

ESCAP/WMO Typhoon Committee

48th Session

22- 25 February 2016

Honolulu, Hawaii

USA

FOR PARTICIPANTS ONLY

WRD/TC.48/4.3.2

31 December 2015

ENGLISH ONLY

**The Experiment on Typhoon Intensity Change in Coastal Area (EXOTICCA)
ANNUAL REPORT 2015**

(Submitted by WGM Chair)

ACTION PROPOSED:

The Committee is invited:

- (a) To take note of the major progress and issues in implementing the project in 2015 as reported
- (b) To encourage TC Members to participate the field campaign and the share the observational data related to the target typhoon

The Experiment on Typhoon Intensity Change in Coastal Area (EXOTICCA)

(WGM of TC)

1. Background (context)

With the significant advances in numerical prediction modeling of typhoon, there has been vital improvement in typhoon track forecast. However, there is no considerable progress in typhoon intensity forecast. In recent decades, the intensity forecasts of numerical prediction models still remain challenging, which may not yet fully meet the need of operation, while operational forecasting of typhoon intensity still mainly relies on statistical methods. In Northwest Pacific region, the core issue that impedes more in-depth analysis and improvements in forecasting capabilities is the lack of observations of structure and intensity changes of tropical cyclones. The primary technique for tropical cyclone intensity analysis widely used by operational forecast centers is the Dvorak technique. The tropical cyclone intensity estimated in warnings may vary across different centers due to the subjectivity of the Dvorak technique. In recent years, though on-board microwave sensors in satellites have gained wide application, they still cannot provide **remarkable** improvement in this situation.

During the 45th Session of the UNESCAP/WMO Typhoon Committee (TC), held in Hong Kong, China from 29 January to 1 February 2013, the Working Group on Meteorology (WGM) proposed a regional field experiment to be implemented with the cooperation and joint efforts of the TC Members. Similar in scale to the “SPECTRUM-90” Typhoon Research Experiment, this experiment focuses on resolving the difficulties of operational typhoon forecasting and identifying the key scientific issues of tropical cyclone-related disaster prevention and mitigation. The proposed project's concept was well received by TC Members.

Soon after the 45th Session, the WGM drafted the project proposal (first draft). In March 2013, former TC Chair JIAO Meiyuan (Deputy Administrator of CMA), at the request of the current TC Chair, organized a thematic symposium with the participation of the WGM Chair and the WMO/WGTMR Chair (DUAN Yihong, President of Chinese Academy of

Meteorological Sciences). The proposal (first draft) was then submitted to TRCG Chair (AWG member) for feedback. Based on discussions during the symposium and recommendations from the AWG, the proposal was then revised and submitted for discussion at the AWG Meeting in Bangkok on May 10, 2013.

Based on the input from AWG meeting, WGDRR and WGH workshop in 2013, the proposal was amended and submitted for discussion at the 8th IWS in Macao, China on December 2-7, 2013. Based on the proposed amendments at the WGM parallel meeting during 8th IWS and the input from Japan Meteorology Agency (JMA) and Hong Kong Observatory (HKO) after the meeting, the proposal was then modified for the fourth time, and was endorsed in the 46th Session of ESCAP/WMO Typhoon Committee in Bangkok, Thailand on February 10-13, 2014.

2. The major progress

2.1 2014 (after 46th Session)

The Organizing Committee (OC) Meeting, which planned to be held in June 2014, was not able to be realized due to the time conflict of the OC Members with their own commitments during the typhoon season. Nevertheless, the field campaign was conducted by CMA and HKO in 2014, which including:

- The reconnaissance flights were conducted by HKO, in collaboration with the Hong Kong Government Flying Service (GFS), to collect meteorological observations (wind) for tropical cyclones over the South China Sea.
- ~~The contract for the supply of a dropsonde system to be installed on the new GFS fixed-wing aircraft for obtaining vertical atmospheric profiles was signed in 2014.~~
- The mobile sounding was conducted by STI/CMA to collect vertical atmospheric profiles for typhoon landfalling in East China region.
- The satellite buoy array (including 5 buoys) established successfully in South China Sea. Two tropical cyclones (Rammasun and Kalmaegi) path over the buoy array in 2014, the essential atmospheric and oceanic parameters under typhoon conditions (including the air-sea flux) obtained.
- The technique of rocket sounding developed by CMA as well as the unmanned aerial

vehicle (UAV) in 2014.

The following research project related to the EXOTICCA, on the air-sea interaction and its influence on tropical cyclone intensity change (national basic research programme) and the High Resolution Model (WGM-PP) were carried out by CMA in 2014 and beyond.

The progress on EXOTICCA in 2014 was noted by the 3rd joint session of TC and PTC (include 47th Session of Typhoon Committee and 42th Session of Panel on Tropical Cyclones) in Bangkok, Thailand on February 9-13, 2015.

2.2 2015(after 47th Session)

According to the 47th Session, the first Organizing Committee Meeting for EXOTICCA was held in Shanghai Meteorological Service in Shanghai, China on 9 October 2015. There were 15 experts from China, Hong Kong, China, Japan and United States in the Meeting. The Terms of Reference, Scientific Steering Committee Start-Up Scheme and Research Groups Start-Up Scheme as well as the **Project Understanding** were discussed with the following highlights:

- A project office (actual or virtual) should be set up and attached to TCS for leading and coordinating with the project;
- Participation of the project should be open to all Members, **invited by the OC;**
- A Member can participate in both operational and/or research areas in the project;
- **A Member can write to the OC to express interest;**
- **All members are eligible to nominate typhoon experts to form the Scientific Steering Committee,** no matter the Member is participating in the project or not;
- **Participating Members are encouraged to share the information and/or research results to other Members but there is no obligation to do so.**

Technical presentations about the latest technologies and experiments were delivered by STI, HKO and NRL. ~~Two~~ field campaigns were carried out by STI in 2015 including UAV Observation for Typhoon Chan-hom in July and ~~Rocket-Dropsonde~~ for Typhoon Mujigae in October 2015; and two aircraft reconnaissance flights were conducted by HKO for Typhoon Linfa in July and Typhoon Mujigae in October 2015. The data were proved to be useful for monitoring the **intensity change** of the TCs as they approached the coast.

3. Future planning and implementation schedule

The project is scheduled to be implemented from 2014 to 2018. The detailed plan in 2016 and beyond is as follows:

(1) 2016:

- To hold the OC and/or SSC meeting in 2016 for preparing the implementation of the experiment and confirm the tasks of participating TC Members in 2016.
- To pilot the field campaign include trial target observations for 1-2 tropical cyclones and testing of new instrument (new jet-aircraft, buoy array and rocket dropsonde) as well as the mobile GPS rise-sonde.
- ~~Demonstration research~~ on tropical cyclone intensity change by using target typhoon data from the field campaign (~~to be included in the TC Fellowship Scheme~~) with the focus on target typhoon data assimilation technique development.

(2) 2017:

- Implementing the field campaigns for 1-2 target typhoons from June to October.
- ~~Demonstration research~~ on tropical cyclone intensity change by using target typhoon data from the field campaign (~~to be included in the TC Fellowship Scheme~~) with the focus on the mechanism of target typhoon structure/ intensity change and tropical cyclone model system development.

(3) 2018:

- Joint scientific demonstration research on the effect of intensity changes on storm surge and the flood forecasting of landfalling typhoon and its related disasters risk.
- Consolidating the outcomes of the project and submitting the project summary report to the Typhoon Committee Session in 2019.