COSS-TT meeting 2025

17-20 June 2025

Ifremer, Brest-Plouzané
France

Report

Prepared by

Alex Kurapov, Joanna Staneva, Stéphanie Cuven and Kirsten Wilmer-Becker

COSS-TT members and guests at Ifremer – June 2025

Enquiries:
Kirsten Wilmer-Becker and Stephanie Cuven
OceanPredict Programme Office Coordinators

Kirsten.Wilmer-Becker@metoffice.gov.uk
scuven@mercator-ocean.fr

Table of contents

1. Introduction

1.1. Welcome and Acknowledgments

Welcome to the COSS-TT meeting at Ifremer. On behalf of the COSS-TT co-chairs and coordinators, we extend our sincere gratitude to our hosts at Ifremer for their generous support in making this meeting possible. We would especially like to thank Guillaume Charria and Audrey Mallejac for their dedication, hard work, and patience throughout the organization of this event. Our thanks also go to Philippe Moal, Director of the Centre Ifremer de Bretagne, and his colleagues for their warm and welcoming hospitality.

This gathering marks the first in-person meeting under the current co-chairs, Alex Kurapov (NOAA) and Joanna Stanev (Hereon). We take this opportunity to pay special tribute to our former co-chairs, Pierre De Mey-Frémaux and Villy Kourafalou. Since the late 2000s, they have been instrumental in guiding COSS-TT, bringing together its members, fostering new initiatives, and creating a platform for knowledge exchange across coastal ocean and shelf sea communities that did not exist before. We sincerely thank them for their longstanding dedication, vision, and tireless efforts in shaping COSS-TT into one of the most impactful task teams within OceanPredict, for their role in launching CoastPredict, and for their unwavering commitment to driving COSS-TT forward.

1.2. Meeting objectives

The mission of COSS-TT, within the OceanPredict framework, is to foster international coordination that supports the development of new science and expertise aimed at advancing coastal ocean prediction and forecasting systems. Our overarching goal is to contribute to the realization of a truly seamless forecasting framework that spans from global to coastal scales.

Achieving this requires tackling the unique challenges associated with monitoring and forecasting in coastal zones and regional seas, while ensuring our efforts are aligned with societal needs. This includes recognizing that the majority of human marine activities occur in coastal areas and that sustainable marine resource use should be a key component of our objectives.

This meeting will focus on specific themes designed to support and advance these goals.

1.3. Themes

All meeting session presentations are available in *Appendix B* and on the COSS-TT website.

No	Themes
1	**Observing infrastructure in the coastal seas, its integration with ocean model, prediction and forecast systems**
2	**Ocean modelling at the regional and shelf sea spatial scales and seamless integration with larger-scale estimates**

3	**The land-ocean continuum: integration of models for coastal ocean and estuaries/deltas/wetlands, including effects on urban built environments/coastal cities**
4	**Coastal projections and scenarios, coastal vulnerability, wave and storm surge impacts in the coastal zone**
5	**AI/ML applications in the coastal ocean prediction**
6	**User applications and decision tools in the coastal ocean (including Digital Twins)**
7	**The role of the COSS-TT in the UN Ocean Decade and beyond**

2. Sessions

The session descriptions in this paragraph were kindly provided by our session chairs and rapporteurs.

Session 1: Observing infrastructure in the coastal seas, integration with models and with forecasting

Session chair and rapporteur: Jianping Gan, Hong Kong University and Florence Toublanc, LEGOS/CNRS

- The session featured 5 presentations and 6 posters on in-situ and satellite observation systems and their integration with models and forecasting, for example through data assimilation (DA) of these observations in numerical ocean models. Both in situ and satellite observations were displayed in the session.
- In particular, "cost-effective" observation systems were shown, with the aim of optimizing coastal observations to improve the spatial and temporal scales covered by in-situ data. For example, an adaptable "smart" sampling strategy was discussed, based on the occurrence of specific events (e.g. high-frequency sampling during storm passage vs low-frequency sampling and no data storage during "low" dynamics periods). Small, modular platforms (micro-AUV, ASV) were displayed.
- SWOT satellite data represent a new source of high spatial resolution data for the coastal community. Promising results on the representation of small scales in models with SWOT data assimilation were shown. The temporal resolution, accuracy, validation and integration with in-situ measurements of SWOT data were discussed and require further studies and data exploration.
- Data assimilation results were shown in several presentations and posters. DA at the sub-mesoscale is not problematic and does not spike errors, as they will generally propagate to smaller scales and dissipate. The positive impact of assimilating in-situ data (salinity and temperature) to complement satellite data assimilation (temperature, SLA, surface geostrophic currents), has also been demonstrated.
- Discussions suggested that model, DA and the underlying science need to be integrated to better serve coastal system forecasting. OSSEs or OSEs could help determine where to place sensors so that they are most effective to help optimize observation networks, as well as advocate for their funding and maintenance.

Find all presentations (pdf) of all sessions here.

Session 2: Ocean modelling at the regional and shelf sea spatial scales and seamless integration with larger-scale estimates (focus on processes)

Session chair and rapporteur: Byoung-Ju Choi (Chonnam National University) and Baptiste Mourre (CSIC-UIB)

The theme of the session was ocean modeling at regional and shelf sea spatial scales, and its seamless integration with larger-scale estimates. The session featured 11 presentations that focused on various types of coastal ocean processes, including river plume dynamics, deep convection, the interaction of waves and ocean circulation, coastal trapped waves, barotropic tidal mixing, dense water cascading, and coastal jet dynamics. These processes were analysed using high-resolution simulations covering coastal and regional areas from different parts of the world (Bay of Biscay, North Sea, Iberian Atlantic coast, northwestern Mediterranean Sea, northern Adriatic Sea, Brazilian continental margin, and the Greater Bay Area). It also included a global study considering the results of km-scale coupled climate simulations in coastal zones.

The presentations and subsequent discussions provided the opportunity to explore a variety of specific ocean modeling aspects: the importance of wave-current coupling, the advantages of unstructured grid modeling, the effects of hydrostatic, non-hydrostatic, and quasi-non-hydrostatic assumptions, the impact of horizontal and vertical model grid resolution, the impact of vertical mixing schemes, the effects of wind, tidal, and runoff forcings on the modeling of Regions of Freshwater Influence (ROFIs), the importance of tidal forcing, the coupling of atmosphere-land-biosphere-ocean in Earth System models, and the coupling of physical and biogeochemical components for coastal forecasting.

Data assimilation was also another key theme of the session. Discussions covered different approaches to data assimilation in multigrid nested simulations, the definition of ensemble verification metrics, the impact of open boundary ensemble perturbations, and how to properly address mean sea level and account for correlated errors in satellite along-track data during the altimeter data assimilation.

Find all presentations (pdf) of all sessions here.

Session 3: Land-ocean continuum & Theme 4: Coastal resilience

Session chair and rapporteur: Chair: Villy Kourafalou (University of Miami) and Mike Herzfeld (CSIRO)

The session featured 4(5) talks and summaries are provided below.

