Introduction to International NPOCE Program

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“Northwestern Pacific Ocean Circulation and Climate Experiment (NPOCE)” was recently endorsed by Climate Variability and Predictability (CLIVAR) as an international joint program, which provides framework for 19 institutions from 8 countries so far including Australia, China, Germany, Indonesia, Japan, Korea, Philippines and United States to conduct cooperative field experiment and joint studies in the northwestern Pacific (NWP).

As well known, ocean plays an important role in global climate system. The NWP features a complicated ocean circulation system with intensive multi-scale air-sea interactions. It holds crossroads and major pathways for different water masses from mid- and high-latitudes and the southern hemisphere to enter the equatorial thermocline. As the origin or fate of several major currents, the NWP strongly interacts with the ambient oceans and marginal seas, and participates in the recharge-discharge process of the western Pacific warm pool. The changes in the NWP can highly influence the heat and freshwater budget and hence the atmospheric deep convection over the Indo-Pacific warm pool, thereby playing a key role in modulating ENSO cycles and the East Asian Monsoon (EAM), as well as in the development and evolution of the tropical cyclones.

Although significant advances have been made over the last several decades, understanding of the mean circulations in the region still remains incomplete and variability of the low latitude western boundary currents is largely unknown. Lack of in-situ observations severely hinders our understanding of subtropical-tropical water/heat exchanges and their roles in decadal and long-term changes of the tropical ocean-atmospheric circulations. Few observations in the region provide reliable information to validate model capability in simulating oceanic heat and freshwater transport, which are crucial to the warm pool maintenance and low-frequency variability.

After TOGA (Tropical Ocean and Global Atmosphere) and WOCE (World Ocean Circulation Experiment) (from the middle 1980s to early 1990s, it took over 15 years to welcome another long-term, large-scale field experiment program in terms of

ocean circulation and air-sea interaction in the NWP. The proposal of the new field experiment program NPOCE was experiencing the past 6 years through a series of workshops, with aim at tackling some scientific issues remained from TOGA and WOCE to fill the gap in the post-TOGA and WOCE period.

NPOCE program is designed to observe (see figure on Page 952), simulate, and understand the dynamics of the NWP ocean circulation and its role in low-frequency modulations of regional and global climate such as the western Pacific warm pool variability, ENSO, EAM, and the tropical cyclones. The NPOCE scientific issues are archived into four research themes: 1. western boundary currents, 2. interaction with ambient circulation systems, 3. roles in warm pool maintenance and variability, 4. regional air-sea interaction and climatic impacts. NPOCE will integrate different approaches with emphasis on coordinated observation and modeling to provide a more complete description of the structure and variability of the ocean circulation in the NWP, and to help improve prediction of the climate change.

In various countries, there had been some related projects in the last few years even before NPOCE being endorsed. Supported by such Chinese agencies as the National Natural Science Foundation of China (NSFC), Ministry of Science and Technology of China (MOST), Chinese Academy of Sciences (CAS), and State Oceanic Administration (SOA), Chinese scientists have set up several large-scale projects relevant to NPOCE, including the National Basic Research Program (973 Program), NSFC major project, and CAS External Cooperative Project, representing well coordinated, multi-institutional efforts of institutions from various Chinese institutions. We are sure that Chinese scientists will continue their effort to get sustained funds to give full play to NPOCE in the next 10 years or so. The NPOCE Inauguration Meeting was held on May 30, 2010 in Qingdao, China, where chair of CLIVAR SSG Prof. Martin Visbeck announced the NPOCE SSC composition with chair Prof. Dunxin HU and 21 members from participating countries.