



Operational Oceanography as a basis for Blue Growth

Nadia Pinardi



Bologna University, IT




Istituto Nazionale di Geofisica e Vulcanologia, IT



CMCC Centro EuroMediterraneo sui Cambiamenti Climatici, IT






www.myocean.eu




Outline




- Operational oceanography building blocks: the science of predictions and GOOS
- Two of the main European implementation programs: Copernicus and EMODnet
- Blue growth at work: Copernicus Marine Service downstream services
- Future outlook




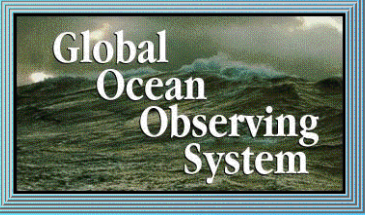
www.myocean.eu

 **The paradigm of ocean predictions**

<p>Multidisciplinary Multi-platform Observing system (permanent and Relocatable)</p>	<p>Numerical models of hydrodynamics and ecosystem, coupled a/synchronously to atmospheric forecast</p>	<p>Data assimilation for optimal field estimation and uncertainty estimates</p>
--	---	---

   www.myocean.eu

 **The GOOS paradigm: developing, operating and maintaining the observing system**






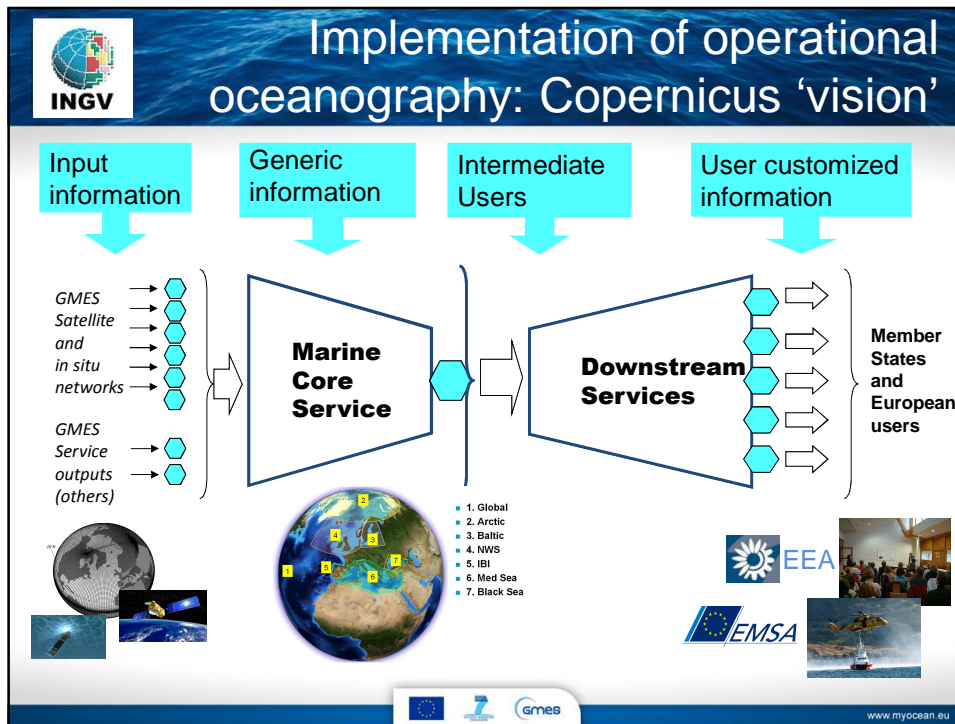
The Web site in the nineties

Welcome to the world of GOOS

- **The Global Ocean Observing System (GOOS) is intended to be a permanent global system for observations, modelling and analysis of marine and ocean variables needed to support operational ocean services worldwide.**
- **GOOS will provide: (i) accurate descriptions of the present state of the oceans, including living resources; (ii) continuous forecasts of the future conditions of the sea for as far ahead as possible; and (iii) the basis for forecasts of climate change.**
- **GOOS is being implemented by national and international facilities and services**

razione completata
MouseMate SS VManager Distiller Assistant 3... Home Page - Mi... Connessione a ilbero Microsoft PowerPol... Internet 17:38

   www.myocean.eu



Implementation of operational oceanography: EMODnet 'vision'

