Joint IAG-IHO Advisory Board on the Law of the Sea

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IS UNCLOS FIT FOR PURPOSE IN MODERN TIMES?
ACHIEVEMENTS, CHALLENGES AND FUTURE PATHWAYS

Organised in association with The Qatari Standing Committee of the Convention on the Law of the Sea

ABSTRACTS

SESSION 1 – UNCLOS: Fit for Purpose in Modern Times

The Ability of UNCLOS to face Modern Challenges: An Overview
Dr. Elfatih Elnour
It has been over 40 years since the United Nations Convention on the Law of the Sea (UNCLOS) was concluded and opened for signature, and 30 years since its entry into force. This has sparked renewed interest in how UNCLOS can continue to regulate new uses and threats to our oceans. The Agreement has a long list of milestones and successes, yet it also faces many challenges. Most of these challenges do not stem from poor implementation of UNCLOS itself; rather, some may arise from the inadequate enforcement of other treaties, while others originate from land-based issues that cannot be addressed by this framework agreement. This presentation briefly examines these successes and challenges and argues that UNCLOS remains functional due to the flexible mechanisms it has in place, which means it should not be renegotiated. UNCLOS is a framework convention that provides a broad commitment to its parties while allowing the specifics to be worked out through other detailed and subsequent agreements and mechanisms.

"Flexibility" of UNCLOS
Professor Andrew Serdy
The paper will discuss why the need for flexibility arises, pointing to the difficulty of amending UNCLOS as well as reluctance of most States to do so. It then considers the underused role of meetings of the States Parties, explaining why the contention that such meetings have no authority to discuss matters of substance is misguided, and highlighting instances where they have done just that. Moving to examples of provisions in UNCLOS being interpreted and applied flexibly, two are offered: a general provision with inbuilt flexibility (Article 59) and a technical one (Article 76(4)), one unnecessarily restrictive aspect of whose text has been sensibly disregarded by all concerned. Lastly, the paper ponders whether there are instances of too much flexibility, answering in the affirmative for situations where it leads to undesirable non-uniformity, illustrated by straight baselines and rocks within the meaning of Article 121(3).

Successes and Shortcomings of UNCLOS in Safeguarding the Marine Environment
Dr. Adnan Al-Azri
The United Nations Convention on the Law of the Sea (UNCLOS) serves as the main legal framework for governing the oceans, establishing a comprehensive legal framework for the rights and responsibilities of states in the use and protection of the world's oceans. Among its notable successes,

UNCLOS has advanced the equitable delineation of maritime zones, strengthened international cooperation, mandated the prevention and reduction of marine pollution, and encouraged scientific research and knowledge sharing. These achievements have provided a basis for stability, predictability, and collaboration in ocean governance. Central to its implementation is the Commission on the Limits of the Continental Shelf (CLCS), which plays a critical role in reviewing and making recommendations on states' submissions regarding the outer limits of their continental shelves beyond 200 nautical miles. This paper explores the strengths and limitations of UNCLOS in the realm of ocean governance, with a specific focus on successes and challenges of the CLCS.

From Policy to Practice: Strengthening Nigeria's Blue Economy through Integrated Ocean Governance
Admiral Ayo Olugbode

Sustainable ocean governance is a critical global priority for advancing the blue economy, balancing economic growth, environmental protection, and social equity. International frameworks such as the United Nations Convention on the Law of the Sea (UNCLOS) and Sustainable Development Goal 14 provide guidance for nations to manage their marine resources effectively. However, many countries face challenges in translating blue economy policies into actionable outcomes due to fragmented institutions, legal gaps, and limited technological capacity. This paper explores these global challenges through the lens of Nigeria, a maritime nation with significant ocean resources and strategic importance in the Gulf of Guinea. Focusing on Nigeria's integrated ocean governance framework, the study evaluates the alignment of national policies with international standards, the effectiveness of institutional coordination among key agencies including the National Hydrographic Agency, and the implementation of Marine Spatial Planning. The analysis highlights persistent legal and regulatory inconsistencies, data-sharing limitations, and enforcement challenges that hinder the realization of Nigeria's blue economy potential. The paper concludes by recommending targeted legal reforms, enhanced inter-agency collaboration, and strategic investments in hydrographic and geospatial technologies. These measures are essential to bridge the gap between policy and practice, positioning Nigeria as a model for sustainable blue economy development in the global maritime community.

