      </sml:IdentifierList>
    </sml:identification>
      <!-- Classification -->
      <!-- Contacts -->
    <sml:contacts>
      <sml:ContactList>
        <sml:contact>
          <gmd:CI_ResponsibleParty uuid="">
            <gmd:organisationName>
              <gco:CharacterString>IFREMER</gco:CharacterString>
            </gmd:organisationName>
            <gmd:contactInfo>
              <gmd:CI_Contact>
                <gmd:address>
                  <gmd:CI_Address>
```

```
                <gmd:electronicMailAddress>
                  <gco:CharacterString>carlo.mantovani@cnr.it</gco:CharacterString>
                </gmd:electronicMailAddress>
              </gmd:CI_Address>
            </gmd:address>
          </gmd:CI_Contact>
        </gmd:contactInfo>
        <gmd:role>
          <gmd:CI_RoleCode codeListValue="platform manager"
          codeList="http://www.ifremer.fr/tematres/vocab/index.php?tema=67"/>
        </gmd:role>
      </gmd:CI_ResponsibleParty>
    </sml:contact>
  </sml:ContactList>
</sml:contacts>
    <!-- history -->
<sml:history>
  <sml:EventList>
    <sml:event>
      <sml:Event>
        <swe:description/>
        <sml:time>
          <gml:TimeInstant gml:id="Call0">
            <gml:timePosition/>
          </gml:TimeInstant>
        </sml:time>
      </sml:Event>
    </sml:event>
  </sml:EventList>
</sml:history>
    <!-- type OF -->
<sml:typeOf xlink:href="http://www.ifremer.fr/isi/sensorNanny/emso-yp-sml/basic.Platform.xml"/>
    <!-- output -->
<sml:outputs>
  <sml:OutputList>
    <sml:output xlink:href="http://radarhf.ismar.cnr.it/" name="radial and total current velocities"/>
  </sml:OutputList>
</sml:outputs>
    <!-- position -->
<sml:position>
  <gml:Point gml:id="stationLocation" srsName="http://www.opengis.net/def/crs/EPSG/0/4326">
    <gml:coordinates> </gml:coordinates>
  </gml:Point>
</sml:position>
    <!-- components list -->[4]
<sml:components>
  <sml:ComponentList>
    <sml:component
    xlink:href="https://datacloud.ifremer.fr/owncloud/index.php/apps/snannyowncloudapi/sml/8a36fd
    dc-e89c-42d5-a151-36c2d804838a" name="TINO"/>
```

[4] Component PCOR is missing in this file.

```
        <sml:component
        xlink:href="https://datacloud.ifremer.fr/owncloud/index.php/apps/snannyowncloudapi/sml/781b3a14-674c-4511-b721-628bf7618cc1" name="VIAR"/>
      </sml:ComponentList>
    </sml:components>
</sml:PhysicalSystem>
```

6.2.2. *Description of TINO*

```
<?xml version="1.0" encoding="UTF-8"?>
<sml:PhysicalSystem xsi:schemaLocation="http://www.opengis.net/sensorml/2.0
http://schemas.opengis.net/sensorML/2.0/sensorML.xsd" gml:id="top"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:swe="http://www.opengis.net/swe/2.0" xmlns:gml="http://www.opengis.net/gml/3.2"
xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns:sml="http://www.opengis.net/sensorml/2.0">
        <!-- Description -->
    <gml:description> HF Radar Station located on Tino Island </gml:description>
        <!-- Name -->
    <gml:name> TINO </gml:name>
        <!-- keywords-->
    <sml:keywords>
      <sml:KeywordList>
        <sml:keyword>Oceanography</sml:keyword>
        <sml:keyword>Observatory</sml:keyword>
      </sml:KeywordList>
    </sml:keywords>
        <!-- Identification-->
    <sml:identification>
      <sml:IdentifierList>
        <sml:identifier>
          <sml:Term definition="http://www.ifremer.fr/tematres/vocab/index.php?tema=66">
            <sml:label>UUID</sml:label>
            <sml:value>8a36fddc-e89c-42d5-a151-36c2d804838a</sml:value>
          </sml:Term>
        </sml:identifier>
      </sml:IdentifierList>
    </sml:identification>
        <!-- Classification -->
        <!-- Contacts -->
        <!-- history -->
        <!-- type OF -->
    <sml:typeOf xlink:href="http://www.ifremer.fr/isi/sensorNanny/emso-yp-sml/basic.Sensor.xml"/>
        <!-- output -->
        <!-- position -->
    <sml:position>
      <gml:Point gml:id="stationLocation" srsName="http://www.opengis.net/def/crs/EPSG/0/4326">
        <gml:coordinates> </gml:coordinates>
      </gml:Point>
    </sml:position>
        <!-- components list -->
    <sml:components>
```