- Change the present fragmented EU repositories of marine data with an interoperable sharing framework
- Move to a new paradigm where data are collected once and used for many purposes
- Optimize observation networks by showing how monitoring meets the needs of public and private users

Marine knowledge 2020

MARINE DATA AND OBSERVATION FOR SMART AND SUSTAINABLE GROWTH

adopted 8 September 2010

www.myocean.eu




The prototype European *in situ* observations assembling system: EMODnet Portals

 <p>Bathymetry</p> <p>Data on bathymetry (water depth), coastlines, and geographical location of underwater features: wrecks.</p>	 <p>Geology</p> <p>Data on seabed substrate, sea-floor geology, coastal behaviour, geological events, and minerals.</p>	 <p>Seabed Habitats</p> <p>Data on modelled seabed habitats based on seabed substrate, energy, biological zone, and salinity.</p>
 <p>Chemistry</p> <p>Data on the concentrations of pesticides, heavy metals, and anti-foulants, in water, sediments and biota.</p>	 <p>Biology</p> <p>Data on temporal and spatial distribution of species abundance and biomass from several taxa.</p>	 <p>Physics</p> <p>Data on salinity, temperature, waves, currents, sea-level, light attenuation, and FerryBoxes.</p>
<p>DISCOVER</p> <p>VIEW</p> <p>DOWNLOAD</p> <p>Open & Free</p>		 <p>Human Activities</p> <p>Data on the intensity and spatial extent of human activities at sea.</p>




www.myocean.eu



The prototype Copernicus Marine Environment Service: MyOcean


QC OBSERVATIONS
in real time and 10-20 years t.s.

