![OceanPredict - Advancing the science of ocean prediction]

Coastal Ocean and Shelf Seas Task Team (COSS-TT)

8th COSS-TT meeting (2nd online meeting)
Introduction

Pierre De Mey-Frémaux

https://oceanpredict.org/events/coss-tt-online-meeting

12-13 April 2022, virtual (MS Teams)

- **Introduction**

- **Presentations** (7' + 2' questions, strict timekeeping)

  - Science in support of Coastal Ocean forecasting

  - Coastal and Regional (pre-)operational ocean forecasting systems and applications

  - Seamless integration between Coastal and Regional systems and Large scale systems

  - Synergy between altimetry and modelling in coastal regions

- Discussion on **future priorities for the Task Team**

- The **TT participation in the UN Ocean Decade**

  - Labelled programmes: CoastPredict, ForeSea

  - Projects: SynObs

  - Should we revisit our thematic/strategic priorities?

  - Discussion

- **Concluding remarks** incl. next meeting(s).

DAY 1

DAY 2

- **OceanPredict** (OP) (formerly known as GODAE OceanView) is an international research and development network to accelerate, strengthen and increase the science and impact of ocean prediction >>>
  - GODAE started in 1999

- Within OP, the Coastal Ocean and Shelf Seas Task Team (**COSS-TT**) aims to foster international collaboration to advance science and expertise in support of regional/coastal ocean forecasting >>>
  - 33 members + COSS community
  - 7 international meetings so far
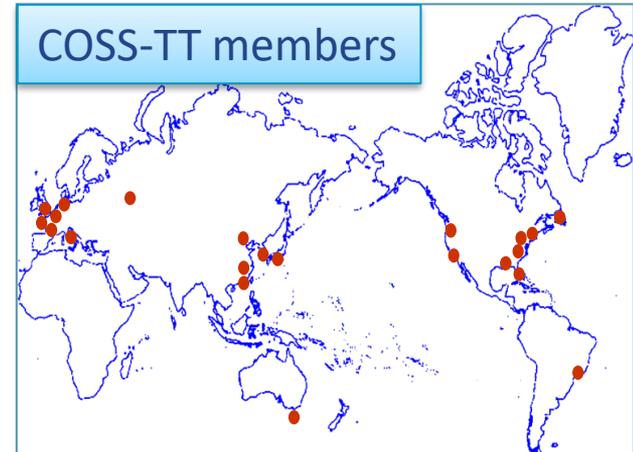
COSS-TT members

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1. **Science** in support of Coastal Ocean forecasting

2. Coastal and Regional (pre-)operational ocean **forecasting systems** and applications

3. Seamless **integration** between Coastal and Regional systems (R/COFS under COSS-TT) and Large scale systems (LOFS under OceanPredict)

4. Synergy between **altimetry and modelling** in coastal regions

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- Montréal COSS-TT meeting postponed twice because of pandemic.

- June 2021 COSS-TT online strategy meeting (Villy, Pierre). Report on web site.

- Synergy with other OceanPredict Task Teams: DA-TT (Pierre), OSEval-TT (Villy)

- TT co-chairs and members are involved in the steering of several UN Ocean Decade programmes and projects (to be discussed tomorrow)

- Coastal Systems Information Table updated (Pierre, Mauro, Kirsten), available on web site.

- *"Guide on Operational Ocean Monitoring and Forecasting Systems"* edited by GOOS/ET-OOFS with contributions from the TT in Chapter 5 (Pierre, Mauro, colleagues). To be published this year by UNESCO.

  – Very nice all-in-1 table with large-scale, regional, coastal and local LOFS, many from OceanPredict and several from the COSS-TT. Too big to fit here.

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- Need for closer interaction with OP "national systems"
- Need for fit-for-purpose OP large-scale estimates for coastal systems (COSS-TT) and CP uses
- Farther reach via "global coastal ocean" concept and CO typology
- Advance and promote good COF practices within an integrated downscaling/modelling/observation framework (OceanObs paper; promotion via ET-OOFS)
  - Definition of suitable coastal in situ observing systems (with OSEval-TT, SynObs, co-design w/GOOS)
  - Good practices for assessment in coastal regions, added value of downscaling
  - Good practices for using future altimetry data in coastal regions (with SWOTST
- Role of ML/DL in the CO, esp. given our sparse obs. networks (and perhap
- Extend COFS to include estuaries/deltas as an integrated system (up to catchment area)
- Assess the quality of surface current estimates in regional/coastal systems, and develop better approaches
- Coastal vulnerability: advances on coastal relocatable models for emergency situations
- Assess multidisciplinary extended range predictive capabilities for the coastal zone (from events to climate) – test atmospheric forcing capabilities in CO – "Coastal CMIP" (w/ CP-TT?)

