

Islands, with the aim to identify gaps and enhance the awareness of available data products and predictive capability of observing systems. The workshop achieved improved assessment of capacities and requirements of Pacific Islands Nations in ocean observations and data applications for environmental, economic and social benefits, including the forecasts of tropical cyclones track and intensity, hazardous waves, and other ocean related natural disasters. DBCP integrates the vandalism prevention information in the capacity building workshops and to create a repository of education material available nationally for broader use.

VIII Maritime safety and security and flag State implementation

WMO continues its collaboration with the International Maritime Organization (IMO) and the International Hydrographic Organization (IHO) for coordinated and standardized Metocean (Meteorology and (physics) Oceanography) information, forecasts and warning services for safety of life and property at sea, improved marine environment and sustainable management of natural resources, with due focus on Polar Regions.

WMO continuously works with its partners relating to international shipping by the WMO-IMO WorldWide Metocean Information and Warning Service ([WWMIWS](#)) as contribution to the IMO's Global Maritime Distress and Safety System (GMDSS). The WWMIWS ensures daily forecasts covering the 21 METAREAs across the globe. This fulfils the obligation of WMO

the 2020 Atlantic record-breaking season with notably Hurricanes Iota and Eta (Caribbean Sea, November 2020) ¹

WMO continues to contribute to the global development agenda through its programmes and initiatives. Aside from those mentioned above, it also includes the programmes for Marine Meteorology and Oceanography, Public Weather Services, Tropical Cyclone, Small Island Developing States (SIDS), Least Developed Countries (LDC), Disaster Risk Reduction, Education and Training, Capacity Development and Voluntary Cooperation. The Climate Risk and Early Warning Systems

With regards to space-based observations of the ocean, the [WMO Space Programme](#) interfaces with relevant ocean discussions in the Coordination Group for Meteorological Satellites (CGMS) and with the Committee on Earth Observation Satellites (CEOS).

WMO through its [Global Cryosphere Watch](#) (GCW) has initiated an international coordinated effort to evaluate, intercompare and make recommendations on the available satellite products on sea ice thickness and snow on sea ice, to take place between 2020 and 2023. The project will engage and address individual end-user requirements and other data performance critical to their application (e.g., operational users are likely to require (near) real-time [(N)RT]; data assimilation and Numeric Weather Prediction (NWP) groups are likely to need NRT data, this project will provide the framework for increased coordination and standardization of sea ice observing and dataoaoatbC ET /d

source of technical regulation for all operational data-processing and forecasting systems operated by WMO Members, including designation of specialized centres. In this context, there are 24 RSMCs for marine meteorological services covering METAREAs, four RSMCs for numerical ocean wave prediction and six RSMCs for tropical cyclone forecasting, including marine-related hazards. WMO promotes an Earth System Modelling and Prediction (ESMP) approach, which implies more integration of ocean parameters into ESMP. This responds to various ocean users' needs (coastal issues, shipping, fishing etc.) and will improve the access to and use of marine products for protection of life and property at sea and along the coast.

The Polar Prediction Project (PPP) is a decade long core project of the World Weather Research Programme (WWRP) with the aim of promoting cooperative international research enabling development of improved weather and environmental prediction services for the polar regions, on time scales from hours to seasonal. PPP will end in December 2022 and is currently in the final or Consolidation stage of the three stages in the project. One of the PPP flagship activities has been the Year of Polar Prediction (YOPP) consisting of periods of enhanced observations, modelling and verification in the Arctic and the Antarctic as well as education activities, and engagement with many of the user communities of polar environmental prediction services. A face-to-face YOPP Final Summit is scheduled for 1 to 4 May 2022 in Montreal, Canada. The research in PPP is to a large degree embedded in existing value chain structures and operational at several prediction centres. PPP have supplemented and advanced scientific developments by establishing links with academia and research institutions, as well as direct coupling to important research activities and applications of research. The Southern Hemisphere component of YOPP (YOPP-SH) was originally to have only one Special Observing Period (SOP) which was in the Antarctic Summer 2018/2019. Following this SOP, it was decided to run a second SOP that captured the winter freeze and mid-winter conditions. Due to operational reasons this SOP was delayed and will now run from mid-April to mid-July 2022. To allow for data processing and analyses for the Antarctic Winter SOP in 2022 the YOPP-SH component of PPP/YOPP will now run to the end of December in 2024. The PPP has been able to generate significant

seasonal forecasts (up to 60 days) and re-forecasts (sometimes known as hindcasts) from 11 operational centres, since January 2015. Most of the S2S models are coupled ocean-sea ice-atmosphere models and the list of parameters available from the S2S database has always included ocean sea-surface temperature and sea-ice cover. In a recent development, since January 2020, nine new ocean and sea-ice parameters have been added to the S2S database. The availability of this extensive set of ocean and sea ice variables substantially increases the power of the database for S2S coupled system research, and to address the science questions mentioned above.