➔

FORECASTS
2 to 10 days

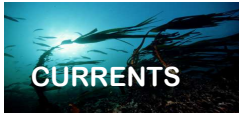





➔

REANALYSES
10 to 45 years



- 1 Global
- 2 Arctic
- 3 Baltic
- 4 NWS
- 5 IBI
- 6 Med Sea
- 7 Black Sea

ESSENTIAL MARINE VARIABLES




 CURRENTS	 TEMPERATURE SALINITY
 SEA LEVEL	 SEA ICE
 SEA WIND	 BIOGEO CHEMISTRY

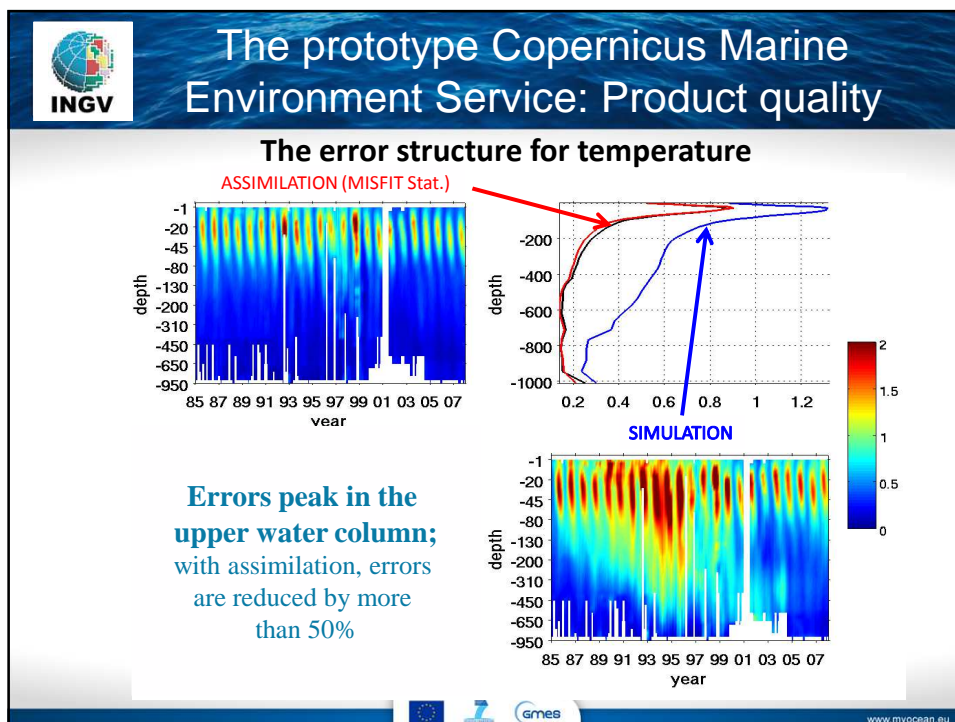
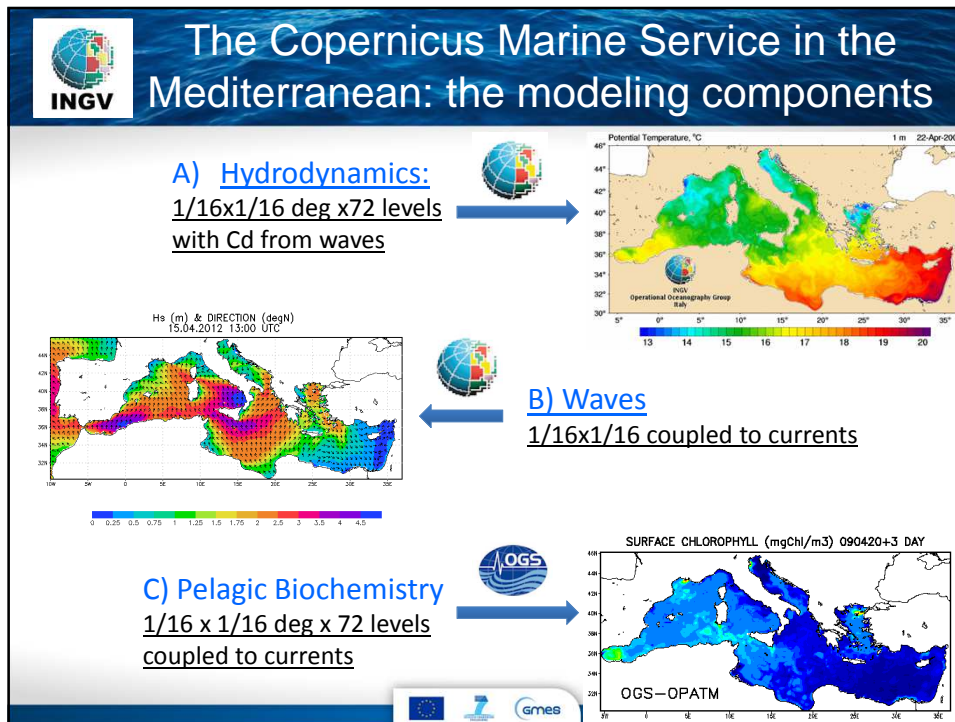
DISCOVER

