L-Università ta' Malta

Press Briefing

Prepared by Prof. Aldo Drago
Project leader of CALYPSO South

Preamble
Delivering marine data to the nation

Every day and every moment we are constantly watching and measuring the sea for you. Besides the daily commitment of scientists and research staff at the Physical Oceanography Research Group within the Dept. of Geosciences at the University of Malta, specialised equipment installed at selected stations on the coast and offshore, are sensing the sea and churning out data on essential variables describing the state of the sea (waves, currents, temperature salinity and sea level) and the atmospheric conditions (wind, atmospheric pressure, air temperature, humidity, solar radiation and rain). Sensors using latest technological systems take routine measurements, in some cases detailed in time to the second, providing regular data at set intervals and giving us repeated snapshots of meteo-marine conditions as these evolve in time. This data is channelled in real time on our web portals, streaming data flows, and delivered free of charge to users as it is generated.

But discrete stations are not enough to give the whole picture. A robust computing infrastructure is daily running numerical models to interpolate data in between, and provide the whole spatial synoptic fields horizontally, and in 3D with depth, to cover the full scale of changes in the sea as they evolve in time and space. We create the movie of the sea that enables us to see conditions now and in the

future, enabling us to provide forecasts on how the sea will look like in the coming hours and days. Apart from third party data derived from regional and pan-European networks, the daily data production locally by the Physical Oceanography Research Group amounts to 53MB for observations and 2.7GB for models, a tremendous flow of data that is expected to double by 2022.

This data chain is an essential backbone for the nation. Our projects are endeavouring to enhance it with a wider range of datasets to also cover the biochemical parameters, to improve on the data quality following set standards, and to provide further added value products that target the needs of national stakeholders, users and the general public. The prime characteristic of our data services is the operational real-time delivery of data. Delivering data on the spot, when and where it is needed, entails a remarkable effort that pays to users who need the data on the instant to aid decision-making, supporting their operational activities, enhancing their own products and service deliveries, and supporting economic exploitations through innovative added value applications. Data is also the essential ingredient for our relationship with the sea. In this era of digitalisation, the elaboration of marine data becomes a cutting edge aspect of economic excellence and competitiveness. Marine data serves also to monitor the state of health of the sea, and keeps the sustainability of marine resources under control against over exploitation and irreversible impacts like climate change.

FIG 1: Merging of satellite data and oil spill models to assess origin and fate of marine pollution