```
      <sml:ComponentList>
        <sml:component
        xlink:href="https://datacloud.ifremer.fr/owncloud/index.php/apps/snannyowncloudapi/sml/13c000
        fd-38e0-4211-a223-e0da11ee2841" name="TINO"/>
      </sml:ComponentList>
    </sml:components>
</sml:PhysicalSystem>
```

6.2.3. Description of PCOR

```
<?xml version="1.0" encoding="UTF-8"?>
<sml:PhysicalSystem xsi:schemaLocation="http://www.opengis.net/sensorml/2.0
http://schemas.opengis.net/sensorML/2.0/sensorML.xsd" gml:id="top"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:swe="http://www.opengis.net/swe/2.0" xmlns:gml="http://www.opengis.net/gml/3.2"
xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns:sml="http://www.opengis.net/sensorml/2.0">
        <!-- Description -->
    <gml:description> HF Radar station located in Monterosso </gml:description>
        <!-- Name -->
    <gml:name> PCOR </gml:name>
        <!-- keywords-->
    <sml:keywords>
      <sml:KeywordList>
        <sml:keyword>Oceanography</sml:keyword>
        <sml:keyword>Observatory</sml:keyword>
      </sml:KeywordList>
    </sml:keywords>
        <!-- Identification-->
    <sml:identification>
      <sml:IdentifierList>
        <sml:identifier>
          <sml:Term definition="http://www.ifremer.fr/tematres/vocab/index.php?tema=66">
            <sml:label>UUID</sml:label>
            <sml:value>1e4c8696-bb75-469e-97e0-f955f61266d9</sml:value>
          </sml:Term>
        </sml:identifier>
      </sml:IdentifierList>
    </sml:identification>
        <!-- Classification -->
        <!-- Contacts -->
        <!-- history -->
        <!-- type OF -->
    <sml:typeOf xlink:href="http://www.ifremer.fr/isi/sensorNanny/emso-yp-sml/basic.Sensor.xml"/>
        <!-- output -->
        <!-- position -->
    <sml:position>
      <gml:Point gml:id="stationLocation" srsName="http://www.opengis.net/def/crs/EPSG/0/4326">
        <gml:coordinates> </gml:coordinates>
      </gml:Point>
    </sml:position>
        <!-- components list -->
```

```
</sml:PhysicalSystem>
```

6.2.4. Description of VIAR

```
<?xml version="1.0" encoding="UTF-8"?>
<sml:PhysicalSystem xsi:schemaLocation="http://www.opengis.net/sensorml/2.0
http://schemas.opengis.net/sensorML/2.0/sensorML.xsd" gml:id="top"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:swe="http://www.opengis.net/swe/2.0" xmlns:gml="http://www.opengis.net/gml/3.2"
xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns:sml="http://www.opengis.net/sensorml/2.0">
      <!-- Description -->
    <gml:description> HF Radar station located in Viareggio </gml:description>
      <!-- Name -->
    <gml:name> VIAR </gml:name>
      <!-- keywords-->
    <sml:keywords>
     <sml:KeywordList>
      <sml:keyword>Oceanography</sml:keyword>
      <sml:keyword>Observatory</sml:keyword>
     </sml:KeywordList>
    </sml:keywords>
      <!-- Identification-->
    <sml:identification>
     <sml:IdentifierList>
      <sml:identifier>
       <sml:Term definition="http://www.ifremer.fr/tematres/vocab/index.php?tema=66">
        <sml:label>UUID</sml:label>
        <sml:value>781b3a14-674c-4511-b721-628bf7618cc1</sml:value>
       </sml:Term>
      </sml:identifier>
     </sml:IdentifierList>
    </sml:identification>
      <!-- Classification -->
      <!-- Contacts -->
      <!-- history -->
      <!-- type OF -->
    <sml:typeOf xlink:href="http://www.ifremer.fr/isi/sensorNanny/emso-yp-sml/basic.Sensor.xml"/>
      <!-- output -->
      <!-- position -->
    <sml:position>
     <gml:Point gml:id="stationLocation" srsName="http://www.opengis.net/def/crs/EPSG/0/4326">
      <gml:coordinates> </gml:coordinates>
     </gml:Point>
    </sml:position>
      <!-- components list -->
</sml:PhysicalSystem>
```

6.3. SensorML files of Paloma beacon in Figure 8

The fields that have been filled in are highlighted in green. Those automatically assigned by the console, but wrong are highlighted in red.

6.3.1. *Description of Paloma*