See full Report on web site for a more complete account

> Come back to this in discussion on strategic priorities tomorrow

"The science we need for the ocean we want"

Come back to this in discussion on UN Decade tomorrow

- Labelled programmes: ForeSea, CoastPredict
- Projects: SynObs

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Coastal Ocean and Shelf Seas Task Team (COSS-TT)

8th COSS-TT meeting (2nd online meeting) Presentations (S1,S2 on day 1; S3,S4 on day 2)

Villy Kourafalou (S1)

Pierre De Mey-Frémaux (S2,3,4)

https://oceanpredict.org/events/coss-tt-online-meeting

12-13 April 2022, virtual (MS Teams)

- *Where do we go from here?*

- *What are the major science challenges and international collaboration opportunities?*

TOPIC 1:

❖ estuarine-coastal-open ocean continuum: how has this integration advanced and what are the challenges going forward? (incl BGC applications)

- *Where do we go from here?*

- *What are the major science challenges and international collaboration opportunities?*

TOPIC 2:

- ❖ science is support of inter-disciplinary and trans-disciplinary forecasting: important recent developments and future opportunities/challenges

- *Where do we go from here?*

- *What are the major science challenges and international collaboration opportunities?*

TOPIC 3:

❖ integration of coastal models w/ observations – contribution to infrastructure synthesis
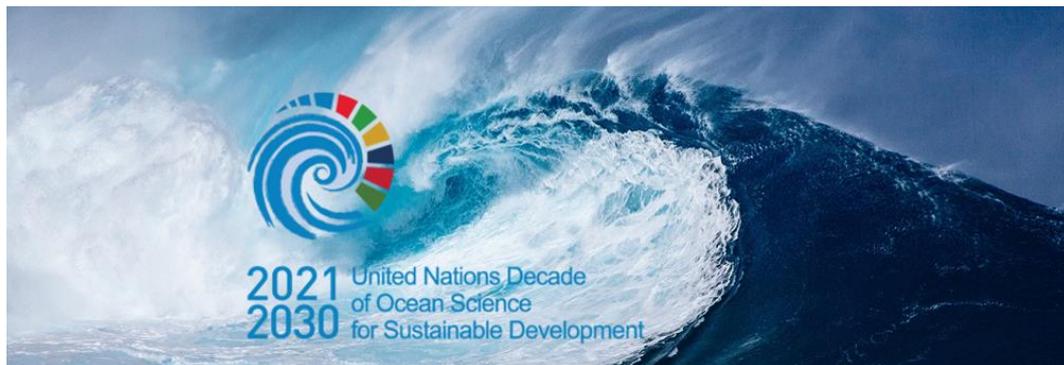
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Coastal Ocean and Shelf Seas Task Team (COSS-TT)

CoastPredict Programme

Villy Kourafalou *(co-chair of CoastPredict)*

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2021 2030 United Nations Decade of Ocean Science for Sustainable Development

"The science we need for the ocean we want"

CoastPredict: Observing and Predicting the Global Coastal Ocean

https://www.coastpredict.org/

(endorsed / 2021)