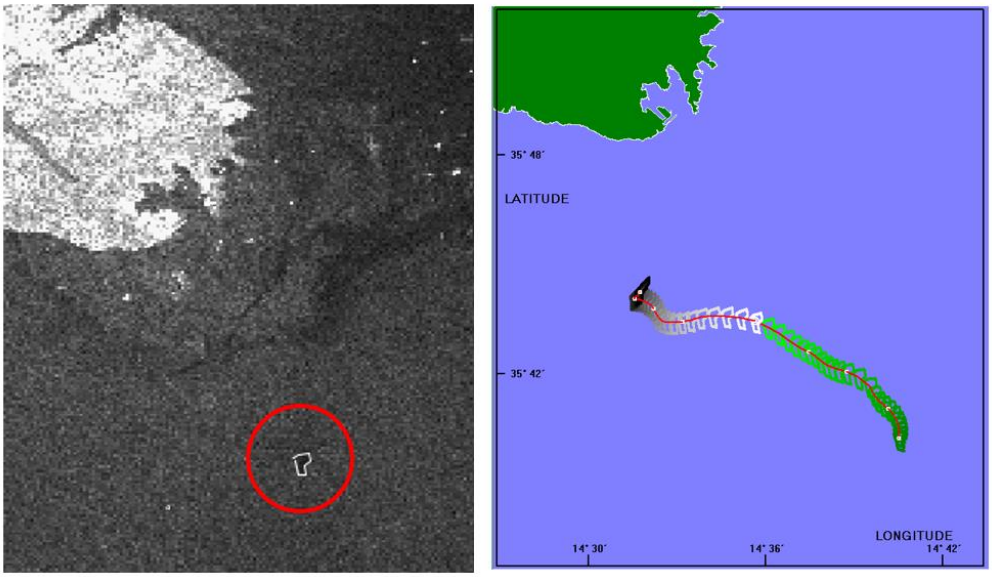


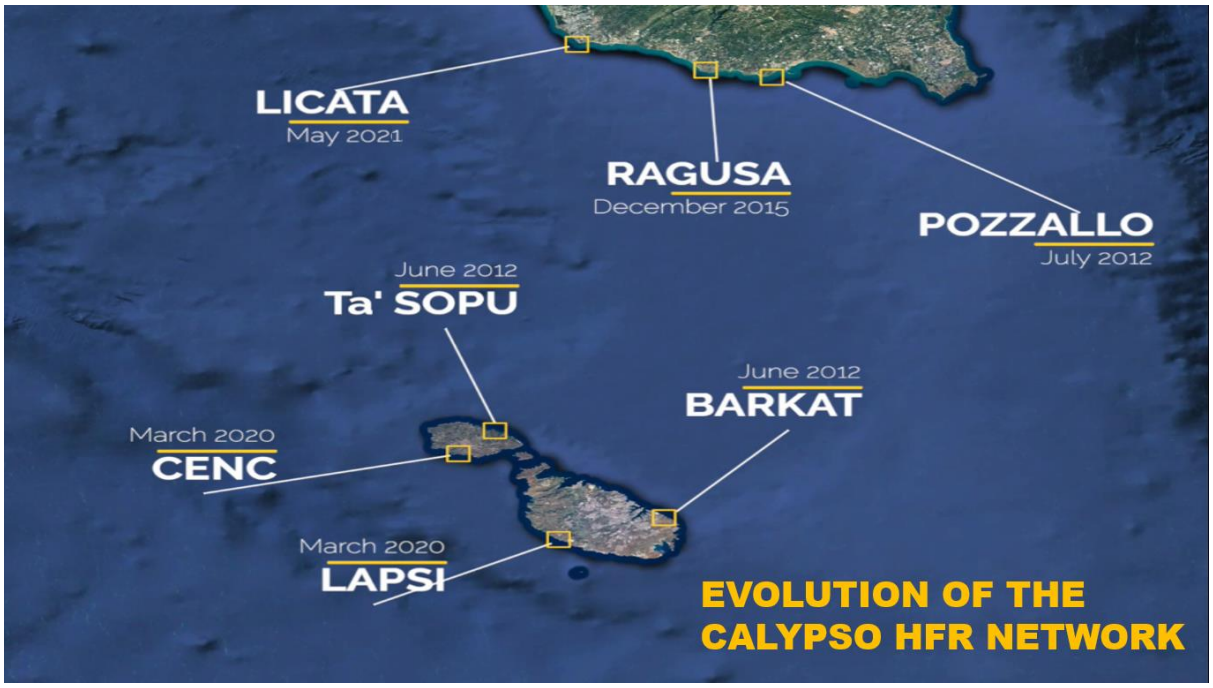
FIG 2: Handling of data by the public – Made in Malta

The CALYPSO South project (www.calypsosouth.eu)

CALYPSO South builds on the achievements of the preceding CALYPSO and CALYPSO Follow On projects (Italia-Malta Programme 2007-2013), which enabled the activation of the first phase of a permanent and operational High Frequency (HF) radar system, in October 2013, made up of three radars (one in the harbour area of Pozzallo and another two in Malta, at Ta' Barkat and Ta' Sopu), and subsequently extended in 2015 with the installation of a fourth radar in the touristic port of Marina di Ragusa.

The HF-Radars used in CALYPSO consist of shore-based systems in the form of a compact antenna which transmits electromagnetic waves of 13.5 MHz that travel along the sea surface beyond the horizon by ground wave propagation and scattered back from moving ocean waves of half the electromagnetic wavelength (Bragg scattering). The resulting Doppler spectrum provides a measure of the speed of the surface current carrying the ocean waves. Using the second-order sea echoes of the Doppler spectrum it also measures size of sea waves and their direction of propagation. The SeaSonde type of radars used in CALYPSO are compact systems integrating the transmitter and receiving components in one chassis. By combining two or more radars, this technology provides a tool for synoptic on-line mapping of total surface current observations and the spatial distribution of the wave fields. The system operates unassisted in all sea states and is able to measure in harsh and extreme sea conditions offering a solution to monitor the sea completely and when it counts most.

FIG 3: Evolution of the CALYPSO HF radar network – an Italy-Malta trans-boundary collaboration



In the current CALYPSO South project the HF radar system has been incremented by three units to a total of seven radars covering a marine area of 13000 square kilometres around the Maltese Islands and the south-eastern Sicilian coast. This part of the Mediterranean Sea, in particular the Malta-Sicily Channel dividing the Maltese Islands from the southern Sicilian coast, is particularly vulnerable to oil spills, with around 20 % of the world's oil tanker traffic passing through. Oil spills devastate marine wildlife, but can also cause severe economic damage especially to islands that rely heavily on tourism, such as Malta and Sicily. Contamination also threatens Malta's vulnerable water desalinisation plants, which are the country's major source of fresh water.

FIG 4: The radar installation ast GHar Lapsi – How it looks!