```
<?xml version="1.0" encoding="UTF-8"?>
<sml:PhysicalSystem xsi:schemaLocation="http://www.opengis.net/sensorml/2.0
http://schemas.opengis.net/sensorML/2.0/sensorML.xsd" gml:id="top"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:swe="http://www.opengis.net/swe/2.0" xmlns:gml="http://www.opengis.net/gml/3.2"
xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns:sml="http://www.opengis.net/sensorml/2.0">
    <!-- Description -->
  <gml:description> PALOMA is a beacon located in the center of the Gulf of Trieste, on a depth of 25 m, between the coastal resorts of Piran (Slovenia) and Grado. Distant about 8 nautical miles from the coast of Trieste it was installed by ISMAR in July 2002. Beginning mainly as a weather station, over the years the instrumental equipment has been expanded with the addition of temperature measurements along the water column, at 3, 15 and 24 m depth. Starting in 2012, the station has been specialized to study the carbonate system. In the current configuration it hosts a sensor for high precision automatic CO2 measurements (Hydro CO2 II - Contros) and a probe for temperature, salinity, pressure and dissolved oxygen measurements (SBE 37-SMP-ODO) at 3 meters below sea surface; temperature sensors (SBE 39) at 15 and 24 meters depth; a station for measurements of CO2 concentration in the air (LI-840 Licor) about 10 m above the sea surface. The data, acquired with frequencies ranging from 15 minutes to 2 hours are transmitted in near real time to a dedicated server at the ISMAR headquarters in Trieste and are immediately available in ascii format. </gml:description>
    <!-- Name -->
  <gml:name> Paloma </gml:name>
    <!-- keywords-->
  <sml:keywords>
   <sml:KeywordList>
    <sml:keyword>Oceanography</sml:keyword>
    <sml:keyword>Observatory</sml:keyword>
   </sml:KeywordList>
  </sml:keywords>
    <!-- Identification-->
  <sml:identification>
   <sml:IdentifierList>
    <sml:identifier>
     <sml:Term definition="http://www.ifremer.fr/tematres/vocab/index.php?tema=66">
      <sml:label>UUID</sml:label>
      <sml:value>84accc75-ef83-4dd8-8690-261db4eb99ac</sml:value>
     </sml:Term>
    </sml:identifier>
   </sml:IdentifierList>
  </sml:identification>
    <!-- Classification -->
    <!-- Contacts -->
    <!-- history -->
```

```
        <!-- type OF -->
    <sml:typeOf xlink:href="http://www.ifremer.fr/isi/sensorNanny/emso-yp-sml/basic.Platform.xml"/>
        <!-- output -->
        <!-- position -->
    <sml:position>
      <gml:Point gml:id="stationLocation" srsName="http://www.opengis.net/def/crs/EPSG/0/4326">
        <gml:coordinates>45.6204° N 13.5658° E</gml:coordinates>
      </gml:Point>
    </sml:position>
        <!-- components list -->
    <sml:components>
      <sml:ComponentList><sml:component
      xlink:href="https://datacloud.ifremer.fr/owncloud/index.php/apps/snannyowncloudapi/sml/9ecf8989
-3463-42fd-8d37-e815c35b3c73" name="SBE37-SMP-ODO_MicroCAT"/>
      <sml:component
      xlink:href="https://datacloud.ifremer.fr/owncloud/index.php/apps/snannyowncloudapi/sml/3065293
e-c4c0-4fa8-bfc6-eebbe0d74116" name="SBE39-15m"/>
      <sml:component
      xlink:href="https://datacloud.ifremer.fr/owncloud/index.php/apps/snannyowncloudapi/sml/ef7fb747
-3412-4fc7-8df6-6c827a1c0778" name="SBE39_-24.5m"/>
      </sml:ComponentList>
    </sml:components>
</sml:PhysicalSystem>
```

6.3.2. Description of SBE37-SMP-ODO MicroCAT