Talk 1: **Modelling and Forecasting of Compound Coastal-Fluvial Floods in Urban Built Environment**

Indiana OLBERT, University of Galway

This presentation focussed on the city of Cork in Ireland where coastal flooding is an issue, particularly compound flooding where a combination or successive occurrence of two or more flood drivers can amplify flood impacts. It is acknowledged that engineering solutions can't protect everyone/everywhere, so there is an effort to shift to early warning systems to allow the population to prepare for an event.

Compound flood can be difficult to forecast, and this study focussed on a combination of statistical, hydrodynamic and machine learning. Here a statistical approach Statistical supplies boundary conditions for hydrodynamic model (MSN_Flood), which in turn supplies training for machine learning models model. Numerous ML models were used (10 in total), providing differing levels of prediction skill (with the RBF model being the most suitable). The ML model uses 9 inputs and can successfully predict flood occurrence and early warning when coupled to a decision-making dashboard. After ML training is complete, the advantage of this system is the very rapid production of flood forecasts, which is a benefit for time-critical responses.

Talk 2: **2021 historical flood and 2024 historical drought of the Amazon River: Seamless modelling of their impacts on the Amazon estuary water level**

Paul COULET LEGOS/IRD, France

A study extreme flood and draught in Amazon estuary, delta and adjacent coastal ocean. The Amazon is an important ecosystem, accounting for 20% of global runoff and sustaining important socio-economic benefits for its riparian population. However, the Amazon is a poorly observed system, and satellite altimetry and a model (Schism) was to provide insight into the water level dynamics of the region. The focus was the year 2021 in which the second largest flood occurred, and 2023 was saw the largest draught, eclipsed in the subsequent year (2024). First a tidal atlas was established from SLA altimetry (AVISO) for the past 3 decades – the PyAtide atlas at 1/10°resolution, which allowed investigation of the variability of the M2 tidal constituent at seasonal timescales. Extreme sea level events were then modelled using Schism in 2D mode. This model had 1 million nodes from 5km to 40m resolution encompassing the estuary to coastal ocean. It was validated to the tidal atlas, exhibiting errors of up to 0.45m difference with a mean difference of 0.18m.

Water level maximums were studied for the 2021 flood by running sensitivity studies. The drivers of the flood were found to be due to 44% discharge and 47% tide in the mid estuary, 79% tide at the mouth and 86% tide at the coast. Alternatively, in drought conditions, water level minimums were due to lack of discharge and low tide. It was concluded that a cross-scale non-linear model is needed to study these effects.

Talk 3: **Salinity Study in the Casamance Estuary: Modeling and Observations**

Birane NDOM LOCEAN, CNRS/IRD/MNHN/SU

This presentation shifted to a case study in Africa, specifically salinity in the Casamance Estuary located in south Senegal. This estuary has a wet / dry season climate where salinity is ~40 psu in the dry and ~20 in the wet. In the dry season it behaves as an inverse estuary, where there is a landward salinity gradient. A hydrodynamic model was used to study these effects; a nested CROCO implementation with 1km parent and 200m child models coupled with AGRIF. The model used 10 levels and was forced with tide and freshwater flows it the head of an idealised channel beyond the tidal limit. Calibration was to sea level, exhibiting good temporal agreement but magnitude underestimated by up to 50%.

Particle tracking was used to investigate residual flows, revealing a complex pattern near the estuary mouth. Passive tracers were also used to estimate flushing time, which was ~600 days consistent with a residual current of 0.5 ms-1. The decrease in salinity decreases during the wet was found to be influenced by both the river discharge and the salty water imposed upstream. A field campaign undertaken, confirming a salinity distribution typical of a positive estuary in wet, but an inverse estuary in the dry. This was supported by modelling of the western estuary (for 2015), however, salinity increase in the dry was underestimated. This salinity was mainly driven by evaporation and advection, counterbalanced by horizontal mixing. Future improvements to address this underestimation are better representation of the idealised canal and new bathymetry.

Talk 4:

An Integrated Ocean Platform for Extreme Wave and Weather Early Warning Systems in The Bahamas

Brandon BETHEL, University of The Bahamas

Cancelled.

Talk 5: **3D seamless cross-scale modelling of tides and their seasonality in the GBM (GangesBrahmaputra-Meghna) delta**

Florence TOUBLANC LEGOS/CNRS

The focus of this study was the Bengel Delta in India, which is the largest in the world hosting 150M people. The area is characterised by low topography (<3m) and a macrotidal (4m) environment making it prone to flooding. A sharp salinity front exists at mouth of delta, which is influenced by tides, flow, extreme events (cyclones) and sea level rise. This front moves downstream under high flow (wet season). Strong stratification tends to stabilize the water column and alter the tidal dissipation within the flood plume. The aim of the study is to better understand the interactions between salinity and the tidal dynamics.

The system was modelled in 3D using Schism, which had evolved from previous 2D implementation. The model used 600,000 nodes, with resolution 15km offshore to 250m within the delta. There were 38 layers offshore, with 10 in shallow regions. The model was spun-up for the years 2006-2007. A large-scale validation was undertaken with 2020 salinity observations, where similar trends were sought to be identified. The model performed OK subsurface, but up to 2 psu errors were apparent at surface. A comparison to 10 years of in-situ data (Sherin), showed low salinity in the east, and higher in the west. The model shows overall overestimation of this trend, but more overestimation at start of dry, and underestimation at end (by up to 6 psu). The model performs better at the delta/coastal interface.

The tide has 10-30cm complex errors and amplitude errors of 0.4 to 18cm at mouth. Inclusion of inland data increases complex error (both under and overestimation). M2 tide showed seasonality differences: maximum differences in the west (22 cm for the model vs. 49 cm from observations). At the coast this reduced to 11 cm vs. 20 cm and 9 cm vs 8cm, also 20 cm vs. 10cm inland.

It is challenging to model mega-deltas with interconnected channels. The system is very dynamic with natural and anthropogenic channel changes. This is hard to represent with a mesh, and some tidal channel blockages can occur in the model with detrimental consequences on the solutions.

Future work should prioritize investigations – which areas to focus on? Ongoing work is to improve tidal representation. Also investigate shift in salinity in 2006-2007.

Discussion

- The session presented a variety of studies of sea to land and land to sea. How to go forward?
- Seamless transitions from ocean to up-estuary – should we persist with this approach? What is the role of DA?
- Depends on what you're looking for. Look to the needs of local population to make relevant science. Science question posed may dictate approach to modelling. Not only model refinement is important, also communication of results is important.
- COSS-TT – are we too scientific? We assume uptake of the science – is this happening? Need to educate stakeholders more. Need to listen to local needs to build a better solution. Science needs to be driven by societal impact.
- What does our science mean? How does it translate to a 'headline'?
- Coastal DA needs more attention, e.g. near river plumes. Requires more observations to make DA useful. Not a trivial exercise to correct flood plumes.

Find all presentations (pdf) of all sessions here.

Session 5: AI/ML applications in the coastal ocean prediction

Session chair and rapporteur: Pierre de Mey-Fremaux (CNRS) and Ronan Fablet (IMT Atlantique)

Session 5 featured 6 presentations, which focused on AI applications in coastal ocean predictions covering a variety of areas, from digital twins to model improvements and climate impacts to understanding heatwaves. The last presentation provided an overview of the results from the survey on the uptake of AI and ML in COSS-TT.

