D9.1– Central Atlantic Demonstration Report

Lead organisation for this deliverable
[OCEANIC PLATFORM OF THE CANARY ISLANDS (PLOCAN)]

Lead authors: [Carlos Barrera (PLOCAN)]

Contributors: [Eric Delory, Simone Memè, Rayco Moran, Eduardo Caudet, Ruben Marrero, Cristina Almisas, Gabriel Juanes, Hector Rodriguez (PLOCAN), Damien Malardé (NKE)]

THE OCEAN OF TOMORROW

NeXOS - Next generation Low-Cost Multifunctional Web Enabled Ocean Sensor Systems Empowering Marine, Maritime and Fisheries Management, is funded by the European Commission's 7th Framework Programme - Grant Agreement Nº 614102

[Deliverable 9.1 – Central Atlantic Demonstration Report]

Project Acronym: NeXOS

Project Title: Next generation Low-Cost Multifunctional Web Enabled Ocean Sensor Systems Empowering Marine, Maritime and Fisheries Management**.**

Project Coordinator: Eric Delory

Programme: The Ocean of Tomorrow 2013 – 7th Framework Programme

Theme 2: Food, Agriculture and Fisheries, and Biotechnology
Theme 4: Nanosciences, Nanotechnologies, Materials and new Production Technologies
Theme 5: Energy
Theme 6: Environment (including climate change)
Theme 7: Transport (including aeronautics)

Topic: OCEAN.2013-2 Innovative multifunctional sensors for in-situ monitoring of marine environment and related maritime activities

Instrument: Collaborative Project

Deliverable Code: [170831-NXS-WP9_D.9.1-v.0.5]
Due date: [2017/08/31]

DISSEMINATION LEVEL	
PU: Public	[X]
PP: Restricted to other programme participants (including the Commission Services)	[]
RE: Restricted to a group specified by the consortium (including the Commission Services)	[]
CO: Confidential, only for members of the consortium (including the Commission Services)	[]

DOCUMENT HISTORY

Edit./Rev.	*Date*	*Name*
Prepared	170730	[Carlos Barrera]
Checked	170802	[Simone Memè]
Checked	170806	[Project Coordinator]
Checked	170808	[Simone Memè]
Approved	170831	Project Coordinator

DOCUMENT CHANGES RECORD

Edit./Rev.	*Date*	*Chapters*	*Reason for change*
v.0.2	170802	[Whole Document]	Demo background, pictures, general format adjustments
v.0.3	170808	[Whole Document]	General format
V0.4	170822	[2]	Can 4 mission added
V0.5	170908	[Whole Document]	Dates corrections

DISTRIBUTION LIST

Copy no.	*Company / Organization (country)*	*Name and surname*
1	PLOCAN (ES)	Eric Delory, Ayoze Castro, Simone Memè, Carlos Barrera
2	IFREMER (FR)	Jean-Francois Rolin, Jerome Blandin, Laurent Delauney, Patrice Woerther
3	UNI-HB (DE)	Christoph Waldmann, Eberhard Kopiske, Andreas J. Häusler, Tina Dohna
4	52-N (DE)	Simon Jirka, Matthes Rieke
5	AMU (FR)	Madeleine Goutx, Marc Tedetti
6	UPC (ES)	Joaquín del Río, Daniel Mihai Toma
7	ALSEAMAR (FR)	Laurent Beguery, Yann Le Page, Frédéric Fiquet, François-Xavier Demotes-Mainard, Dorothée Coulomb
8	UNOL (DE)	Oliver Zielinski, Rohan Henkel, Daniela Voß, Oliver Ferdinand
9	NKE (FR)	Patrice Brault, Damien Malardé, Arnaud David
10	TRIOS (DE)	Rüdiger Heuermann
11	CMR (NO)	David Peddie
12	CTN (ES)	Noelia Ortega, Pablo Ruiz, Pablo Cervantes, Daniel Alonso
13	HZG (DE)	Wilhelm Petersen, Steffen Assmann, Rüdiger Roettgers, Frank Carsten, Jochen Wollschlaeger
14	REC (NO)	Nils Roar Hareide, Karsten Kvalsund
15	NIVA (NO)	Lars Golmen, Kai Sørensen, Emanuele Reggiani
16	SMID (IT)	Luigi Corradino, Diego Pinzani, Alberto Figoli, Alessandra Casale
17	FRANATECH (DE)	Michel Masson, Joaquim Schwerdtfeger
18	UNIRESEARCH (NO)	Svein Østerhus
19	CNR-ISMAR (IT)	Marco Faimali, Stefania Sparnocchia, Giovanni Pavanello, Michela Martinelli
20	IEEE (FR)	Jay Pearlman, Francoise Pearlman, René Garello
21	ECORYS (NL)	Johan Gille, Dick Mans, Ioannis Giannelos, Linette de Swart

Acknowledgements

Funding for the NeXOS project (Grant Agreement No. 614102) was received from the EU Commission as part of the 7th Framework Programme, “The Ocean of Tomorrow”.

The help and support, in preparing the proposal and executing the project, of the partner institutions is also acknowledged: Plataforma Oceánica de Canarias (ES), Institut Français de Recherche pour l’Exploitation de la Mer (FR), Universität Bremen (DE), 52°North Initiative for Geospatial Open Source Software GmbH (DE), Aix Marseille University (FR), Universitat Politècnica de Catalunya (ES), Architecture et Conception de Systèmes Avancés (FR), Carl von Ossietzky Universität Oldenburg (DE), NKE Instrumentation (FR), TriOS MEss- und Datentechnik GmbH (DE), Christian Michelsen Research AS (NO), Centro Tecnológico Naval y del Mar (ES), Helmholtz-Zentrum Geesthacht Zentrum fur Material- und Kustenforschung GmbH (DE), Runde Miljøsenter AS (NO), Norsk Institutt for VAnnforskning (NO), SMID Technology s.r.l. (IT), Franatech AS (NO), Uni Research AS (NO), Consiglio Nazionale delle Ricerche (IT), IEEE France Section (FR) and ECORYS Nederland BV (NL).

Abstract

The document reports on the demonstration of NeXOS sensors O1 and A1 on fixed and mobile platforms in the Canary Islands; Demonstrations are delivering real-time and near-real time data to the Sensor Observation Services (SOS) and the NeXOS SWE client. End-to-end data flow is demonstrated from the different sensor-platform configurations, further validating interoperability schemes developed in the project. Deviations from the initial plan consisted in the use of a wave glider instead of a deep glider (already demonstrated in Norway), and the use of a coastal area instead of an open-ocean area for logistics reasons.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. Common Background

This document describes the final Demonstration phase of the NeXOS project held in the Central Atlantic Ocean for the passive acoustic and optical sensors developed within the project. This is the last important phase, aiming at demonstrating the value of the NeXOS approach and takes place on selected platforms after the integration and validation of the sensors. Here is reported the effectiveness of integrating such sensors into particular platforms for specific purposes or applications, into realistic operational scenarios (developed in the Deliverable 1.2) under mission control services (SWE, SOS) allowing data handling and visualization (interoperability). The final purpose is to demonstrate the end-to-end path from the sensor to the web-based dissemination tool.

Demonstration missions were carried out following the plans developed in Deliverable 8.4, and in particular have considered the following user scenarios:

- Characterising the underwater soundscape, with a focus on areas where human activities take place (CAN1, CAN3 and CAN4)
- Glider application for dissolved hydrocarbons detection (CAN2).

Three platforms selected were paired with NeXOS sensors as summarized in Table 1. Sensors and platforms are described in detail in deliverables 8.1 and 8.4.