```
<?xml version="1.0" encoding="UTF-8"?>
<sml:PhysicalSystem xsi:schemaLocation="http://www.opengis.net/sensorml/2.0
http://schemas.opengis.net/sensorML/2.0/sensorML.xsd" gml:id="top"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:swe="http://www.opengis.net/swe/2.0" xmlns:gml="http://www.opengis.net/gml/3.2"
xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns:sml="http://www.opengis.net/sensorml/2.0">
        <!-- Description -->
    <gml:description> The SBE 37-SMP-ODO pumped MicroCAT is a high-accuracy conductivity and
    temperature (pressure optional) recorder with Serial interface (RS-232 or RS-485), internal batteries,
    Memory, integral Pump, and Optical Dissolved Oxygen. The MicroCAT is designed for moorings or other
    long-duration, fixed-site deployments. Data is recorded in memory and can be output in real-time.
    Measured data and derived variables (salinity, sound velocity, specific conductivity) are output in
    engineering units. Memory capacity exceeds 380,000 samples. Battery endurance varies, depending on
    sampling scheme and deployment temperature and pressure. Sampling every 15 minutes (10 °C, 500
    dbar), the MicroCAT can be deployed for almost 9 months (25,000 samples). </gml:description>
        <!-- Name -->
    <gml:name> SBE37-SMP-ODO MicroCAT </gml:name>
        <!-- keywords-->
    <sml:keywords>
      <sml:KeywordList>
        <sml:keyword>Oceanography</sml:keyword>
        <sml:keyword>Observatory</sml:keyword>
      </sml:KeywordList>
    </sml:keywords>
        <!-- Identification-->
```

```xml
    <sml:identification>
      <sml:IdentifierList>
        <sml:identifier>
          <sml:Term definition="http://www.ifremer.fr/tematres/vocab/index.php?tema=66">
            <sml:label>UUID</sml:label>
            <sml:value>9ecf8989-3463-42fd-8d37-e815c35b3c73</sml:value>
          </sml:Term>
        </sml:identifier>
      </sml:IdentifierList>
    </sml:identification>
        <!-- Classification -->
    <sml:classification>
      <sml:ClassifierList>
        <sml:classifier>
          <sml:Term>
            <sml:label>depth of deployment</sml:label>
            <sml:value>3 m</sml:value>
          </sml:Term>
        </sml:classifier>
      </sml:ClassifierList>
    </sml:classification>
        <!-- Contacts -->
        <!-- history -->
        <!-- type OF -->
    <sml:typeOf xlink:href="http://www.ifremer.fr/isi/sensorNanny/emso-yp-
    sml/basic.TEMPERATURE.xml"/>[5]
        <!-- output -->
        <!-- position -->
    <sml:position>
      <gml:Point gml:id="stationLocation" srsName="http://www.opengis.net/def/crs/EPSG/0/4326">
        <gml:coordinates> </gml:coordinates>
      </gml:Point>
    </sml:position>
        <!-- components list -->
</sml:PhysicalSystem>
```

6.3.3. Description of SBE39 at 15 m

```xml
<?xml version="1.0" encoding="UTF-8"?>
<sml:PhysicalSystem xsi:schemaLocation="http://www.opengis.net/sensorml/2.0
http://schemas.opengis.net/sensorML/2.0/sensorML.xsd" gml:id="top"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:swe="http://www.opengis.net/swe/2.0" xmlns:gml="http://www.opengis.net/gml/3.2"
xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns:sml="http://www.opengis.net/sensorml/2.0">
        <!-- Description -->
    <gml:description> The SBE 39 is a high-accuracy temperature (pressure optional) recorder with internal
    battery and non-volatile memory for deployment at depths up to 10500 m (34,400 ft). The 39 is intended for
    moorings or other long-term, fixed-site applications, as well as shorter-term deployments on nets, towed
```

[5] This is not the correct reference for our sensor because the original template has been modified to meet our needs (see section 3.3).

vehicles, or ROVs. Calibration coefficients are stored in EEPROM, and uploaded data is in ASCII engineering units (°C and decibars). The 39's thermistor, the same sensor used in the SBE 16plus V2 SEACAT and 37 MicroCAT, has a long history of exceptional accuracy and stability; drift is typically less than 0.002 °C per year. Two configurations are offered: • Thermistor embedded in titanium endcap (25-second time constant), for rugged conditions. • External thermistor in pressure-protected sheath (0.5-second time constant), for fast sampling. The 39's optional Druck pressure sensor employs a micro-machined silicon diaphragm in which the strain elements are implanted with semiconductor fabrication techniques. Unlike metal diaphragms, silicon's crystal structure is perfectly elastic, so the sensor is essentially free of pressure hysteresis. Compensation of temperature influence on pressure offset and scale is performed by the 39's CPU. </gml:description>