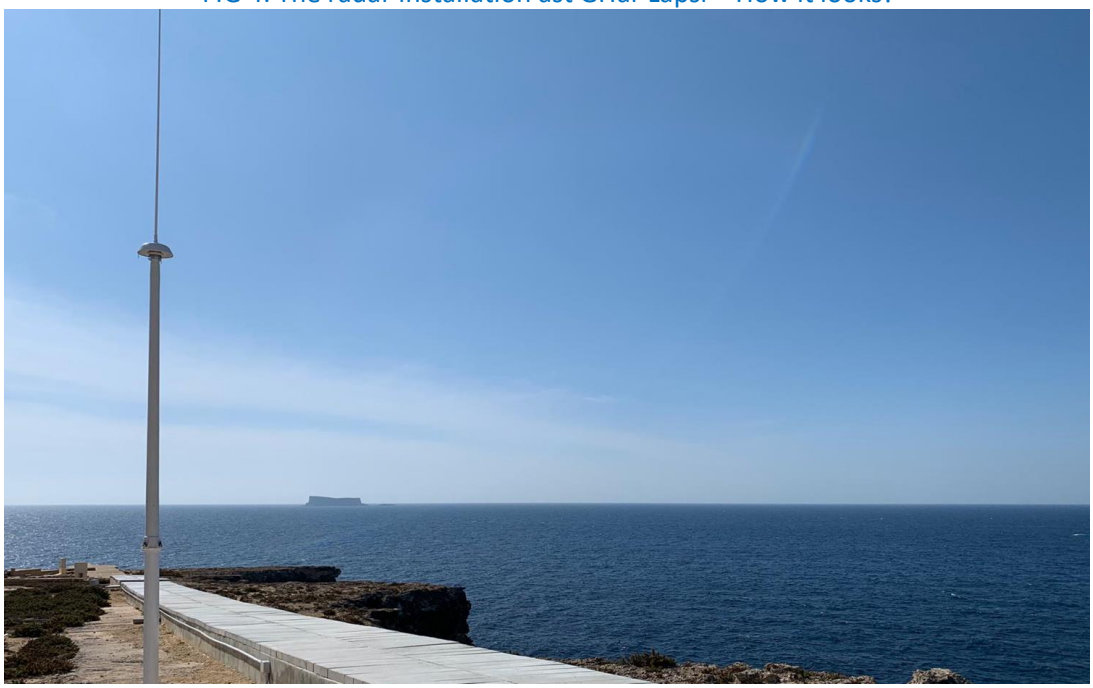
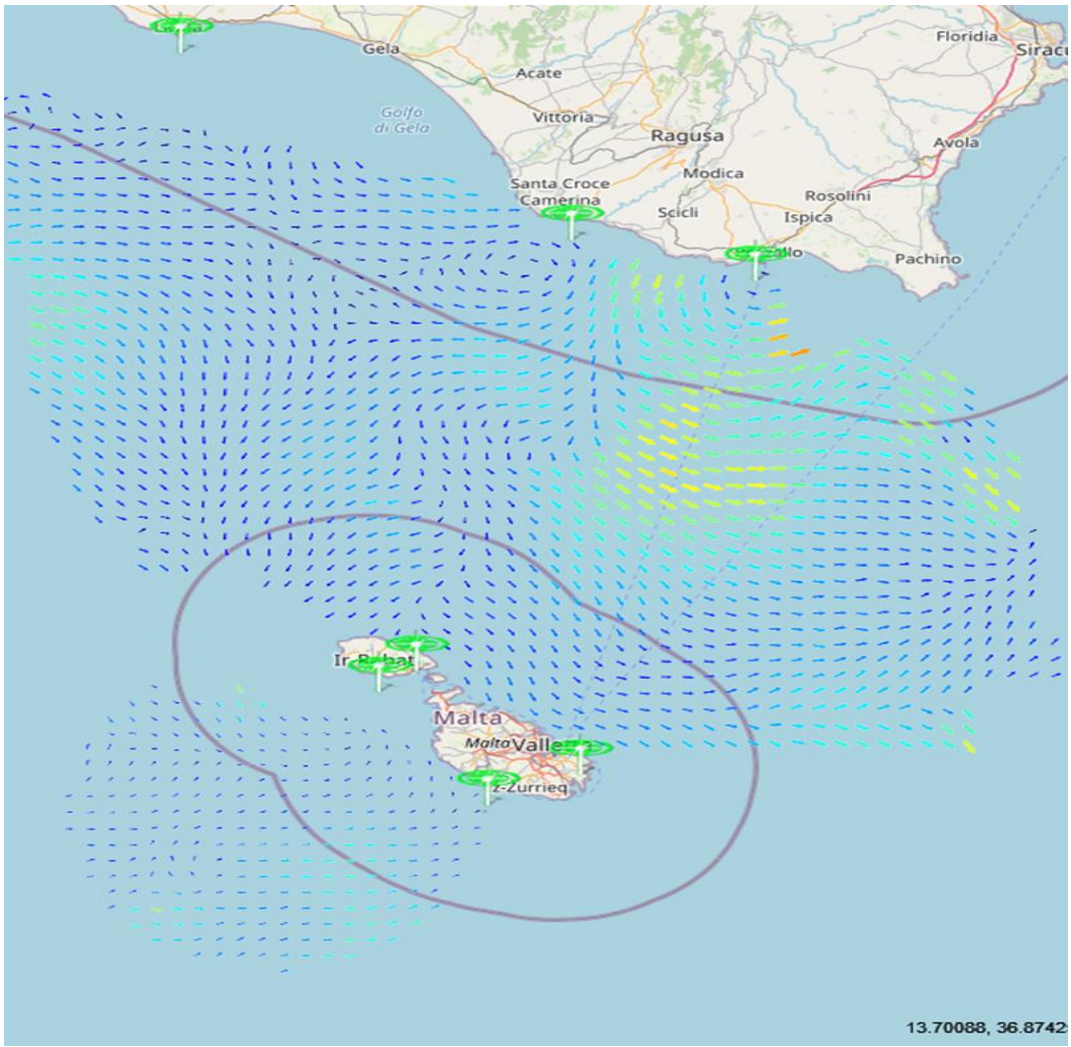