Table 1: Platforms and Sensors for each Demonstration Mission in the Central Atlantic Ocean

Mission	Platform name and type	Platform owner	Sensor name and type	Sensor owner	Contacts
CAN1	WAVEGLIDER	PLOCAN	A1.1 Passive acoustic	PLOCAN	Platform: carlos.barrera@plocan.eu Sensor: eric.delory@plocan.eu
CAN2	WAVEGLIDER	PLOCAN	O1.4 MatrixFlu	UNOL	Platform: carlos.barrera@plocan.eu Sensor: oliver.zielinski@uni-oldemburg.de
CAN3	PROVOR	CNR	A1.3 Passive acoustic	CTN	Platform: dmalarde@nke.fr Sensor: Pablocervantes@ctnaval.com
CAN4	BUOY	CNR	A1.4 Passive acoustic	SMID	Platform: carlos.barrera@plocan.eu Sensor: a.figoli@smidtechnology.it

2. Demonstration reports

This section provides the reports from the demonstration missions in the Central Atlantic Ocean, following a template which is common to all demonstrations.

2.1 CAN1 and CAN2 mission report

CAN1 + CAN2 Demonstration report

Sensor(s) name: Passive Acoustic A1.1 and O1.4	Sensor owner(s): PLOCAN and UNOL
Platform name: Waveglider	Platform owner: PLOCAN
Mission leader(s): PLOCAN	Involved partners: UNOL, 52N, TRIOS

Mission motivation

This demonstration mission consists in testing the NeXOS system in a real ocean mobile platform, the WaveGlider, in a real operational scenario, i.e. the PLOCAN test-site area in the NE coast of Gran Canaria. Sound levels in the ocean are not constant, but differ from location to location and change with time. Different sources of sound contribute to the overall noise level, including shipping, breaking waves, marine life, and other anthropogenic and natural sounds. Noise from ships and other human activities have the potential to mask the communication of acoustically active marine mammals and result in changes in their behaviour.

The International Maritime Organisation (IMO) recently released guidelines for the reduction of underwater shipping noise (IMO, 2014 MEPC.1/Circ.833). Anthropogenic underwater noise has also recently been recognised as a form of pollution in European legislation through the Marine Strategy Framework Directive (MSFD descriptor 11: 2010/477/EU). For low frequency noise policy requires monitoring of trends in the ambient noise level within the 1/3 octave bands of 63 and 125 Hz (centre frequency). With chronic persistent noise, a comprehensive approach is required since both the source (ship) and the receiver (mobile marine species) are moving through space and time, and this provides an additional challenge to assessing sound exposure.

Fluorescent sensors, which establish a matrix of wavelength combinations, can provide detailed information on both water constituents and other relevant contaminants that are optically active in the respective spectral regions. This sensor will allow detection of potential contaminants next to areas where human activities take place.

Sensor description

The sensor suite used for this specific demonstration includes A1.1 and O1.4 and their detailed description can be found in Deliverable 8.1, D8.2, D8.3 and D8.4.

Platform description

Powered by wave and solar energy, the Wave Glider is an autonomous, unmanned surface vehicle (USV) that operates individually or in fleets delivering real-time data for up to a year with no fuel. With the latest advancements in energy harvesting and propulsion, combined with a payload and sensor open architecture, the Wave Glider is a persistent mobile data-gathering platform able to travel tens of thousands of miles, collect data in the most demanding conditions, and deliver this data in real time. The Adaptive Modular Power System is designed to accommodate power hungry payloads (e.g., sonar) and support a wide array of sensors. With powerful computational capabilities for real-time on-board processing of large volumes of data at sea, the Wave Glider can transmit "just the answer" back to shore, representing a big step forward in unmanned ocean monitoring and exploration. The Wave Glider is designed for long term operations, providing a truly 24×7 platform for up to 12 months with no fuel, emissions or crew. The Wave Glider was conditioned to host an acoustic (A1) and optical (O1) sensors via a PLOCAN-developed datalogger. For more details about the Waveglider, see: https://www.liquid-robotics.com/

Transversal innovations

Sensors include an embedded memory, which contains the PUCK payload with all the information that uniquely identifies the instrument (PUCK protocol, datasheet, manufacturer ID, instrument model ID, etc) and the SensorML, which specifies the instrument's data output and the control protocol to obtain the data in the form of a Sensor Interface Descriptor (SID).

On a Waveglider, the sensor connects to the datalogger through a PC unit (Raspberry Pi) through RS232 port. The Sensor Web Enablement (SWE) driver obtains the SensorML document with the PUCK protocol client and creates an EXI file with the information received. Since the Iridium RUDICS modem can't send files bigger than 340 bytes/message, a filesize option is available in the SensorML to establish the required size according to SBD's size constraints and later sent by email to the shore station. At shore station, the EXI files are downloaded to a local computer with the file DownloadEmail.py and sent to the 52 North server with Send_EXI_files.sh for its visualization on the NeXOS 52 North Server (Figure 1).

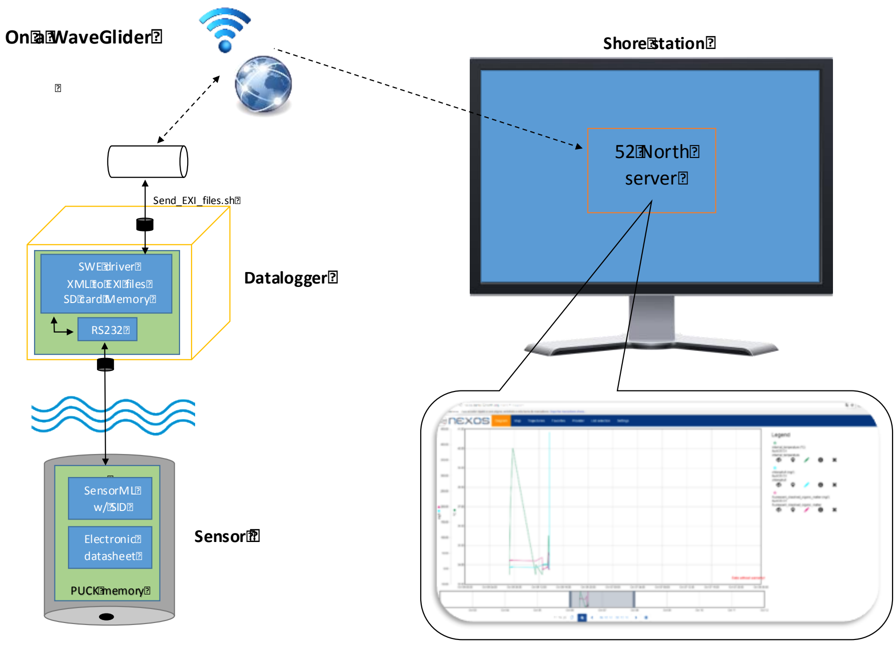


Figure 1. NeXOS software integration on the Waveglider

Datalogger for demonstration: For the purpose of the waveglider demonstration, a low-cost datalogger was built at PLOCAN, on the basis of the initial datalogger reported in WP8, fit for the wave glider in order to implement the NeXOS end-to-end approach. The logger was built, using low-cost mechanical parts 6-Pin and 8-Pin Bulgin 400er series as connectors in a PeliCase IP68 box.

