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Eurofleets Innovation Case Studies

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	Name	**Organisation**	**Date**
Coordinator	Aodhán Fitzgerald	Marine Institute	30.11.2022
Activity Coordinator	Joseta Roca	IQUA Robotics	29.11.2022
WP Leader	Serge Scory	Royal Belgian Institute of Natural Sciences	29.11.2022

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1.0	29.11.2022	First Release	Serge Scory
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1 Introduction

Innovation is a key-concept of EUROFLEETS+. Therefore, Innovation management has been assigned a dedicated work package to ensure a high level of industrial collaboration in the project, sound innovation management practices, and appropriate identification and management of key exploitable results (KERs)[1] to increase the impact of Eurofleets+, during and after the project.

These KERs could be used either by the project partners or by other stakeholders in the Eurofleets+ ecosystem and can take multiple shapes: reusable and **exploitable entities** (inventions, products, services) or **elements** (knowledge, technology, processes, networks) that have potential to contribute for further work, research or innovations.

This Deliverable highlights the innovative aspects of the outcomes generated in the Joint Research Activities of Eurofleets+. As it is a public Deliverable it has been prepared in close collaboration with WP9 "Dissemination and Communication" to produce attractive "Fact Sheets" that can be either distributed in printed form at public events or as "slides" in presentations.

2 Methodology

The purpose of the Deliverable 7.5 "Eurofleets+ Exploitation Roadmap" was to ensure that the Eurofleets+ KERs which could be developed into new products, processes or services are adequately protected and exploited. D7.5 was based on the information acquired through the distribution of a questionnaire to the various partners of the Joint Research Activities carried out in the project.

For D7.6, the Industry Platform Chair alongside with the Project Manager and the WP leader, have implemented a strategy to generate awareness of the KERs generated in the project, based in the following steps:

0) PRESENTING THE IDEA: A meeting with the Innovation Committee and the Industry Platform took place to agree on the next steps towards a wider dissemination of the KERs;
1) GATHERING DATA: a new questionnaire online (using Google Forms) requesting short answers in a plain language was design to gather all the necessary data to be able to complete the factsheets;
2) QUESTIONNAIRE COMPLETION: the JRA partners with identified KERs were contacted to complete the new form, all the answers were completed in one week;
3) DATA PROCESSING: the answers were processed by the Industry Platform Chair and converted into a preliminary version of a slideshow which was presented in Eurofleets+ General Assembly in Barcelona (15th-16th of November 2022) by WP7 leader;
4) MAKING THE FINAL DESIGN: to make the factsheets more suitable as a communication tool, this slideshow was then integrated in an attractive template designed by Sandra Sá (WP9, Eurocean) that conveys structured "key messages" about the developed KERs:
    - Short description of the product
    - TRL level increase thanks to Eurofleets+

[1] Any tangible or intangible output of the action, such as data, knowledge and information whatever their form or nature, whether or not they can be protected.
http://ec.europa.eu/research/participants/portal/desktop/en/support/reference_terms.html

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- Goal
- Motivation
- Outcome
- Value
- Next Steps

The Partner is clearly identified, and the name and e-mail address of a contact person are also given (see Figure 1).

Figure 1: Example of Eurofleets+ innovation case studies fact sheets.

3 Results

Currently a total of ten fact sheets has been produced:

- ✓ AUV-ASV COOPERATION USING AN ACOUSTIC MODEM / USBL SYSTEM
- ✓ SEAFLOOR CLASSIFIER
- ✓ UP-TO-SCALE 3D RECONSTRUCTION USING A MONOCULAR CAMERA SYSTEM
- ✓ VIRTUAL PLAYGROUND
- ✓ MULTIPURPOSE CRANE/HANDLING SYSTEM FOR DEEP WATER OPERATIONS
- ✓ DUAL MODE HANDLING SYSTEM
- ✓ ONLINE TARGET RECOGNITION
- ✓ DEEP-SEA WINCH SYSTEM
- ✓ SUBSEA NAVIGATION ALGORITHMS AND SOFTWARE

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They are provided as an Annex to this document. Should other interesting innovative results emerge during the last year of the project (e.g. from the research cruises) new fact sheets can easily be added to this series.