FIG 5: Typical sea surface current maps delivered operationally by the CALYPSO HF radar system



In addition, irregular migration can result in tragic loss of life, due to difficulties in Search and Rescue (S&R) operations. Operational tools capable of predicting the trajectory of floating objects at sea might help significantly.

In combination to numerical models, the CALYPSO radar network supports a more effective response in case of threats from marine spills of oil and hazardous materials, and provides other advantages including S&R tools and safer navigation. The system is capable of recording – in real-time with hourly updates – sea surface currents with high precision and a resolution of 3km. Aided by Vehicle Tracking System (VTS), this information can be used to back-track the origin of spills and provide evidence to identify the source of the pollution. It can also help define the optimum position for oil containment barriers necessary for coastal protection.

With its seven radar sites and the enhanced data quality for more consistent data deliveries, the CALYPSO HFR network is serving safer navigation, oil spill response, search and rescue and other areas of support to national stakeholders. The system requires the constant supervision of the competent team of scientists on both the Maltese and Sicilian sides, calling for a strong trans-boundary collaboration and teamwork to maintain the observing and computing infrastructure, intervening round the clock when necessary to provide a consistent service. This represents a great challenge for the University of Malta which needs to gear up in support of such national commitments. In the wider context of national observing and forecasting systems in which HF radars are an essential element, the relevance of data and information in the digital age is spearheading the evolution of marine services to serve the stakeholder demands and boost R&I applications, such as within the ambit of Blue Growth – which is the European Commission's initiative to further harness the potential of Europe's oceans, seas and coasts, for sustainable growth, jobs and value.

PORTO Stations (http://ioi.research.um.edu.mt/porto-stations/index.php/welcome)

Another major target of this project, conducted in collaboration with Transport Malta, consists in the setting up of a network of automated operational meteo and sea level stations at key harbours in Malta and Gozo, and similar systems on the side of Sicily. The PORTO stations network, as it is called, provides harbour masters with real time data that supports decision making for safer navigation inside and in the proximity of harbours, especially in the case of the entry and exit of large ships. In the Maltese Islands the PORTO network includes eight weather stations situated in key ports or strategic locations (Oil Tanking, M'Xlokk; Delimara Power Station; Kordin, Grand Harbour; University heat monitor station; Zebbiegh; Mgarr and Cirkewwa Harbours) around the coast of the Maltese Islands. Sea level is measured at three stations in M'Xlokk Harbour and the Grand Harbour. The numerical and graphical display of data collected by the PORTO network are delivered in real time with updates every 2 minutes on a dedicated browser-based interface that is specially designed to serve harbour masters.

