**JOINT STATEMENT ON THE 4th MEETING OF THE BRICS WORKING GROUP ON OCEAN AND POLAR SCIENCE AND TECHNOLOGY**

Xiamen, CHINA

 July 27-28, 2021

We, the representatives of Brazil, Russia, India, China, and South Africa joined the 4th meeting of the BRICS Working Group on Ocean and Polar Science and Technology conducted online on 27-28 July, 2021. The meeting was coordinated by the Administrative Centre for China’s Agenda 21, Ministry of Science and Technology, China and hosted by Xiamen University.

Considering that the five BRICS countries are washed by all Oceans and their vital interests encompass both polar regions, BRICS countries are deeply engaged in developing ocean and polar science and technology;

Taking into consideration the pathway for collaboration within BRICS set forth during the 1st Workshop on Operational Oceanography held in China in 2016, and the 1st, 2nd and 3rd Meetings of the BRICS Working Group on Ocean and Polar Science and Technology held in Brazil, Russia and India (online), in 2018, 2019 and 2020, respectively;

Having over-viewed and discussed previous and current research programs and activities in the field of ocean and polar science and technology carried out by each BRICS country, as well as bilateral and multilateral cooperation initiatives among BRICS countries

THE MEETING HAVE CONSENSUALLY AGREED ON THE FOLLOWING ACTIONS:

1. To formulate the roadmap for the Working Group within the BRICS STI (Science, Technology, and Innovations) frameworks;
2. To update and identify priority cooperation themes for establishing guidelines for future collaborative research and development activities;
3. To specify capacity development including, but not limited to, training and M.Sc./Ph.D. education; best practices in infrastructure utilization; development of standardized and harmonized methodological approaches;
4. To reiterate the commitment to the joint research cruises and expeditions in areas of common interests;
5. To update the mutual cooperation in planning among BRICS countries; and
6. To pave the joint activities of BRICS countries in the United Nations Decade of Ocean Sciences for Sustainable Development.

At the 4th meeting of the WG on Ocean and Polar Science and Technology, WE REACHED CONSENSUS ON THE FOLLOWING:

1. **Developing roadmap for the Working Group within the BRICS STI (Science, Technology, and Innovations) frameworks**

The WG proposes that a Standing Committee for BRICS cooperation should be established including at least one representative from the funding agencies or corresponding departments of each country for effectively streamlining the BRICS cooperation activities on ocean and polar research and making supportive decisions. The WG strongly recommends the Standing Committee take the overarching themes into account as one of the critical criteria in the evaluation process and selection of successful proposals.

Considering that the 5th BRICS STI call for proposals planned for September 2021 and the 6th BRICS STI call for proposals expected to be announced in 2022, the WG recommends that funding agencies or departments of each BRICS country should synchronize their calls for proposals, and harmonize conditions and criteria for proposals evaluation.

A roadmap, recapitulating the goals and objectives of the WG, the expected outcomes and benefits, as well as the governance arrangements in the BRICS STI frameworks, should be developed by the Standing Committee and circulated to WG members for comments. The roadmap will serve as a guideline for the essential steps and processes when developing an Implementation Plan for the WG. The roadmap and the Implementation Plan should include plans for research and technical infrastructure; plans for engagement and communication; plans for capacity building, training and education; and plans for resource consolidation.

The WG strongly recommends formulating strategic flagship programs and support mechanisms additional to the BRICS STI Framework Program.

1. **Overarching and cross-cutting cooperation themes**

While the deep-sea research, climate variability and predictability including air-sea-ice exchanges, and coastal processes and ocean-land interactions including marine pollutants and plastics as specified at the 1st WG meeting;

the operational and applied oceanography including observations, model development and data assimilation, applied oceanography, biogeochemistry and hydrometeorology, and extreme environment research including permafrost, anoxia, hypersaline water bodies, as specified at the 2nd WG meeting;

and marine disaster prevention and mitigation, joint observation and model development including the structure and physical properties of sea ice, and polar research including Arctic paleoceanography, sea ice dynamics and ecosystem evolution, development of the capacity building as specified at the 3rd WG meeting remain the priority topics for collaborative research,

in the meantime, the 4th meeting of the WG on Ocean and Polar Science and Technology outlines the need for closer cooperation in the following areas:

1. State-of-the-art technology of ocean and climate observation and prediction. Including models, data assimilation schemes and joint observation for providing BRICS countries high-quality service on ocean forecast and climate prediction which can be used for disaster prevention and mitigation, sustainable use of ocean resources and ecosystem services, marine ecosystem protection and adaptation to climate change;
2. Global hadal trench research. Exploration to investigate geology, biology, and environment of hadal trenches; mid-ocean ridges research and seamounts, including hydrothermal activity; deep-sea science and technology advancement in marine resource exploration and development.
3. Marine ecosystem health. Especially the marine ecosystem health under the impact of global climate change and human activities (e.g., shipping, fisheries, aquaculture, energy production, drilling for petroleum and gas, etc) – developing regional studies on biodiversity and resilience, marine pollution, disaster prevention and mitigation.
4. Polar science research. Deep ice and subglacial environment exploration and sampling in polar regions; paleomicrobes in the polar permafrost; remote sensing of Antarctic surface and bed topography; and observation of space and universe on advantage sites in polar regions.

The WG also emphasizes the following overarching themes for collaboration among BRICS countries as enabling priorities for the partnership: technology development, observing systems and technologies, data management and sharing.

1. **Capacity Building**

The WG recommends and agrees on the establishment of a Memorandum of Understanding (MoU) for Postgraduate Programs among the leading research centers on Ocean and Polar Science and Technology functioning in the BRICS countries which should include: (i) training courses and summer courses on a rotating basis; (ii) student exchange at a minimum of 5 students per country yearly; and (iii) at least 1 joint cruise per year.

China agrees to coordinate the existing platforms, especially the UNESCO/IOC Regional Training and Research Center on Ocean Dynamics and Climate (UNESCO/IOC-ODC, http://odc.fio.com.cn/), to provide training for BRICS candidates on model development, applications, and data assimilation, etc., every year.

The WG discusses and agrees to establish the BRICS Deep-sea Resources International Research Center, led by the Second Institute of Oceanography, Ministry of Natural Resources and jointly established with the Institutes of Oceanography among BRICS countries. Deep-sea resources have great potential to supply future new energy, biological resources and non-biological resources. Through joint efforts, BRICS countries are able to provide techniques, suitable equipment and facilities to boost the research in this regard.

China agrees to establish the BRICS Working Group for the 4th World Ocean Observation Conference, led by the Qingdao Marine Science and Technology Pilot National Laboratory, to promote cooperation on ocean observation networks and prediction systems at different time and space scales.

1. **Joint cruises**
2. All BRICS countries (coordinated by Brazil and Russia) will prepare a five-year plan for suggested joint cruises to be initiated, possibly starting from 2022.
3. The focal point of each country, which will be responsible for coordinating the BRICS research cruises, has been updated, namely: ***Osmar Moller*** (Brazil), ***Peter Zavialov*** (Russia), ***Anand Singh*** (India), ***Wentao Wang*** (China) and ***Ashley Naidoo*** (South Africa).
4. BRICS cruises will be organized on principles such as what sort of equipment, what kind of research and technical staff is needed for each mission, and detailed information regarding the scope of the research cruise and the number of available berths for BRICS countries should be provided, so that the BRICS could complement each other’s capacities.
5. BRICS joint cruise to the area of Amazon plume in the equatorial Atlantic and Patos lagoon plume in the subtropical Atlantic proposed earlier by Russia and Brazil shall commence in 2022 (subject to approval by the authorities of Russia and Brazil) to investigate the areas in the world where river systems have the greatest impact on marine nutrition and pollutants, as well as the corresponding physical and chemical environments.
6. China proposes the following joint cruises: i) in the Atlantic Ocean Region near Brazil’s EEZ to explore the cold seep and hydrothermal vent system by the Shenhaiyongshi (Deep-sea Warrior) manned submersible for the common interests of Brazil and China; ii) in the East Siberia Sea, Laptev Sea, Chukchi Sea and Kara Sea to investigate the processes critical for environmental protection of the Arctic, and to develop new technologies (e.g., sea ice monitoring and ship navigation) for safe shipping in the Northeast Passage for the common interests of Russia and China; and iii) in Kuril-Kamchatka to explore the ecology and process of the hadal trench by the full-ocean-depth manned submersible Fendouzhe (Striver).
7. **Mutual Cooperation**
	1. **Development of marine forecast system towards EEZ**

South Africa expresses a lack in capacity and a need for developing human capacity to develop and operate an Ocean Forecasting System (OFS).  BRICS partnership could be ideal to co-develop such expertise and models, including regional models and data assimilation schemes.