The oral presentations were:

- R. Fablet: AI in the Digital Twins of the Ocean: Opportunities and Challenges
- F. ADOBBATI: Statistical spatial wave downscaling in a regional sea from the global ERA5 dataset
- B. YUAN: Developing data-driven ocean models for the Norwegian coast and fjords using graph neural networks
- I.K.B. KULLMANN Norwegian Meteorological Institute
- E. Leroux: Equation discovery for climate impact: symbolic regression to emulate climate impact indicators for unseen scenarios
- A. Simon: Observational data-driven model to understand onset and decline of marine heatwaves in the Mediterranean
- Survey on AI uptake in COSS-TT *(see also paragraph 4. below)*

The poster presentations were:

- Irem Yildiz, Helmholtz Zentrum Hereon, Germany: Advancing Bathymetric Reconstruction and Forecasting Using Deep Learning
- Lars R. Hole, met.no, Norway: Applying Machine Learning to Predict Typhoon-Induced

Storm Surges in Vietnam --

The discussion covered:

- Key features of benchmarks
- Key challenges for AI in coastal oceanography
- Use of Symbolic Regression/Equation Discovery in Climate Science
- Fine-tuning and over-fitting issues
- Transition from deterministic regression models to generative models
- Coastal ocean benchmarks
- Operational uptake of AI and expected gains in coastal oceanography
- AI & ethical/governance issues
- Hybrid ocean models: important topic, technological bottleneck (Fortran-AI), high-level differentiable programming for ocean modeling (Julia, Jax, Pytorch,....)
- Relevance of a Community-level approach for model and benchmark development
- OSSE and data-driven approaches

Find all presentations (pdf) of all sessions here.

Session 6: User applications and decision tools / digital twins

Session chair and rapporteur: Dominique Obaton (Ifremer) and Mauro Cirano (University of Rio de Janeiro)

The session on User Applications and Decision Tools / Digital Twins featured eight oral presentations, showcasing a wide range of cutting-edge applications focused on digital twins, forecasting, decision support, and user engagement in marine and coastal environments. Topics ranged from nature-based solutions and real-time modeling systems to operational search and rescue platforms and pollution tracking tools. The presentations collectively emphasized the growing importance of integrated data systems, stakeholder collaboration, and technological innovation in addressing complex marine challenges.

- Joanna Staneva presented on the development of a Digital Twin of the Ocean, which aims to empower users to explore "what-if" scenarios through shared data, models, and collective knowledge. The presentation introduced EDITO, a public platform supporting the European community, and highlighted the use of nature-based solutions for enhancing biodiversity and mitigating coastal hazards. Examples included the use of seagrass meadows to reduce coastal erosion and the modeling of wave impacts.
- Md Jamal Uddin Khan discussed cyclone modeling in the Bengal Delta, a region highly vulnerable to extreme weather. His work emphasized the importance of coupled tide-surge-wave models, specifically through a SCHISM configuration, and used Cyclone Remal as a benchmark event. A notable outcome was the development of the BandSOS decision-support system, created in partnership with the Bangladesh Water Development Board to improve emergency preparedness.
- Lars R. Hole introduced an open-source ocean pollution model, addressing the current lack of pollution modeling coverage in European waters. The model was validated

using observations from an oil platform and supports several applications, including the assessment of shipping emissions and the dispersion of pollutants.

- Xueming Zhu focused on the Guangdong-Hong Kong-Macao Greater Bay Area in the South China Sea, a region influenced by dynamic processes at multiple scales, including mesoscale eddies, submesoscale features, and oceanic fronts. The presentation detailed the configuration and validation of a system designed to reproduce and predict the full 3D ocean field. Applications included combustible ice mining and maritime search and rescue, as part of a broader digital twin initiative.
- Tomasz Dabrowski presented a modeling approach aimed at supporting mariculture and biodiversity restoration, particularly for oyster farming. The model integrates ROMS, CROCO, PISCES, and a wave model, with near-real-time freshwater flow data and quarterly field measurements (CTD). A custom web portal provides users with access to data and forecasts. Key insights included the effect of high temperatures and low salinity on bay's water, with direct implications for decision-making in aquaculture.
- Ivan Federico (presentation delivered by a colleague) explored the construction of a coastal digital twin to address marine extremes and climate change impacts. The system combines SHYFEM and WW3 models and incorporates deep learning to improve wave forecasting. Applications include simulating flooding scenarios in the Venice Lagoon, modeling coastal erosion, and integrating biogeochemical coupling to support a holistic understanding of coastal systems.
- Cristina Forbes showcased the US Search and Rescue (SAR) service, which is also available internationally upon request. The system boasts readiness in under 30 minutes and typical mission deployment within two hours, contributing to the rescue of an estimated 12 lives per day, with 95% of incidents occurring within 20 nautical miles. The use of heat maps and independent assessments of forecasting models plays a central role in efficient SAR planning.
- Guillaume Charria concluded the session with a presentation on Marine Heatwaves (MHW) and their ecological impacts, such as geographical shifts in species, changes in phenology, and coral bleaching. He discussed the methodological distinction between fixed and shifting baselines in MHW detection and their implications for interpreting climate-driven changes in marine ecosystems.

Discussion

- Importance of long-term data for several processes and mechanisms for maintaining the infrastructure
- The use of relocatable models in SAR

Find all presentations (pdf) of all sessions here.

Session 7: The role of the COSS-TT in the UN Ocean Decade and beyond

Session chair and rapporteur: Tomasz Dabrowski (Marine Institute) and Joanna Staneva (Hereon)

The session focused on how COSS-TT can contribute to the UN Ocean Decade by supporting solution-oriented science and strengthening the link between coastal ocean forecasting systems, services, and societal needs.

Discussions emphasized the importance of aligning COSS-TT with major Decade initiatives, such as OceanPrediction DCC, CoastPredict, and DITTO, ensuring complementarity and avoiding duplication. The need to better understand connections and synergies between COSS-TT, OceanPredict, and DCC was highlighted. While some overlap exists, these efforts are largely complementary, with OceanPrediction DCC more directly connected to end users.

The need for COSS-TT to act as a bridge across disciplines and initiatives was highlighted. COSS-TT should take full advantage of existing efforts while strengthening ties with regional teams and initiatives such as the OceanPredict Digital Value Chain (DVC). Inclusion of ECOP (Early Career Ocean Professionals) in regional teams was seen as essential to ensuring sustainability and fresh perspectives.

Expanding participation from the Global South and working across disciplines—including social sciences, economics, and ecology—was seen as a key priority. Stronger connections with initiatives such as Global Coast, coastal atlases, and regional stakeholders were identified as important goals.

COSS-TT can help address the gap between science and decision-making. Many events focus mainly on policy makers, with limited scientific input. COSS-TT should ensure that scientific knowledge effectively informs decision-support tools, services, and coastal resilience strategies.

Strengthening connections with the new AI/ML working group and closer integration into the DCC architecture were seen as important next steps. The group encouraged monitoring COSS-TT participation in regional teams and supporting cross-cutting activities that contribute to the Ocean Decade's goals.