4 Next Steps

The Innovation Committee is committed to identify as many KERs as possible out of Eurofleets+ activity and, thereby, the reports of the Trans National Access that have taken place during the project will be analysed in search for potential results. At this point, it is difficult to affirm that there will be exploitable entities amongst them, as has happened for JRA activities, but potential elements for further development have already been identified by the Industry Platform members.

As for further activities to follow in the case of the already mentioned KERs, the focus until the end of the project will be in understanding well the tools provided by the European Commission for the exploitation of the results such as Horizon Results Platform.

Eurofleets+ team members have already shown interest in the tool and have attended info days in this regard to be able to inform about the potential of the tool to the WP7 participants. A final meeting from the Innovation Committee is scheduled for January 2023 and this matter will be in the discussion agenda alongside with other potential measures for boosting Eurofleets+ KERs and reaching the widest audience possible, focusing on stakeholders in general and in industry in particular.

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5 Annexes

Eurofleets+ innovation case studies fact sheets

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AUV-ASV COOPERATION USING AN ACOUSTIC MODEM / USBL SYSTEM

TRL from 2 to 5

GOAL

Develop capabilities on IQUA vehicles to operate cooperatively

MOTIVATION

Cost reduction on AUV operations using an ASV for monitoring.

OUTCOME

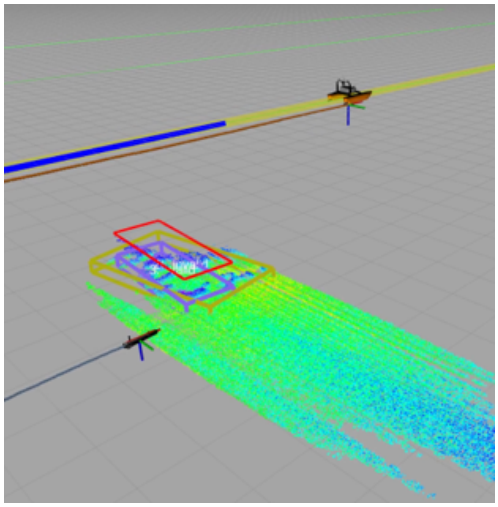
Algorithms to enable 2 different cooperative modes: 1) ASV follows AUV and 2) AUV is guided by ASV. This involves advances in the IQUA AUV's software architecture with regards to acoustic communication protocols, mission re-planning, path planning and saliency detectors over multibeam data.

VALUE

ASV follows AUV mode: gurantee acoustic coverage and provide position updates AUV is guided by ASV mode: mapping the seafloor from the surface and command the AUV to inspect detected targets

NEXT STEPS

Improve the technology to integrate it in the AUVs architecture as a potential add-on for customers requesting cooperation between vehicles.