* 1. **Global Deep Trench Exploration Program**

The abyssal area is the deepest part of the world’s oceans as well as the least explored area and the final boundary of our planet. The continuous in-depth understanding of the abyss region can provide new insights and understandings on ecology, geology, environment, human emissions of pollutants, global carbon cycle and the origin of life. The BRICS countries, connecting all oceans, are ideal choices for promoting such exploration programs.

* 1. **Marine environment monitoring and marine ecosystem health assessment**

We should carry out sustained monitoring and robust assessment of the quality and pressure of the marine environment, with particular attention to coastal areas. Common practices for the observation and analysis (e.g., for pollutants like microplastics) should be standardized to ensure the delivery of quality-controlled data that can be more broadly used. Key marine ecosystem health indicators should be established to provide essential support for characterizing marine pollution and for prevention and control of marine disasters.

* 1. **Joint Research on the ice sheet in East Antarctica**

China approves to cooperate with the BRIC countries to jointly observe the movement and rapid ice flow of the East Antarctic ice sheet and explore subglacial lakes to study the dynamic characteristics of the rapid ice flow, outlets and tidal glaciers in the polar ice sheet, the subglacial process, the mechanism of influence on the mass balance of glaciers, the key role of subglacial structures, and processes on the movement of the upper ice cap.

* 1. **Information Sharing**

The WG recommends sharing data and samples among BRICS countries for marine and polar scientific research.

1. **Cooperation under the United Nations Decade of Ocean Science for Sustainable Development.**

The WG agreed that BRICS countries should actively contribute and participate in the UN Decade of Ocean Science for Sustainable Development (2021-2030). The WG approves establishing the BRICS Coordination Center in China under the umbrella of the UN Decade to promote cooperation among BRICS countries. In the next step, China will work with the BRICS countries to prepare and apply as the application process indicates.

The WG acclaims that the CoastPredict Consortium including the BRICS PLUMPLAS project among Brazil, Russia, and China funded under BRICS STI Framework Programme has been endorsed as a Decade Action.

All BRICS countries show high interest in state-of-the-art operational Ocean Forecasting System (OFS) to mitigate and prevent ocean disasters and protect marine ecosystems, etc. The WG agrees to initiate a “BRICS Predicted Ocean” project to support two outcomes, A Predicted Ocean and A Safe Ocean, of the total seven expected outcomes of the UN Decade.

1. **Enhance BRICS mechanisms**

Scientists among BRICS countries shall enhance their communications and interactions on a routine basis. The responsible person (Peter O. Zavialov, peter@ocean.ru) from the Russian side will update the BRICS ocean and polar science and technology WG website (<http://land-ocean.ru/brics/>) after the delegates send their inputs. Scientists can provide their existing research potential for cooperation.

BRICS countries will carry out more joint activities on ocean and polar science to enhance impacts and visibility. In addition, communications with non-BRICS countries (BRICS plus) are also encouraged. A BRICS Program Office should be established to serve as the coordination center and maintain the routine activities.

**Arrangement of next WG Meeting**

In order to further strengthen the communications among young scientists of the ocean and polar science and technology from the BRICS countries, and to discover and train young talents, China will hold the 1st BRICS youth forum on Ocean and Polar Science and Technology in Qingdao in 2021(Depends on the COVID-19 situation). The forum is planned to be held biannually and hosted by the BRICS countries in turn. Young scientists under the age of 45 will be invited to participate in exchanging the latest progress in the ocean and polar science and technology.

The WG recommends inviting the PIs of the projects supported within the BRICS STI Program in the area of ocean and polar science and technology to the annual WG meetings for broader dissemination and discussion of project results.

The WG recommends that in addition to working group meetings, 2-3 high-level scientist seminars on specific key topics should be held every year to promote project selection and platform construction.

According to the BRICS meeting rotation sequence and voluntary national applications, the 5th meeting of the WG on Ocean and Polar Science and Technology in 2022 will be hosted by South Africa.

**Signatures:**

**Brazil**

**Russia**

**India**

**China**

**South Africa**