COSMOS
in the framework of national and international marine observatory initiatives

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based on input and collaboration from NOON members

www.gfi.uib.no
The classical approach in oceanography
New technology: Norwegian Atlantic Current Observatory (NACO)

Glider observatory off the Norwegian shelf from 2011

Operation central

Data centre → FTP → Modem → Data → Missions → GPS + IRIDIUM

20-40 km/day horizontally

1000 m

NACO launch, minister Tora Aasland
NACO: National base funding for 6 gliders and support, available for national and international research projects contributing to running costs. Outreach included.
Testing other technologies -
Acoustic network and underwater platforms

Experiment in Fram Strait 2010-2012, Nansen Center and AWI
The vision: A basin wide acoustic network

Kronikk “Orgelpiper måler havtemperaturen i Arktis”, TU Nr. 4 2011
How can we understand the global ocean?

- Remote sensing
- Research cruises
- Ships of opportunity
- Drifting floats such as Argo
- Gliders, ROVs and AUVs
- Fixed point moorings

Seafloor based observatories which communicate and are powered via cable!
The Norwegian Ocean Observatory Network (NOON) is the consortium behind this application for establishing cable-based ocean observatories infrastructure in Norway. NOON was established in 2007 with seven (later increased to nine) Norwegian research institutions and industry as partners.

www.oceanobservatory.com

Vision for COSMOS:

*Establish next generation infrastructure for a permanent interactive presence in the ocean to enable sustainable monitoring and management of earth and life processes in the marine environment.*
Who are we?

COSMOS consortium:

Coordinator (P. Haugan)

Operational manager

Submitted a project proposal to the Research Council of Norway October 2010

→ Collaboration in the NOON network since 2007

http://www.havobservatorium.no/
Where and when?

2012-2016:
Vesterålen Margin
Svalbard Margin
Ocean Ridge Demo Mission

After 2016:
Svalbard Ocean Ridge
Snøhvit

→ Control over main water masses entering the Barent Sea ecosystem
→ Cover an ocean region of global importance and of high sensitivity to climate change
→ Control over different ocean regimes (fjord-margin-deep sea)
Where are we now?

2010-2011:
Fjord (Masfjorden, Hardanger)

We are online!
http://www.havobservantium.no/news/masfjorden

Main surface currents
Future perspective: Towards ocean management

Long-term real time cabled observatories

Our observatories will become part of a global network
What do we want?

Develop the next generation in marine science technology for a permanent interactive presence in the ocean

→ Establish multi-sensor platforms in the ocean

→ Connected to land station by cable

→ For unlimited real-time in-situ data

Source: Institute of Marine Research
Few limits to observatory options – Choose and design!
Scientific objectives COSMOS:

- Ecosystem function, marine life, turbulent mixing and biophysical interactions

- Operational management and impact assessment of marine resource extraction

- Geological phenomena including fluid-rock and geo-biosphere interactions

- Hazards, real time monitoring and assessment of risks

- Ocean climate variability and ocean-atmosphere exchange
Multi-sensor platforms planned at Vesterålen

Different sensors are placed at nodes (N) and satellites (S) on the sea floor.

Cable connection to land.
COSMOS Svalbard shelf observatory with future links to mid-ocean ridge demo
COSMOS Project management

Research Council of Norway

Project steering committee
- Leader: Project director
- Function: Determine priorities, make fundamental decisions
- Members: 1 representative of each project partner.
- PIs (below) as advisors.