SESSION 2 – UNCLOS and Ocean Management Challenges

UNCLOS and the New Challenges of the Underwater Dimension
Ilaria Tani

Forty-one years after the entry into force of the United Nations Convention on the Law of the Sea (UNCLOS), the connection between its provisions and the management of marine geospatial data has become more significant than ever. The effective management of such data is essential for the implementation of a legal instrument whose geographical scope is not only exceptionally vast — as is the case with many international treaties — but also three-dimensional. GIS specialists operate within, or are frequently called upon to collaborate with, all institutions established under UNCLOS, and GIS Officers serve permanently within its Secretariat. This occurs despite the fact that the Convention itself provides no detailed guidance on the collection, transmission, or management of geospatial data. Nevertheless, the availability of marine geospatial data and its sound management are fundamental for achieving a wide range of objectives and for the effective implementation of legal instruments.
One illustrative example is the BBNJ Agreement, whose implementation will necessarily depend, to a considerable extent, on the expertise of geospatial data management specialists. Deep-sea operations — including those aimed at the protection of critical infrastructure and submarine-escape-and-rescue missions for individuals trapped on the seafloor or in the water column — represent further contexts in which reliable, timely, and authoritative geospatial information is indispensable.
My contribution to the 12th ABLOS Conference seeks to highlight the importance of fostering effective dialogue between geospatial specialists and legal experts, identifying an opportunity for exchange within the framework of the United Nations Informal Consultative Process on Oceans and the Law of the Sea. On the same occasion, the recent publication by the Secretary-General on Marine Geospatial

Information Management could be presented, reflecting the current interest of Member States in this topic."

The Effectiveness of the UNCLOS in Combating Maritime Environmental Crimes: A Contemporary Criminal Approach
Professor Randa El Fakhry and Dr. Roger Fakhoury

The United Nations Convention on the Law of the Sea is the primary international reference regulating issues related to the use of seas and oceans. It has devoted significant attention to protecting the marine environment, regulating navigation, and resolving maritime disputes. While this convention has established a legal framework that ensures harmony between the concept of coastal states' sovereignty and the preservation of the common interests of the international community, it is distinguished by its penal dimensions, in terms of combating criminal acts across the seas and assuming criminal liability. Here, the issue of environmental crimes in the oceans and seas, such as oil pollution, illegal dumping of toxic waste, and overfishing, emerges, with all the challenges they pose in light of climate change and rampant transboundary pollution. This raises a fundamental question regarding the effectiveness of the UNCLOS in combating marine environmental crimes. The disparity between the commitment of ratifying states to ensure this protection through the enactment of penal laws to punish perpetrators and the intended implementation of these states' obligations is linked to significant difficulties, including weak penalties and the lack of deterrent effect. Other difficulties relate to the difficulty of monitoring ships in vast areas, especially on the high seas. While the UNCLOS is undoubtedly a major achievement in international law, it suffers from several shortcomings in combating marine environmental crimes, with major challenges emerging that require innovative strategies and mechanisms. The general and flexible nature of the Convention's provisions, the weakness of oversight mechanisms, the absence of deterrent sanctions, the limited role of the international judiciary, and the emergence of environmental crimes linked to modern marine technology, such as those resulting from electronic and chemical waste, and those linked to artificial intelligence, all constitute compelling reasons not to be satisfied with the general regulatory framework established by this Convention to protect the marine environment, but rather to move forward towards making it a powerful penal tool to combat environmental crimes, which have become increasingly complex and dangerous.

Limits in the Seas: Evaluating Maritime Claims under the Law of the Sea
Mr Kevin Baumert

More than three decades after its entry into force, the Law of the Sea Convention stands as the centerpiece of the international law of the sea. Whether the Convention remains “fit for purpose” depends in part on whether coastal States conform their maritime claims to its provisions, including with respect to coastal baselines, maritime limits, and jurisdictional assertions. Despite not being a party to the Convention, the United States has urged coastal States to conform their maritime claims to the relevant provisions of the Convention, which generally reflect customary international law binding on all States.

One means of encouraging coastal State conformance with the international law of the sea is the U.S. Department of State’s *Limits in the Seas* series. *Limits in the Seas* studies provide a geographic and legal assessment of a coastal State’s maritime claims and boundaries. Published continuously since 1970, these studies reflect the considered views of the U.S. Government on the maritime claims examined therein, including their consistency with the international law of the sea.

National Sovereignty and International Law: A Case Study of the Brotherhood Marine Reserve Delimitation under UNCLOS Principles
Lieutenant Jose Cordova-Aguilar
The creation of Mine Protected Areas (MPAs) is a fundamental tool for the protection and conservation of ocean biodiversity; however, this situation often presents complex challenges when balancing

national sovereignty and international law. This research examines the delimitation of Ecuador's Hermandad Marine Reserve, a new MPA adjacent to the Galapagos Islands, as an interesting case study. In light of UNCLOS Articles 192, 194, and 56(1)(b)(iii), which oblige coastal states to protect the marine environment within their Exclusive Economic Zones (EEZs) through measures including MPAs, we analyze the process of defining the reserve's boundaries. This process involved adhering to existing national legal instruments, specifically Presidential Decree No. 319 (January 2022) and Ministerial Agreement MAATE-2022-019 (March 2022), while simultaneously navigating international maritime law, particularly UNCLOS and the 2014 Ecuador-Costa Rica Maritime Delimitation Agreement.