TALK TO US

IQUA robotics
Joseta Roca · info@iquarobotics.com

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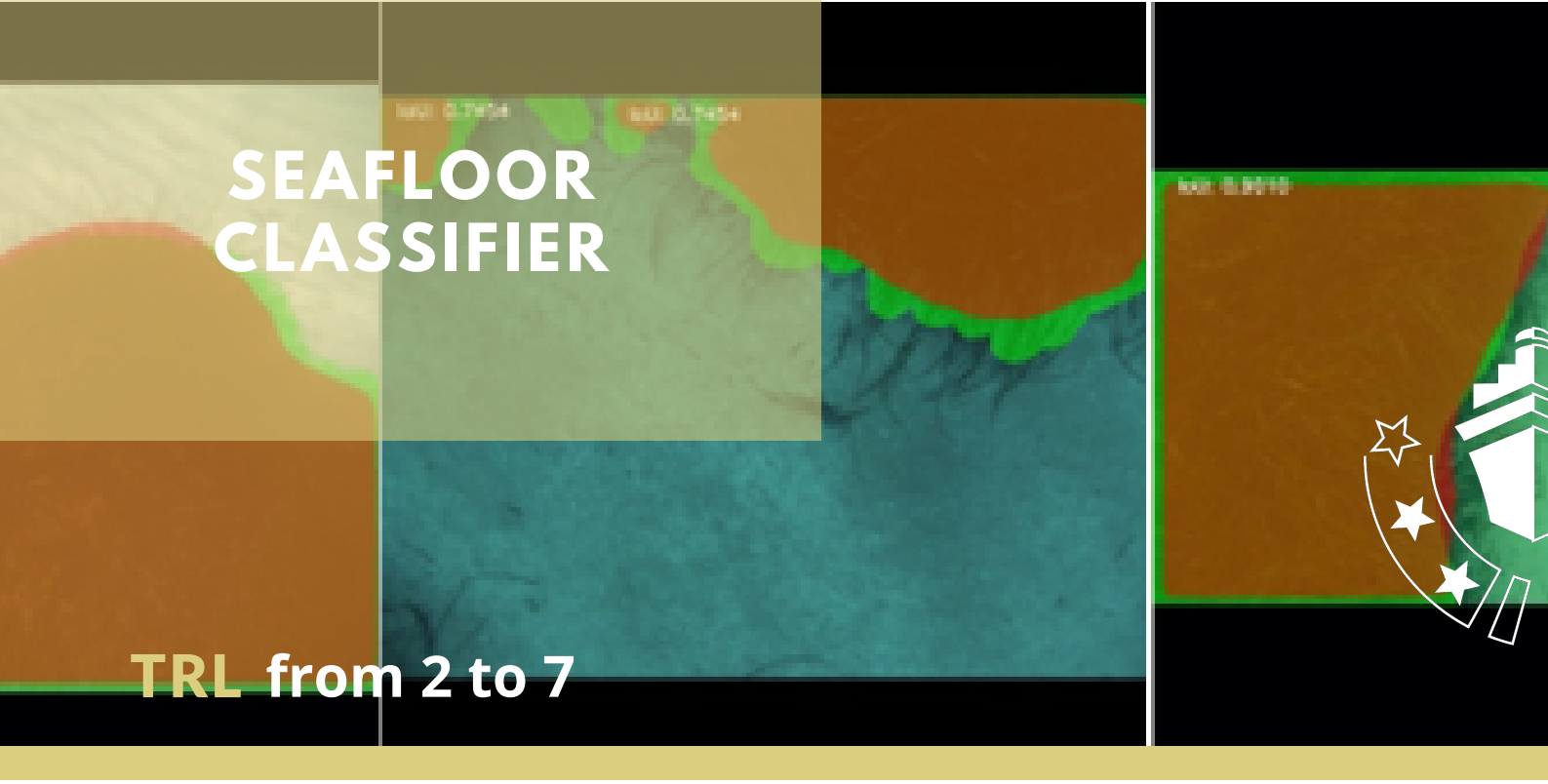

SEAFLOOR CLASSIFIER

TRL from 2 to 7

GOAL

A machine learning model has been trained to detect Posidonia oceanica. This model could be adapted and trained to detect other types of seafloor.

Universitat de Girona

MOTIVATION

Image classification from a sequence of images may be used to characterise the seafloor, complement sonar surveys to refine and calibrate acoustic backscatter.

OUTCOME

Machine Learning model for real-time detection of Posidonia oceanica

VALUE

It allows the automated monitoring of seagrass meadows

NEXT STEPS

Licensing, further development to adapt it to the classification of other seafloor classes.

TALK TO US

University of Girona
Rafael Garcia · rafael.garcia@udg.edu

This project has received funding from the European Commission's Horizon 2020 Research and Innovation programme under grant agreement No 824077

UP-TO-SCALE 3D RECONSTRUCTION USING A MONOCULAR CAMERA SYSTEM

TRL from 2 to 6

GOAL

3D underwater mapping

MOTIVATION

Sometimes we find situations in which we obtain underwater images using a camera that is not synchronised to the navigation data of the robot which was used to acquire them, or there is no navigation data at all.
In these cases, it is possible to carry out a 3D reconstruction, but impossible to determine the correct scale of the model.
Therefore, a scale estimation step is vital in the reconstruction to us the models for scientific purposes.
The scale estimation system developed within Eurofleets+ is comprised of three main steps.
First, a laser detection method is required to determine the locations of laser spots on an image. Secondly, the pose of the camera (with respect to the 3D model) is estimated through a feature-based localization process. And finally, the computed estimations are used in the third step, which determines the 3D position of the laser beams intersecting with the scene.

OUTCOME

Software for 3D reconstruction using a monocular camera and laser scalers

VALUE

It is possible to create up-to-scale 3D models of underwater structures from a low-cost setup that does not require navigation data from the platform carrying the camera

NEXT STEPS

Licensing.

