

Chinese Academy of Sciences (CAS) – European Academy of Sciences (EurASc)

China – Europe Frontier Forum on Progress in Ocean Science and Technology

20-21 October 2020

Synthetic report

Executive summary. The China–Europe Frontier Forum on “Progress in Ocean Science and Technology” (POST) was held in Shanghai and on line on 20-21 October 2020 in the framework of the imminent launch of the UN decade of Ocean Science for Sustainable Development (2021-2030). The Forum was attended by about 300 participants. Thirteen invited speakers made presentations during three sessions on: the Earth System and the future ocean in a changing climate; progress in ocean sciences and technology; and ocean sustainable development. The POST Frontier Forum was intended to enhance collaborations between China and Europe, and identified the following three frontier topics for China-Europe action (recommendations): 1-Ocean based solutions for climate change mitigation and adaptation that offer a policy-relevant framework for decision and action; 2-Making the global coastal ocean sustainable for the well-being of human societies; 3- Contributing to the "Digital Twin of the Ocean" component of the “Digital Earth” initiatives, which would contribute to enhance the understanding of the role of the ocean in the changing climate. The Forum also highlighted the need to develop capacity building, and to organize two-way (China–Europe) exchanges for early career scientists. Given the success of this event and the needs for future collaboration it is proposed that the two academies hold a CAS-EurASc Frontier Forum on Ocean Science and Technology in China or Europe every second year.

Summary of the 13 oral presentations

Jean Jouzel (IPSL, Paris, France) showed the absolute need to keep in line with the Paris agreement (2015) if we are to reduce the risks and impacts of climate change. *Minhan Dai* (Xiamen University, China) demonstrated the importance of vertical stratification in the upper oligotrophic ocean, and proposed a new model in which the euphotic zone is characterized by a two-layered structure. *Nadia Pinardi* (University of Bologna, Italy) developed the concept of the sustainable global ocean through implementing operational oceanography in the global coastal regions and developing standards and methodologies adapted to coastal complexity. *Ying Wang* (Nanjing University, China) used the major rivers of China as examples to explain the land-sea interaction processes in estuaries and deltas. *Jack Middelburg* (Utrecht University, The Netherlands) presented the biogeochemical processes that impact the ocean's carbonate system over multiple timescales. *Pierre Karleskind* (European Parliament) introduced the concept of a “digital twin of the ocean” that is being developed in Europe. *Huadong Guo* (AIRI, China) explained how the “Big Earth Data Science Engineering Program” shaped science-based policies and data-driven decision mechanisms concerning the sustainable development targets of marine pollution and marine ecosystem health management. *Dake Chen* (SIO, Hangzhou, China) presented China's polar oceans and climate research, including a multi-platform, multi-disciplinary circumpolar “Big Ring” to serve as backbone for the Southern Ocean Observing System. *Lixin Wu* (OUC, Qingdao, China) showed how eddies act as important suppliers of heat to the surface ocean in frontal regions, and the usefulness of high-resolution Earth System modeling with multiscale air-sea interactions. *Martin Visbeck* (GEOMAR, Kiel University, Germany) addressed the question of moving from the presently unsustainable use of the ocean by humans towards a world where sustainability would be a key and ocean-based ecosystem-services would be valued and preserved. *Nianzhi Jiao* (Xiamen University, China) introduced the importance of the microbial carbon pump, and described the ONCE (Ocean Negative Carbon Emission) program of climate change mitigation. *Jean-Pierre Gattuso* (LOV, Villefranche-sur-Mer, France) discussed ocean-based measures to reduce climate change and its impacts and rebuild marine life, in line with the Paris agreement (2015). *Hans-Otto Pörtner* (AWI, Bremerhaven,

Germany) described the special report on the ocean and cryosphere in a changing climate (SROCC) of the Intergovernmental Panel for Climate Change (IPCC).

The discussions following the oral presentations showed that the numerous participants in the Frontier Forum wished to strongly enhance the already existing collaborations between ocean researchers in China and Europe, which are two key players in 21st century research and in the framework of the Paris Agreement Strategy. The challenges that were identified for the next decade include: 1-the development of a global infrastructure for sharing Earth System observations, model outputs and community best practices; and 2-the building of generic and customized services for the entire Earth System Science approach. It was recognized during this bilateral workshop that dialog between CAS and EurASc can contribute to further enhance the collaborations between China and Europe to fulfill the objectives of the Paris Agreement.

This China-Europe Frontier Forum on POST was well received by society, and the presentations and discussions created great interest among the audience. Based on the data tracking, 1981 person-times participated online to the two-day workshop, and the online participants were from a total of 29 countries in Asia, Europe, Africa and North America.

Recommendations

The CAS and EurASc fellows and other participants of this bilateral workshop proposed to intensify their common interests and their joint activities on frontier topics through working groups and/or summer schools co-organized by the two academies. The following three frontier topics are based on the summary from this workshop and proposed for joint China-Europe action:

1-To investigate ocean-based solutions for climate change mitigation and adaptation, including ocean carbon cycle and its feedback to the Earth system, that offer a policy-relevant framework for decision and action. Improved knowledge on their effectiveness, benefits, disbenefits and governance will offer a policy-relevant framing for decision and action for a wide range of stakeholders.

2-Making the global coastal ocean sustainable. The Global Coastal Ocean is the area extending inshore from the river catchments and offshore to the continental slope. This concept needs to be tested and generic/customized services developed for it, taking into account the sustainability of human welfare.

3- Contributing information from ocean sciences to the "Digital Twin of the Ocean" component of the "Digital Earth" initiatives. This is viewed as a next step in the value chain, filling the need to integrate a wide range of information sources, to transform data into knowledge and to connect, engage, and empower citizens, governments and industries by developing the capacity for strategic decisions with the goal to arrive at a more sustainable ocean governing system.

In addition, the Forum highlighted the need to develop capacity building, ocean literacy and education of the young generation. In particular, the academies should take initiatives to promote two-way (China–Europe) exchanges for early career scientists.

To promote the collaborations between Chinese and European ocean researchers and given the success of this joint workshop, it is proposed that the two academies hold a CAS-EurASc Frontier Forum on Ocean Science and Technology in China or Europe every second year.

Acknowledgements

The conveners and participants in this workshop take this opportunity to thank the Earth Science Division of CAS and the Division of Earth and Environmental Sciences of EurASc for their support to organize this workshop.