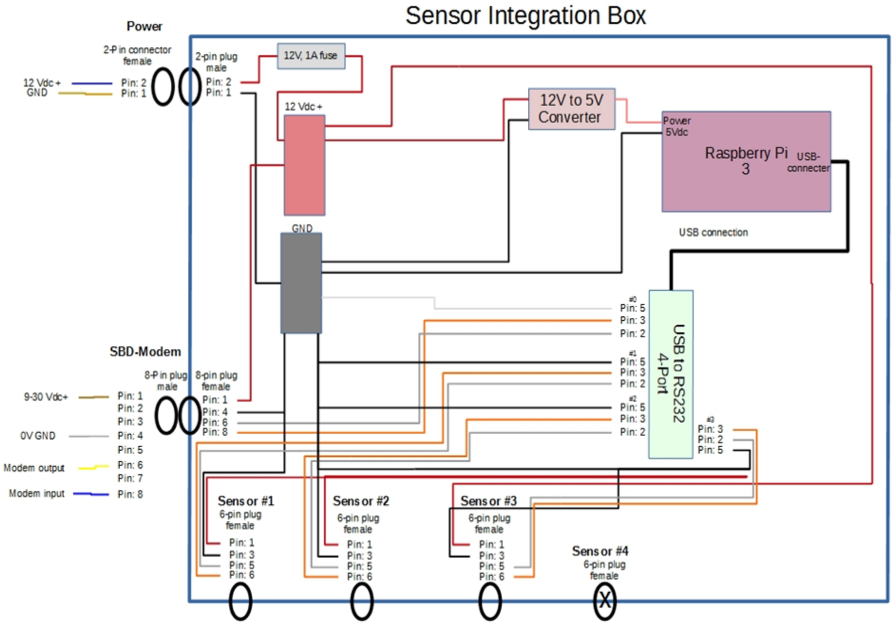


Figure 2. First prototype electrical scheme.

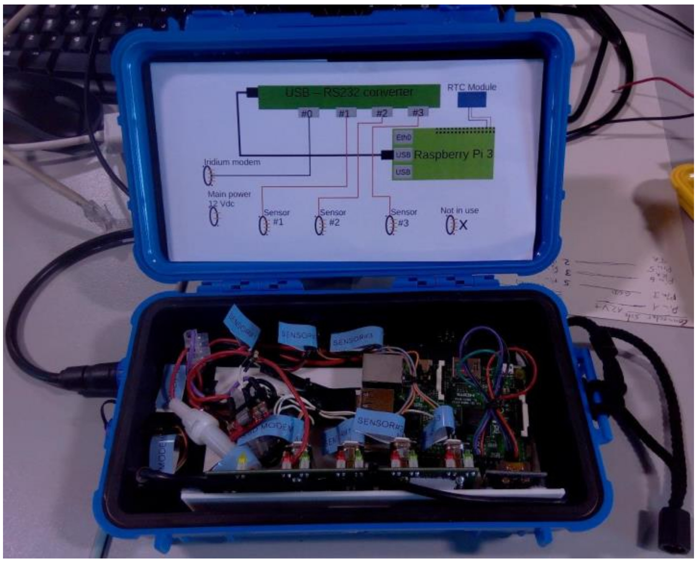


Figure 3. First Datalogger prototype.

Datalogger box and sensors and modem were installed on the Waveglider. The box was mounted under the solar panels, as shown in Figure 4. The next step was to install the supports for the MatrixFlu O1 sensor to the keel of the Waveglider as shown in Figure 4. The modem was fixed to the communication pole of the Waveglider as shown in Figure 5. The towbody of the Hydrophone A1.1 sensor was connected to the datalogger as shown in Figure 6.

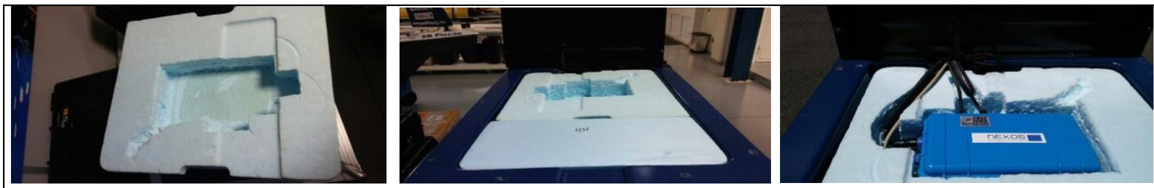


Figure 4. Datalogger integrated in the Waveglider.

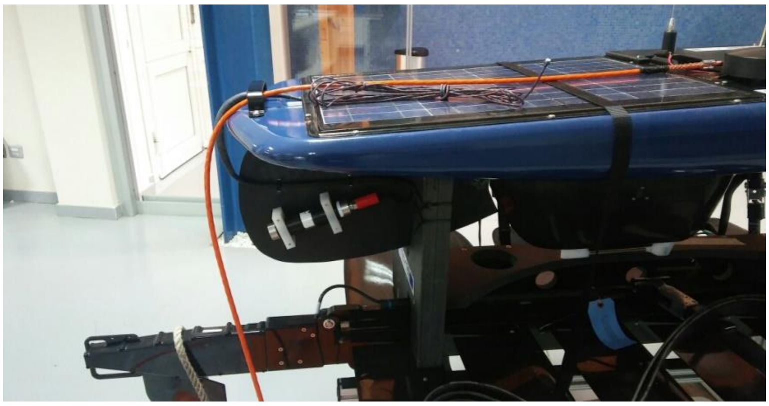


Figure 5. MatrixFlu O1 sensor fixation on the Waveglider.

Figure 6. SBD modem and tow-body fixed on the Waveglider

A Pre-Demo deployment allowed to identify a water leak as shown in Figure 7, later corrected by the use of cable glands instead of connectors.

Figure 7. Result of water filtering inside Sensor Integration Box.

A new datalogger was also built, the same steps as the first prototype were followed (Figure 8). The electrical scheme was also updated as shown in Figure 9, where the only two changes are that connector strips were added to make possible the connections with the sensors directly plus a GPS unit.

Figure 8. Second Sensor Integration Box prototype

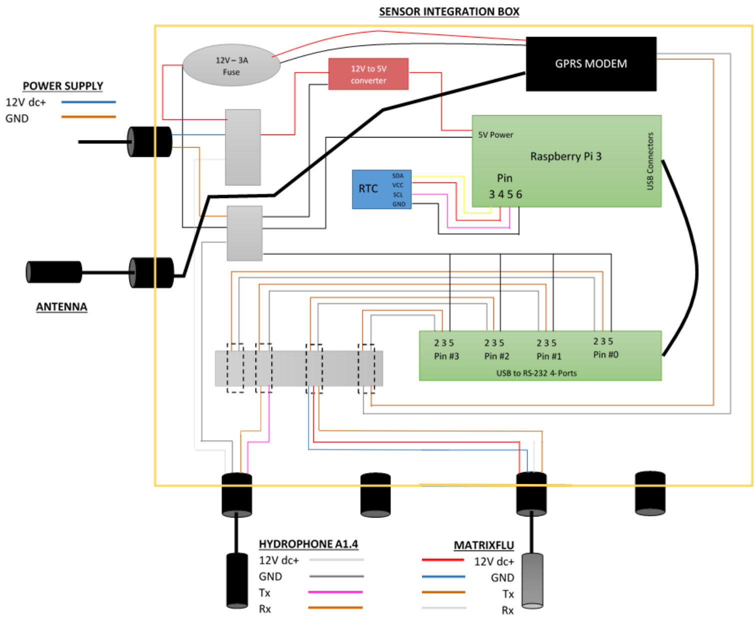


Figure 9. Electrical scheme of the second Datalogger

The A1 sensor was installed in a tow-body system, as a technical solution to optimize performance and mitigate mechanical and surface-induced movement and interferences.