SESSION 3 – Advances in Ocean Governance

Underwater Cultural Heritage
Professor Tullio Scovazzi
To the question asked by this Conference – "is UNCLOS fit for purpose in modern time? – I would respectfully answer: "No, it is not, as regards underwater cultural heritage". The UNCLOS devotes only two provisions to such heritage and, at least in the English official text, Art. 303, para. 3, which gives priority to "the law of salvage or other rules of admiralty", can be understood as an invitation to the looting of underwater cultural heritage for commercial purposes. Also to provide a remedy to such a disastrous result, the Convention on the protection of the underwater cultural heritage has been adopted in 2001 within the UNESCO framework. It establishes a regime of cooperation among States having a verifiable link with a given underwater cultural heritage to ensure its effective protection. Unfortunately, so far, the 2001 Convention has received 80 ratifications, not as many as it would deserve.

Equity and Justice in the Design of Blue Carbon Legal Frameworks: Reflections from Aotearoa New Zealand
Professor Elizabeth Macpherson
International law increasingly recognises the need for integration of policy approaches related to the ocean and climate change, including respecting the rights and knowledge of Indigenous peoples. In this context, effective management and restoration of blue carbon ecosystems has emerged as a natural climate solution, providing a range of potential co-benefits to people and ecosystems. Advocates argue that a combination of regulatory controls and economic incentives, including in compliance and voluntary markets for carbon and biodiversity credits, can be used to support shifts away from unsustainable marine management commensurate with the threats facing blue carbon ecosystems. However, international and domestic legal and policy frameworks for blue carbon are still underdeveloped. In this presentation, I explore the legal challenges and opportunities involved in designing blue carbon laws, drawing on my study of legal and policy frameworks in Aotearoa. I argue that we must integrate siloed approaches to marine-climate policy across sectors and scales to support the effective management and restoration of blue carbon ecosystems. It is essential that justice and equity are centred in the design of blue carbon legal frameworks, in particular: enabling the rights, relationships, and knowledge of Indigenous peoples; embedding an ecosystem-based approach across space; managing cumulative effects of marine activities across time; and taking a precautionary approach to new marine uses. This will require a commitment from States, including to further research and funding to aid the development of blue carbon legal frameworks

Shipping Decarbonization in the age of the ITLOS and ICJ Advisory Opinions
Associate Professor Beatriz Martinez Romera
This presentation explores the evolving interplay between international climate change law and the regulation of greenhouse gas emissions from shipping. Situating this evolution within the broader framework of the law of the sea and international environmental law, in particular the ITLOS and ICJ advisory opinions on climate change.

Integrating Ocean Observation into Plastics Governance: Legal Pathways under UNCLOS, the Emerging Plastics Treaty, and Climate Obligations

Mr Tihao Zeng

The emerging international legally binding instrument on plastic pollution, negotiated under UNEA Resolution 5/14 (the “plastics treaty”), offers a unique opportunity to integrate robust ocean observation into global plastics governance. The overwhelming fossil fuel basis of plastics production connects the plastics crisis directly to the climate crisis, implicating States’ legal duties under both international climate change law and the law of the sea. UNCLOS, particularly Part XII, imposes obligations to protect and preserve the marine environment, to monitor and report on marine pollution, and to undertake environmental impact assessment. Recent jurisprudence, including the 2024 ITLOS Advisory Opinion and the 2025 ICJ Advisory Opinion, has clarified that these obligations encompass a precautionary and risk-scaled due diligence duty, extending to climate-linked marine pollution and requiring the use of best available science.

This paper argues that ocean observation is central to meeting these obligations for plastic pollution. Observation generates the baseline and compliance data necessary to operationalise treaty commitments, to attribute sources, and to evaluate cumulative impacts. Yet integrating observation into plastics governance raises unresolved legal and policy questions: whether plastics-related monitoring in the EEZ constitutes marine scientific research requiring coastal State consent; how to reconcile national security concerns with open data principles; how to harmonise methods for evidentiary reliability; and how to link sectoral regimes such as BBNJ ABMTs, MARPOL Annex V, FAO fishing-gear rules, and port State control to a unified observation architecture. Drawing on IOC-UNESCO, GOOS, and WMO best practices, and engaging with the ongoing plastics treaty negotiations, the analysis outlines possible pathways for integrating ocean observation, high-seas governance, and lifecycle plastics regulation within the broader framework of the law of the sea.