G3OS | **CoastPredict**
with The Global Ocean Observing System

Revolutionising Global Coastal Ocean observing and forecasting

Nadia Pinardi, University of Bologna
Villy Kourafalou, University of Miami
Joaquín Tintoré, Balearic Islands Coastal Observing & Forecasting System
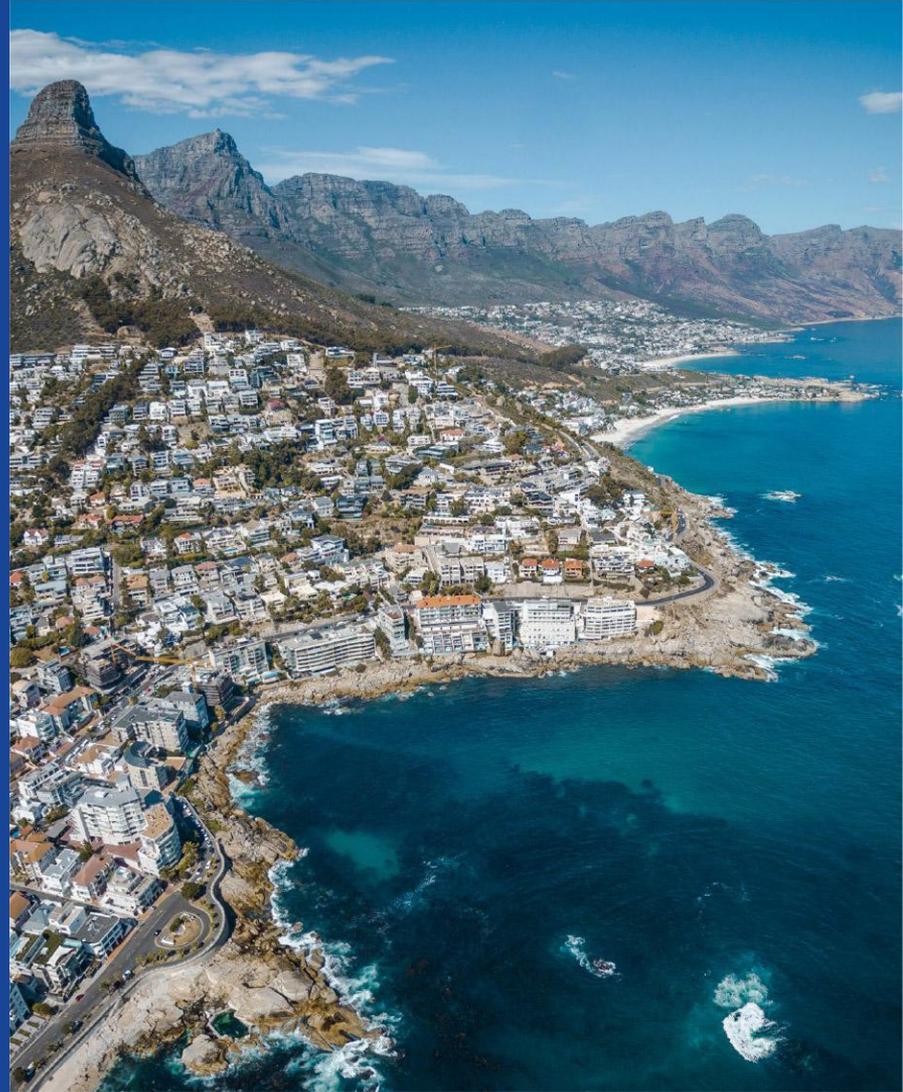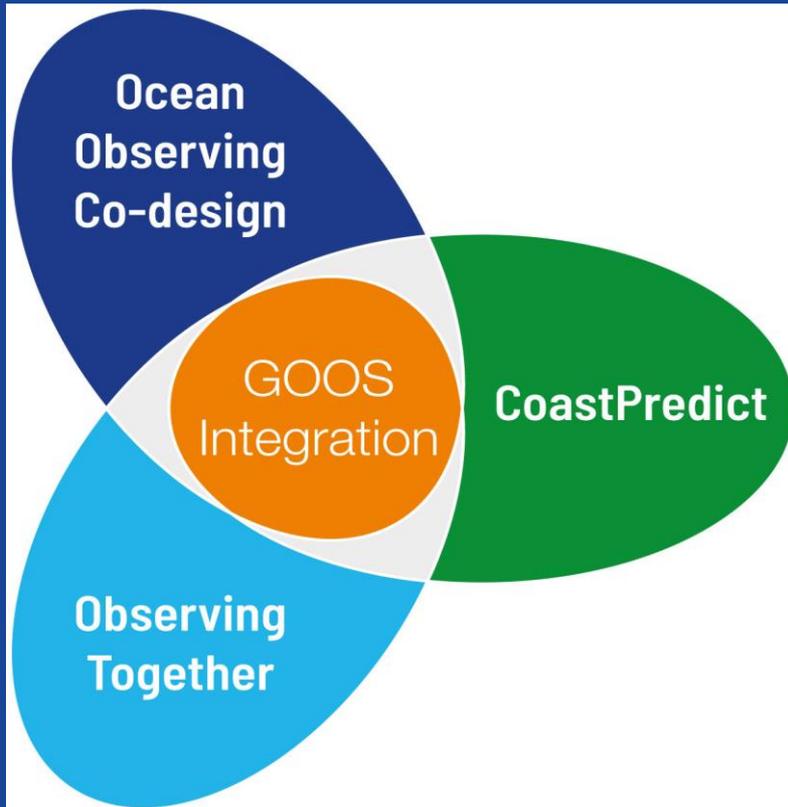&
Emma Heslop, GOOS, IOC/UNESCO

