

EUROPEAN OPERATIONAL NETWORK OF FERRYBOXES



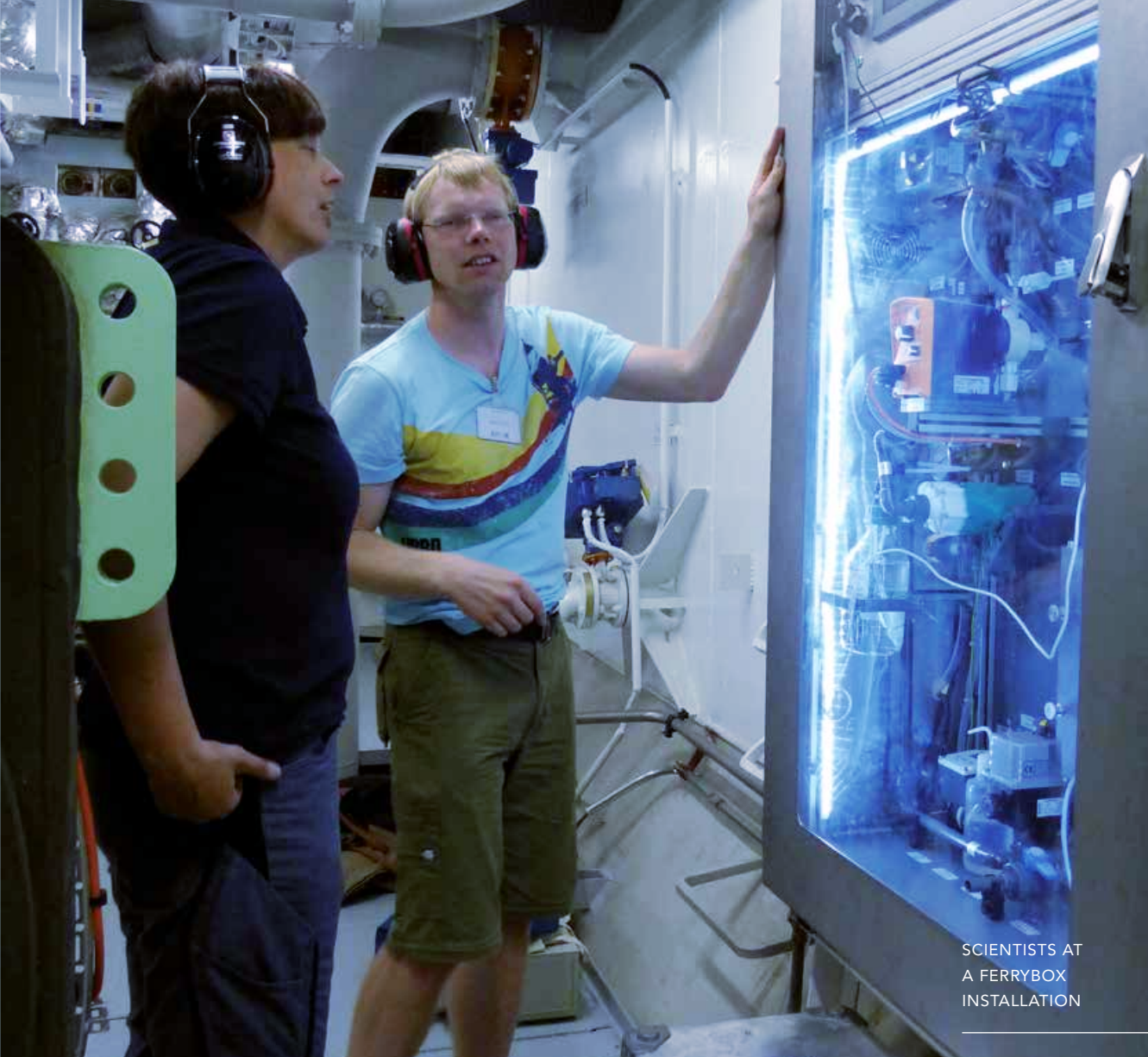
www.eurogoos.eu



EuroGOOS
European Global Ocean
Observing System

KNOWLEDGE OF THE OCEAN IS LIMITED

Our knowledge of the ocean is limited by our observational ability and the ocean continues to be severely under-sampled. To better understand and manage the oceans and the coastal systems, there is a clear need for environmental data of high spatial and temporal resolution. Efforts within global and regional programmes are evolving to better coordinate observations internationally. However, gathering the required ocean information can prove costly. Recent efforts have shown great promise in reducing this cost by taking advantage of ships of opportunity (SOOP) or volunteer observing ships (VOS) as mobile platforms for environmental data collection. The installed systems can integrate data from water quality and meteorological sensors with GPS information and automatically transfer the data from ship to shore.