WEDNESDAY 8 OCTOBER

SESSION 4 – Climate Change and the Ocean

Sea Level Rise and the Evolution of State Practice – The Role of the International Law Association Committee on International Law and Sea Level Rise

Professor David Freestone

The last decade has seen a major, possibly unprecedented, evolution in state practice on the impact of sea level rise on maritime entitlements and the continuity of statehood. This presentation assesses the impact of the work of the influential International Law Association (ILA) Committee on International Law and Sea Level Rise (2014–2024) on these processes. In 2012 the ILA set up this specialised committee to consider the likely impacts of, and possible responses to, sea level rise on the coastal zones and maritime entitlements of small island sates if, as the ILA Baselines Committee had concluded, coastal baselines are ‘ambulatory’. The reports of the ILA Committee have been relied upon heavily in the work of the International Law Commission Study Group on the issue which has itself prompted extensive debate within the Sixth (Legal) Committee of the UN. The result has been a rapid and radical realignment of state practice to reflect the need for equity, continuity and legal certainty in the maintenance of the maritime entitlements of coastal and archipelagic states impacted by sea level rise and a similar reassessment of the impacts of possible loss of territory and population on the continuity of statehood of those most vulnerable states.

Climate Change and the Law of the Sea: A Vision for a more Sustainable Future

Lolwa Al-Kuwari

Climate change constitutes a global challenge whose impacts extend beyond environmental dimensions to encompass legal and geopolitical aspects related to the use and governance of the seas. Rising temperatures, ocean acidification, and melting ice – resulting in sea-level rise- lead to coastal erosion, the loss of coastal land, and the reshaping of maritime baselines, placing the United Nation Convention on the Law of the Sea under a real test of its ability to keep pace with these transformations. The severity of these challenges is amplified in the Qatari and Gulf context, where accelerating climatic phenomena threaten fragile islands, sandy coasts, coastal infrastructure, and marine biodiversity, including coral reefs, fisheries and mangroves.

Addressing these challenges requires an integrated vision that combines the updating of national legislative frameworks with alignment to the international maritime law, the integration of climate commitments such as Nationally Determined Contributions (NDCs) into marine governance policies, and the promotion of investment in advanced monitoring technologies, thereby contributing to the development of an approach capable of adapting to climate change, safeguarding marine resources, and ensuring a more sustainable future.

1. Climate change and its impact on oceans and coasts:
- Sea level rise and its impact on marine baselines and maritime boundaries.
- Coastal erosion and the direct threat to small islands and low-lying coastal areas.
- Impact of climate change on marine biodiversity (coral reefs, fisheries, coastal ecosystems).
- Ocean acidification caused by increased carbon dioxide emissions.
2. Legal dimensions and maritime governance according to the UNCLOS
- How does climate change pose challenges to the implementation of the UNCLOS, particularly with regard to the delimitation of maritime borders as coastlines change?
- The role of new agreements such as the BBNJ in supporting adaptation to the effects of climate change.
3. International and regional cooperation and the role of Qatar
   Qatar's initiatives in protecting the marine environment and adapting to climate change
4. Final recommendations
- The need to update maritime laws to keep pace with climate challenges.
- Strengthening the link between climate policies such as (NDCs) and marine policies.
- Focus on investing in modern marine monitoring technologies (such as remote sensing and autonomous aircraft) to support decision-making.

Are the Fisheries Provisions of UNCLOS Fit for Purpose to Respond to the Impacts of Climate Change?

Dr Mitchell Lennan

Climate change is reshaping marine ecosystems through ocean warming and acidification, shifting species distributions and threatening biodiversity. For commercially important fish stocks, these changes have negative and positive socio-economic implications for fishing communities and pose significant challenges for States and international organisations managing shared and highly migratory stocks. There is a practical need to adapt fisheries management to climate impacts, to what extent does UNCLOS also impose a legal duty to do so?

Some scholars have argued that the UNCLOS provisions on the conservation and management of fish stocks within and beyond national jurisdiction are not “fit for purpose” in light of climate change and ocean acidification. However, recent scholarship and evolutive interpretation by the International Tribunal for the Law of the Sea indicate that States do have a legal obligation to integrate climate considerations into fisheries management. The scope and content of these obligations and their interaction with other international legal instruments remain underexplored. This presentation first outlines the scientific and technical background on climate change and fisheries, then examines the relevant UNCLOS provisions and their interpretation by the Tribunal. It argues that while these provisions can be read as fit for purpose, they must be applied in conjunction with other instruments and institutions within international fisheries law, as well as relevant obligations under climate, biodiversity, and human rights regimes. Drawing on the recent International Court of Justice Advisory Opinion on climate change, it further contends that the absence of a generally recommended international minimum standard on fisheries and climate change adaptation hampers effective implementation. The paper concludes by proposing the development of such a standard to ensure that UNCLOS fisheries provisions are genuinely fit for purpose in the era of climate change.

Advancing Continuous Monitoring of the Atlantic Meridional Overturning Circulation (AMOC): A Framework for Integrated Observations and Climate Impact Assessment

Mr Ander López Puertas (co-authors: Miguel Bruno Mejías, Mercedes Pozo Buil, Juan Jesús Gomiz Pascual)

The Atlantic Meridional Overturning Circulation (AMOC) is a key component of the global climate system, redistributing mass and heat in the North Atlantic. It relies on a delicate balance between temperature and salinity effects on density and is considered one of the main driving forces of the Earth system. Increased Greenland melting and salinity changes may weaken it, impacting atmospheric dynamics, ocean heat distribution, and the frequency of extreme weather events in Europe and North America. Such weakening could reduce heat transport to high latitudes, altering regional and global weather patterns.