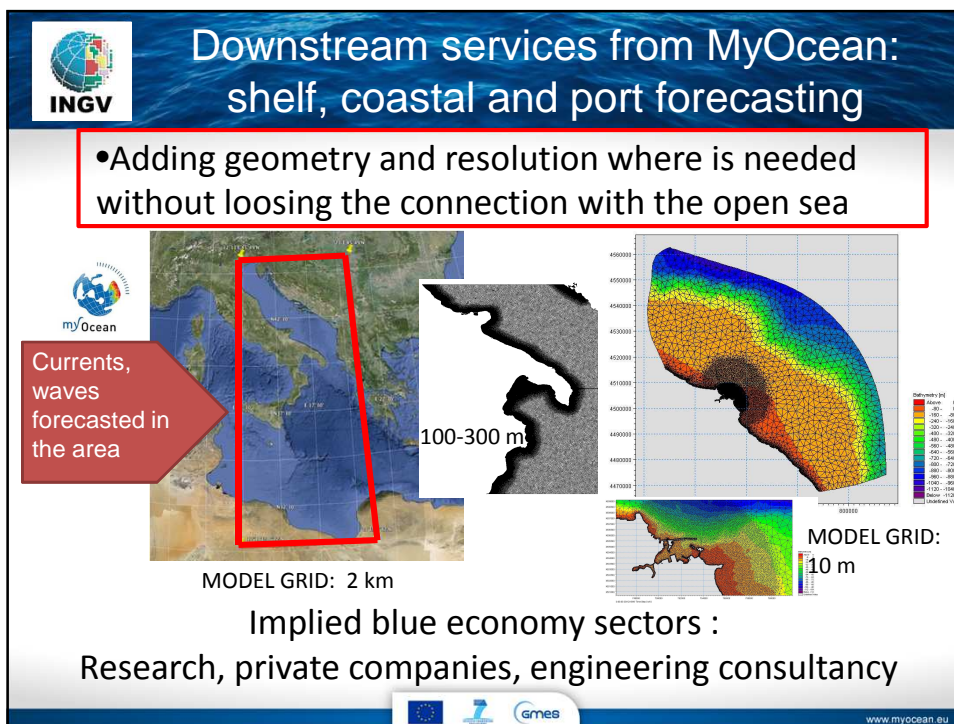
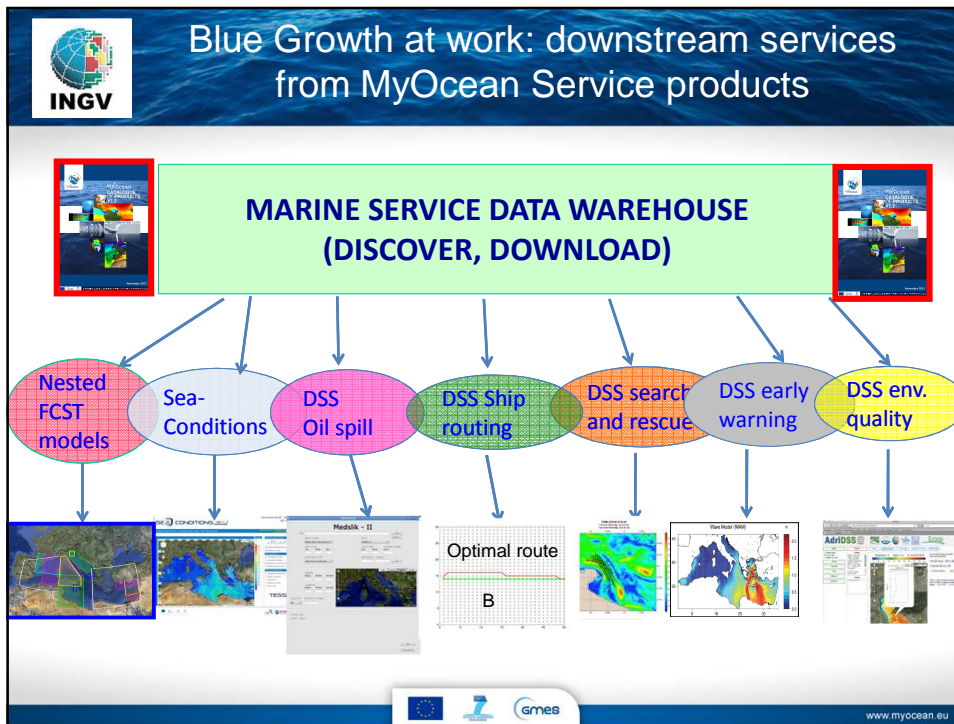
VIEW