Finally, the group discussed that it may be appropriate to revise the Terms of Reference for COSS-TT in the future. This could ensure the team's mandate reflects evolving priorities, such as AI-enhanced forecasting, advanced observation strategies, and the inclusion of socio-economic and socio-ecological dimensions. It was also noted that COSS-TT should position itself to take full advantage of ongoing and emerging initiatives, acting as a unifying force that builds connections, reduces fragmentation, and promotes co-designed, solution-oriented science.

Find all presentations (pdf) of all sessions here.

3. Working group breakouts

Three working groups focusing on different science questions related to COSS-TT future activities were identified that participants could rotate through sequentially. Moderators and rapporteurs remained fixed at each group. Early-career scientists were encouraged to speak first at each group.

Working group 1: Integrated Observations – Modelling Framework

Rapporteur: Bruno Levier, MOi

WG 1 was addressing the question **“What are the key innovations and synergies needed to advance next-generation observation-modeling systems for coastal zones?”** and were given a few prompts to help explore the topic deeper.

1. What observational data are most critical for **high-resolution coupled models**?

The question was seen as problem-dependent and user-dependent. **Salinity** and **bathymetry** are crucial, but also nutrient loads by rivers, sediments, currents, water level, or discharges.
Another crucial aspect is quality control, as one study concluded that 50% of the data that is assimilated into a model makes the forecast better, while 50% makes it worse! (numerical weather forecast, US West coast). For some applications high-spatial (horizontal and/or vertical) and temporal resolutions are needed (mixing), while for others long time-series are useful.
Calibration of a model and assimilation do not require necessarily the same data.
New platforms: micro satellites, drones
More observational data from platforms like micro satellites, drones could be used, but would need to be collected, treated (quality control) and distributed. Low tech and lost cost instruments (and low carbon science) should have broader coverage.
Substitute: infer variables from not dedicated devices (water level from GPS station, water depth from optical measurements)

2. How can we better align **observations and model design**?

This provoked some questions. Does it mean models are designed to explain observations, or are models used to choose the location of observations? Do we want the resolution of observations to match the resolution of the models, or do we want model resolution to match observations resolution? It was stated that both communities, modeling and observations, would need to work closer together.
As model resolution increases, we need current observations to constrain the model. It needs to be ensured that the necessary data necessary for the calibration of the model (smart design) are available. Observing system simulation experiments (OSSEs) are a useful tool to know where to put observational platforms. It’s important to have high-resolution models where you have high-resolution observations to assimilate.
AI could be used to align model and data.

3. What partnerships can support bridging **observational gap**?

Local communities and its infrastructure should be more involved in covering gaps in observations, and new options could be sought, similar to obs data collection through ships of opportunity (fishing, ferries). A good example is the Macao Hong Kong bridge where a lot of instruments for taking measurements were installed.

Use OSEs and/or OSSEs could persuade funders to support new obs.

4. Other points:

We need social media for communication, collect funds, …

Working group 2: Artificial Intelligence (AI), Data assimilation (DA) and Digital twins

Rapporteur: Mauro Cirano, University of Rio de Janeiro

WG 2 was addressing the question **"How can AI, Machine Learning and DA enhance adaptative, resilient coastal forecasting systems, contributing to Digital Twins?"** and were given a few prompts to help explore the topic deeper.

Prompts:

- What hybrid DA/AI or physics-informed approaches are most promising?
- What are the main barriers (data, skills, computer resources)?
- How to ensure transparency and uncertainty quantification in AI enhanced systems?

Notes taken:

- Big debate regarding whether AI can or cannot replace DA. For sure, it can substitute some activities needed for DA
- For several people, AI is seen as a threat
- AI will require a new workflow
- AI can be frustrating, since sometimes it cannot provide the expected solution
- The first barrier to AI is cultural and also there is a problem in terms of a common language between the two communities
- There is an increased need for people to be open minded with regards to AI
- AI requires training before it can be used, but even if provided, there is a concern, since it is not based in physical processes
- The associated skill is a great limitation
- There is a need for standard methods
- There is a need to have someone from the AI community working hand in hand with people who understand the physics behind the processes
- AI can be used to develop products and/or to optimize tasks

Summary:

This session explored how AI, Machine Learning, and Data Assimilation (DA) can contribute to adaptive, resilient coastal forecasting systems and the development of Digital Twins. Key discussion points included:

- **AI and DA as Complementary Tools:** While AI is unlikely to replace DA entirely, it can support or enhance specific tasks within DA workflows.
- **Cultural and Technical Barriers:** A significant barrier to integration is the gap in language and mindset between AI experts and oceanography scientists. A lack of interdisciplinary skills and limited standard methods also hinder progress.
- **Transparency and Trust:** Concerns remain about AI's opacity, especially when models are not grounded in physical processes. Uncertainty quantification and explainability are essential.
- **Training and Collaboration Needs:** Reliable AI requires well-trained models and close collaboration between AI practitioners and oceanography experts.
- **Opportunities:** Hybrid approaches—particularly physics-informed AI—show promise. AI can also streamline processes and help develop targeted products.

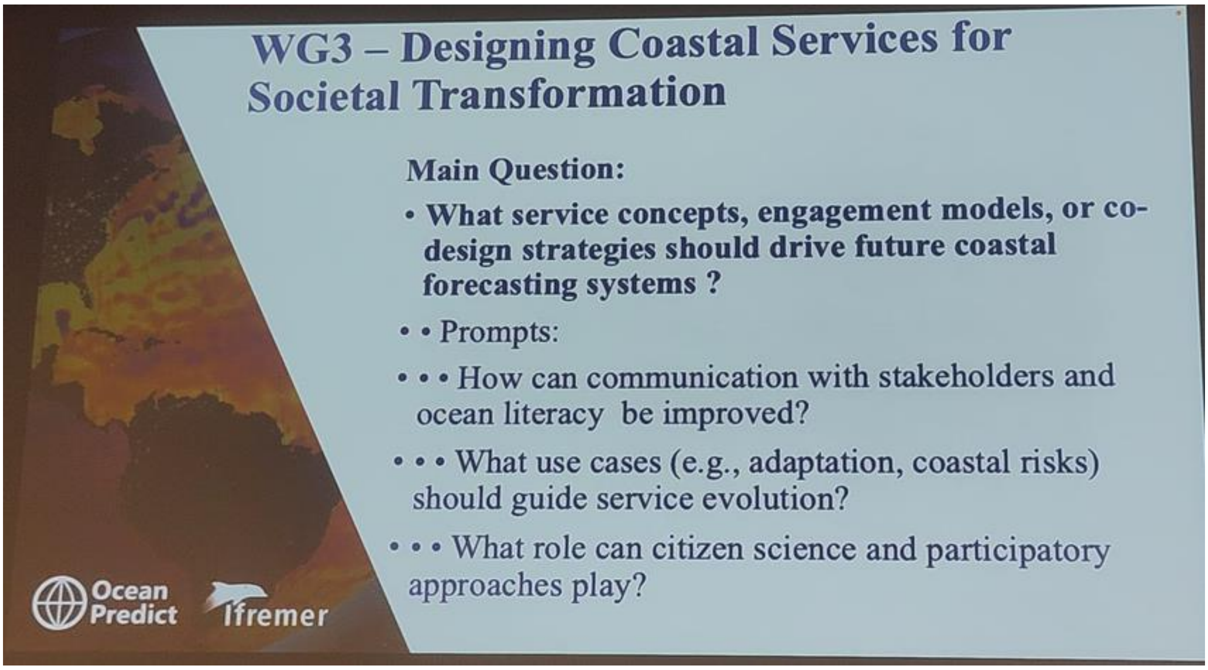
Recommendations

- Promote cross-disciplinary collaboration and training.
- Develop standards and shared methodologies for AI in forecasting.
- Ensure transparency and uncertainty quantification in AI-enhanced systems.
- Use AI strategically to optimize and support, not replace, physical models.