TALK TO US

University of Girona
Rafael Garcia · rafael.garcia@udg.edu

Universitat de Girona

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VIRTUAL PLAYGROUND

TRL from 4 to 5

GOAL

To extend the notion of Virtual Research Environments towards that of a Virtual Playground where a web based collaborative system will facilitate to bridge the gaps between different scientific domains and ways of thinking.

MOTIVATION

The availability of new technologies, the limitations in resources and the need to reduce environmental footprints of meetings, suggests that collaboration among scientists can be moved, for at least some aspects, to the web.

OUTCOME

Web based technologies and prototype developed in a specific scientific feels.

VALUE

Currently (to our knowledge) there is no such solution available to a remotely operating research team.

NEXT STEPS

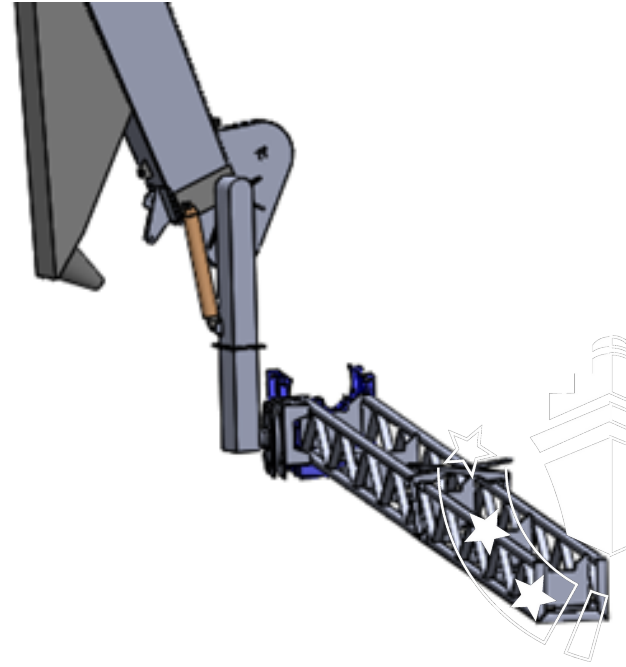
Development of a fully operating prototype

TALK TO US

Istituto Nazionale di Oceanografia e di Geofisica Sperimentale
Paolo Diviacco · pdiviacco@ogs.it

This project has received funding from the European Commission's Horizon 2020 Research and Innovation programme under grant agreement No 824077

MULTIPURPOSE CRANE/HANDLING SYSTEM FOR DEEP WATER OPERATIONS



TRL from 1 to 2

GOAL

The objective of this project is to introduce and analyse the manoeuvres developed for deep water operations using a multipurpose crane.

MOTIVATION

Take advantage of existing rigs on RVs saving valuable space needed on vessels.

OUTCOME

Knuckle boom cranes are common on-board research vessels. Multipurpose crane/handling system for deep water operations proposes the use of one of these cranes commonly found on oceanographic research vessels to carry out different work operations in deep water areas..

VALUE

Regional RV have a limited espace in deck. The use of these gears for the deployment of, for example, corers allows a more efficient deck layout. It is a reuse of existing rigs giving them double functionality.

NEXT STEPS

Simplify the elements and the operation and probably design a crane with the elements already integrated.

CSIC
CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS

UTM
UNIDAD DE TECNOLOGÍA MARINA

FERRI

TALK TO US

Marine Technology Unit. CSIC and Industrias Ferri S.A.
Arturo Castellón Masalles · arturoc@utm.csic.es

