臺灣區域豪雨觀測與預報實驗

Taiwan-Area Heavy rain Observation and Prediction Experiment (TAHOPE)

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NARLabs 國家實驗研究院 National Applied Research Laboratories

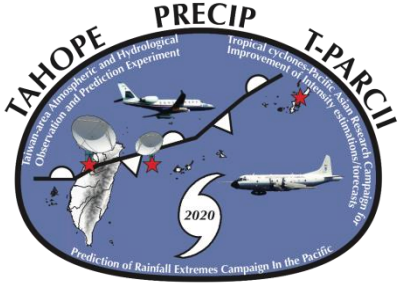
MOST 科技部 Ministry of Science and Technology

Background

- 2014/7：MOST science team led by Minister Dr. San-Cheng Chang visited NSF and had intense discussion on mutual cooperation. One of the mutual interests from the meeting was the severe weather and extreme rainfall, thus scientists from both countries decided to promote further cooperation.
- 2015/5: 1st Taiwan-USA Severe Weather Workshop at Taipei
- 2016/6: 2nd Taiwan-USA Severe Weather Workshop at Hawaii
- 2017/6: PRECIP 2020 workshop at Colorado State University
- 2017/9: First TAHOPE Planning meeting at TTFRI
- 2017/10/16: First Taiwan-USA working meeting
- 2017/10/18：The 1st Planning Meeting for the Joint Projects (with scientists from Taiwan, USA, Japan, and Korea)

- 2017/9 - 12: 6 working meetings at TTFRI, and 1 meeting at CWB
- 2017/12/14-15: Second Taiwan-USA working meeting
- 2018/3: Radar site survey and 3rd Taiwan-USA working meeting
- 2018/5: 4th Taiwan-USA working meeting
- 2018/6: Taiwan-USA-Japan joint meeting at AOGS
- 2018/10: Prof. Ming-Jen Yang as the TAHOPE lead PI

Abstract



"Taiwan-Area Heavy rain Observation and Prediction Experiment" (TAHOPE) will be conducted from August 2019 to July 2022 to study Mei-Yu fronts, mesoscale convective systems (MCSs), and landfalling typhoons near Taiwan. From May to August 2020, TAHOPE will join the PRECIP2020 (USA) and TPARC-II (Japan) experiments to conduct the joint observations for severe weather (Mei-yu fronts and typhoons) in the vicinity of Taiwan. The main themes of TAHOPE project range from large-scale monsoon influence, mesoscale convective systems, as well as cloud physics processes, under the complex topography on Taiwan Island. Through the joint intense observations, real-time or near real-time data assimilation and prediction will be conducted with the advanced atmospheric models.