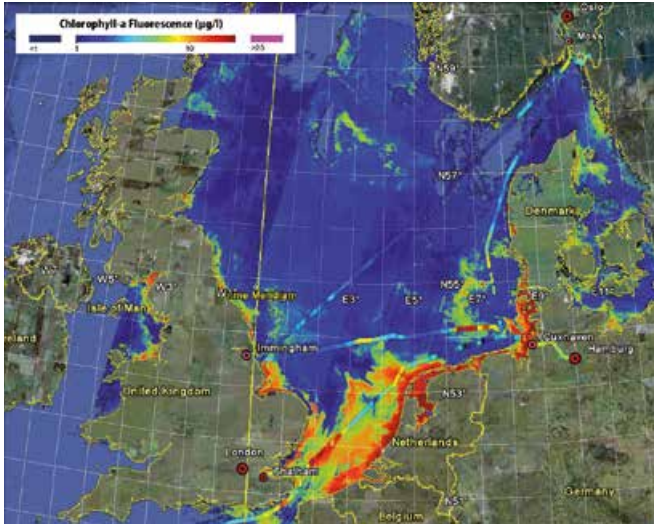


SCIENTISTS AT
A FERRYBOX
INSTALLATION

There are numerous advantages with the ship of opportunity programme: no ship costs nor energy restrictions to making ocean measurements, regular maintenance of the measuring equipment is possible, transects are sampled repeatedly and problems with biofouling of sensors can be better controlled. There is great potential for data coverage using ferries

and cargo ships cruising the same route on a regular basis, especially in coastal regions. The first steps to a European system of FerryBoxes was taken during an EU-funded project (2002-2005) helping to optimize the use of these systems for automated measurements and water sampling on ships of opportunity, e.g. merchant vessels and ferries. The core parameters measured

were temperature, salinity, turbidity, and chlorophyll-a fluorescence. In addition, non-standard sensors were tested for observation of currents and sediment transport, pH, oxygen, nutrients, and algal species. Currently, FerryBox systems are installed on a network of European FerryBox contributors, mainly national marine research institutes and environmental agencies.



Since those first steps the European FerryBox community has further increased the cooperation through the establishment of a FerryBox Task Team under EuroGOOS. The FerryBox Task Team (www.ferrybox.org) is one of seven EuroGOOS Task Teams, operational networks of observing platforms promoting scientific synergy and technological collaboration among European ocean observing infrastructures. Task Team members exchange open source tools, collaborate in areas of common interest, and jointly make European data available to the EuroGOOS Regional Operational Oceanographic System data portals across all European maritime regions, which in turn feed data to the European Marine Observation and Data Network (EMODnet) and Copernicus Marine Service (CMEMS).

Task Teams are important operational components of EOOS, the European Ocean Observing System, setting out a vision and a coordination mechanism for a truly integrated and sustained ocean observing in Europe, for the benefit of society, science and innovation.

The FerryBox concept has been developed in partnership with scientists and European ferry companies. Presently in Europe, approximately thirty ships are involved in this type of activity, covering waters from the Baltic Sea, the North Sea, the Atlantic coast and the Mediterranean Sea.

In general, all FerryBox systems employ a similar basic design, however there are differences in the design of the flow-through system, the degree of automation and biofouling prevention as well as the possibilities of supervision and remote

MAP SHOWING CHLOROPHYLL-A SATELLITE IMAGE COMPARED TO IN-WATER MEASUREMENTS TAKEN WITH FERRYBOX HELPING TO VALIDATE THE SATELLITE DATA. CREDIT WILHELM PETERSEN, HZG

control. A FerryBox system consists of a water inlet from which the water is pumped into the measuring circuit containing multiple sensors. This inlet may be positioned at the sea chest or on an extra valve in the hull of the ship which is specially designed for the FerryBox purposes. A basic system includes sensors for temperature, salinity, turbidity and chlorophyll-a fluorescence, and a GPS receiver for position control. Many systems also include an inline water sampler and additional sensors, e.g. for oxygen, pH, pCO₂ or algal groups as well as meteorological instruments.

For reliable, unattended operation, the system is controlled by a computer that also logs the data. The data are transmitted to shore via mobile phone connection or satellite communication. In some systems, biofouling is prevented by automatic cleaning of the sensors with tap water, and by rinsing the equipment with acidified water or water containing a detergent after each cruise, controlled by the position of the vessel. A schematic diagram of a FerryBox system is shown on page 5.