International Advisory committee
- Function: Advice to project
- Members: Deborah Kelley, University of Washington, US; Micheal Kleges, AWI Bremerhaven, Germany

Operative project manager
- F Hoffmann, UniRes
- Function: daily operation of the project; secure information flow within the project; coordinate project activities; responsible for PR issues; report to project director and steering committee

Infrastructure installation manager
- G Pedersen, CMR
- Part of operative management team during infrastructure installation and operation

Project director
- P Haugan, UiB
- Function: Contract partner for RCN; scientific leadership; responsibility for whole project

Project partners

Information flow

requests

research

Representative

Scientific strategy
- Fjord
  - PI: OR Gade, IMR

Continental Margin
- PI: J. Mienert, UiT

Deep Sea/Ocean Ridge
- PI: R-B Pedersen, UiB

Training and education
- PI: S Kårvedt, UiO

Data management
- PI: E Pfeil, UiB

Technology and installation
- PIs: G Pedersen, CMR; TA Rainen, SINTEF

Technical/operational planning
COSMOS access, use, data and knowledge management
Why Cabled Ocean Observatories?

Data access 24/7/365 for long-term in-situ observations

Examples of research advances:
- Better understanding of important and vulnerable ecosystems (camera, chemical sensors)
- Sustainable resource management (fish stocks, plankton dynamics)
- Seismic processes for earthquakes and tsunami warning (seismic sensors)
- Impact of ocean acidification, marine pollution and climate change on the ocean system (multiple parameters)
- Improved climate and earth models (CO₂ system, temperature)

We miss a lot by not being there!!!
Why Norway and why now?

- Norway hosts large and important ocean areas with international interest
- Norway has strong marine science + Strong subsea industry
- Related activities with future potential: Marine renewable energy: wind, waves

Marine renewable energy, example test site near Runde
Why monitor the Arctic Ocean?

Services to society from a sustained ocean observing system

UNESCO/IOC report 2011

Arctic ROOS

SAON
http://www.arcticobserving.org/

SAON
http://www.arcticobserving.org/

Unesco/IOC report 2011

http://arctic-roos.org/observations
Perspective: Contribute to iAOOS by cross-shelf cabling in the Arctic Ocean
Marine Observatories in the Fram Strait

- Seafloor observatory "Hausgarten" (AWI) since 1999
- "Mooring" stations in and outside Kongsfjorden since 2002 (NPI, UiT, SAMS)
- To be merged in project "KONGHAU" (2008-2010)
- Fram Strait transect ARCOONE (ESONET component)
- Seafloor methane observatory (MASOX) due in 2010

Svalbard Integrated Arctic Earth Observing System (SIOS)  
www.sios-svalbard.org
The main goal of SIOS

- Establish an (Arctic) Earth System Observing Facility in and around Svalbard that covers meteorological, geophysical, hydrological, cryospheric and biological processes from a set of platforms to match Earth System Models.

- Establish a first important node in the envisaged Sustained Arctic Observing Network (SAON).
  - Identify gaps in existing infrastructure, complement accordingly
  - Organize the set of scientific and general infrastructure in the most practical and effective way
  - Establish an overarching integration structure (SIOS Knowledge Centre)

SIOS is now in an EU funded planning phase 2010-2013, Implementation and operation from 2013 at the latest
"Towards a European Network of Marine Observatories for monitoring and research"

Brussels, 16 September 2010
The vision: The 2nd Marine Board Forum, held in Brussels on 16 September 2010, culminated in a unanimous call from its participants for the prioritization at national and EU level of actions to deliver:

“A long-term, stable and integrated network of strategic marine observatories, installed and operated through multinational cooperation and support, providing consistent in situ data from the seas and oceans in support of the EU Integrated Maritime Policy and as a driver for smart, sustainable and inclusive growth in Europe (Europe 2020).

Actions
1. A Europe-wide mapping exercise and gap analysis on long-term marine data provision
2. A European strategy on the development of an integrated network of marine observatories.

This was also supported in October through the declaration at EUROCEANS 2010 in Ostende
Status and where to go from here

- COSMOS is recognized in major international Arctic science planning processes
- COSMOS fits well with European strategies for marine observatories
- COSMOS is a Norwegian project but has key partnerships outside Norway
- COSMOS is cheap (!)
- COSMOS can set a standard for future marine observatories for multiple science and operational users

*COSMOS is timely – get it in the water!*

(And showcase at IEEE OCEANS in Bergen 11-13 June 2013)