This project develops a methodological framework for continuous AMOC monitoring, integrating in situ observations aboard the Spanish Navy training ship Juan Sebastian Elcano with analysis of numerical model outputs. In particular, Lagrangian drifter data are used to estimate mass transport, together with thermal and salinity profiles from XBT and EK80 acoustic systems, which characterize the water column's thermal structure and identify pycnoclines in key regions. At the same time, outputs from the MOM6 model developed by NOAA, coupled with a Lagrangian module, are used to validate and complement observations and estimate heat transport following Wunsh and Gaposchkin (1980).

This integrated approach to AMOC observation is designed to strengthen climate resilience and support decision-making within the frameworks of the United Nations Convention on the Law of the Sea (UNCLOS) and the Decade of Ocean Science for Sustainable Development. Although still in its preliminary phase, it offers a basis for early detection of weakening trends, improves understanding of AMOC variability, and advances observation strategies aligned with the United Nations Decade of Ocean Science. Ultimately, this research seeks to provide actionable scientific tools that enhance ocean governance and mitigate the impacts of climate change on Atlantic circulation.

SESSION 5 – New Technologies and Maritime Security

Marine AI, Autonomy, and the Internet of Things at Sea
Professor James Kraska
The rapid advancement of autonomous marine instruments and devices on the seabed, in the water column and airspace above the oceans poses novel challenges to the international law of the sea. AI is accelerating the use of autonomous, recoverable as well as expendable, marine instruments and devices, including floaters, gliders, "ocean data acquisition systems (ODAS)," unmanned surface vehicles, unmanned underwater submersibles, smart buoys, and seabed installations and structures. The Internet of Things (IoT)has reached the maritime domain, with "SMART" submarine communications cables, biologging from marine fauna, and a burgeoning number of sensors for oceanographic, meteorological, scientific, and commercial purposes, biologging of marine fauna, and naval and intelligence sensors and weapons. This paper examines the governance regimes applicable to these technologies throughout the oceans, including areas under coastal state sovereignty, including the territorial sea, straits used for international navigation and archipelagic waters, and subject to sovereign rights and jurisdiction, including the exclusive economic zone (EEZ) and the continental shelf, as well as the freedoms of all states to operate on the high seas and in the deep seabed Area. Rules applicable across the marine domains consist of rights and restrictions of presence, navigation, operation, and jurisdiction. In the territorial sea, such instruments must comply with coastal state rules governing safety and security, while a more limited remit for coastal state jurisdiction applies in the EEZ and on the continental shelf. On the deep seabed, beyond national jurisdiction, a more limited subset of autonomous operations are subject to the International Seabed Authority.

Emerging Maritime Security threats in the Arabian Gulf: Causes and Implications
Captain Rashid Al-Hajri
Maritime security in the Arabian Gulf is a pivotal element for the region's stability and the protection of its strategic interests, given the importance of this vital corridor linking East and West and securing a significant portion of the world's energy supplies. However, geopolitical challenges and unconventional threats, such as maritime terrorism, piracy, smuggling, and cyberattacks, pose increasing risks with broad economic, political, and security implications. Hence, the need to study these threats and their causes, and explore effective response mechanisms that enable the State of Qatar to enhance its maritime

security and maintain its stability and strategic position, emerges. Al-Hajri will discuss emerging maritime security threats in the Arabian Gulf, their causes, and their implications, within several sequential topics:

- Introduction to Maritime Security and its Strategic Importance
- Emerging Maritime Security Threats
- Economic and Political Implications
- Effective Strategies to Confront Threats
- Regional and International Cooperation

SatRecon and Maritime Boundary Dispute Resolution

Robert van de Poll and Clive Schofield

The advent of broad claims to maritime jurisdiction, most notably the exclusive economic zone (EEZ), has resulted in a proliferation of overlapping maritime claims and thus potential maritime boundaries only around half of which have been resolved. It is recognised that the predominant method of maritime boundary delimitation is the definition of equidistance or median lines. Accordingly, the definition of baselines along the coast is a critical consideration as the geodetically robust construction of equidistance lines is ultimately dependent on the location of opposing baselines. Emerging technologies that are transforming hydrographic survey techniques and approaches are examined. In particular, Satellite-derived Seabed Intelligence using recent historical access to satellite imagery (over time) now that we have Satellites revisiting any Global Coastal sites (nearshore-foreshore waters) up to 7x times per month (past 10 years), gives us immense site intelligence (with over 9265 terabytes of accessible data available) to analyze both 2D and 3D derivatives, for both Satellite derived bathymetry (SDB) and/or satellite seafloor morphology (SatRecon® (4DSSM Image) Technology), can help to optimize the locations of territorial sea baselines, thereby contributing to maritime boundary dispute resolution. Enhanced knowledge of the location of baselines, combined with increasingly sophisticated positioning systems and advances in the computation of distances and areas as well as visualization through geographical information systems (GIS) provide for the precise determination of equidistance lines which can serve as a confidence-building mechanism in maritime delimitation negotiations and can assist in geodetically robust representation of maritime boundary lines.