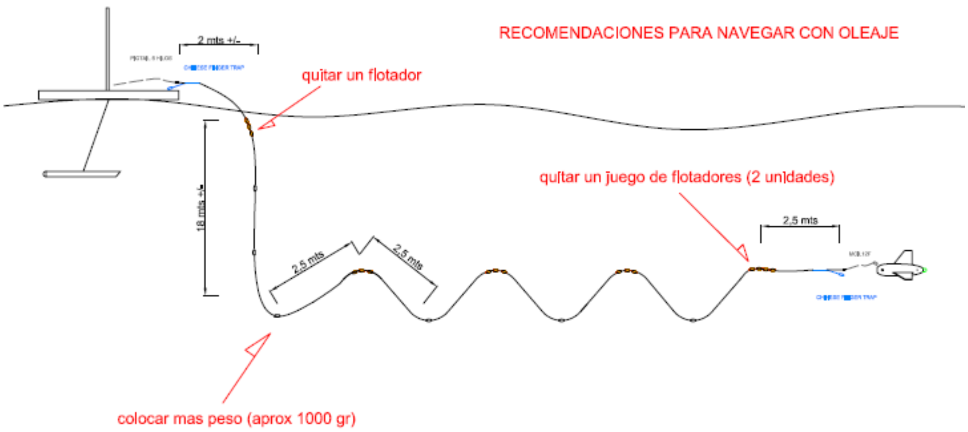


Figure 10. Drawing of the tow-body technical solution for the A1 sensor

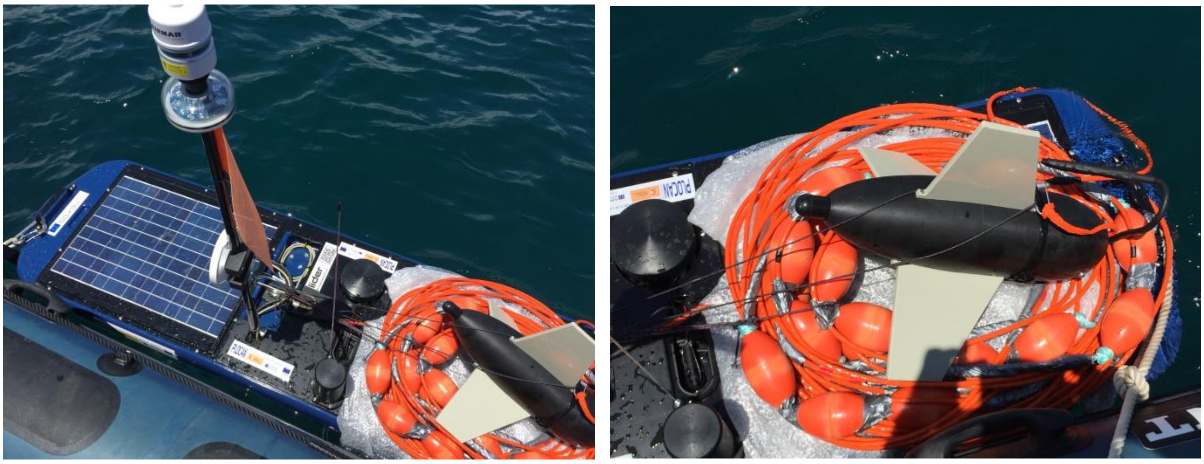


Figure 11. A1 sensor fully integrated and ready for the Waveglider demo.

Mission report

The Waveglider ASV equipped with the A1.1 and O1.4 sensors was first deployed offshore Taliarte (East coast of Gran Canaria) on Tuesday 17th May 2017 from PLOCAN-2 rubber boat in the surroundings of Taliarte harbour and operated until 24th May 2017 when it was successfully recovered.

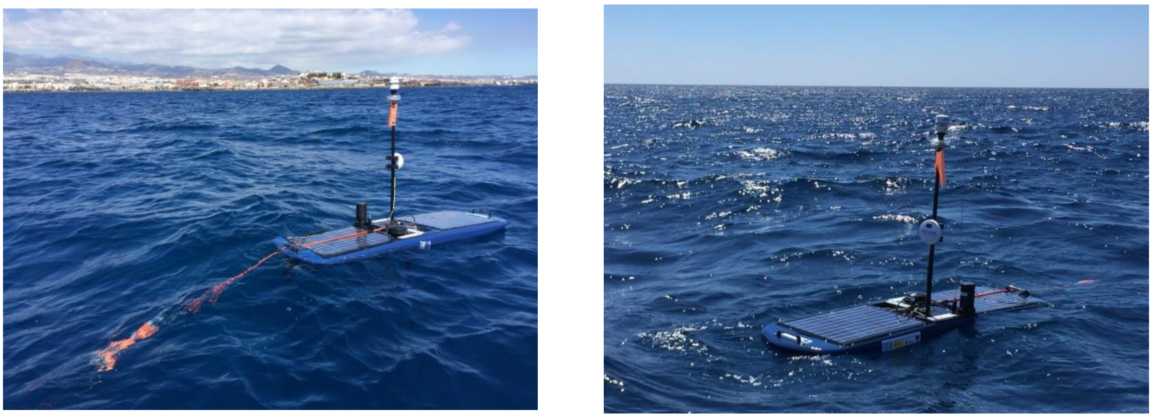
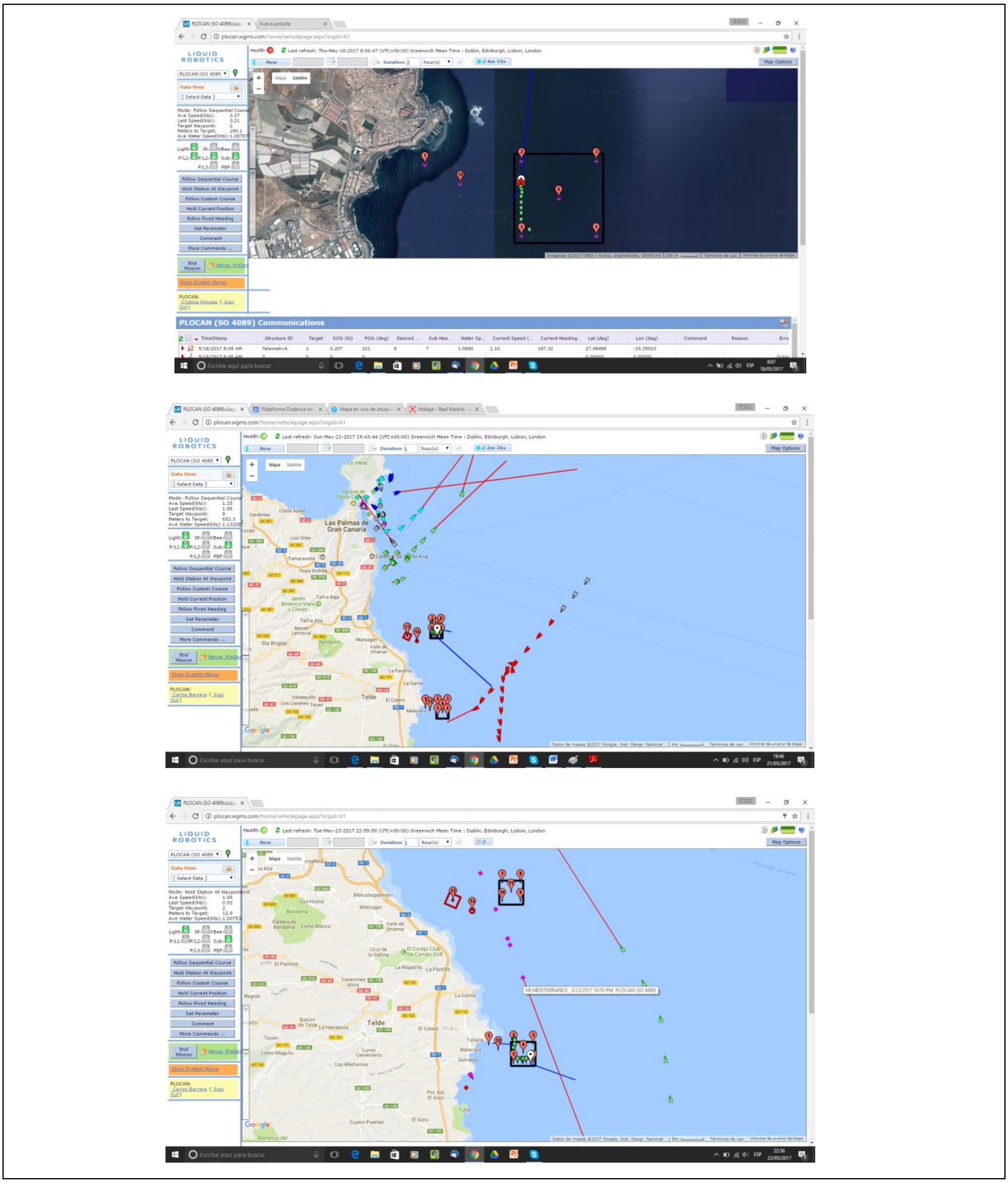


Figure 12: Waveglider deployment in the surroundings of Taliarte harbour, East coast of Gran Canaria.