DOWNLOAD

Open & Free





www.myocean.eu






Downstream services from MyOcean: oil spill emergency services


- Daily scenario forecasts of the oil spill drift and spreading during emergencies



myOcean



INGV




ITALIAN COAST GUARD HEADQUARTERS


Currents and winds forecasted in the area

Oil spill scenario derived locally

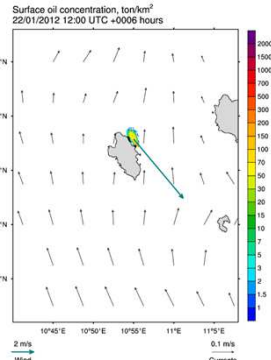
Decision support for operations

13th Jan 2012








Comando Generale
Corpo del
Capitanerie di



Surface oil concentration, ton/km²
22/01/2012 12:00 UTC +0006 hours


Implied blue economy sectors:
Coast Guards, Civil protection, offshore econ.

www.myocean.eu

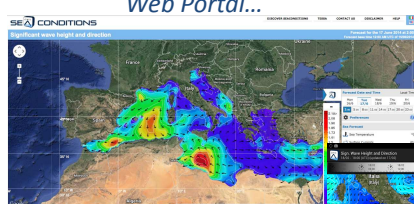
Downstream services from MyOcean: situational sea awareness services

- Situational Sea Awareness technology develops multi-channel services, customized for general public and special users

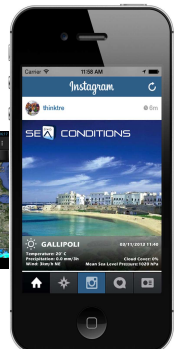


myOcean

Web Portal...

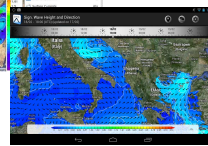


Smartphone...






Currents, waves and winds forecasted in the area

Tablet...



Implied blue economy sectors :
IT companies, transport, tourism






www.myocean.eu

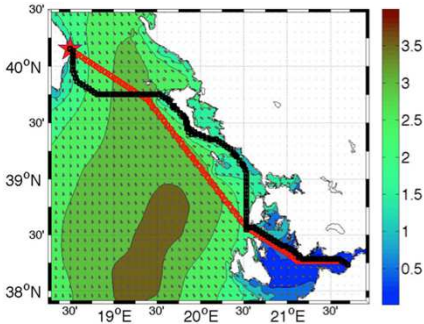
INGV Downstream services from MyOcean: ship safety and routing

- Ferry, fishing Boats & Yachts routing in the ocean dynamical environment: shortest time with IMO safety constraints


myOcean
Waves, winds and currents forecasted in the area



Optimal Route Otranto-Patrasso



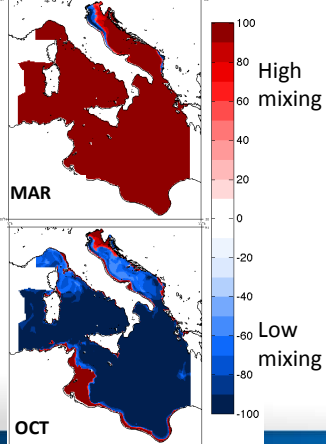
Implied sectors of the blue economy:
Research, naval constructions, transport, tourism

 www.myocean.eu

INGV Downstream services from MyOcean MSFD Indicators

- MSFD indicators are extracted from MyOcean reanalyses/reprocessed satellite data

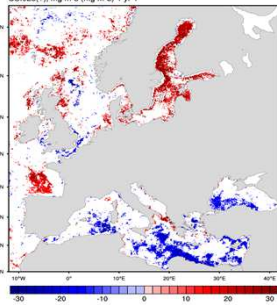
Central Med Mixing index



High mixing


Low mixing

CS8023(+), mg m-3 (mg m-3):1 yr-1



Eutrophication Indicator from ocean color

Implied blue economy sectors:
EEA, Env. Prot. Agencies

 www.myocean.eu



Final remarks

- Operational oceanography is at the basis of ocean innovation, supporting the implementation of the European Integrated Maritime Policy.
- Copernicus and EMODnet are main implementation pillars of operational oceanography in Europe
- Copernicus prototype products support already a large blue economy sector allowing the development of innovative downstream services
- It is mandatory in the next few years to support the upgrade and maintenance of the European REAL TIME in situ 'data collection' system with an open and free data policy
- The Challenge is to continuously incorporate science and technology innovations in the European Operational Oceanography systems

