**The JERICO Malta Summer School**

**Operational Oceanography in the 21st Century – The Coastal Seas**

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In Europe, marine research and technology underpin the competitiveness of the industry and service sectors. Society needs to invest in human resources and infrastructure to advance marine sector development against a background of the rising industrialisation of Europe’s seas and oceans. European seas are experiencing increasing human impact; for example from renewable energy provision, aggregate extraction, fishing and leisure industries. The goal is for sustainable development, which means protecting the marine ecosystem, minimising the impacts of climate change, natural hazards and anthropogenic influences, whilst maximising benefits to society. Marine environmental policies, management of marine resources, coastal planning and marine operations should support sustainable development. Managers need to adopt an integrated approach in order to make the best informed decisions. Good management and decision support systems rely on the timely delivery of routine, reliable, quality-assured marine data. Finding innovative solutions that meet the sustainable development challenge stimulate the economy and at the same time protect our environment is clearly beneficial.

Operational oceanography is defined as ‘*systematic and long-term routine measurements of the seas and oceans and atmosphere, and the rapid interpretation and dissemination of information*’. Operational oceanography is evolving towards the provision of integrated, service-oriented applications, which are essential for the needs of a knowledge-based society. Marine observing systems are being set up in European coastal seas to meet a range of different requirements; policy, research, operation and for industry. A key requirement from marine observing systems is the provision of reliable, high-quality and comprehensive measurements over long time periods. These are provided through the use of multiple observing platforms that include ships, automated platforms and sensors systems. In-situ observations, combined with remote sensing and numerical modelling techniques, help detect, understand and forecast the most crucial coastal processes, over extensive areas. The JERICO project aims to create a network of European coastal marine observatories that integrate a range of observational systems such as moorings, drifters, ferrybox and gliders. The project also identifies best practices for design, implementation, maintenance and distribution of data from coastal observing systems, as well as setting quality standards.

The advent of multi-disciplinary, spatially widespread, long term and real-time marine data and information is triggering an unprecedented leap in the economic value of ocean data. Marine data, information and knowledge are essential for managing marine resources efficiently and are of benefit to industry and the services sectors, for example marine transportation, safety and public health. The future will require multiple-purpose observing systems, linking marine data to economic, environmental and social domains. Such systems cater not only for monitoring, but also for research, service provision, security, safety and for policy purposes. This is critical to competitiveness, product development and enhancement of services, and will help implement the EU integrated maritime policy.

Operational oceanography in the coastal seas is the focus of this summer school. It will deal with technical and theoretical aspects related to metocean observations, operational monitoring platforms, numerical modelling and forecasting, data quality control and management, data assimilation and assessments, data archiving and dissemination. Other aspects include downstream services, applications and links to a wide range of users. The school will provide participants with an overview of coastal observatories and European operational oceanography, now and in the future. Students will be introduced to state-of-the-art methods and tools of operational oceanography across inter-related disciplines from physics to ecology, and over wide geographic scales. They will experience how this links to data acquisition and forecasting systems, and to managing sustainable development for scientific and socio-economic purposes.

Over five days, the students will be introduced to the following topics:

**Day 1 Morning – Overview on Operational Oceanography**

Basic concepts in Operational Oceanography: From data to knowledge with a focus on the coastal seas

International cooperation and governance in Operational Oceanography

The customer base for Operational Oceanography

The European vision for Operational Oceanography

**Day 1 Afternoon – Coastal Observatories (1)**

Concept of coastal observatories and the JERICO project

Marine Observatories and Infrastructure

Purpose of observation (time series, variability, range, sensitivity, …)

Remote vs *in situ* observations

Sensors technology (acoustic, optical, physical, chemical)

Sensors and systems for navigation and tracking

Fixed Platforms (CTDs, profilers, buoys, …)

**Day 2 Morning – Coastal Observatories (2)**

Ferryboxes

Underwater wired and wireless systems

Unmanned underwater exploration (gliders, ROVs)

Calibration and inter-comparison exercises

The JERICO label

Observation programmes

**Day 2 Afternoon – Hands-on session**

Visualisation and analysis techniques of time series data

**Day 3 Morning – Data Management**

QC in delayed and real time modes

Data formats and archiving

Use of climatological data

IODE, EMODNET and SeaDataNet

Data mining

Web services

**Day 3 Afternoon – Numerical Modelling Techniques**

Concept of predictability in oceanography; Concept of parameterisation

Numerical modelling of the marine environment: from physical processes to ecosystem functioning

Introduction to data assimilation

**Day 4 Morning – Numerical Modelling Techniques**

Dynamically coupled atmosphere-ocean-shelf sea-coastal models

Oil spill modelling

Models for engineering

Models for state of health of the oceans

**Day 4 Afternoon – Hands-on session**

Exercises in QC, formats and management of ocean data

**Day 5 Morning - Applications**

Applications in marine environmental monitoring and assessments

Applications in maritime transport, security, safety and pollution

Applications in coastal engineering

**Day 5 Afternoon – Hands-on session**

Using satellite and model data for environmental assessments

**Day 6 Excursion**

Including site visit to HF radar in Malta

Apart from introducing students to the above mentioned content, the summer school will also help bring interested parties together to learn about JERICO, to link to its activities and network, and to promote coastal observatories. It is expected that the school participants will stay in contact after the course, which will encourage future collaboration joint efforts. The school will thus provide room for participants to share experiences and learn best practices. Also they will be able to contribute to future operational oceanography for the timely, continuous and sustainable delivery of high quality environmental data and information products related to the marine environment of European coastal seas.

The course content is to be further elaborated by a dedicated committee set up from the JERICO partnership. All the chosen lecturers are highly trained and specialised in their respective fields of expertise.