Two areas of operation were selected: Taliarte and PLOCAN test-site, and a 24/7 piloting schedule was conducted continuously during the period of operation. The following screen shots are some representative track positions of the Waveglider during the mission:



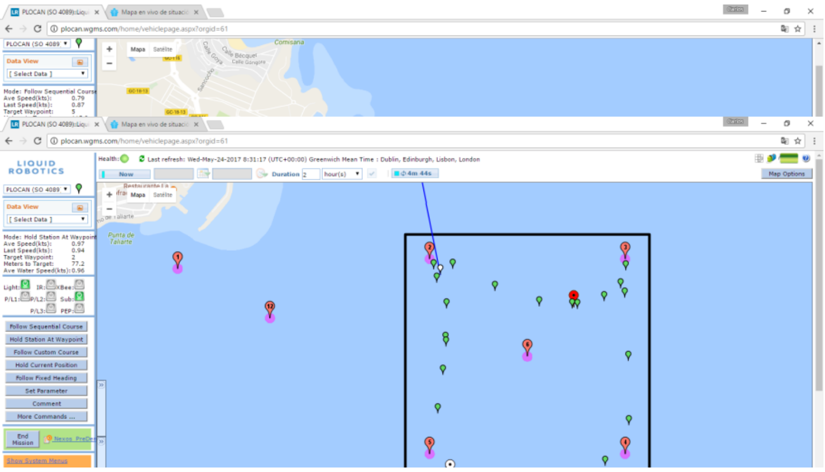


Figure 13: Waveglider WGMS piloting interface.

During the first mission, the WG payload (PL1) hosting the A1 and O1 sensors, was remotely turned on 30 minutes a day (15 minutes from 08:00 am and 15 minutes from 08:00 pm) to reduce power consumption and costs incurred by continuous satellite transmission.

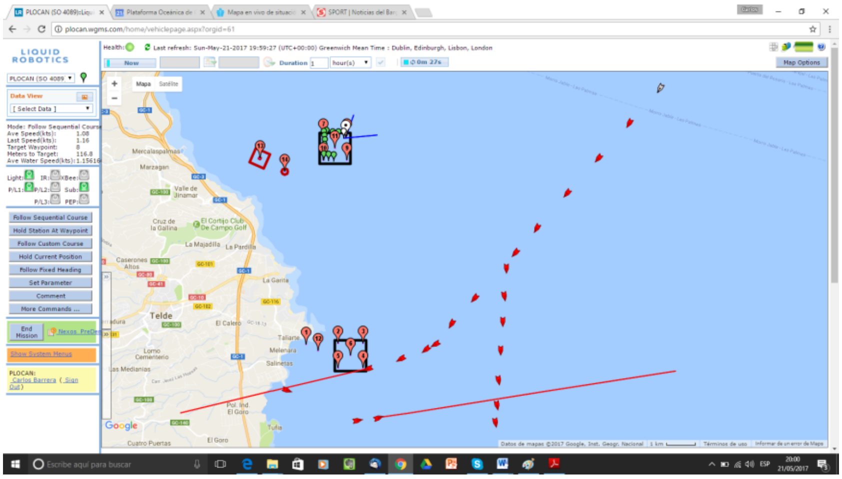


Figure 14: Piloting interface with Payload 1 turned on.

A leak failure on the main board electronics NeXOS housing was the reason for not being able to gather any data from both sensors during the first demonstration period. Also the operations depth of the A1 was too shallow (approximately in 10 meters).

For both reasons, once the Waveglider was recovered, some improvements were necessary (housing sealing and new tow-body ballasting) in order to be able to resume the demo mission. Once the whole system was ready to be redeployed, the Waveglider was put into operation for a new demonstration on the 12th of June 2017. Some minutes after deployment, another failure occurred with the telemetry system which prevented carrying out the planned mission. Again, the Waveglider was retrieved from water and repaired with a new telemetry approach (GPRS instead of Iridium-SBD). Depth of the tow-body in this case was correct (aprox. 20 meters depth) and no leak was detected in the main board electronics of the NeXOS housing. A new mission has been completed in august, where data files where recorded on a local server and converted to be compliant to the SOS/O&M standards. Data can be now visualized from the NeXOS Sensor Web client. This demonstration permits to validate the complete chain O1 and A1 hydrophone/puck protocol communication/transmission.

Figure 15: Waveglider deployment for a second demo-mission in Canary Islands.

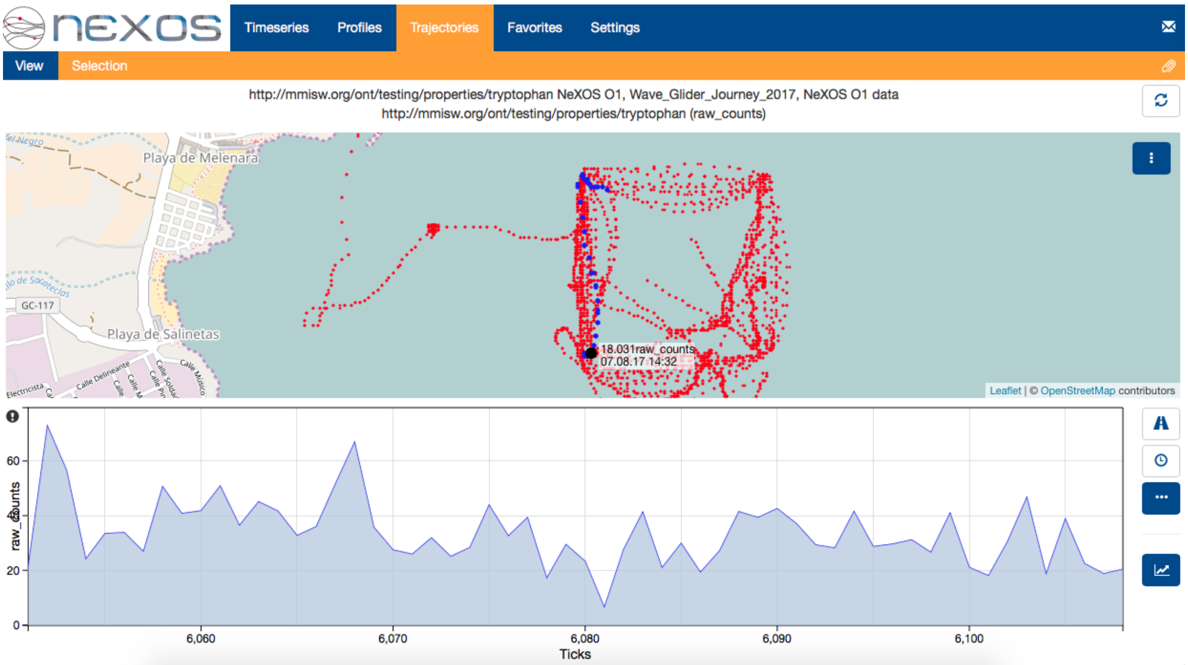


Figure 16: NeXOS user-interface with real-time data from O1.