```
    <!-- Name -->
<gml:name> SBE39-15m </gml:name>
    <!-- keywords-->
<sml:keywords>
  <sml:KeywordList>
    <sml:keyword>Oceanography</sml:keyword>
    <sml:keyword>Observatory</sml:keyword>
  </sml:KeywordList>
</sml:keywords>
    <!-- Identification-->
<sml:identification>
  <sml:IdentifierList>
    <sml:identifier>
      <sml:Term definition="http://www.ifremer.fr/tematres/vocab/index.php?tema=66">
        <sml:label>UUID</sml:label>
        <sml:value>3065293e-c4c0-4fa8-bfc6-eebbe0d74116</sml:value>
      </sml:Term>
    </sml:identifier>
  </sml:IdentifierList>
</sml:identification>
    <!-- Classification -->
<sml:classification>
  <sml:ClassifierList>
    <sml:classifier>
      <sml:Term>
        <sml:label>depth of deployment</sml:label>
        <sml:value>15 m</sml:value>
      </sml:Term>
    </sml:classifier>
  </sml:ClassifierList>
</sml:classification>
    <!-- Contacts -->
    <!-- history -->
    <!-- type OF -->
<sml:typeOf xlink:href="http://www.ifremer.fr/isi/sensorNanny/emso-yp-
sml/sensorDATA_TEMPERATURE_82.xml"/>
    <!-- output -->
    <!-- position -->
<sml:position>
  <gml:Point gml:id="stationLocation" srsName="http://www.opengis.net/def/crs/EPSG/0/4326">
    <gml:coordinates> </gml:coordinates>
  </gml:Point>
```

```xml
        </sml:position>
            <!-- components list -->
</sml:PhysicalSystem>
```


6.3.4. Description of SBE39 at 24.5 m


```xml
<?xml version="1.0" encoding="UTF-8"?>
<sml:PhysicalSystem xsi:schemaLocation="http://www.opengis.net/sensorml/2.0
http://schemas.opengis.net/sensorML/2.0/sensorML.xsd" gml:id="top"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:swe="http://www.opengis.net/swe/2.0" xmlns:gml="http://www.opengis.net/gml/3.2"
xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns:sml="http://www.opengis.net/sensorml/2.0">
            <!-- Description -->
        <gml:description> The SBE 39 is a high-accuracy temperature (pressure optional) recorder with internal
        battery and non-volatile memory for deployment at depths up to 10500 m (34,400 ft). The 39 is intended for
        moorings or other long-term, fixed-site applications, as well as shorter-term deployments on nets, towed
        vehicles, or ROVs. Calibration coefficients are stored in EEPROM, and uploaded data is in ASCII
        engineering units (°C and decibars). The 39's thermistor, the same sensor used in the SBE 16plus V2
        SEACAT and 37 MicroCAT, has a long history of exceptional accuracy and stability; drift is typically less
        than 0.002 °C per year. Two configurations are offered: • Thermistor embedded in titanium endcap (25-
        second time constant), for rugged conditions. • External thermistor in pressure-protected sheath (0.5-
        second time constant), for fast sampling. The 39's optional Druck pressure sensor employs a micro-
        machined silicon diaphragm in which the strain elements are implanted with semiconductor fabrication
        techniques. Unlike metal diaphragms, silicon's crystal structure is perfectly elastic, so the sensor is
        essentially free of pressure hysteresis. Compensation of temperature influence on pressure offset and
        scale is performed by the 39's CPU. </gml:description>
            <!-- Name -->
        <gml:name> SBE39 -24.5m </gml:name>
            <!-- keywords-->
        <sml:keywords>
          <sml:KeywordList>
            <sml:keyword>Oceanography</sml:keyword>
            <sml:keyword>Observatory</sml:keyword>
          </sml:KeywordList>
        </sml:keywords>
            <!-- Identification-->
        <sml:identification>
          <sml:IdentifierList>
            <sml:identifier>
              <sml:Term definition="http://www.ifremer.fr/tematres/vocab/index.php?tema=66">
                <sml:label>UUID</sml:label>
                <sml:value>ef7fb747-3412-4fc7-8df6-6c827a1c0778</sml:value>
              </sml:Term>
            </sml:identifier>
          </sml:IdentifierList>
        </sml:identification>
            <!-- Classification -->
        <sml:classification>
          <sml:ClassifierList>
            <sml:classifier>
              <sml:Term>
                <sml:label>depth of deployment</sml:label>
```

```xml
            <sml:value>24.5 m</sml:value>
            </sml:Term>
          </sml:classifier>
        </sml:ClassifierList>
      </sml:classification>
        <!-- Contacts -->
        <!-- history -->
        <!-- type OF -->
    <sml:typeOf xlink:href="http://www.ifremer.fr/isi/sensorNanny/emso-yp-
    sml/sensorDATA_TEMPERATURE_82.xml"/>
        <!-- output -->
        <!-- position -->
    <sml:position>
      <gml:Point gml:id="stationLocation" srsName="http://www.opengis.net/def/crs/EPSG/0/4326">
        <gml:coordinates> </gml:coordinates>
      </gml:Point>
    </sml:position>
        <!-- components list -->
</sml:PhysicalSystem>
```