Working group 3: Designing Coastal Services for Societal Transformation

Rapporteur: Isabel Garcia Hermosa, MOi

WG 3 was addressing the question **"What service concepts, engagement models, or c-design strategies should drive future coastal forecasting systems?"** and were given a few prompts to help explore the topic deeper.



Prompts

Q1: How can communication with stakeholders and ocean literacy be improved?

Q2: What use cases (e.g., adaptation, coastal risk) should guide service evolution?

C3: What role can citizen science and participatory approaches play?

Key points mentioned in the summary:

Co-design of coastal services

- Include stakeholders from the onset of the co-design effort, even at proposal writing stage. Have several meetings to get diverse perspectives in the mat.
- Include interested parties (farmers, visitors, fishermen, locals (people).
- Consider viewpoints from other "community experts" like software engineers, social scientists, economists, communication experts (as focus groups).
- Understand the scope, the key questions, user needs (policy, management) and consider the output format, e.g. should this be plots, time series, a traffic light system (red, yellow, green).

In general, decision makers need to receive sufficient background information before they can provide clear statements of their needs. Background information needs to be kept clear and simple (language and communication), has to be easily findable … our worries (as scientists) are not their worries. Additionally, to close the loop, scientists could set up events to communicate and explain what is happening and inform, educate and share knowledge in their own language… literally (tools should be in their own languages).

Citizen science, literacy

- Involve the public to help get information, measurements, observations. They can be very motivated…
- Clear/easy instructions > REMEMBER feedback… they want to know how you use the data.
- SIMPLE communication and concepts. Not all communities have the same landmarks/references… different approaches can work in certain situations... can use less orthodox methods to reach further… artistic means to communicate, theatre, music, dance.

4. Survey on the uses of Artificial Intelligence and Machine Learning in the COSS-TT

Organised and presented by Pierre de May-Frémaux (CNRS)

We have set up a survey to learn more about uses of AI/ML in COSS-TT. AI/ML are now becoming part of the toolbox of the coastal modelling/forecasting community, on several aspects: retrieval from data, super-resolution and downscaling, forecasting, emulators, etc. It will be important to categorize the different uses of the AI in the Task Team, and the COSS-TT Systems Information Table (SIT) does not list the uses of AI in the COSS-TT systems. We also like to prepare the linkage with the AI-TT within OceanPredict and the COSS-TT components of Digital Twins.
The survey was run among TT members

Survey questions

Q1 - Please list in a few words/lines the current or planned uses of AI/ML in your regional and coastal systems represented in the COSS-TT.
Q2 - For each numbered use, please indicate to which system, or model, or application, this use is attached (please indicate if it is already listed in the SIT).
Q3 - For each use, indicate the development status: current, under development, planned, envisaged.
Q4 - For each use, briefly indicate what motivates or has motivated the use of an AI/ML technique.
Q5 - For each current or under development use, briefly indicate the obstacles and difficulties encountered.

Summary of survey results

We received 13 responses from 29 COSS-TT members = 44.8% response rate. We think the 16 who did not respond have no current AI/ML activities or plans.

- **Examples of AI/ML use in COSS-TT**
  - Construction of fields of bgc variables (Herzfeld), of pCO2 (Veitch), of SSS (Zavialov)
  - Generation of pseudo-obs of ML-generated total alkalinity (Edwards)
  - Downscaling of currents (Paquin), downscaling of climate change scenarios (Sotillo)
  - Predicting currents (Choi), coastal forcings (Sotillo), storm surges (Hole), wave parameters (Federico), Chlorophyll-A (Gan)
  - Generating emulators of port-scale systems (project, Dunphy)

- **Need to continue survey – run new questions**
  - Could include training
  - What would be expected from the COSS-TT?
  - Other suggestions?

5. COSS-TT business meeting

Rapporteur: Stéphanie Cuven, Mercator Ocean international

Organising the next COSS-TT meeting

Venue

- Tentatively planned for Brazil in 18 months – Nov/Dec 2026. Need to invest another continent than Europe. Mauro Cirano could host the next in-person COSS-TT meeting.
- It is hoped to get in-kind support for networking event.

ECOPs

- Importance to have ECOP participation. This could be facilitated through a special ECOP session, or through invitations of ECOPs to all sessions.

Format / lessons learnt

- The current format of talks followed by a 20-minute discussions per session was welcomed but the discussion slot could be longer in future.
- Breakout sessions should have been given more time for discussion.
- Duration of oral presentations could be extended (was 15 min (12'+3' for questions)) to 20' to allow more detailed presentations which would cut time for discussions or keep 15' or only 12' to have more time for session discussions. Decision for next meeting will depend on number of presentations and available time.

Themes

- Theme 3 "Land-ocean continuum" has received a low number of contributions. Need to attract a broader community by defining less-specific themes

UN Decade engagement

- Important to have OceanPrediction DCC representation.

Topical Collection in Ocean Dynamics "Theoretical, Computational and Observational Oceanography"

- A new topical collection is planned, including an introduction from the co-chairs
- Possibility to submit individually

ACTION: COSS-TT co-chairs and coordinators to conduct a survey in Sep 2025 to define the best way to organise the next topical collection (deadline, title…) and to identify authors (interested contributors) and lead editor(s).

COSS-TT Review Paper

- A review paper is under discussion.

- Further details to be clarified.

Membership

- Efforts will be made to attract more participants from the Global South.

Communication

- How to improve communication among COSS-TT members between meetings? The interaction between members increases during the preparation of collaborative contribution.
- Strengthening coordination between COSS-TT and other Task Teams (notably AI, SynObs, and ETOOFS, which already have some connections). Interactions between TTs are accelerating through events, special issues, and collaborative projects.