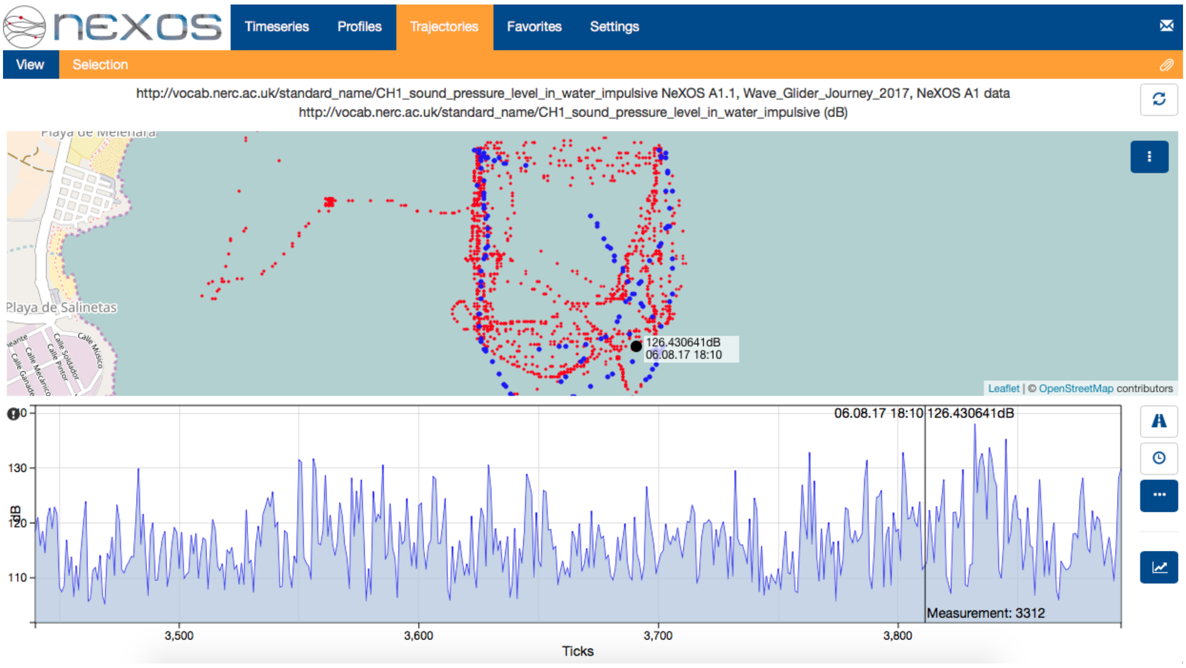


Figure 17: NeXOS SOS client with real-time data from A1.

Author list:

Carlos Barrera, Simone Memè, Eric Delory

2.2 CAN3 mission report

CAN3 demonstration report

Sensor(s) name: Passive Acoustic A1.3	Sensor owner(s): CTN
Platform name: PROVOR	Platform owner: NKE
Mission leader(s): NKE	Involved partners: PLOCAN, 52N

Mission motivation

This demonstration mission deals with testing the NeXOS system in a real ocean mobile platform, as it is the PROVOR float, in a real operational scenario as it is the PLOCAN test-site area in the NE coast of Gran Canaria.

Sound levels in the ocean are not constant, but differ from location to location and change with time. Different sources of sound contribute to the overall noise level, including shipping, breaking waves, marine life, and other anthropogenic and natural sounds. Noise from ships and other human activities have the potential to mask the communication of acoustically active marine mammals and result in

changes in their behaviour. The International Maritime Organisation (IMO) recently released guidelines for the reduction of underwater shipping noise (IMO, 2014 MEPC.1/Circ.833). Anthropogenic underwater noise has also recently been recognised as a form of pollution in European legislation through the Marine Strategy Framework Directive (MSFD descriptor 11: 2010/477/EU). For low frequency noise policy requires monitoring of trends in the ambient noise level within the 1/3 octave bands of 63 and 125 Hz (centre frequency). With chronic persistent noise, a comprehensive approach is required since both the source (ship) and the receiver (mobile marine species) are moving through space and time, and this provides an additional challenge to assessing sound exposure.
Sensor description
NeXOS A1.3 acoustic sensor is a compact, low power, low consumption digital hydrophone with embedded pre-processing of acoustic data, OGC PUCK and SWE interoperability standards. A1 enables acoustic measurements and characterization of underwater noise, bio-acoustic sources and several soundscape sources. It is mainly designed to be used on mobile and fixed platforms with limited autonomy and/or limited communication capability. For more details see D8.1, D8.2, D83 and D8.4
Platform description
This is a drifting float, developed by the French NKE company, of the type used in the ARGO programme. It perform profiles, carrying sensors between the surface and depths down to 2000m, at slow speed. The vertical speed is controlled by the buoyancy of the float, the horizontal speed by the ambient ocean currents. It was planned to use this float as a platform carrying an acoustic sensor, A1. For more details about the PROVOR float, see: http://www.argo.ucsd.edu/Arvor_Provor_AST12.pdf http://www.nke-instrumentation.com/products/profilers/products/provor-cts4.html
Transversal innovations
The link to the SOS server between the A1.3 – NKE profiling float pair was established partially using the SEISI mechanisms (the SensorML was retrieved by the platform from the A1.3 PUCK payload and transmitted to the SOS proxy). The SOS proxy has been modified to transform the data files produced by NKE profiling float (CSV format) to O&M Profile Observations and upload the resulting O&M files to the SOS server.

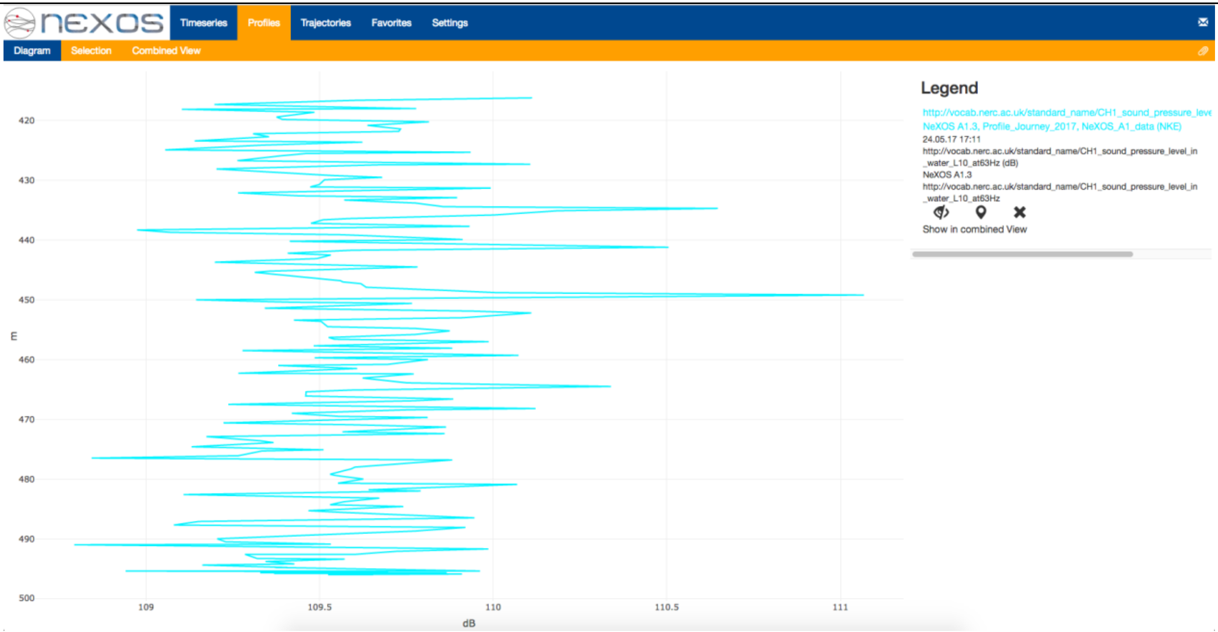


Figure 18: A1.3 output in the SOS Client.