FIG 6: The operational network of port stations to monitor atmospheric conditions and sea conditions in major harbours in Malta and Southern coast of Sicily

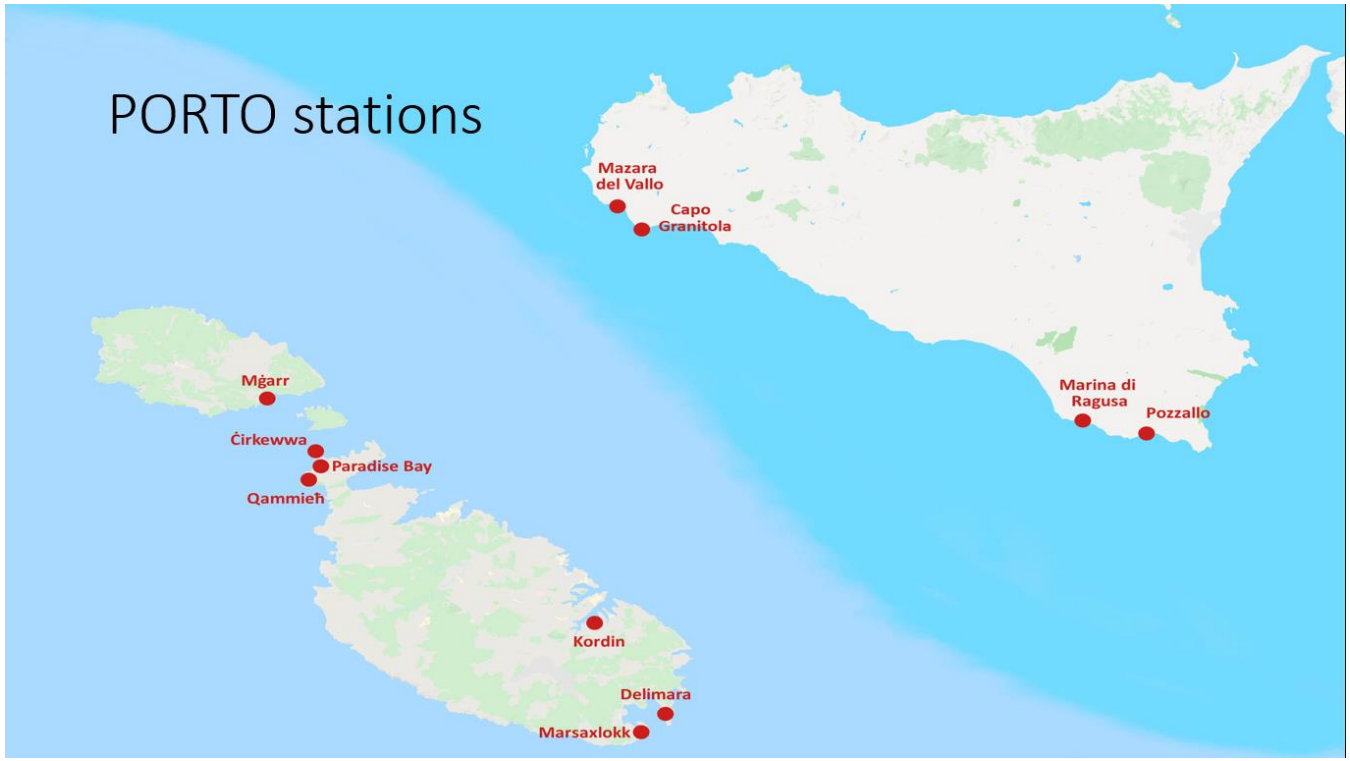
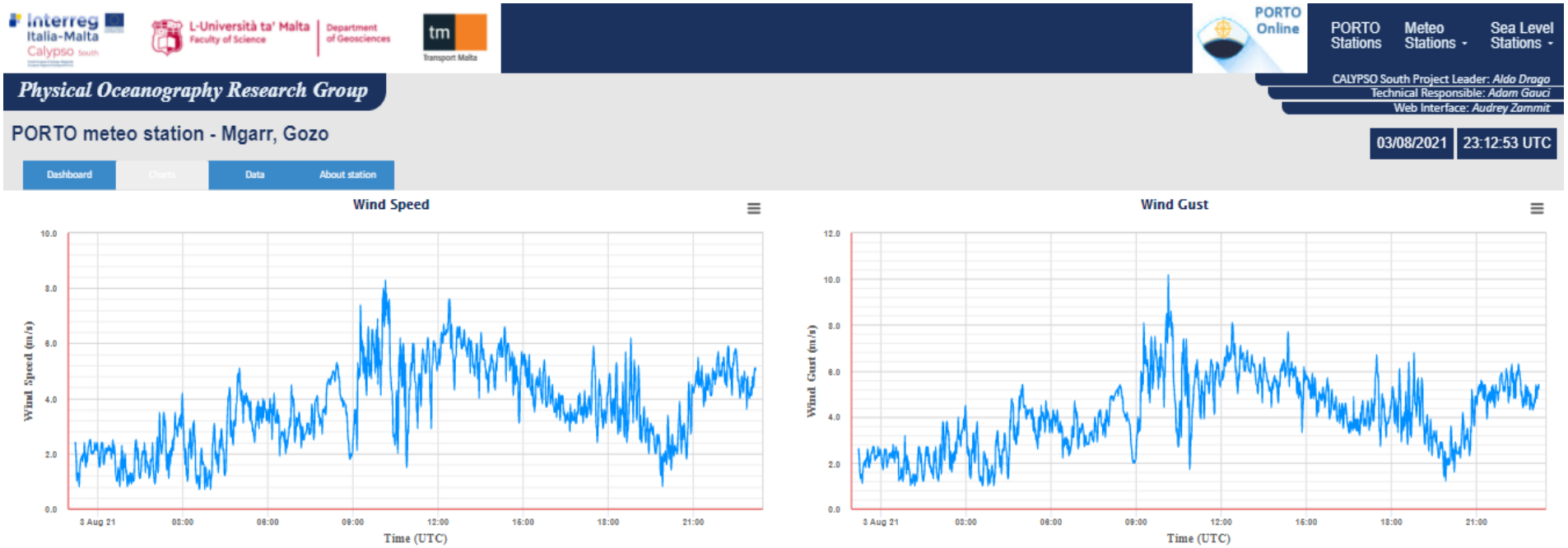