2021
2030
United Nations Decade
of Ocean Science
for Sustainable Development

This programme is endorsed by the **UN Decade of Ocean Science**

Synergy of CoastPredict and GOOS

- **3 x GOOS Ocean Decade Programmes**

- **Working together for the Decade**
  - Challenges
  - Opportunities

GOOS | CoastPredict
with The Global Ocean Observing System

CoastPredict high level objectives

1. A **predicted** global coastal ocean;

2. The upgrade to a **fit-for-purpose** oceanographic information **infrastructure**;

3. Co-design and implementation of an **integrated coastal ocean observing and forecasting system** adhering to **best practices and standards**, designed as a global framework and implemented locally.
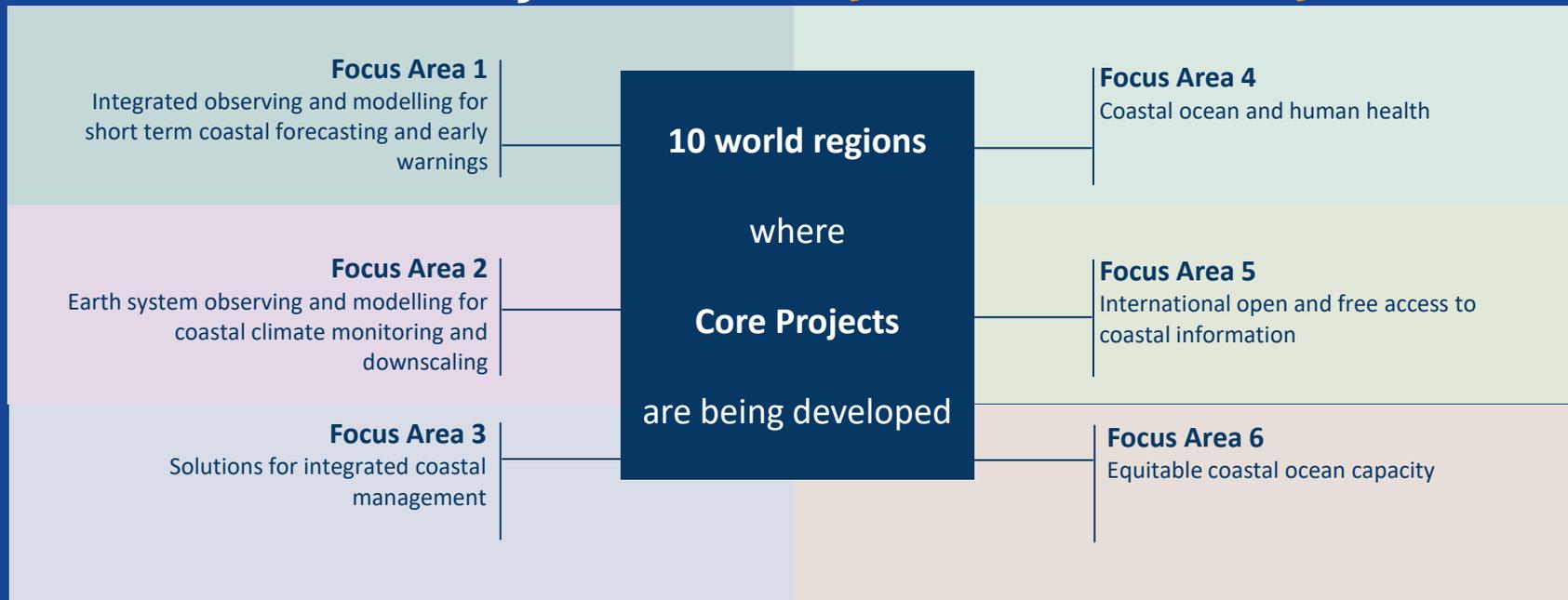
G3OS | CoastPredict
with The Global Ocean Observing System

Focus Areas
(each is advised by Expert Members incl. at least one ECOP representative and the CORE project leaders)
~10-15 people

Projects – Core
proposed for endorsement by UN Decade

Projects - Affiliated
proposed for endorsement by UN Decade

Core Projects submitted for Decade endorsement (Jan. 2022)

Focus Area 1: PredictOnTime - will develop systems to observe and predict natural extreme events in the global coastal ocean in due time and with the appropriate accuracy so that impacts on natural and human resources and assets will be minimised

Focus Area 2: FLAME - Future Coastal Ocean Climates will generate innovative, high-resolution, downscaled projects of future coastal ocean climates and impacts.