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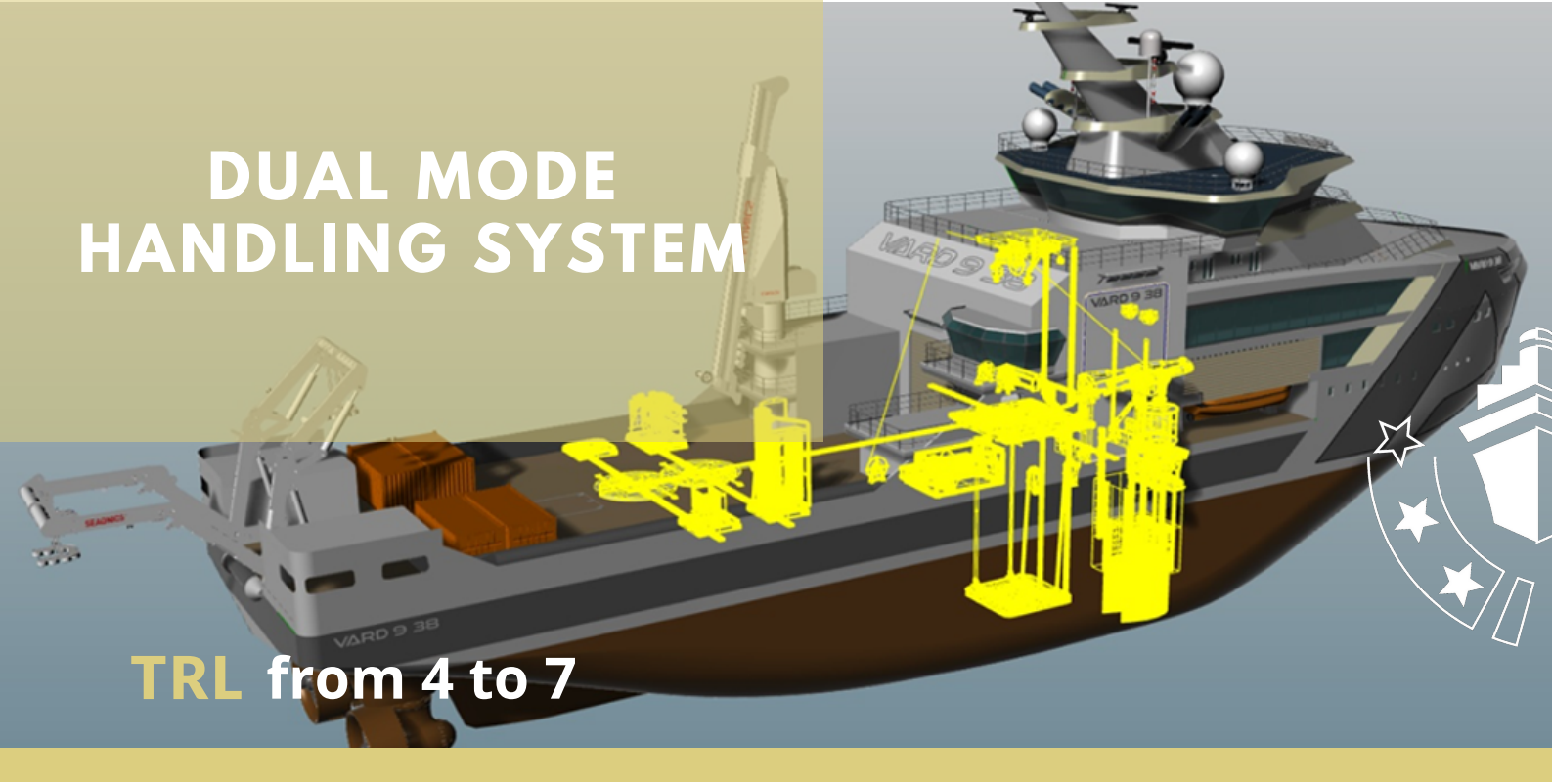
DUAL MODE HANDLING SYSTEM



TRL from 4 to 7

GOAL

Make an efficient and flexible system for handling of current and future scientific equipment both over side and through moonpool.

MOTIVATION

Make handling of science equipment safer, more efficient and flexible.

OUTCOME

A system that is scalable and easy to use from small instruments to the largest identified in the project. in addition the system is prepared for use in small to large vessels.

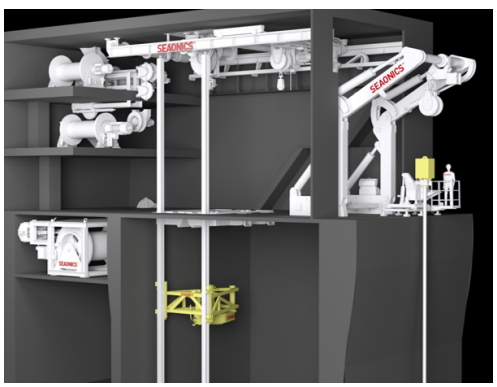
VALUE

The system offers improved operational efficiency and flexibility. Enabling more sampling/test to be performed within a mission. This is achieved through safe and efficient rigging in all weather conditions.