FIG 7: Snapshot from the PORTO stations interface showing wind data at Mgarr Harbour on 3rd August 2021

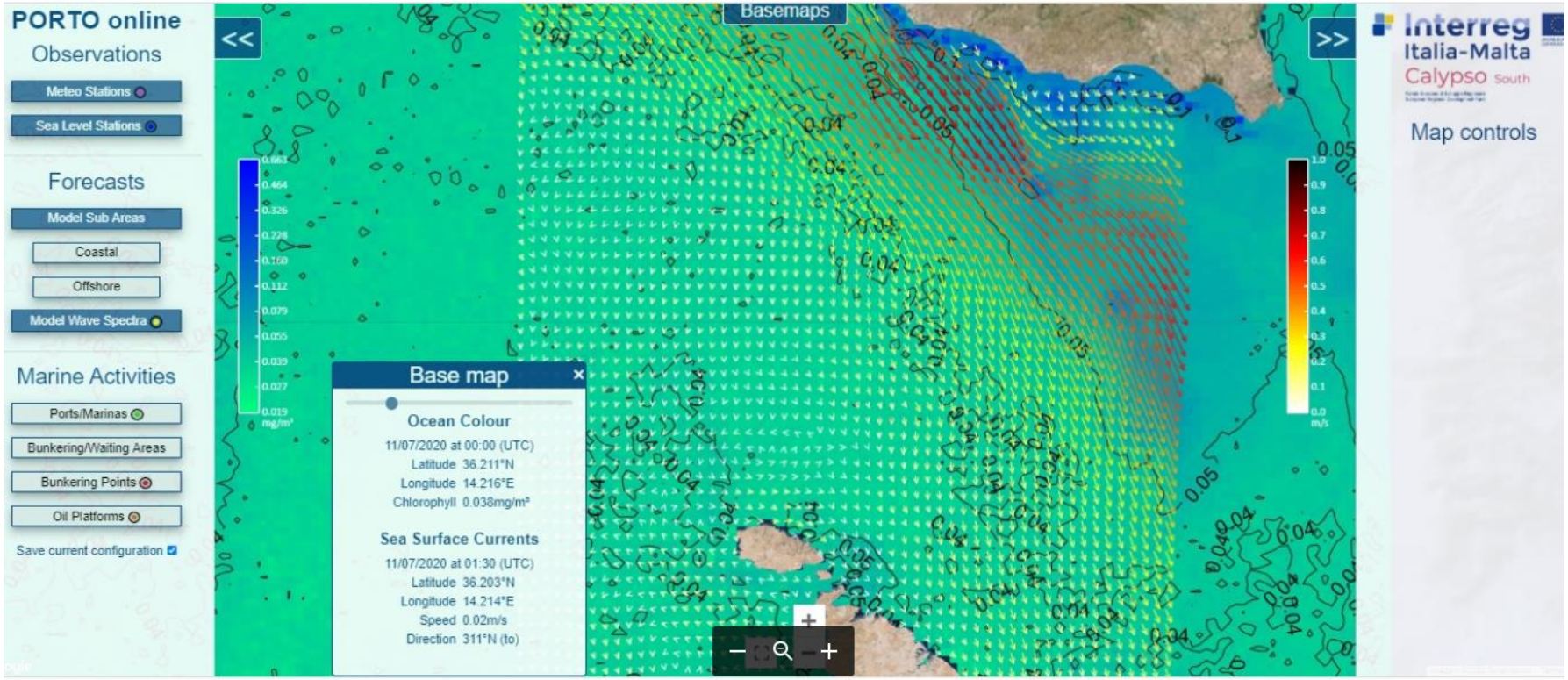


PORTO ONline (http://ioi.research.um.edu.mt/porto-online/)