Balancing National Data Protections and UNCLOS Obligations in the Age of AI

Ms Eva van Heukelom

UNCLOS has long provided the main legal framework for ocean governance. It was drafted on the assumption that States would collect and share ocean data, relying on manual, government-managed records. For decades this framework served international law well. Today, however, rapid technological advances and AI-driven analysis are transforming how commercial at-sea activity, such as fisheries, can be monitored and managed more effectively. These developments create new opportunities for states to meet their obligations under UNCLOS but also raise concerns over data protection, as modern technologies make it easier to collect and analyze vast amounts of data.

Governments have responded by adopting national legal safeguards to prevent misuse of shared data, particularly where privacy or trade secrets—issues highly relevant to fisheries—are involved. Rules such as the European Union’s General Data Protection Regulation (GDPR) have already proven to be barriers to data sharing, a challenge likely to grow with emerging AI legislation. In jurisdictions such as the United States, concerns over trade secrecy and national security are increasingly used to justify limiting fisheries data sharing beyond public authorities. While these measures reflect legitimate concerns, they also allow states to withhold data even when they may be essential to meet resource management obligations under UNCLOS.

As national regimes become more complex, a key question arises. UNCLOS assigns collective international responsibilities and envisions cooperation. Yet many barriers to data sharing and AI use stem from national law. My PhD at the University of Hamburg examines how national data protections should be balanced against UNCLOS obligations through comparative legal analysis. It asks whether

UNCLOS remains fit for purpose or requires clarification to address modern technological and legal realities. This contribution directly engages with the main conference theme and several outlined issues

MRV Data Liability for Alternative Marine Fuels: UNCLOS as a "Living Instrument" for Ocean Observation Accountability
Mr Andrey Chernov
The rapid shift to alternative marine fuels—ammonia, hydrogen, methanol—has tethered maritime compliance to data. Monitoring, Reporting and Verification (MRV) regimes (CII, EU ETS, FuelEU) now determine port access, levies, and even insurability. Yet the legal architecture behind this data chain—from onboard sensors and crew inputs to third-party verifiers and regulators—remains fragmented. Errors or manipulation at any stage can cascade into sanctions, charterparty disputes, or loss of P&I cover, while responsibility for "bad data" is unclear.

Treating UNCLOS as a living instrument, this paper situates ocean observation liability within Part XII due-diligence obligations and the evolving practice of flag, port, and coastal States. It maps the full MRV pipeline (collection → processing → verification → submission → regulatory use → downstream reliance) and overlays it with liability bases (contractual, tortious, administrative) and evidentiary choke points (calibration records, algorithm transparency, audit trails, cyber incidents). Building on emerging technologies at sea, it proposes a modular liability matrix and a checklist of data clauses—quality and audit rights, evidence preservation, cybersecurity standards, capped indemnities—to embed in bunker contracts, MRV service agreements, and charter parties.

By linking technical ocean observation to concrete legal remedies, the paper moves from "gaps" to "pathways": standardizing MRV data governance, clarifying recourse among actors, and aligning insurance products with quantified digital risks. It thereby strengthens ocean governance and safeguards the integrity of decarbonization metrics on which future regulation will increasingly rely.

(Note: The views expressed are those of the author and do not necessarily reflect those of the United Nations or its Member States.)

SESSION 6 – Ocean Observation Infrastructure and Space

Technical aspects of our space infrastructure and its impact on the future UNCLOS
Dr Michael Linden-Vørnle
Our modern society cannot function without free and safe access to space and our space-based infrastructure. This is already true now, but will be even more so in the future. It is therefore foreseeable that the maritime domain will be strongly dependent on space systems and services for navigation, communication, Earth observation and emergency services. This talk will present an overview of the technical aspects of this future integration of the two domains – the open seas and space – give perspectives of the opportunities and challenges this will present for the future UNCLOS.