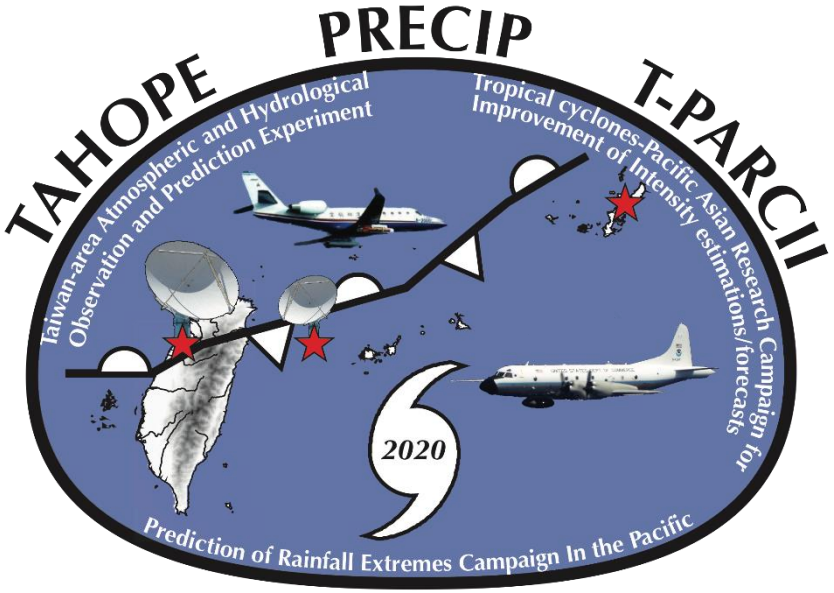
In order to accomplish this internationalljoint observation and prediction experiment, National Taiwan University takes a lead role in integrating the available observation instruments and invites scientists to jointly submit an integrated three-year research proposal (from 1 August 2019 to 31 July 2022) to the Ministry of Science and Technology (MOST), Taiwan. The U.S. partners have submitted requests to the National Science Foundation (NSF) and National Oceanic and Atmodpheric Administration (NOAA) on several instruments (P3-aircraft, S-PolKa radar, and CSU SEA-Pol radar) to combine with CWB's operational observation facilities (radars and radiosondes), and the instrurments (wind profiler and dropsonde) of National Applied Research Laboratory (NARL) to perform intense observations during 15 May to 30 September 2020. The evaluation of data impact from Taiwan's own satellite (FORMOSAT-7) measurements will be carried out during the TAHOPE experiment. The U.S. partners include principal investigator, Dr. Michael Bell (CSU professor) and many renowned scientists (Profs. Yi-Leng Chen, Yuh-Lang Lin, Kristen Rasmussen, Rob Rogers, Fuqing Zhang, and others). On Taiwan side, the TAHOPE Project Office has integrated 10 subprojects related to the observation and data assimilation. Prof. Ben J.-D. Jou at NTU and Dr. Bill Y.-H. Kuo at NCAR served as the project consultants. The Scientific Advisory Committee consisting of senior scientists in Taiwan and USA will also provide valuable comments and suggestions on the proposed scientific goals and experimental design of the joint project.

PRECIP2020

(Prediction of Rainfall Extremes Campaign In the Pacific)

US science team: *Colorado State Univ.:* Michael M. Bell and Kristen Rasmussen, *Univ. of Washington*: Angela Rowe, *Univ. of Hawaii*: Alison Nugent and Yi-Leng Chen, Penn. State Univ.: Anthony Didlake and Fuqing Zhang, *UC at Davis*: Shu-Hua Chen, *North Carolina A&T*: Yuh-Lang Lin, *NCAR*: Rosimar Rios-Berrios, *NOAA*: Rob Rogers and Joe Cione