The project also offers operational services with meteo-marine data provision and visualisation through the PORTO Online interface and the KAPTAN smartphone app. All the data generated by the CALYPSO South project are integrated with all the other major operational data products prepared by the Physical Oceanography Research Group as wellas other third party data sources on PORTO Online. This is an integrated featured online service of met-ocean information delivered to especially aid harbour masters, port authorities and operators in the shipping and maritime services in the proximity of the Maltese

Islands and south of Sicily. The initiative follows the trail of efforts to deliver services deriving from operational oceanography and meteorology to dedicated users. PORTO online gives the user a direct handle to view, analyse and compare different datasets online such as through user-selected geographic sub-domains, transects, inter-comparison of sites and overlaying of data layers.

FIG 8: PORTO Online provides a GIS-like web interface for the user-defined visualisation of operational data



The novelty of PORTO is that it delivers featured data services, providing routine data-derived products to support targeted users in their operational day-to-day activities. This is achieved by allowing the user to combine data employing augmented web features to customise the use of the online data. A drawing board allows the user to adapt the viewing the content. The interface is a work in progress, as more features will be added as they become available. Future additions include early warning alerts on extreme events such as gale winds, high waves or strong currents, serving as important indicators to operators who can avail of such information to mitigate adverse conditions.

Data for the interface comes from various sources, including both observations and numerical model data. Key data in PORTO are real time observations from ten meteorological stations, four sea level gauges and seven HF radars belong to the CALYPSO network; numerical model data for atmospheric parameters, waves, currents sea surface temperature and salinity; satellite data from different platforms. The raw model data outputs are further elaborated to extract secondary data, which is also available to the user.

The PORTO Online concept and design has been developed by Prof. Aldo Drago within the CALYPSO South project. The setting up, operational running and routine publishing of data on the system is done by the team of the Physical Oceanography Research Group of the University of Malta.

Summary

Technological progress and results of scientific research are jointly and increasingly at the service of humanitarian response efforts in emergency situations, in order to decrease the risks associated with migration and maritime transport. Through the CALYPSO South project we are providing products and data based on the actual requirements of the stakeholders. National responsible entities like Transport Malta, the Armed Forces of Malta, the Civil Protection Departments and the Environmental Agencies in Malta and Sicily, the Italian Coast guard and the Italian Navy will be able to monitor coastal seas in line to EC Directives, optimise navigation security operations and reduce reaction times by limiting search areas, to survey and safeguard both the sea and coast, and also in the case of international rescue and interventions at sea.

The CALYPSO projects have put both Malta and Sicily at the forefront of such initiatives in the Mediterranean. Monitoring the sea between Malta and Sicily with this advanced technology is essential because of heavy sea traffic. Those ships carry billions of euros worth of goods and thousands of people while providing a crucial link between North Africa and Europe. The Maltese and Italian responsible entities for the environment, for national security, maritime transport and surveillance need to integrate this data within their own systems, in order to develop operational tools to support their daily operations. All data collected is made available to general and experienced users. CALYPSO saves money and lives, and provides improved security at sea.

Some suggested points for the Press Conference

The operational collection and delivery of marine data is a demanding effort. Which are the major bottlenecks in the current system? How can the situation be improved?

The University is an academic institution entrusted to mainly deliver the human resources to the country. How does the University look at its role as a national provider of essential infrastructure and services such as this one for marine data?

How does the University look at the evolving role of research groups within its faculties and departments?

Which are the challenges that national responsible entities face to uptake and integrate such data sources in their daily operations?

Which are the technology targets of TM for the coming years especially with regard to data, digital aids, AI and innovative services?

What are the plans of the Ministry and Government in general with respect to environmental monitoring especially of the sea, and not only as a commitment to EU Directives, but as an effort to better use, manage and safeguard marine resources?

What is the level of planning and support that Government is putting, even in financial terms, to trigger and maintain the necessary national systems for data (in general and not only marine) acquisition, management, access and re-use by multiple users, as a precursor for a knowledge based society and a boost for economic growth?