Focus Area 5: CORE - Coastal Ocean Resource Environment will provide sustainable delivery of high-quality environmental data and information, products to research, industry and government for purposes such as ecosystem health, hazard response and resource management.

G3OS | CoastPredict with The Global Ocean Observing System

Focus Areas
(each is advised by Expert Members incl. at least one ECOP representative and the CORE project leaders) ~10-15 people

Projects – Core
proposed for endorsement by UN Decade

Projects - Affiliated
proposed for endorsement by UN Decade

Affiliated Projects submitted for Decade endorsement (Jan. 2022)

Focus Area 1: Integrating Coastal Hazards Early Warning Systems in the Tropical Americas and Caribbean submitted by the Regional Office for the Americas and the Caribbean Sea

Focus Area 1: Forecasting the Argentine Sea – accelerating the capacity for operational forecasting in Argentina

Focus Area 2: European Knowledge Hub on Sea Level Rise - Coastal Ocean Resource Environment will provide sustainable delivery of high-quality environmental data and information, products to research, industry and government for purposes such as ecosystem health, hazard response and resource management.

Focus Area 3: Mangroves as Nature-based Solutions to Coastal Hazards in Eastern Ghana (MANCOGA) endorsed for funding by Meerwissen

OTHER: Collaborative project with Ocean Observing Co-Design: Coastal inundation and storm surge exemplar project of the Ocean Observing Co-Design Programme will be a project affiliated to Focus Area 1 PredictOnTime core project.

DECADE COLLABORATIVE CENTRE
COASTAL RESILIENCE IN A CHANGING CLIMATE

MAIN FUNCTIONS

Catalyst/strategic: be a place for strategic thinking and planning of the UN decade transformative science for sustainable development
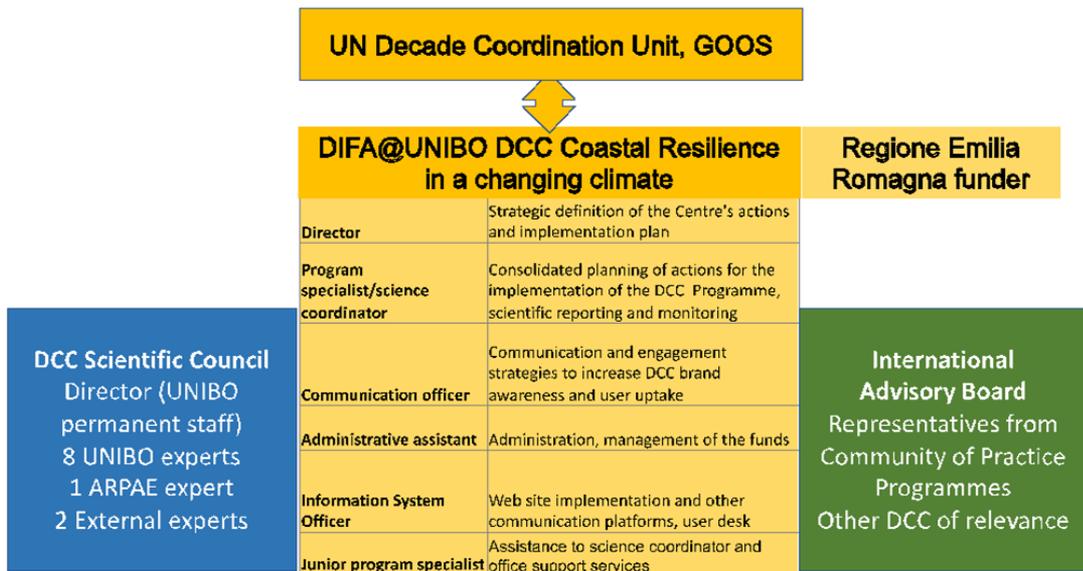
Coordination: in consultation with the DCU at Unesco-IOC, and GOOS, coordinate Decade Programs in the Community of Practice

Communication: Make sure that adequate dissemination tools are developed

Monitoring and reporting: Develop reporting/regular reviews of all relevant Programs/Projects

Resource mobilization

Governance structure

UN Decade Coordination Unit, GOOS		

DIFA@UNIBO DCC Coastal Resilience in a changing climate		Regione Emilia Romagna funder
Director	Strategic definition of the Centre's actions and implementation plan	
Program specialist/science coordinator	Consolidated planning of actions for the implementation of the DCC Programme, scientific reporting and monitoring	
Communication officer	Communication and engagement strategies to increase DCC brand awareness and user uptake	
Administrative assistant	Administration, management of the funds	
Information System Officer	Web site implementation and other communication platforms, user desk	
Junior program specialist	Assistance to science coordinator and office support services	