NEXT STEPS

The equipment, ideas and technology is being utilized when we bid on and realize new project both for scientific and other markets.

SEAONICS™



TALK TO US

SEAONICS AS.
Jarle ødegård· jarle.odegard@seaonics.com

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ONLINE TARGET RECOGNITION

TRL from 3 to 7

GOAL

Develop a new underwater sensor with deep learning capabilities

MOTIVATION

Introduce a new sensor to be used by AUV, ROV, boats.

OUTCOME

A new Omnidirectional Underwater System with 6 cameras able to work at 1000-meter depth. The systems includes an embedded PC with deep learning capabilities where algorithms for target recognition can be deployed..

VALUE

aving underwater omnidirectional systems allows the inspection of the seafloor in all directions at the same time, it also allows experts to have an immersive 360º view of it.

NEXT STEPS

Integrate the system with partners AUVs as a potential add-on for customers requesting this kind of underwater sensors.

CORONIS COMPUTING
Computer Vision and Machine Learning

TALK TO US

Coronis Computing SL
Josep Quintana Plana· josep.quintana@coronis.es

This project has received funding from the European Commission's Horizon 2020 Research and Innovation programme under grant agreement No 824077

DEEP-SEA WINCH SYSTEM

TRL from 7 to 8

GOAL

To provide a standardized winch system with high flexibility for use-case-scenarios.

MOTIVATION

Introduce a new sensor to be used by AUV, ROV, boats.

OUTCOME

MacArtney has based on know technologies, within Electrical winches, designed a winch meeting the requirement for versatile operations on research vessel. All parts of the winch system has been build in delivered systems, and tested in continues operation since ~2000.

VALUE

As we see a world moving toward autonomous vessel operation, the system is adding value with a fully electrically controllable winch system, with a high level of self-diagnostic and remote/automated operations.

NEXT STEPS

Continues product development to keep abreast with technology requirements and possibilities.

MacArtney
UNDERWATER TECHNOLOGY

TALK TO US

MacArtney
Hans-Jørgen Hansen · hjh@macartney.com

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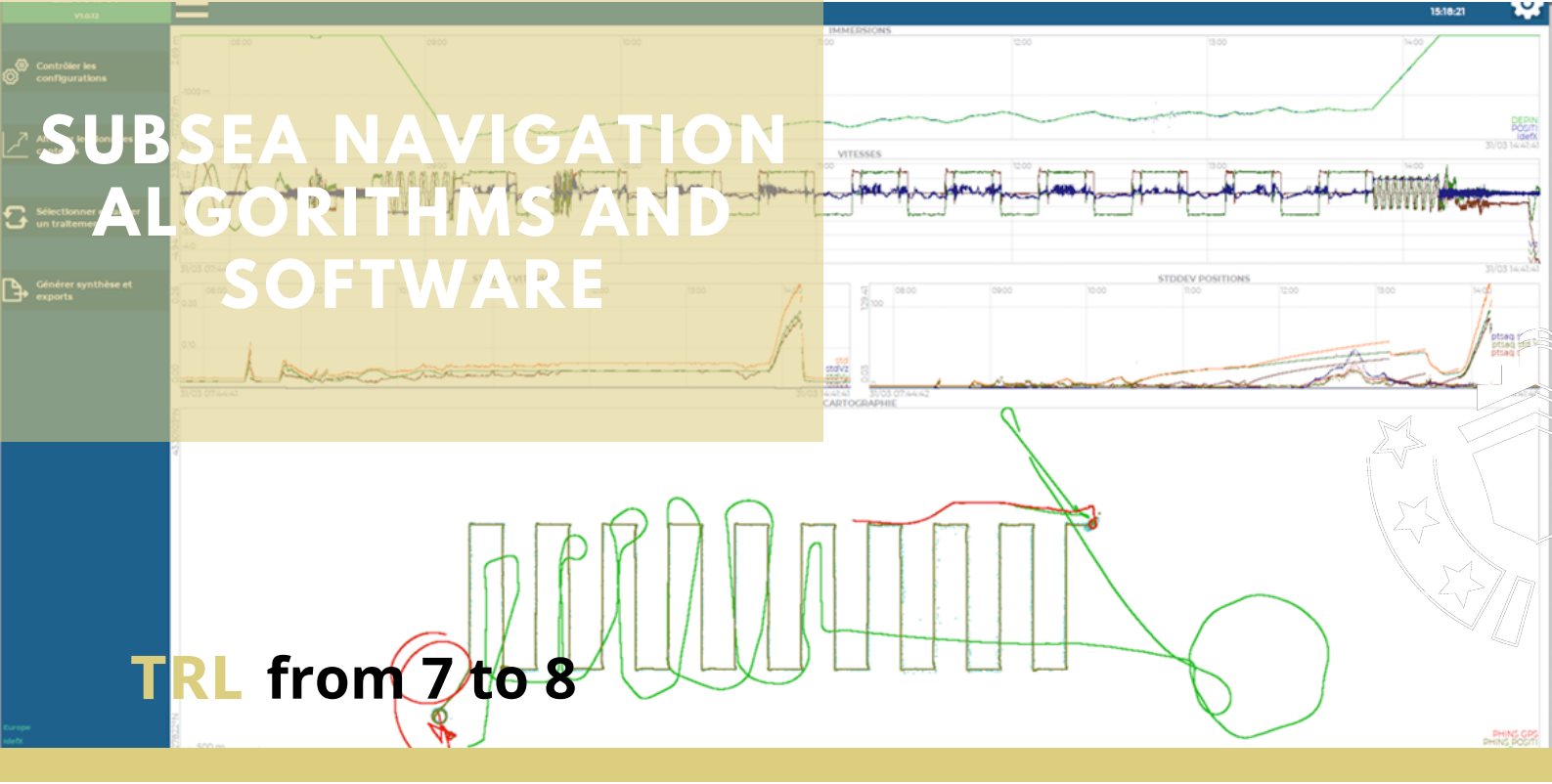
SUBSEA NAVIGATION ALGORITHMS AND SOFTWARE