Past Present and Future: Challenges Raised by the Regime of Marine Scientific Research and Ocean Observation
Professor Erik Franckx
Our present-day knowledge of the Oceans can best be captured by the introduction to a recent book in Dutch, entitled "The unknown sea", where the authors state that by now we know more about the surface of Mars than about our own deep seabed (*Colin Janssen and Jan Mees*, De onbekende zee : het belang van de oceaan voor mens en planeet, Gent, Academia Press, 2024, 299 pp.). The elaboration of the regime of the exclusive economic zone (EEZ) by the Third United Nations Conference on the Law of the Sea (1973-1982), as codified today in the 1982 United Nations Convention on the Law of the Sea (1982 Convention), has not really helped in this respect, as the freedom of marine scientific research, which up till then governed these maritime spaces, was transferred into a coastal state EEZ competence. The present contribution looks into the practical impact this important shift has had on the conduct of

marine scientific research and ocean observation in State practice and how the 1982 Convention has at least tried to smooth out certain of rough edges of this new regime.

From Consent to Collaboration: EOOS as a Pathway to Fit-for-Purpose Ocean Observation under UNCLOS

Dr Inga Lips

The United Nations Convention on the Law of the Sea (UNCLOS) establishes the legal framework for ocean observations, requiring the consent of coastal States for marine scientific research (MSR) in exclusive economic zones (EEZs) and on continental shelves. However, global observing networks report that these provisions often clash with the societal needs for ocean information and operational realities of modern, technology-driven observation systems, particularly due to uncertainty over whether activities such as passive floats, gliders, and routine monitoring constitute MSR. Amending UNCLOS directly is politically challenging; instead, regional agreements, interpretive guidelines, and consistent State practice offer more viable near-term solutions. The implementation of the European Ocean Observing System (EOOS) offers a promising platform for applying these solutions in practice, particularly in fully EEZ-covered seas such as the Baltic Sea. The presentation will highlight the current regional achievements and proposed mechanisms for collaboration in Europe and the potential role of EOOS in facilitating these collaborations further between all European States, e.g., implementation of a unified digital entry point for EEZ research consent requests, with auto-routing to relevant national authorities, drafting of technical and procedural standards for autonomous platforms (e.g., (platform IDs, recovery protocols), implementation of a real-time situational awareness for States and users (e.g., unique platform/sensor IDs, owners, published mission cards, live status/consent metadata in a single dashboard). EOOS as Europe's "single voice" could formally represent EU interests in the IOC/UNESCO for MSR norms, IMO for autonomous vessel safety standards, IHO for hydrographic/bathymetry protocols, and GOOS for technical and metadata standards.

Ocean Observation, Institutional Fragmentation, and the Limits of UNCLOS: A Legal and Policy Inquiry into the Fit-for-Purpose Test in the Age of Climate and Technological Disruption

Sheila Kong Mukwele

The United Nations Convention on the Law of the Sea (UNCLOS) has long served as the cornerstone of international ocean governance. However, recent developments in ocean observation technologies, climate change impacts, and digital data ecosystems have raised critical questions about the Convention's adequacy in addressing 21st-century challenges. This paper critically examines whether UNCLOS remains fit for purpose in light of rapidly evolving ocean observation practices. Focusing on legal, institutional, and policy dimensions, the paper explores three interrelated gaps: (1) the limited normative scope of marine scientific research provisions in addressing modern autonomous and satellite-based observation systems; (2) the fragmentation between legal regimes governing environmental protection, scientific research, and maritime security; and (3) the lack of clear rules around liability, data sharing, and technology transfer, particularly affecting developing countries and small island developing States (SIDS).

Case studies from recent global initiatives—such as the BBNJ Agreement and Seabed 2030—highlight both the potential and limitations of existing legal frameworks. The paper argues that while UNCLOS offers a flexible foundation, its practical effectiveness is increasingly constrained by outdated definitions, institutional overlaps, and capacity asymmetries.

The analysis concludes by proposing legal and institutional pathways to enhance the governance of ocean observation, including the development of clearer international standards on data access, the harmonization of legal regimes, and strengthened mechanisms for equitable participation in ocean science. These reforms are essential to ensure UNCLOS can meaningfully respond to emerging ocean challenges and support the sustainable and inclusive development of ocean knowledge systems.

SESSION 7 - Ocean Observation and Cooperation Frameworks

Where Oceans Unite: CIESM Marine Research across the Mediterranean and Black Sea
Professor Laura Giuliano
Marine research is entering a transformative phase, where technology and governance converge to address pressing global challenges. The Mediterranean, once characterized by fragmented datasets and limited observations, is now monitored through a wide array of autonomous platforms, satellites, and cabled observatories. These innovations generate continuous streams of high-quality data, but their true value lies in how they are collected, shared, and translated into actionable knowledge.

Artificial intelligence and machine learning play a growing role in transforming raw datasets into insights that support timely, evidence-based decision-making. Predictive models now allow researchers to anticipate harmful algal blooms, biodiversity shifts, and climate-driven changes, providing critical tools for policymakers and resource managers. However, these scientific and technological gains must be matched by frameworks that ensure equitable access, transparency, and shared responsibility.

The recent UN High Seas Treaty underscores this priority by setting standards for data sharing and governance beyond national jurisdictions. In this evolving landscape, CIESM offers a unique model: for over a century, it has fostered multinational collaboration across the Mediterranean and Black Sea, ensuring that data are collected using standardized protocols and disseminated in a spirit of scientific openness.