DCC Scientific Council
Director (UNIBO permanent staff)
8 UNIBO experts
1 ARPAE expert
2 External experts

International Advisory Board
Representatives from Community of Practice Programmes
Other DCC of relevance

TT involvement in the CoastPredict programme – *a few ideas*

- Global coastal ocean concept, outreach via CO typology
- Focus Areas of particular interest for the TT: FA1, FA2, FA3 ➡️
- Possible involvement of COSS-TT and COSS-COMM with endorsed Projects
- Possible contribution to exemplars (ongoing discussion btw. CP and ObsCoDe/GOOS)
- Should the TT develop its own Project? Examples:
  - Downscaling (common to CoastPredict and ForeSea)
  - Estuarine/nearshore/shelf connection (sediments? BGC?)
  - Coastal resilience (trans-disciplinary forecasts)
  - Storm surges
  - Marine Heat Waves
  - ….

Focus Area 1
Integrated observing and modelling for short term coastal forecasting and early warnings

Focus Area 2
Earth system observing and modelling for coastal climate monitoring and downscaling

Focus Area 3
Solutions for integrated coastal management

ForeSea Programme

Villy Kourafalou

ForeSea – The Ocean Prediction Capacity of the Future

Vision: Strong international coordination and community building of the ocean prediction capacity for the future.

Overarching goals

Lead institution: OceanPredict (OceanPredict.org)
Co-Chairs: E. Chassignet, F. Davidson, Vinayachandran P.N.

➢ Improve the science, capacity, efficacy, use, and impact of ocean prediction systems.

➢ Build a seamless ocean information value chain, from observations to end users, for economic and societal benefit.

=> make ocean prediction science more impactful and relevant.

ForeSea: Transformative and beyond "business as usual"

➢ Democratization of ocean information to enable more impactful engagement
➢ Creation of an effective and sustainable operational oceanography ecosystem environment responsive to user needs.
➢ Establishment of a framework for operational oceanography that enables scientists and stakeholders to engage and collaborate with
  - all components of the value chain and
  - the UN Decade programmes associated with these components
➢ Enhancement of communication of the impact and relevance of ocean prediction

Possible COSS-TT contributions to ForeSea

- Facilitation of synergies between CoastPredict and ForeSea projects (e.g., SYNOBS and recently submitted to the Decade)
- Identification and quantification of positive/negative impacts of the large-scale ocean prediction systems used for boundary conditions on the coastal systems
- Vice-versa, how can the downscaled coastal systems be used in the global/regional systems to improve prediction and societal impact? Parameterization, better land/sea boundary conditions, or nesting?
- How do you transition from a coastal to a large-scale ocean prediction system at the end user level?
- Better assimilation in coastal/shelf environments – combined impact of SWOT on large-scale and coastal circulation
- Linkages between coastal and large-scale biogeochemistry

SynObs project

Pierre De Mey-Frémaux *(member of SynObs SC)*

Synergistic Observing network for Ocean Prediction (SynObs)
(From July 2022 to June 2026)

◆ **Objective**

SynObs will seek the way to extract maximum benefits from the combination among various observation platforms, typically between satellite and in situ observation data, or between coastal and open ocean platforms, in ocean/coastal predictions.

◆ **Strategy**

SynObs aims to identify the optimal combination of different ocean observation platforms through observing system design/evaluation, and to develop assimilation methods with which we can draw synergistic effects from the combination.

◆ **Scope**

Targets of **SynObs** include open-ocean (global, tropical, mid-latitude, polar areas), coastal, and biogeochemical (BGC) observing systems