Attendance of COSS-TT members/ or substitutes

No	First name	Surname	Affiliation
1	Jacopo	Alessandri (substitute)	CMCC
2	Guillaume	Charria	Ifremer
3	Byoung-Ju	Choi	Chonnam National University
4	Mauro	Cirano	University of Rio de Janeiro
5	Stéphanie	Cuven (coordinator)	Mercator Ocean international
6	Jianping	Gan	Hong Kong University of S&T
7	Marcos	Garcia Sotillo	NOW Systems
8	Tomasz	Dabrowski	Marien Institute
9	Pierre	De Mey-Frémaux	CNRS
10	Mike	Herzfeld	CSIRO
11	Lars R.	Hole	Met.no
12	Villy	Kourafalou	University of Miami
13	Alexander	Kurapov (co-chair)	NOAA
14	Bruno	Levier	Mercator Ocean international
15	Joanna	Staneva (co-chair)	Hereon
16	Huijie	Xue	Xiamen University

Appendices

Appendix A: Meeting agenda overview

	Tuesday, 17 June
13:30 - 14:00	Registration and poster setup
14:00-14:10	**Aims of the Workshop - COSS-TT Co-chairs**
14:10-15:30	**Theme 1:** Observing infrastructure in the coastal seas, integration with models and with forecasting **ORAL SESSION**
15:30-16:00	**COFFEE BREAK**
16:00-16:40	**Theme 1: Observing infrastructure in the coastal seas, integration with models and with forecasting ORAL SESSION**
16:40-17:00	**Discussion - Theme 1** (20 min)
17:00-18:00	**POSTER SESSION** (60 min)

	Wednesday, 18 June
09:00-09:10	**Welcome to the COSS-TT meeting, P. Moal, Ifremer Bretagne Centre**
09:10-10:30	**Theme 5:** AI/ML applications in the coastal ocean prediction - **ORAL SESSION**
10:00-11:00	**COFFEE BREAK**
11:00-11:40	**Theme 5:** AI/ML applications in the coastal ocean prediction - **ORAL SESSION**
11:40-12:00	**Discussion** - Theme 5 (20 min)
12:00-12:40	**POSTER SESSION** (40 min)
12:40 - 14:00	**LUNCH** (80 min)
14:00-15:20	**Theme 2:** Ocean modelling at the regional and shelf sea spatial scales and seamless integration with larger-scale estimates (focus on processes) - **ORAL SESSION**
15:20-15:50	**COFFEE BREAK**
15:50-16:50	**Theme 2**: Ocean modelling at the regional and shelf sea spatial scales and seamless integration with larger-scale estimates (focus on processes) - **ORAL SESSION**
16:50-17:10	**Discussion** (Theme 2.1: Regional and shelf sea processes) - 20 min
17:10-18:00	**POSTER SESSION** (50 min)

	Thursday, 19 June
09:00-10:20	**Theme 2** (cont.): Focus seamless integration to larger scale estimates - **ORAL SESSION**
10:20-10:50	**COFFEE BREAK**
10:50-11:10	**Discussion** (Theme 2.2: Seamless intergration with larger scale estimates) - 20 min
11:10-12:30	**Theme 3**: Land-ocean continuum & theme 4: Coastal resilience - **ORAL SESSION**
12:30-13:45	**LUNCH** (75 min)
13:45-14:25	**Theme 3:** Land-ocean continuum & theme 4: Coastal resilience - **ORAL SESSION**
14:25-14:45	**Discussion** Theme 3 (ocean-land continuum, coastal resilience) - 20 min
14:45-14:55 14:55-15:05	**Theme 7:** The role of the COSS-TT in the UN Ocean Decade and beyond - **ORAL SESSION**
15:05-15:25	**Discussion** UN Ocean Decade
15:25-15:45	**COFFEE BREAK**
15:45-16:05	**Breakouts** (20 min)
16:05-16:15	**Breakouts** (20 min)
16:15-16:25	**Breakouts** (20 min)
16:45-18:00	**POSTER SESSION + BUSINESS MEETING** (75 min)
19:00-23:00	Cocktail Reception (including food and drinks) organized at the 70.8 Museum, located in downtown venue: "Les Ateliers des Capucins"

	Friday, 20 June
09:00-10:20	**Theme 6:** User applications and decision tools / digital twins - **ORAL SESSION**
10:20-10:50	**COFFEE BREAK**
10:50-12:10	**Theme 6**: User applications and decision tools / digital twins **ORAL SESSION**
12:10-12:30	**Discussion** Theme 6 (20 min)
12:30-12:50	**Reports from breakouts, final thoughts** (20 min)
12:50-13:00	**Concluding remarks**
13:00-14:00	**LUNCH** (60 min)
14:00-18:00	**Networking event** Guided tour (round trip by bus) Discover the typical French Brittany coast

Appendix B: Oral and poster presentations (all sessions)

Oral presentations

ID	Name	Affiliation	Presentation
Introduction		**Welcome to the COSS-TT meeting at Ifremer**	
	Joanna STANEVA & Alex KURAPOV	Hereon & NOAA	Welcome and introduction to the aims of the Workshop
Theme 1 (Day 1)		**Observing infrastructure in the coastal seas, integration with models and with forecasting**	
1.1	Ivane PAIRAUD	LOPS/Ifremer	Augmented observation strategy in the coastal zone to feed numerical twins of the ocean in river impacted areas
1.2	Baptiste MOURRE	IMEDEA (CSIC-UIB)	SWOT satellite sea level observations: assessment and integration with high-resolution regional simulations
1.3	Andrew MOORE	UCSE	4D-Var Data Assimilation in a Nested Configuration of ROMS: Integrating Data from Observations Across Scales
1.4	Anju SATHYANARAYANAN	AWI	Influence of temperature and salinity data assimilation on an operational forecast model for the North and Baltic Seas
1.5	Buoung-Ju CHOI	Chonnam National University, Republic of Korea	Impact of Hydrography and Geostrophic Current Observing Systems for the modeling of Northwestern Pacific Ocean
Theme 2 (Day 2 & 3)		**Ocean modelling at the regional and shelf sea spatial scales and seamless integration with larger-scale estimates (focus on processes)**	

2.1	Mike HERZFELD	CSIRO	Wave-flow coupling of SWAN with an unstructured model
2.2	Pierre GARREAU	Ifremer	Modelling convective plumes in the framework of a quasi-non-hydrostatic approach
2.3	Breno CABRAL	Physical Oceanography Laboratory – LOF/COPPE, Federal University of Rio de Janeiro	Ocean Forecasting and Analysis Systems as a Tool to Investigate Coastal Trapped Waves Along the Brazilian Continental Margin
2.4	Fabio GIORDANO	National Institute of Oceanography and Applied Geophysics – OGS	On the effect of different grid resolutions and mixing schemes on vertical dynamics in coastal ocean models: a case-study in a shallow, semi-enclosed basin (northern Adriatic Sea)
2.5	Audrey DELPECH	CNRS / Physical and Spatial Oceanography Laboratory	Persistent coastal temperature biases in km-scale climate models due to unresolved ocean mixing
2.6	Jianping GAN	The Hong Kong University of Science and Technology	Study of the regional earth system under climate change and human activities in the Greater Bay Area
2.7	Pierre DE MEY-FREMAUX	CNRS/LEGOS	Coupled multi-grid stochastic modelling and data assimilation and their impact on regional/coastal forecasting in the Bay of Biscay
2.8	Tom LOUDEN-COOKE	Met Office	The effect of including boundary perturbations in ensembles of the North-West European Shelf-Seas
2.9	Maud MARTINEZ ALMOYNA	LOPS – Ifremer	Regions Of Freshwater Influence in the Bay of Biscay and the English Channel during the last two decades
2.10	Stefano QUERIN	National Institute of Oceanography and Applied Geophysics – OGS	Monitoring and predicting coastal dynamics for management, conservation and restoration: the MER Italian high-resolution modeling system
2.11	Bruno LEVIER	Mercator Ocean International	IBIRYS: a Regional High-Resolution Reanalysis (physical and biogeochemical) of the last

