



POLITÉCNICA



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ESCUELA TÉCNICA SUPERIOR DE INGENIEROS
EN TOPOGRAFÍA, GEODESIA Y CARTOGRAFÍA

A comparative analysis of capabilities and limitations of acquisition systems of hydrographic marine data

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INTRODUCTION

MARINE DATA and INFORMATION SYSTEMS

TECHNOLOGIES FOR ACQUISITION OF BATHYMETRIC DATA

CONCLUSIONS

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INTRODUCTION

Now we need oceans, and now, the human influence in marine world is huge

European Union context

Blue Book for Maritime Policy the European Commission (2007)

establishing an appropriate marine data and information infrastructure

Communication "Marine Knowledge 2020" (2010)

more coordinated approach to marine data collection and assembly, providing wider access to quality-checked, rapidly available and coherent marine data

INSPIRE Directive (Directive 2007/2/EC)

ensure the interoperability of spatial data sets and services

share data sets and services between public authorities for the purposes of public task

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MARINE DATA and INFORMATION SYSTEMS

European Marine Observation and Data Network (EMODnet)

- Develop a system that will allow a better identification of what is being collected
- Facilitate access to coherent data sets
- Recognition of data gaps
- Data collection and monitoring infrastructure directly suited to multiple applications

"Pilot Portal for Hydrography" (started in June 2009)

- ✓ Allow the download of data for further analysis by users
- ✓ Available for combination with data from other portal: *marine biology, marine chemistry, marine geology and marine habitats*



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"Pilot Portal for Hydrography"

- Previous experience: SeaDataNet infrastructure
- Data according to Common Data Index (CDI) standard
- Supporting Open Geospatial Consortium (OGC) services
- Ensuring their interoperability, in accordance to the INSPIRE Directive

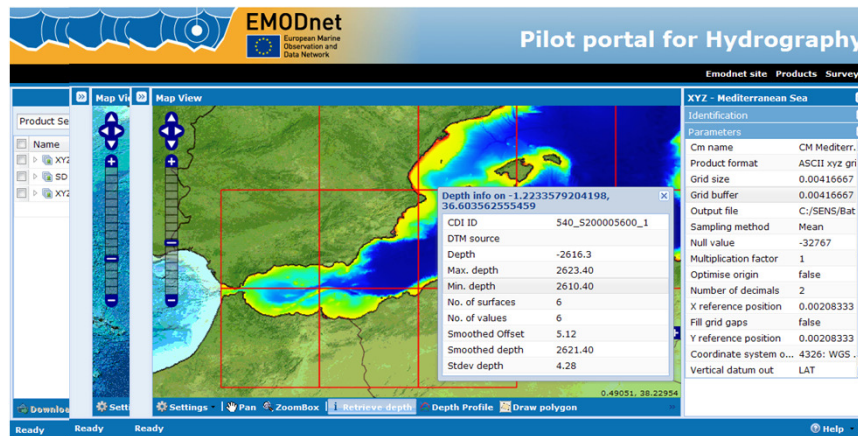


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TECHNOLOGIES FOR ACQUISITION OF BATHYMETRIC DATA

It is essential analyze the current situation of data acquisition techniques and their main capabilities and limitations. It is necessary to ensure the efficient use in order to obtain the best results at a low cost.

Global classification:

- Acoustic methods
- Non acoustic:
 - LIDAR systems
 - Satellite systems
 - Data acquisition by active sensors
 - Data acquisition by passive sensors

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ACUSTIC METHODS

- Mainly the multibeam echo sounders
- The most widely use systems in hydrography
- Applicable to different depth ranges
- The resolution depends mainly on the length and frequency of the pulse
- High frequencies are usually used in shallow waters

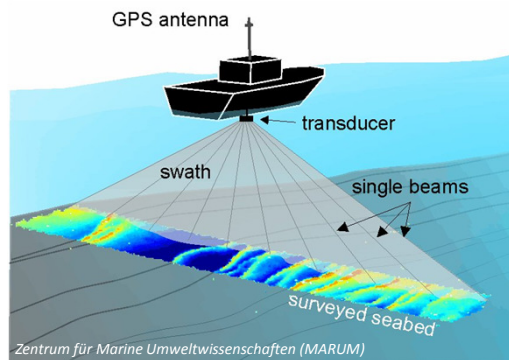


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NON ACUSTIC METHODS

Airborne Systems: LIDAR (Light Detection and Ranging)

A laser pulse within the IR region (**surface sea**) and a green beam (532 nm) (**ocean floor**)

The **water turbidity** is the principal determining factor that limits the use of these systems for hydrographic purposes

The best conditions to obtain reliable data corresponding to that in clear waters (Costa, B.M. et al., 2009)

Limited to 50 m depths in clear waters offshore, because of the effect of light extinction in the water column with depth.