Synergy
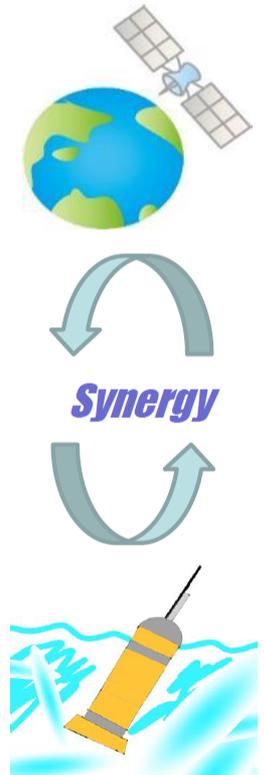
SynObs: A common comprehensive project
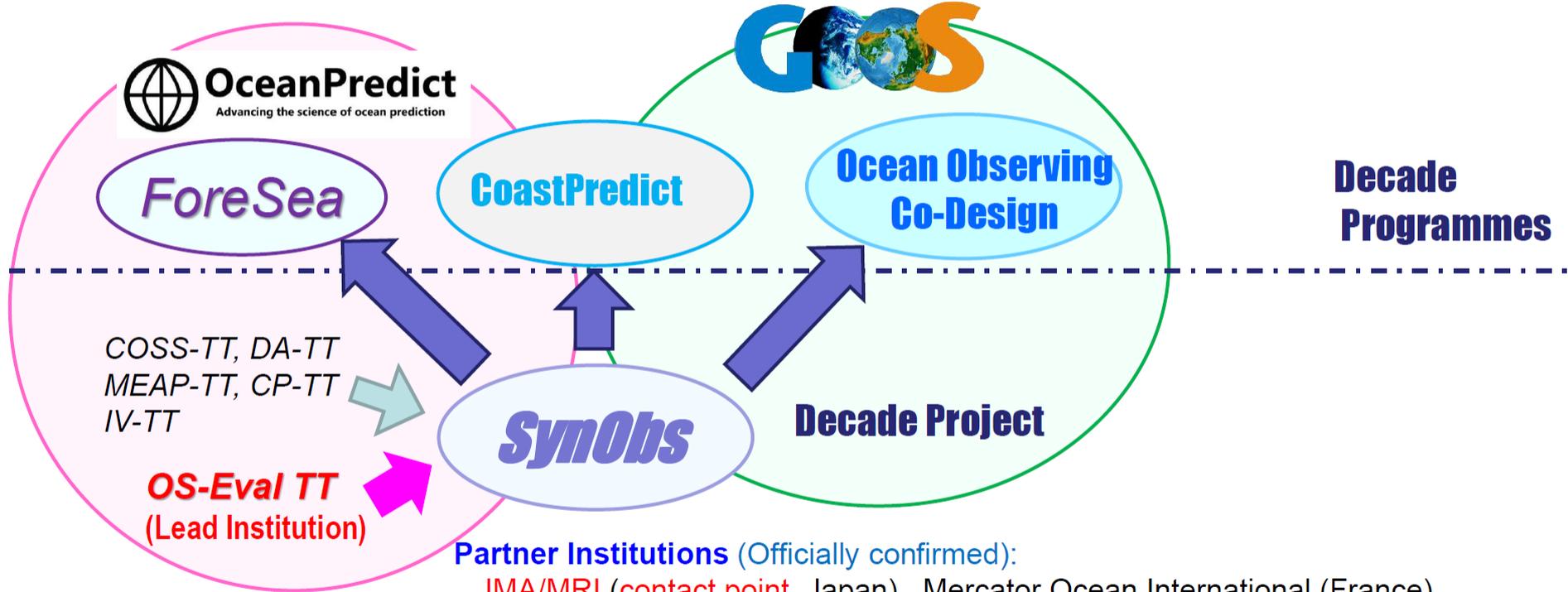
ForeSea

CoastPredict

Ocean Observing Co-Design

Decade Programmes

COSS-TT, DA-TT
MEAP-TT, CP-TT
IV-TT

OS-Eval TT
(Lead Institution)

SynObs

Decade Project

Partner Institutions (Officially confirmed):
JMA/MRI (contact point, Japan), Mercator Ocean International (France)
Met Office (UK), NOAA Quantative Observing System Assessment Program (USA)
ECMWF, CNR ISMAT (Italy), NERSC (Norway), Ocean Data Network (Denmark)
CNRS (France), UFBA (Brazil)

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A. **Satellite altimeters (including conventional and wide-swath altimeters), satellite ocean current observations (SKIM) and Argo floats for reconstructing detailed ocean current fields affected by western boundary currents and meso-scale eddies.**

B. Tropical buoys, Argo floats, and satellite altimeters to detect the equatorial wave activities and its influence on basin scale variations such as ENSO and IOD.

C. Satellite sea surface salinity observations and near surface in situ observations to represent influence of precipitation and runoff.

D. Satellite SST-observing radiometers, near surface in situ observations, and sea surface atmospheric parameters to reproduce the diurnal SST cycle and the SST variation caused by tropical storms, especially in coupled data assimilation systems.