TRL from 7 to 8

GOAL

Study advanced navigation techniques in order to implement scenario for deep-sea AUV supervision by USV (Unmanned surface vehicle), under the aspect of quality positioning of the AUV and the scientific data produced. The concept considers AUV and applications down to 6000m water depth.

MOTIVATION

The accuracy of subsea navigation and mapping is key for scientific, industrial and defense related applications for deep-sea AUV. The observation, monitoring and evaluation of living or mineral resources in the ocean will be a major issue in order to protect, and/or durably exploit the deep ocean.

OUTCOME

Post-processing & real-time algorithms packaged in field usable software package are the direct output of the research activity. Results promote the possible use of USV to monitor AUVs, allowing to reduce ship time used at current times for this task.

VALUE

The competitive positioning of Ifremer (ocean science) and partnering companies (ex. ixblue) through licensing of technology for deep-sea exploration and intervention through enhanced data quality yet reduced ship time, is improved by teh results of the project.

NEXT STEPS

CThe project SEMNA funded by the french government, and potentially the programme France-2030, will directly benefit from the enabling effects of the EuroFleets-Plus research results.

TALK TO US

IFREMER
Jan Opderbecke · jan.opderbecke@ifremer.fr

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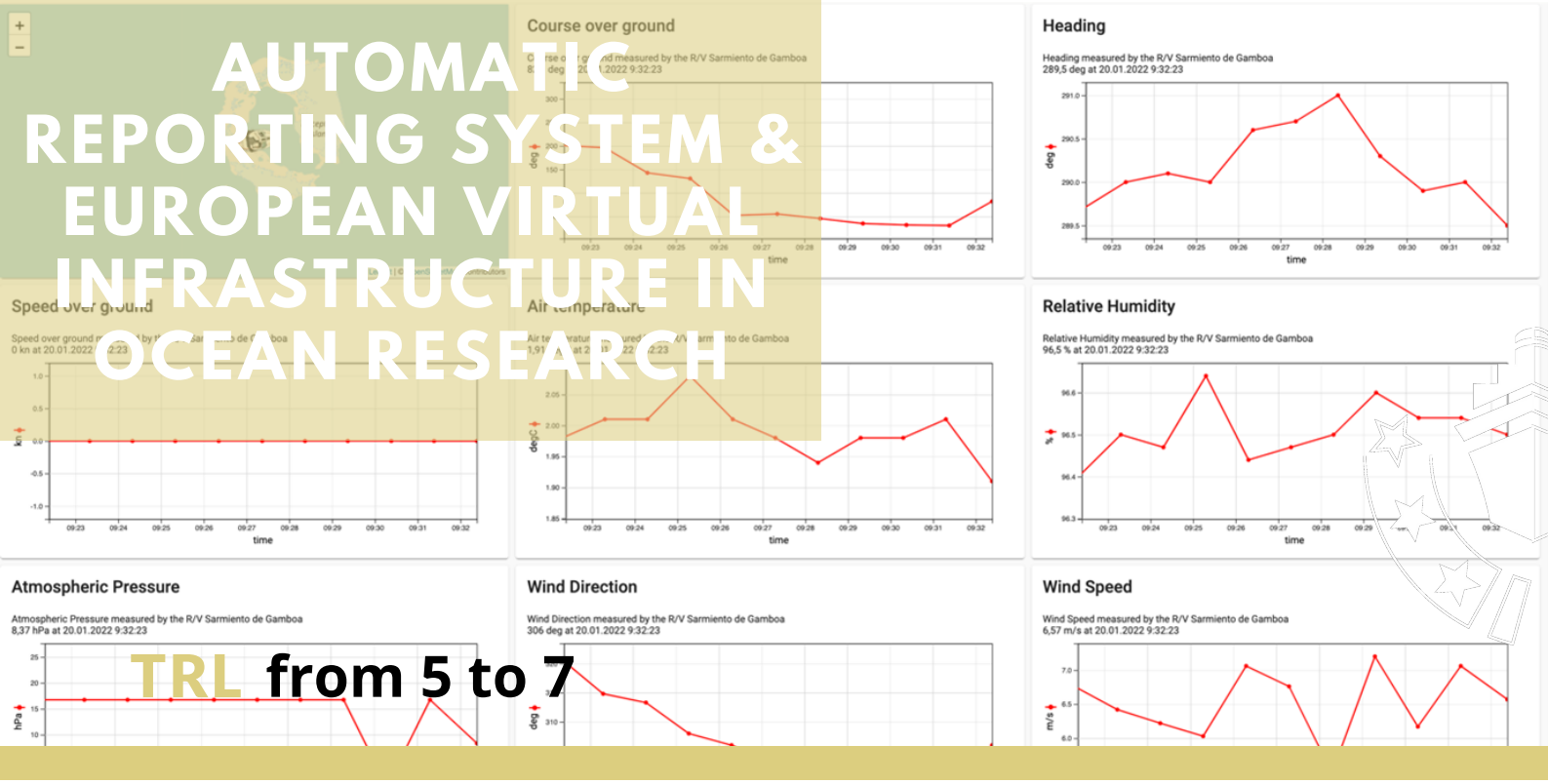
AUTOMATIC REPORTING SYSTEM & EUROPEAN VIRTUAL INFRASTRUCTURE IN OCEAN RESEARCH



TRL from 5 to 7

GOAL

Installed on a Research Vessel, EARS is instrumental for gathering, partly automatically and partly manually, the full set of metadata and data that is acquired during the operations of a cruise by sensors and sampling. It is equipped for (near) real-time transfer of these data to a Hub onshore and to feed a dynamic dashboard at the online EVIOR platform.

MOTIVATION

This way, the sailing and underway data and events information from equipped Research Vessels can be retrieved and displayed. While afterwards, the EARS log data can be used for generating a Cruise Summary Report and contributing to Data Management follow-up.

OUTCOME

The EARS software package including documentation for installation, configuration, and use. It can be installed by VM and as Docker instance.

VALUE

As we see a world moving toward autonomous vessel operation, tUndertaking scientific cruises is expensive and it is of upmost importance that the collected data and samples are well stored and documented for optimal and wider use.

NEXT STEPS

Considering its achievements and future potential, the development team strives for arranging a Intellectual Property Rights between involved partners and to make arrangements for a licensing agreement towards future users.

TALK TO US

RBINS, CSIC, IFREMER, 52North, MARIS
Dick M.A. Schaap · dick@maris.nl

museum

CSIC
Consejo Superior de Investigaciones Científicas

Ifremer

52north
exploring horizons

MARIS

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