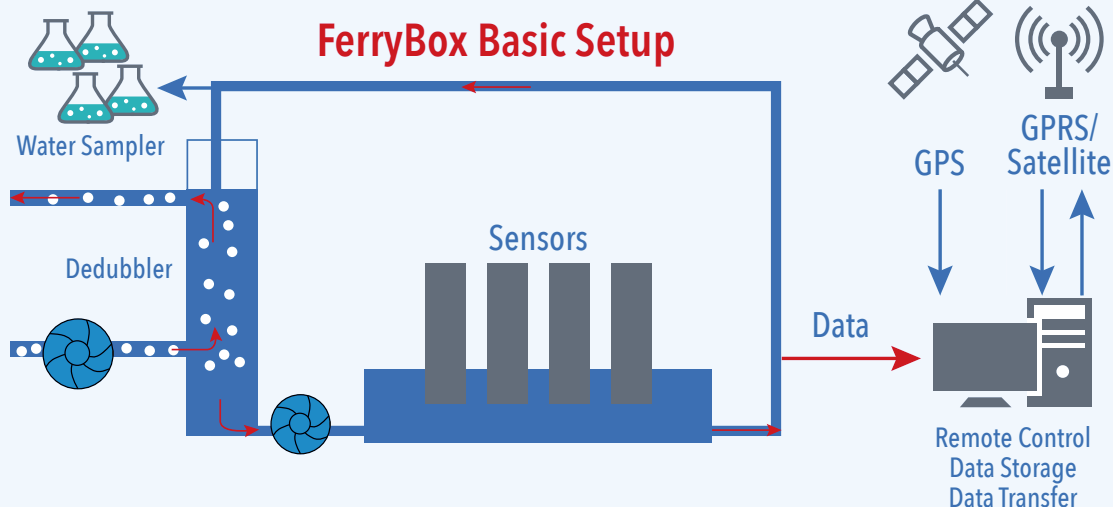
Continuous operation of FerryBox lines creates large volumes of data and requires appropriate data management. This includes sophisticated quality control in both real-time and delayed mode. Quality assessment, in particular, must be harmonized and standardized according to internationally accepted standards to make the data comparable. Within ongoing European projects and initiatives such as Copernicus Marine Service (CMEMS) and European Marine Observation and Data Network (EMODnet) data from European FerryBoxes are openly available for download and use. A common European FerryBox database has also been established. This web-based database has several tools for data visualization as well as data download

in several formats (<http://ferrydata.hzg.de>). FerryBox measurements are useful not only for ocean monitoring purposes but also for scientific research. It should be mentioned that even from automated systems such as the FerryBox, the quality of the data strongly depends on sufficient system maintenance and reliable quality data control on a regular basis. The possibilities to combine different transects and their partial overlap allow a comprehensive overview for a particular area and for a specific parameter. Furthermore, the linkage of such transects data with spatially distributed data from models or satellites can lead to synergistic effects in terms of validation or improvement of the quality of products in the case of data assimilation.

Data assimilation, in particular, needs sufficient spatial coverage, which is reached only in specific areas as yet.

FerryBoxes can contribute significantly to obtain an integrated picture of the oceans, while accompanied by conventional monitoring tools such as fixed platforms (e.g. buoys), autonomous moving platforms (e.g. gliders and autonomous underwater vehicles, AUVs), remotely sensed data and research surveys. A very useful combination of data is those derived from FerryBox observations and satellites which cover large spatial scales and helps calibrate and verify ocean colour data.

SCHEMATIC DIAGRAM
OF A FERRYBOX
FLOW-THROUGH SYSTEM



EUROGOOS FERRYBOX TASK TEAM

The EuroGOOS FerryBox Task Team is one of seven EuroGOOS Task Teams, operational networks of observing platforms promoting scientific synergy and technological collaboration among European ocean observing infrastructures. Jointly Task Team members make available European ocean data to the EuroGOOS Regional Operational Oceanographic System (ROOS) data portals across all European maritime regions, which in turn feed data to the European Marine Observation and Data Network (EMODnet) and Copernicus Marine Service (CMEMS). FerryBox technology allows taking automated measurements aboard ships of opportunity. The core ocean parameters measured are temperature, salinity, turbidity, and chlorophyll-a fluorescence. In addition, non-standard sensors provide data on currents and sediment transport, pH, oxygen, nutrients, and algal species. Currently, FerryBox systems are installed on a network of European FerryBox contributors, mainly national marine research institutes and environmental agencies.

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EUROGOOS

EUROPEAN GLOBAL OCEAN OBSERVING SYSTEM

EuroGOOS identifies priorities, enhances cooperation and promotes the benefits of operational oceanography to ensure sustained observations are made in Europe's seas underpinning a suite of fit-for-purpose products and services for marine and maritime end-users. EuroGOOS is a pan-European network operating within the Global Ocean Observing System of the Intergovernmental Oceanographic Commission of UNESCO (IOC GOOS).

Working hand in hand with partners in the European ocean research and observation community, EuroGOOS is promoting the integration of scientific knowledge and innovation for different users spanning science, policy, industry and society. The EuroGOOS Regional Operational Oceanographic Systems deliver analysis and forecasts of Europe's regional seas and feed quality-assured data to pan-European data portals (e.g. Copernicus Marine Service and EMODnet). EuroGOOS working groups and networks of marine observing platforms (Task Teams) enhance synergy and deliver strategies, priorities and standards, towards an integrated European Ocean Observing System (EOOS).

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