E. Satellite ocean color observations and in situ (Core and BGC Argos) observations to better monitor and forecast the marine BGC environment variability.

F. Observations of sea ice concentrations and sea ice thickness to improve sea ice predictions in arctic and subarctic regions.

G. **Coastal ocean radars and sensors, Gliders, Drones, Satellite remote sensing, and Argo floats to detect coastal phenomena characterized by the small scale and the high frequency.**
Tide gauges missing here

1. Showcase observing system evaluation experiments (OSE, OSSE, etc.) and generate recommendations (reports) on the observation impacts

2. Run and compare evaluation experiments with several systems or with observation combinations and explore the best practices (reports)

3. Promote the development of assimilation schemes and propose observation cruises to support those developments

4. Construction of real-time observation impact monitoring system.

Model-Observations Synergy in the Coastal Ocean

Pierre De Mey-Frémaux[1*], Nadia Ayoub[1], Alexander Barth[2], Robert Brewin[3], Guillaume Charria[4], Francisco Campuzano[5], Stefano Ciavatta[3], Mauro Cirano[6], Christopher A. Edwards[7], Ivan Federico[8], Shan Gao[9], Isabel Garcia Hermosa[10], Marcos Garcia Sotillo[10,11], Helene Hewitt[12], Lars Robert Hole[13], Jason Holt[14], Robert King[12], Villy Kourafalou[15], Youyu Lu[16], Baptiste Mourre[17], Ananda Pascual[18], Joanna Staneva[19], Emil V. Stanev[19], Hui Wang[9] and Xueming Zhu[9]

1. Using Observations to Guide Coastal Model Development and Assessment

2. Using Models to Connect and Interpret Sparse Coastal Observations

3. Using Coastal Models to Synthesize Observations

4. Using Models to Design and Optimize Coastal Observing Systems

- Message to COSS-TT from Yosuke Fujii, SynObs co-chair:
  - *"We expect that COSS-TT members will be interested to contribute to activity (1) in the form of OSE, OSSEs, etc., and will make recommendations for combination (G)."*
  - *"Although it may be difficult to perform multi-system evaluation with coastal systems as in (2) because their targeted coastal areas are different, we can attempt to apply the multi-system approach by targeting a specific phenomenon (e.g., MHW, storm surges, …) or the combination of observations (e.g., HF radars and satellite altimeters)."*
  - *"The COSS-TT can also support (3) towards the development of coastal data assimilation systems for (G)."*
- Through COSS-TT meetings through the years, and our OceanObs19 contributions, it has appeared quite clearly that (1) coastal array design and (2) synergistic uses of obs with coastal models were topics of interest for this regional/coastal community.
- **Should we, COSS-TT, take advantage of the SynObs framework?**

Should we revisit our thematic/strategic priorities?

Pierre De Mey-Frémaux

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Current COSS-TT themes/activities:

1. Science in support of Coastal Ocean forecasting

2. Coastal and Regional (pre-)operational ocean forecasting systems and applications

3. Seamless integration between Coastal and Regional systems (R/COFS under COSS-TT) and Large scale systems (LOFS under OceanPredict)

4. Synergy between altimetry and modelling in coastal regions

Themes introduced in 2021 strategy meeting:

1. Observing infrastructure (incl. alt.) in the coastal seas, integration with models and with forecasting

2. Integration of coastal ocean and estuaries/inland waters/coastal cities

3. Seamless integration of coastal and larger-scale estimates

4. Climate projections, coastal vulnerability and resilience

The themes on the right are more application-driven/open to society than our current 4 themes

Could these replace (or complement) our current themes?

Which priorities are we missing in the list on the right? HF/small-scale dynamics? Other satellite data. Predictability. Include more general theme. Assessment. Monitoring of skill(t). Other?

COSS-TT contribution to Decade actions

Villy Kourafalou

Pierre De Mey-Frémaux

- Can we count on a return to normal regarding the Covid situation and in particular the sanitary measures?
  - Some countries, e.g. Italy, Korea, China, parts of Canada, etc. still have severe restrictions
  - The evolution is still hard to predict
- We could plan another online meeting in the fall since the organization is rather lightweight
- How do online meetings work for your needs?
- Should we go for a mix of online and face-to-face meetings?

- Bravo and thanks to Kirsten for her great help and skill at shaping up this meeting and interacting with all of you!!

- We hope that the meeting was useful and pleasant for you all. Any feedback welcome!

- See you soon!

- (TT members please stay online)

https://oceanpredict.org/science/task-team-activities/coastal-ocean-and-shelf-seas