Draft Logo
in shape of
5 mm raindrop



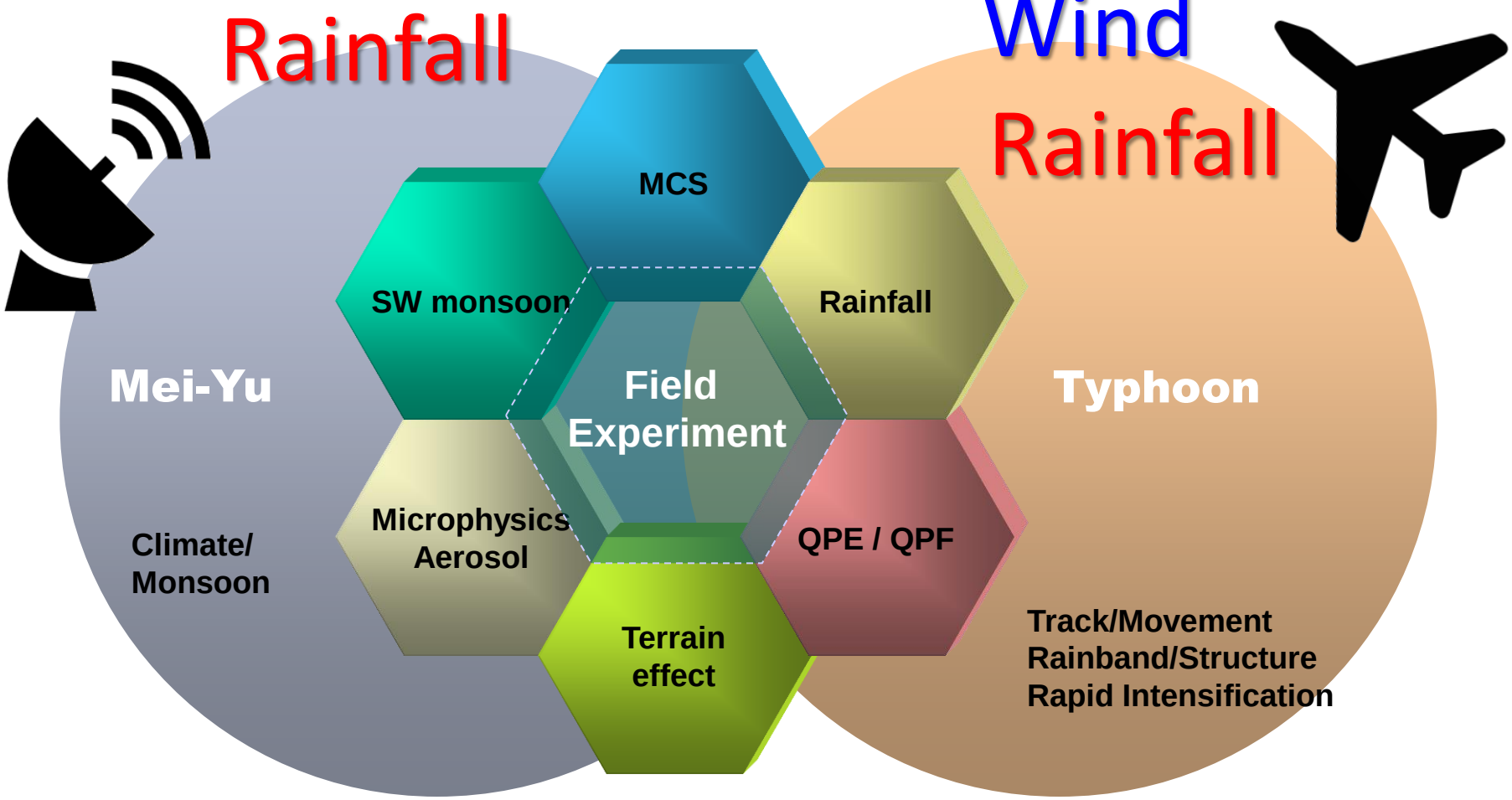
中華民國科技部
Ministry of Science and Technology, R.O.C.