PROJECT FACTSHEET

Managing Authority:
Regione Siciliana – Dipartimento della programmazione
Servizio 6, Cooperazione Territoriale Europea
Programma INTERREG V-A Italia-Malta
Piazza Sturzo, 36
90139 - Palermo
Tel: +39 0917070036; Email: servizio6.programmazione@regione.sicilia.it

Project Concept and Leader:
Prof. Aldo Drago (aldo.drago@um.edu.mt)

Lead Beneficiary:
University of Malta – Physical Oceanography Research Group (Lead Partner)

Other Beneficiaries:
Transport Malta
Civil Protection Department
Agenzia Regionale per la Protezione dell'Ambiente Sicilia
CNR - Istituto per lo studio degli impatti Antropici e Sostenibilità in ambiente marino
Università degli Studi di Palermo – Polo Universitario di Trapani
Universitá di Catania

Academic staff involved in the project:
Dr. Adam Gauci (responsible for HF radars and meteo-marine observations)
Dr. Anthony Galea (hydrodynamical numerical modelling activities)
Dr. Joel Azzopardi (responsible for SWAN wave models)

Research Support Officers in the project:
Ms. Audrey Zammit (responsible for web interfaces)
Ms. Raisa Galea De Giovanni (data analysis and elaboration)
Ms. Jessica Busuttil (Project Administration)
Ms. Adriana Cutajar (Project Administration)

Collaborating entities:
Water Services Corporation (Hosting three HF radar stations)
Armed Forces of Malta (Hosting one HF radar station)

Commissioned entities:
Qualitas Remos (suppliers of CODAR SeaSonde HF radars
Tektraco Ltd. (suppliers and installation of meteo stations)
THINK Ltd (KAPTAN smartphone app developers)

Fund:
European Regional Development Fund
Operational Programme
Interreg Italia – Malta 2014-2020

Project duration:
March 2018 – October 2021

Total investment: EUR 2.5 million

EU Investment: 85%

Project website: https://calypsosouth.eu

Social media:
FaceBook

CALYPSO South
INAUGURATION OF HF RADARS AND PRESS CONFERENCE

12th August, 2021

Organised by

Physical Oceanography Research Group, Dept. of Geosciences, University of Malta

Venue: Għar Lapsi Reverse Osmosis Plant

Video Web stream: University and CALYPSO South Facebook pages

Moderator: *Dr Anthony Galea*

Language: Maltese

10.00	Welcome and presentation of the event
10:00	Introductory video on the CALYPSO HF radar network
10:04	The CALYPSO South project – Delivering marine data to the nation (*Prof. Aldo Drago, Project Leader and Coordinator of the Physical Oceanography Research Group, University of Malta*)
10:08	Benefits to Maltese stakeholders in the CALYPSO South Project (*Dr Adam Gauci, Physical Oceanography Research Group, University of Malta*)
10:16	Predicting meteo-marine conditions in the CALYPSO South Project (*Dr Joel Azzopardi, Department of Artificial Intelligence, University of Malta*)
10:20	Address by *Prof. Alfred Vella*, Rector of the University of Malta
10:25	Relevance of the project to Transport Malta (*Mr. Joseph Bugeja, Chairman and CEO of Transport Malta*)
10:30	Relevance of the project to Civil Protection Department (*Mr. Emanuel Psaila, Director General, Civil Protection Department*)
10:35	Address by Hon. *Dr Aaron Farrugia*, Minister for the Environment, Climate Change and Planning
10:45	Recorded Address by Hon. *Dr Stefan Zrinzo Azzopardi*, Parliamentary Secretary for European Funds
10:50	Press conference on the CALYPSO South project
11:15	Closure
11:15	Visit and Inauguration of the HF radar station at Għar Lapsi

The inauguration event and press conference are being held at the Ghar Lapsi Reverse Osmosis Plant on 12th August 2021 at 10:00 am. Participation is by invitation, but interested parties can follow on the University or the Physical Oceanography Research Group FaceBook.

For more information write to Prof. Aldo Drago (*aldo.drago@um.edu.mt*) or visit the project webpage **www.calypsosouth.eu**

ABOUT THE AUTHOR

Prof. Aldo Drago leads the Physical Oceanography Research Group (ex Physical Oceanography Unit, PO-Unit) within the Department of Geosciences of the University of Malta.

The Research Group conducts specialised marine studies, promotes training of marine professionals and public awareness as well as provides support mainly in operational oceanography focusing on the sustainable use of ocean space and resources, their management and regulation as well as the promotion and conservation of the marine environment. It is the national entity responsible for oceanographic data management and undertakes applied and fundamental research in coastal meteorology, hydrography and physical oceanography with a main emphasis on the study of the hydrodynamics of the sea in the vicinity of the Maltese Islands. It participates in international cooperative research ventures, delivering operational services from real time observations of the sea and numerical forecasting of the marine environment.