If the **turbidity conditions** are high the depth decreases to **10 m or less** in coastal areas (Guenther et al, 2000).

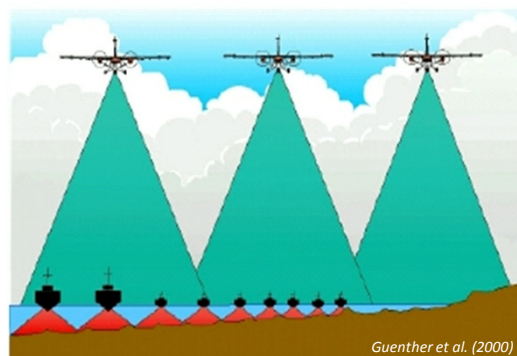


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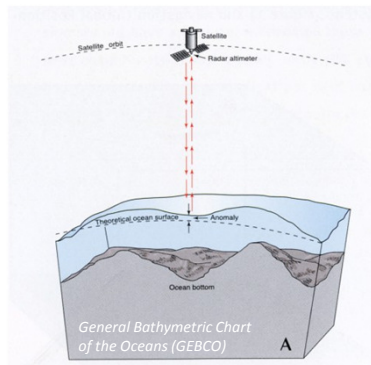
Satellite systems (actives sensors)

Radar Altimeter

Pulse emitted by microwave radar

The anomalies tend to be correlated with variations of the bottom topography

This method is applicable to mesoscale phenomena, such as ocean currents, of plate tectonics processes, submarine volcanism or petroleum exploration



Synthetic Aperture Radar (SAR)

Generates a pulse in the microwave region

Collecting information relating to the roughness of the sea surface

It is necessary to have previous information about the bathymetry

Satellite systems (passive sensors)

The sensor obtains information from the electromagnetic radiation issued

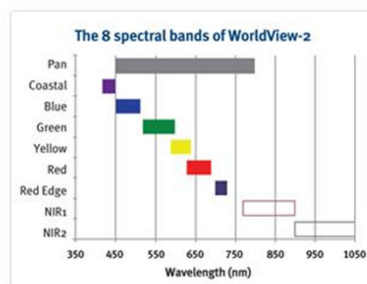
Bathymetric data are based mainly on the attenuation of optical radiation as it passes through the water column

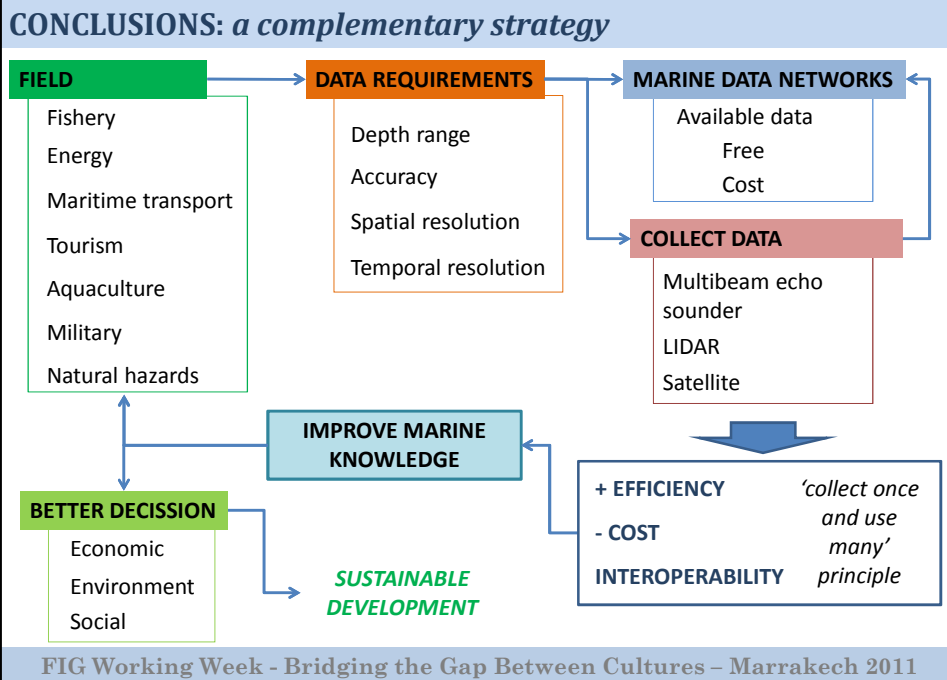
Maximum penetrations depths of solar radiation in the water column reach 20 m (in the blue region), consequently this method is only applicable to shallow waters

Environmental and water conditions can produce variations into the signal

Secure method for hydrographic works in shallow waters where boats cannot access, and in remote areas

Its high temporal resolution is an important advantage





Thank you very much for your attention



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