			30 years (1993-2023) over the European Northeast Shelf
Theme 3 & 4 (Day 3)		**Land-ocean continuum & Coastal resilience**	
3&4.1	Indiana OLBERT	University of Galway	Modelling and Forecasting of Compound Coastal-Fluvial Floods in Urban Built Environment
3&4.2	Paul COULET	LEGOS/IRD, France	2021 historical flood and 2024 historical drought of the Amazon River: Seamless modelling of their impacts on the Amazon estuary water level
3&4.3	Birane NDOM	LOCEAN, CNRS/IRD/MNHN/SU	Salinity Study in the Casamance Estuary: Modeling and Observations
3&4.4	Brandon Bethel	University of The Bahamas	An Integrated Ocean Platform for Extreme Wave and Weather Early Warning Systems in The Bahamas
3&4.5	Florence TOUBLANC	LEGOS/CNRS	3D seamless cross-scale modelling of tides and their seasonality in the GBM (Ganges-Brahmaputra-Meghna) delta
Theme 5 (Day 2)		**AI/ML applications in the coastal ocean prediction**	
5.1	Ronan FABLET	Ifremer	AI in the Digital Twins of the Ocean: Opportunities and Challenges
5.2	Erwan LE ROUX	IMT Atlantique	Equation discovery for climate impact: symbolic regression to emulate climate impact indicators for unseen scenarios
5.3	Amélie SIMON	LOPS/Ifremer	Observational data-driven model to understand onset and decline of marine heatwaves in the Mediterranean
5.4	Ina K. B. KULLMANN	Norwegian Meteorological Institute	Developing data-driven ocean models for the Norwegian coast and fjords using graph neural networks

5.5	Federica ADOBBATI	National Institute of Oceanography and Applied Geophysics, Italy	A deep learning approach for coastal downscaling: the northern Adriatic Sea case-study
5.6	Bing YUAN	Hereon, Germany	Statistical spatial wave downscaling in a regional sea from the global ERA5 dataset
Theme 6 (Day 4)		**User applications and decision tools / digital twins**	
6.1	Joanna STANEVA	Helmholtz Zentrum HEREON	Advancing Coastal Resilience: Scenario-Based Optimization of Nature-Based Solutions
6.2	Md Jamal Uddin KHAN	CNES/CNRS/IRD/UT	A high-resolution robust operational coastal flood forecasting system over the Bengal Delta: the Band-SOS project
6.3	Lars R. HOLE	Norwegian Meteorological Institute	ChemicalDrift – A new open source ocean pollution model
6.4	Xueming ZHU	Southern Marine Science and Engineering Guangdong Laboratory (Zhuhai)	The South China Sea Guangdong-Hongkong-Macao Greater Bay Area Oceanographic Analysis and Forecasting System
6.5	Tomasz DABROWSKI	Marine Institute	A coastal monitoring and forecasting system for Galway Bay and Dublin Bay, Ireland's " services for aquaculture, biodiversity restoration and environmental monitoring.
6.6	Jacopo ALESSANDRI	CMCC	Integrated Coastal Digital Twin framework for enhancing sustainable, science-based coastal resilience and adaptation strategies
6.7	Cristina FORBES	USCG	Numerical Ocean and Atmospheric Forecast Models in Search and Rescue: Benefits, Challenges and Possible Improvements in the Future
6.8	Guillaume CHARRIA	LOPS/Ifremer	Impact of Marine Heatwaves in the coastal ocean: an open question
6.9	Marcos G SOTILLO	NOW Systems	Operational Ocean Monitoring and Forecasting Services for decision-making in the

			coastal ocean
Theme 7 (Day 3)		The role of the COSS-TT in the UN Ocean Decade and beyond	
7.1	Stéphanie CUVEN	Mercator Ocean International	The UN Ocean Decade framework, actions relevant to the COSS-TT
7.2	Villy KOURAFALOU	Univ. Miami	GlobalCoast: A transformative network for observing, modeling and predicting coastal hazard impacts

Posters presentations

No	First name	Last name	Affiliation	Abstract title
1	Alessandro	Aguiar	State University of Rio de Janeiro	Numerical assessment of tidal potential energy in the Brazilian Equatorial Shelf
2	Breno	Cabral (2)	Physical Oceanography Laboratory – LOF/COPPE, Federal University of Rio de Janeiro	An operational daily current bulletin of Santos and Campos basins
3	Guillaume	Charria (2)	LOPS / Ifremer	MARC – Modeling and Analysis for Coastal Research
4	Wei	Chen	Helmholtz-Zentrum Hereon	Effects of heatwave events on dissolved oxygen in the Elbe Estuary
5	Mauro	Cirano (1)	Federal University of Rio de Janeiro (UFRJ)	A Comparative Analysis of Ocean Reanalysis in the South Atlantic

6	Mauro	Cirano (2)	Federal University of Rio de Janeiro (UFRJ)	In situ Observations of the Spatiotemporal Variability of Hydrodynamics on the Amazon Continental Shelf
7	Jacopo	Dall'Aglio	University of Bologna	Two-way nested high-resolution model of the Gibraltar Strait
8	Luis	Ferrer (1)	AZTI	Field observations and modelling of the waters of the southeastern Bay of Biscay
9	Luis	Ferrer (2)	AZTI	Ocean and coastal modelling in the waters of the Basque Country
10	Md Abrar Al	Foysol	Shahjalal University of Science & Technology	Shoreline Dynamics and Land Use Shifts in Sandwip Island, Bangladesh: A Comprehensive Analysis Using Digital Shoreline Analysis System and Satellite Imagery
11	Valérie	Garnier	Ifremer, LOPS-OC	The dynamics off Toulon explored from various datasets
12	Pierre	GARREAU (2)	Ifremer	A low intrusive method to simulate buoyant effluent plume in "Far-Field Hydrodynamics Models"
13	Naoki	Hirose	Kyushu University	Regular triangle approximation for reduced-order Kalman filter
14	Lars R.	Hole	Norwegian Meteorological Institute	SailBuoy Ocean Currents: Low-Cost Upper-Layer Ocean Current Measurements in Coastal and Open sea
15	Lars R.	Hole	Norwegian Meteorological Institute	Applying Machine Learning to Predict Typhoon-Induced Storm Surges in Vietnam
16	Seyed Taleb	Hosseini	Helmholtz Zentrum HEREON	Variations in Sediment Concentration caused by Modified Waves and Currents in an Offshore Wind Farm

17	Kelli	Johnson	Helmholtz Zentrum HEREON	FOCCUS: advancing ocean prediction with improvements to European coastal monitoring and forecasting
18	Md Jamal Uddin	Khan (2)	CNES/CNRS/IRD/UT	High-resolution compound flood modeling with publicly available datasets: A case-study over Madagascar land-ocean continuum
19	Alexander	Kurapov	NOAA NOS	Improvements in the US West Coast Ocean Forecast System (WCOFS)
20	Stéphanie	Louazel	Shom	Shom operational regional ocean forecasting platform
21	Dominique	Obaton	Ifremer	Coastal in situ data available in the Copernicus marine service
22	Coline	Poppeschi	Ifremer	Unraveling hypoxia events in a context of climate change in the Bay of Vilaine, France
23	Tahmina Anwar	Tonny	Shahjalal University of Science & Technology	Investigating Changes in Nijhum Dwip Mangrove Forest: A Study on NDVI, LAI & Land Use Land Cover
24	Huijie	Xue	Xiamen University (XMU)	Physical-Biogeochemical Coupling Mechanisms of Deoxygenation Events in the East China Sea
25	Irem	Yildiz	Helmholtz Zentrum HEREON	Advancing Bathymetric Reconstruction and Forecasting Using Deep Learning

