

Report on the Symposium of Climate Variation, Prediction and Application: 20-Year Anniversary of IOD Research

A symposium themed as Climate Variation, Prediction and Application was held on November 17-19 in Nanjing, China. It was also jointly organized by the Institute for Climate and Application Research (ICAR), the Nanjing University of Information Science and Technology (NUIST) and the Application Laboratory (APL) of the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) to commemorate the 20th anniversary of the discovery of the Indian Ocean Dipole (IOD): an ocean-atmosphere coupled climate mode in the tropical Indian Ocean. A very strong positive IOD event evolved in 2019 and affected the Indian Ocean Rim countries seriously; many parts of East Africa were flooded, and Indonesia and Australia suffered from severe droughts, heatwaves and forest fires, as reported by many international mass media. Thus, the symposium provided an excellent opportunity to understand the IOD and its societal impacts in depth. The symposium, as whole, covered various scientific issues related to climate variation including recent observational, modelling and theoretical studies, and novel metrics. Past achievements and recent progresses were discussed and summarized. Three sessions were embraced in this memorial event; those are 1) the climate variability and modelling, 2) the 20-Year anniversary of IOD research, and 3) climate prediction and application.

This symposium attracted more than 120 participants from 40 institutes and universities from 8 countries. There were 35 invited oral presentations and 24 posters. Four keynote presentations were delivered on the first day of the symposium. In the first keynote on “Is Global Warming Inhibiting an Incipient Ice Age?”, Prof. George Philander at Princeton University drew a large picture of our integrated earth system in the respect of climate evolution associated with atmosphere-ocean interaction. The followed three keynotes delivered by Prof. Guoxiong Wu at the Institute of Atmospheric Physics, Prof. Lixin Wu at the China Ocean University, and Prof. Toshio Yamagata at JAMSTEC presented overviews and prospects for the topics on Asian climate variability, climate extremes, and high-resolution ocean modelling, respectively. In the session of climate variability and modelling, participants summarized the recent progresses on modelling studies on a range of seasonal-to-interdecadal climate variabilities including El Niño-Southern Oscillation, monsoon, and the IOD in respect of the impacts of atmosphere-ocean interactions and model resolutions. In the session of the 20-Year anniversary of IOD research, participants extensively discussed the achievements during the

past 20 years since its discovery, including a variety of canonical and novel climate modes in the tropics that profoundly impact the climate variation and their mutual and inter-basin interactions. Based on the discussion in the first two sessions, the last session for prediction and application focused on how to improve the model prediction skills and the improved prediction skills applied on the agriculture for the sake of societal and economic benefits. Notable scientists including Profs. Swadhin Behera, Wenju Cai, Matthew England, Tim Li, Yukio Masumoto, Antonio Navarra, Saji Hameed, Bin Wang, and Shang-Ping Xie led discussions in each of the above professional sessions.

Rapid advancement in computing technology nowadays can empower the research on climate science. In particular, the super positive IOD event that peaked just during the symposium was successfully predicted one year ahead by means of the dynamical model of the SINTEX-F. In addition, the application of machine learning or artificial intelligence on climate prediction was highlighted in the symposium. Prof. Jing-Jia Luo introduced the recent progress on the application of deep learning on ENSO and IOD prediction, which attracted participants' keen attention. Although this new metrics is still controversial, it is no doubt that the involvement of artificial intelligence in climate science will enhance our knowledge on climate predictability and its applicability.

The intensive two-day symposium was wrapped up with a warm discussion on the rich future of the collaborative climate research. In this prospect, all senior scientists encouraged and blessed earlier career scientists.

(Written by Jing-Jia Luo, Director of ICAR and member of CLIVAR PRP; Swadhin Behera, Director of APL)

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