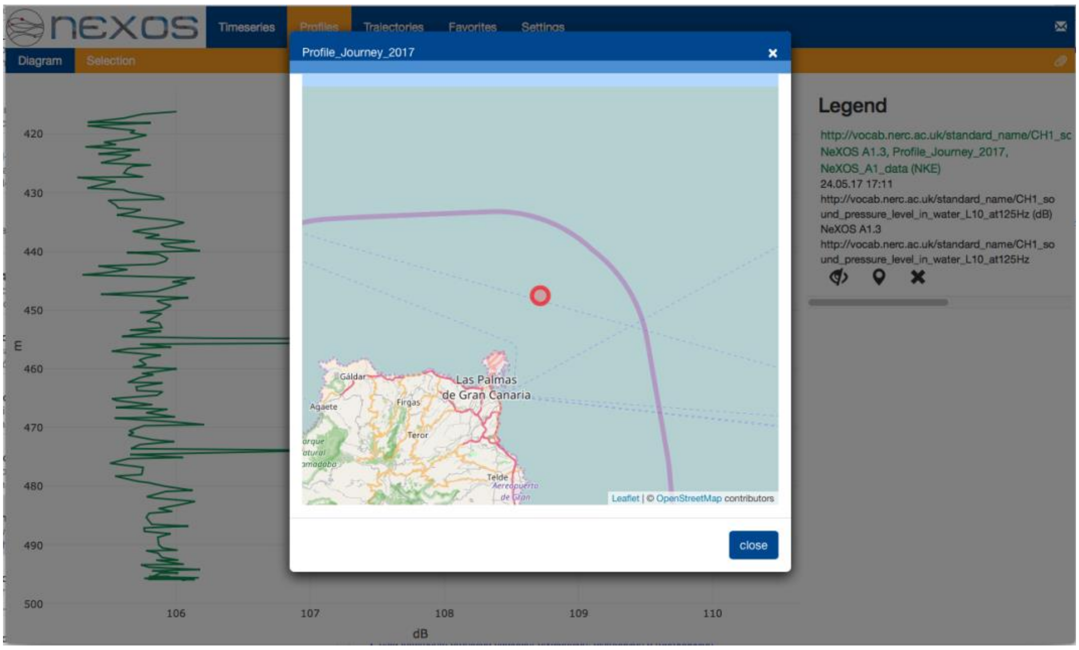


Figure 19: Demo area, offshore Las Palmas (Spain), Atlantic Ocean.

Mission report

The PROVOR float equipped with the A1 hydrophone sensors has been successfully deployed off Las Palmas on Tuesday 23th May 2017 from the Pisko Uno ship and drifted until Wednesday 24th May 2017 afternoon when it was recovered (Figure 20).

A short mission was planned to check that the PROVOR float is fully functional and allowing to recover it. Due to current and weather conditions the float could have drifted fast and go out of vessel capabilities for recovery.

Figure 20: Deployment of NEXOS float from Pizko Uno boat, offshore Las Palmas (Spain).

The float was programmed to achieve parking and profiling depths until 500 meters for the specific needs of *in situ* demonstration. A1 hydrophone was located at the top of the float close to CTD probe in order to measure data in the same water layer. A1 hydrophone measured MSFD sound characteristics every 5-6 seconds when the float ascents to the surface and SBE41 sensor measured temperature, pressure and salinity every 2 seconds.

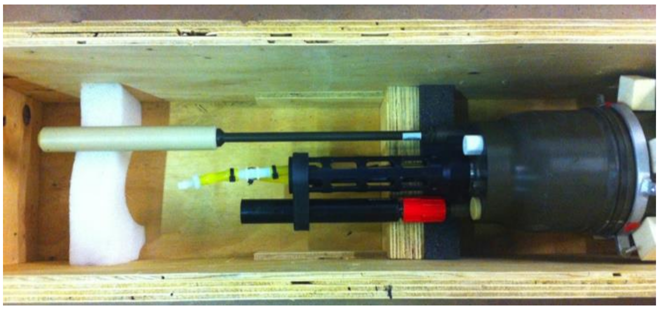


Figure 21: Assembly of A1 hydrophone on the top of ARGO float structure (NKE) close to the CTD probe

The float was deployed by the boat officer using a small stair located at the back of the Pizko Uno ship with direct access to seawater. The map on Figure 3 shows the float positions on the 23th (launching) and the 24th (recovering) of May 2017. The recovery was relatively risky due to the bad weather conditions (heavy swell and strong currents).

Figure 22: GPS positions of the launching of PROVOR-Nexos float.

Figure 23: GPS positions of the recovering of PROVOR-Nexos float.

During the mission, the float transmitted both technical file including GPS position and internal parameters, XML and data file of A1 hydrophone and CTD probe in CSV format.

The mission ran smoothly. The PROVOR float has managed its buoyancy to descend to 500m compliant to settings and during the ascent acoustics data were acquired. Acquisition duration is limited to first 100m from depth due to reduce satellite communication costs.

This demonstration permits to validate the complete chain A1 hydrophone/puck protocol communication/transmission via Iridium to a Rudics server. Once the mission was completed, data files recorded on a local server was converted to be compliant to the SOS/O&M standards. Data can be visualized on the NeXOS Sensor Web client.

Author list: Damien Malardé, Carlos Barrera, Simone Memè, Eric Delory

2.3 CAN4 mission report

CAN4 Demonstration report

Sensor(s) name: A1.4	Sensor owner(s): SMID
Platform name: ESTOC Buoy	Platform owner: PLOCAN
Mission leader(s):	Involved partners: 52N, SMID

Mission motivation

This demonstration mission consists in testing the NeXOS system in a real ocean fixed platform, a moored buoy in a real operational scenario, i.e. the NE coast of Gran Canaria. Sound levels in the ocean are not constant, but differ from location to location and change with time. Different sources of sound contribute to the overall noise level, including shipping, breaking waves, marine life, and other anthropogenic and natural sounds. Noise from ships and other human activities have the potential to mask the communication of acoustically active marine mammals and result in changes in their behaviour.

The International Maritime Organisation (IMO) recently released guidelines for the reduction of underwater shipping noise (IMO, 2014 MEPC.1/Circ.833). Anthropogenic underwater noise has also recently been recognised as a form of pollution in European legislation through the Marine Strategy Framework Directive (MSFD descriptor 11: 2010/477/EU). For low frequency noise policy requires monitoring of trends in the ambient noise level within the 1/3 octave bands of 63 and 125 Hz (centre frequency). With chronic persistent noise, a comprehensive approach is required since both the source (ship) and the receiver (mobile marine species) are moving through space and time, and this provides an additional challenge to assessing sound exposure.