Appendix C: Meeting attendees

(we might be missing names of online participants as we do not hold all the information)

No	First Name	Last Name	Organisation / Institute	Country	COSS-TT member	In-person attendance
1	Hazem Usama	Abdelhady	Texas A&M University	USA	0	0 - online
2	Federica	Adobbati	National Institute of Oceanography and Applied Geophysics - OGS	Italy	0	1
3	Jacopo	Alessandri	University of Bologna	Italy	0	1
4	Touria	Bajjouk	Ifremer	France	0	1
5	Nathaniel	Bensoussan	IFREMER - LOPS - OC	France	0	1
6	Breno	Cabral	Physical Oceanography Laboratory – LOF/COPPE, Federal University of Rio de Janeiro	Brazil	0	1
7	Gildas	Cambon	LOPS / IRD	France	0	1
8	Guillaume	Charria	LOPS / Ifremer	France	1	1
9	Wei	Chen	Helmholtz-Zentrum Hereon	China	0	0 - online
10	Byoung-Ju	Choi	Chonnam National University	Korea	1	1
11	Mauro	Cirano	Federal University of Rio de Janeiro	Italy	1	1
12	Paul	Coulet	LEGOS	France	0	1
13	stephanie	Cuven	Mercator Ocean International	France	1	1
14	Tomasz	Dabrowski	Marine Institute	Ireland	1	1
15	Jacopo	Dall'Aglio	University of Bologna, Department of Physics and Astronomy	Italy	0	1
16	Pierre	De Mey-Frémaux	LEGOS/CNRS	France	1	1
17	Audrey	Delpech	CNRS / Physical and Spatial Oceanography laboratory	France	0	1
18	Fabien	Durand	LEGOS / IRD	France	0	1
19	Morgan	Dussauze	Shom	France	0	1
20	Vincent	Echevin	LOCEAN	France	0	1
21	ronan	fablet	IMT Atlantique	France	0	1
22	Luis	Ferrer	AZTI	Spain	0	1
23	Cristina	Forbes	United States Coast Guard	USA	0	1
24	MD Abrar Al	Foysol	Shahjalal University of Science and Technology	Bangladesh	0	0 - online
25	Jianping	Gan	Hong Kong University of Science and Technology	Canada	1	1
26	Isabel	Garcia Hermosa	Mercator Ocean International	Spain	0	1

27	Marcos	Garcia Sotillo	NOW Systems	Spain	1	1
28	Valérie	Garnier	Ifremer	France	0	1
29	Pierre	Garreau	Ifremer	France	0	1
30	Fabio	Giordano	National Institute of Oceanography and Applied Geophysics - OGS	Italy	0	1
31	Fanny	Girard-Ardhuin	Ifremer	France	0	1
32	Steven	Herbette	LOPS / UBO	France	0	1
33	Mike	Herzfeld	CSIRO	Australia	1	1
34	Naoki	Hirose	RIAM, Kyushu University	Japan	1	0 - online
35	Lars R.	Hole	Norwegian Meteorological Institute	Norway	1	1
36	Gregg	Jacobs	University of Southern Mississippi	USA	0	0 - online
37	Frédéric	Jourdin	Shom	France	0	1
38	Md Jamal Uddin	Khan	LEGOS / IRD	Bangladesh	0	1
39	Vassiliki	Kourafalou	University of Miami	Greece	1	1
40	Ina K. B.	Kullmann	Met Norway	Norway	0	1
41	Alexander	Kurapov	NOAA	USA	1	1
42	Andrew	Kurapov	Endicott College	USA	0	1
43	Evan	Lemarchand	Ifremer	France	0	0 - online
44	Jean-Francois	Le Roux	Ifremer	France	0	1
45	Erwan	Le Roux	IMT Atlantique, Brest	France	0	1
46	Bruno	Levier	MERCATOR OCEAN	France	1	1
47	Qian	Liu	The Institute of Oceanology, Chinese Academy of Sciences	China	0	1
48	Tom	Louden-Cooke	Met Office	UK	0	1
49	Paula	Marangoni	Physical Oceanography Laboratory – LOF/COPPE, Federal University of Rio de Janeiro	Brazil	0	0 - online
50	Audrey	MALLEJAC	Ifremer	France	0	1
51	Maud	Martinez Almoyna	Ifremer	France	0	1
52	Clio	Michel	University of Bergen	Norway	0	0 - online
53	Andrew	Moore	Ocean Sciences Dept, University of California Santa Cruz	USA	0	1
54	Mathieu	Morvan	Shom	France	0	1
55	Baptiste	Mourre	Mediterranean Institute for Advanced Studies, IMEDEA (CSIC-UIB)	France	0	1
56	Lars	Nerger	AWI	Germany	1	0 - online

57	Birane	Ndom	Université Assane Seck de Ziguinchor	Senegal	0	1
58	Dominique	Obaton	Ifremer	France	0	1
59	Indiana	Olbert	University of Galway, Ireland	Ireland	0	1
60	Ivane	Pairaud	Ifremer	France	0	1
61	Jen-Ping	Peng	IMEDEA	Spain	0	0 - online
62	Sebastian	Petton	Ifremer	France	0	0 - online
63	Romane	Pollet	LOV	France	0	0 - online
64	Coline	Poppeschi	Ifremer	France	0	1
65	Stefano	Querin	National Institute of Oceanography and Applied Geophysics - OGS	Italy	0	1
66	Gustav	Rautenbach	SAEON	South Africa	0	1
67	Stephane	Raynaud	Actimar	France	0	0 - online
68	Anju	Sathyanarayanan	Alfred Wegener Institute for Polar and Marine Research	Indian	0	1
69	Amélie	Simon	LOPS / IFREMER	France	0	1
70	Joanna	Staneva	HEREON	Germany	1	1
71	Louazel	Stéphanie	Shom	France	0	1
72	Juliana	TAVORA BERTAZO PEREIRA	Ifremer	France	0	1
73	Sébastien	Theetten	IFREMER	France	0	1
74	Tahmina Anwar	Tonny	Shahjalal University of Science and Technology	Bangladesh	0	0 - online
75	Florence	Toublanc	LEGOS/CNRS	France	0	1
76	Vasilios	Vervatis	National and Kapodistrian University of Athens	Greece	0	0 - online
77	Romaric	Verney	Ifremer	France	0	1
78	Madeleine	Walker	LOV	France	0	0 - online
79	JC	Warner	USGS	USA	0	0 - online
80	John C	Wells	Ritsumeikan University	Japan	0	0 - online
81	Kirsten	Wilmer-Becker	Met Office	UK	1	0 - online
82	Jilian	Xiong	University of Washington	USA	0	0 - online
83	Bing	Yuan	Helmholtz-Zentrum Hereon	China	0	1
84	Li	Zhai	Bedford Institute of Oceanography	Canada	0	0 - online
85	Xueming	Zhu	Southern Marine Science and Engineering Guangdong Laboratory (Zhuhai)	China	0	1