Ocean-OPS

The Ocean-OPS (WMO-IOC Joint Centre for Oceanography and Marine Meteorology in situ Observations Programmes Support) is the international hub and centre of excellence that provides vital services in monitoring, coordinating, and integrating data and metadata, across an expanding network of global oceanographic and marine meteorological observing communities. Under the guidance of the Observations Coordination Group and its stakeholders, in 2020, OceanOPS has released its new five-year Strategic Plan (2021-2025) and rebranded from JCOMMOPS to OceanOPS taking advantage from the disbandment of JCOMM and the creation of the Joint WMO-IOC Collaborative Board.

For 20 years, OceanOPS has been supporting efficient observing system operations to ensure the transmission and timely exchange of high-quality metadata and assisting with the provision of free and unrestricted data delivery to all users. OceanOPS has also been developing tools and metrics to analyse the observing networks and system trends and reporting back to stakeholders to encourage performance improvement and cost efficiency. OceanOPS' core activity is the harmonization of metadata for each observing network, individually and across the ocean observing system collectively. This will vastly increase data usability and global monitoring capacity.

Since the beginning of the Argo Program, OceanOPS has been maintaining network specific services critical to ocean observing systems implementation, such as the IOC/UNESCO

world. OceanOPS is internally restructuring and moving to a more diverse and stable funding platform, thereby enabling it to focus on its strategic goals and allowing sustainable growth to meet new needs.

The proven success of OceanOPS have demonstrated the value and criticality of centralized support, coordination, and system monitoring for the global ocean observing enterprise. The 5-Year Strategic Plan will provide even more the guide for OceanOPS activities to continue that success towards a more efficient and integrated system that delivers data and information necessary for an increased range of services and research.

OceanOPS recalls the continuous challenge of completing the GOOS in Members' Exclusive Economic Zones (EEZ). The current Law of the Sea regulatory procedures are not compatible with the operational maintenance of the core GOOS networks (Argo floats and Tropical Moored Arrays in particular). Such networks have been sustained for more than two decades and can't be reasonably considered as Marine Scientific Research. OceanOPS strongly advocates for practical and multilateral solutions to facilitate the routine deployments of ~2500 ocean observations instrumentations per year, globally and regionally, and is offering its support to keep enhancing the marine observations in EEZ for Members benefits.

The article 247 of the UNCLOS (Marine scientific research projects undertaken by or under the auspices of international organizations) might offer some solution space to facilitate the maintenance of instruments in EEZs and should be piloted at regional level. Meanwhile, OceanOPS calls on all coastal states to provide fast track solutions for EEZ access and to

methodology and its constituent materials were field tested in these countries during the workshops and produced the following outcomes: 1. Case study reports on fisheries and coastline management for further use in a National Adaptation Plan (NAP) or a GCF project in the country context; 2. Feedback and lessons learned to inform GCF/WMO guidelines methods, data and support needed for further climate r

COP	Conference of Parties
CREWS	Climate Risk & Early Warning Systems
DBCP	the WMO/IOC Data Buoy Cooperation Panel
DITTO	Digital Twins of the Ocean
DRR	Disaster Risk Reduction
EC	Executive Council
ECV	Essential Climate Variable
EEZ	Exclusive Economic Zone
ESMP	EarthSystem Modelling and Prediction
FAO	Food and Agriculture Organization
FSO	Forecast Sensitivity to Observations
GAW	Global Atmosphere Watch
GCF	Green Climate Fund
GCOS	Global Climate Observing System
GCW	Global Cryosphere Watch
GDPFS	GlobalData-processing and Forecasting System
GESAMP	Group of Experts on the Scientific Aspects of Marine Environmental Protection
GHG	Greenhouse Gas
GMDSS	Global Maritime Distress and Safety System
GMSL	Global Mean Sea Level
GOOS	Global Ocean Observing System
GTS	Global Telecommunication System
IG ³ IS	Integrated Global Greenhouse Gas Information System
IHO	International Hydrographic Organization
IMO	International Maritime Organization
INFCOM	Commission for Observation, Infrastructures and Information Systems
IN-MHEWS	The International Network for Multi-Hazard Early Warning System
IOGUNESCO	Intergovernmental Oceanographic Commission of UNESCO
IPCC	Intergovernmental Panel on Climate Change
ISC	International Science Council
JCB	Joint WMO/IOC Collaborative Board
JCOMM	Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology
JCOMMOPS	The JCOMM insitu Observations Programme Support Centre
LDC	Least Developed Countries
LLGHG&LCS	