Sensor description

The sensor used for this specific demonstration is A1.4

Platform description

The buoy is a moored surface-autonomous ocean-platform with open architecture able to integrate on-demand science-payloads according to needs in both coastal and open-ocean locations. A Balizamar B1600S buoy owned by PLOCAN was used to emulate the ESTOC station and henceforth make operations moe flexible with respect to ship operations and to mitigate risks considering the prohibitive additional costs of an open-ocean operation should any problem occur with the field activities, as is often the case in a research project. The central buoy hardware was modified in order to allocate all needed elements and components, with a waterproof hull along its main body as a container for a PVC pipe with 5x12V@12Ah batteries, a solar regulator Sunsaver 10L and a timer Finder 80.91, to supply power at the selected timing. Four solar panels Solara S50P36 where mounted in a 90º configuration on the main mast, in order to fully cover the 360º. The waterproof datalogger was connected to the batteries and Iridium antenna (emulating open-ocean ESTOC transmission) in the upper part of the buoy turret. A SeaLite SL60 light beacon was installed on top of the turret for overnight period signaling. For more details about the ESTOC-buoy, see: http://siboy.plocan.eu/

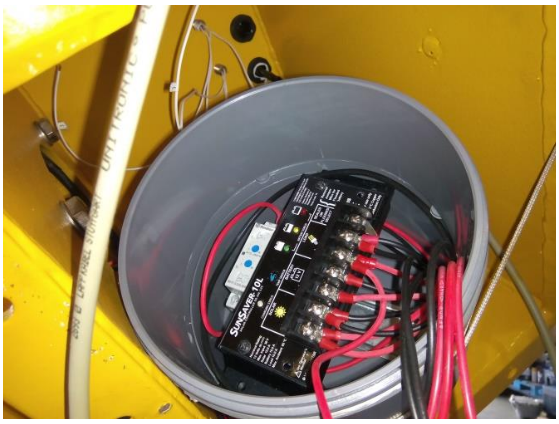


Figure 24: Details of the buoy-components integration at PLOCAN premises.

Transversal innovations

A1 includes an embedded SD memory card that contains the PUCK payload with all the information that uniquely identifies the instrument (PUCK protocol, datasheet, manufacturer ID, instrument model ID, etc) and the SensorML, which specifies the instrument's data output and the control protocol to obtain the data in the form of a Sensor Interface Descriptor (SID).

The sensor connects to the buoy datalogger (Raspberry Pi) through RS232 port. The Sensor Web Enablement (SWE) driver downloads the SensorML document with the PUCK protocol client and creates an EXI file with the information received. Then the logger activates the SBD modem and sends directly to the 52 North Server all the amount of EXI files pre-stablished through internet connection, by running the sos_proxy_service.sh file (Figure 25).

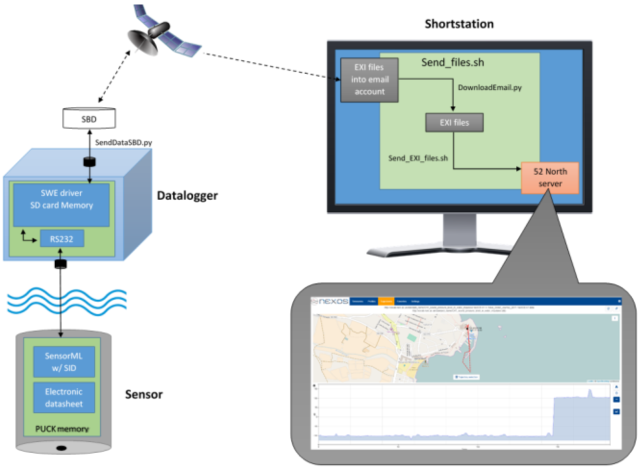


Figure 25. NeXOS software integration on the ESTOC buoy.

To build the datalogger, we use a similar prototype design as the second prototype of the waveglider datalogger.

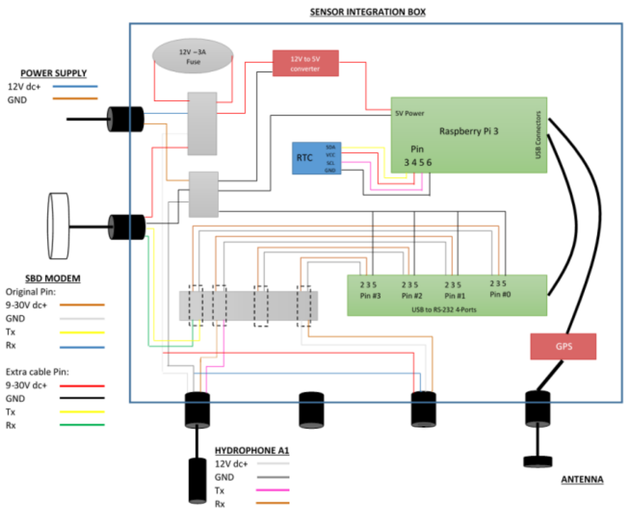


Figure 26. Datalogger electrical scheme for ESTOC buoy

Mission report

The buoy equipped with the A1 hydrophone sensor has been successfully dry-tested from the 24th of July 2017 up to the 22nd of August at PLOCAN lab facility, reporting successfully the expected data package every hour. The mission has been on hold waiting for a good-weather window for the deployment at PLOCAN (see Figure 27). On August 22nd it has been successfully installed nearby the

PLOCAN on-shore facility in the NE coast of Gran Canaria, next to an aquaculture facility, where it will stay until the end of the project. Data are correctly flowing real time to the SOS server as visible in Fig. 28

Figure 27: PLOCAN test-site area where the buoy will be deployed in the next few days.

Figure 28: Nexos buoy substituting the previous installed one.

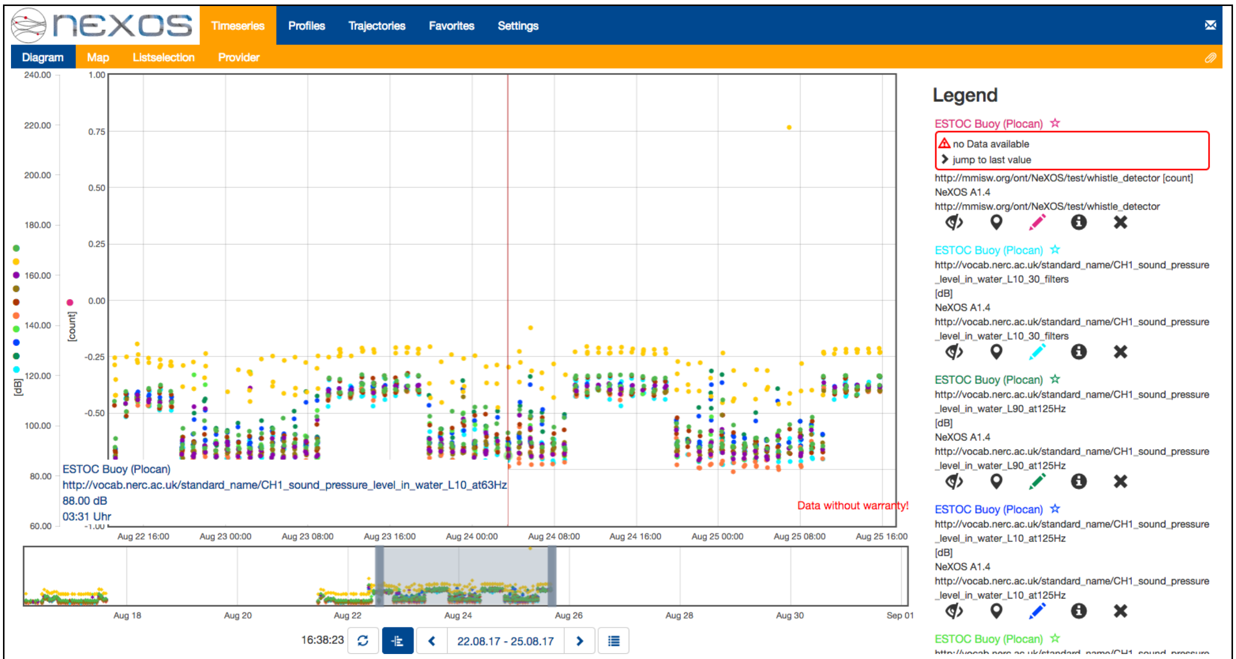


Figure 29: Real-Time dataflow from CAN4 mission to SOS server, showing trends between day and night, probably correlated with ship traffic for aquaculture farm maintenance or harbour in-out traffic.

Author list: Carlos Barrera, Simone Memè, Eric Delory