The presentation argued that the future of ocean science depends not only on innovation, but also on international cooperation. By linking cutting-edge technologies, AI-driven interpretation, and inclusive governance under frameworks like CIESM, the Mediterranean can demonstrate how regional collaboration paves the way for equitable, sustainable stewardship of the global ocean.

From Satellites to Cetaceans: Technical and Legal Challenges of Spatial Ocean Observation
Ms Emily Charry Tissier
Advances in satellite imaging, drones, and artificial intelligence have opened unprecedented opportunities for observing marine megafauna—whales, penguins, seals, turtles, and other keystone species—across scales unimaginable just a decade ago. These tools offer the potential to transform ecological monitoring and enable adaptive management in national waters, Antarctica, and the High Seas. Yet despite technical readiness, protection of marine life remains uneven, constrained by legal, economic, and jurisdictional barriers.

This presentation explores the intersection of technology and governance in spatial ocean observation. Drawing on case studies from Canada's Exclusive Economic Zone, Antarctica, and the High Seas, the presentation will highlight both successes and persistent gaps. Examples include real-time whale detection in Canadian waters, penguin colony monitoring and open-data paradoxes under the Antarctic Treaty System, and efforts to integrate biodiversity into international frameworks such as the IMO's S-100 standard on the High Seas.

Key challenges include limited data sharing, inconsistent legal frameworks, and the risk of creating a two-tiered monitoring system that privileges wealthier states and industries. I will argue that open and equitable access to data is critical if ocean observation is to fulfill its role as a global commons. The talk concludes with a call for ABLOS and the wider legal and technical community to explore pathways that reconcile innovation, sovereignty, and collective responsibility. Only by bridging technical capabilities with legal frameworks can we ensure that marine megafauna monitoring is comprehensive, equitable, and effective at a planetary scale.

Data for Decision-Making: Enhancing Maritime Safety and Economic Security in the RSAHC
Mr Saud Al-Ruways
The strategically vital ROPME Sea Area (RSAHC), serving as a critical corridor for approximately 20% of global oil trade, demonstrates an increasingly crucial interdependence between precise hydrographic data, maritime safety, and economic security. This presentation will illustrate how data-driven decision-making forms the foundation of regional resilience and prosperity.

The address will elaborate on how the adoption of Electronic Navigational Charts (ENCs) and compliance with international standards have substantially improved navigational safety within these heavily traversed and ecologically sensitive waters. Beyond safety considerations, the discussion will examine how hydrographic and geospatial data function as essential economic resources, directly facilitating port development, coastal infrastructure projects, offshore energy initiatives, aquaculture operations, and the precise demarcation of maritime boundaries.

Nevertheless, maximizing these benefits necessitates addressing persistent challenges including data deficiencies, geopolitical considerations, and cybersecurity threats. This presentation will outline a definitive strategic framework for the RSAHC, advocating strengthened regional cooperation, integration of artificial intelligence and digital solutions, and the establishment of collaborative data-sharing mechanisms to support capacity development.

In conclusion, the presentation will emphasize that strategic investment in hydrographic data transcends technical necessity, representing an indispensable commitment to protecting human lives, securing economic stability, and fostering sustainable development for all RSAHC member states.

From Silos to Synergy: Harnessing (Private Sector) Data to Strengthen the Science-Policy Interface - in the Context of the United Nations Decade of Ocean Science for Sustainable Development

Ms Laura Meyer

Despite the ocean's central role as Earth's life-support system, our knowledge of it remains fragmented. Private industries such as offshore energy, shipping, fishing, and telecommunications collect vast amounts of operational ocean data, yet much of it remains inaccessible to the scientific and policy communities. Current international law, including UNCLOS, focuses on marine scientific research and places obligations on States rather than corporations, leaving privately held ocean data largely outside formal governance frameworks.

The United Nations Decade of Ocean Science for Sustainable Development (2021–2030) provides a global platform to bridge this gap. In 2023, the Ocean Decade launched the Corporate Data Group together with Fugro to develop frameworks for unlocking private sector data, normalizing access, and promoting trust. Building on this initiative, the IOC-UNESCO Assembly in 2025 adopted policy recommendations encouraging States to integrate data-sharing obligations into offshore permits and licenses.

This presentation explores how harnessing private sector data can strengthen the science–policy interface and address pressing global challenges. It will highlight the governance and legal dimensions of privately collected data, showcase practical pathways such as the Corporate Data Group, and present policy recommendations to mainstream data sharing.

The discussion will emphasize why sharing ocean data is not only a responsibility but also a benefit for companies—driving innovation, improving efficiency, and enhancing stakeholder trust. Ultimately, complementing existing legal frameworks with practical mechanisms is essential if UNCLOS is to remain fit for purpose in modern times.