NSF

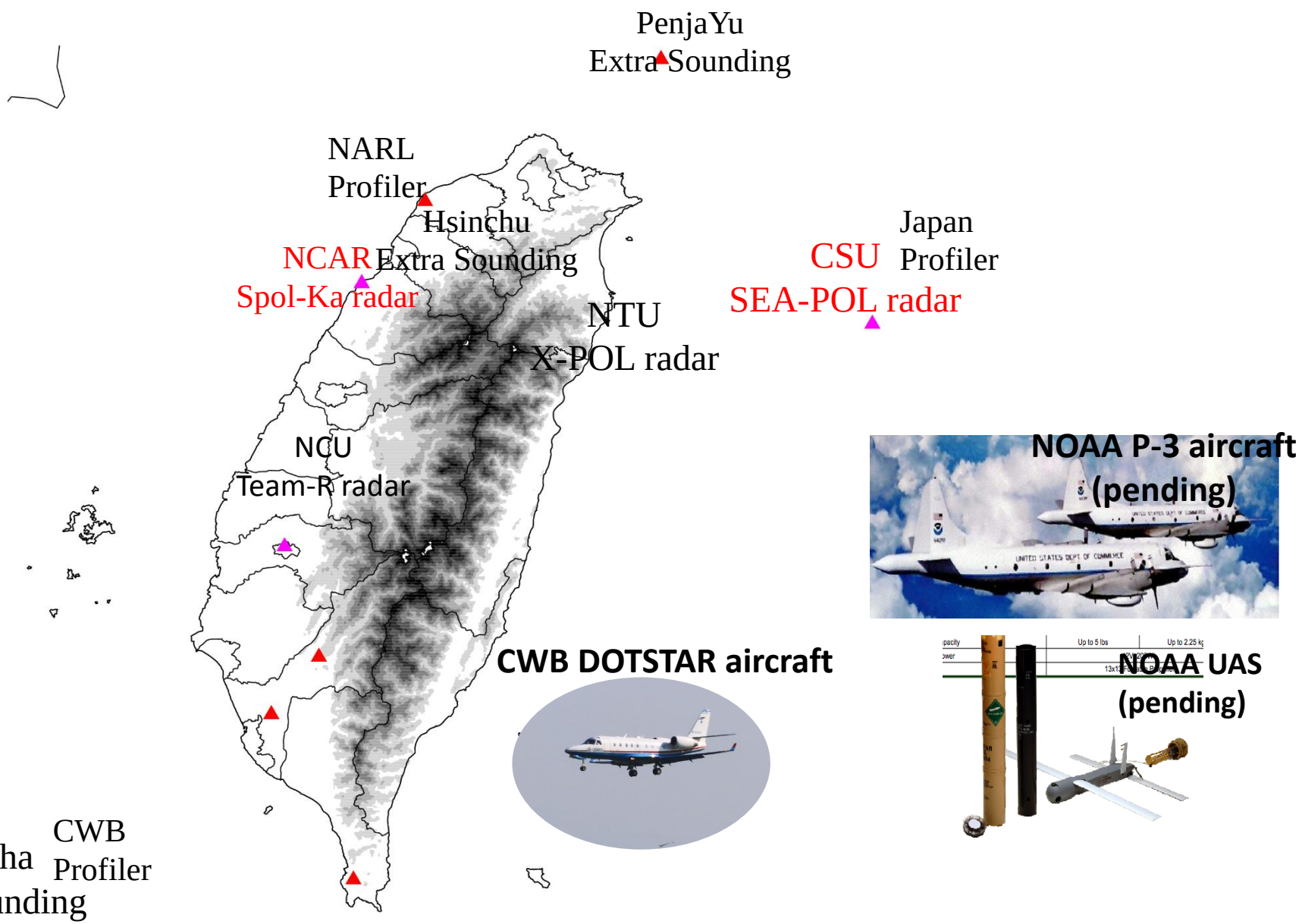
NOAA

JSPS Japan Society for the Promotion of Science 日本学術振興会

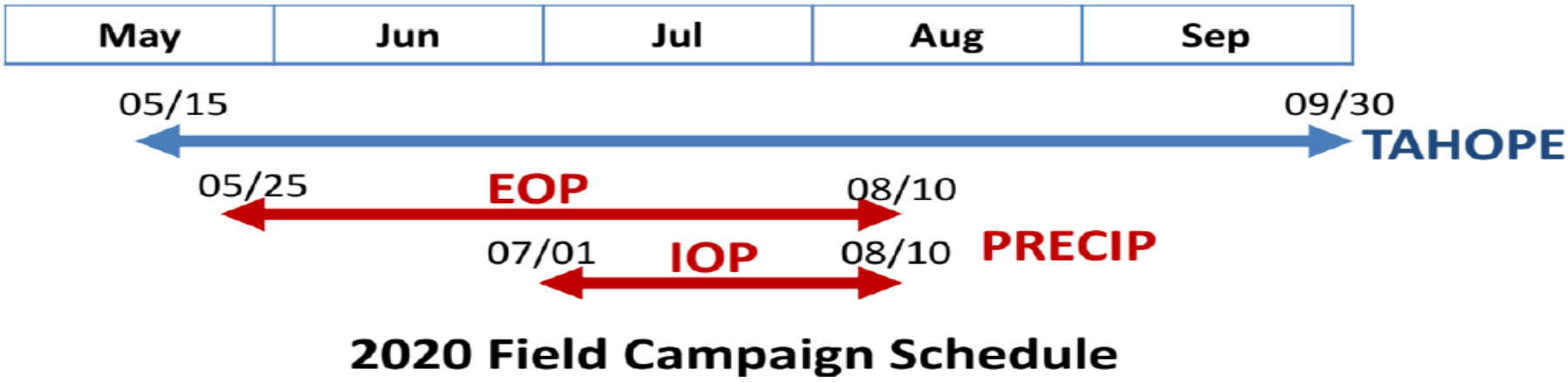
Focus on…


Rainfall
Wind
Rainfall
MCS
SW monsoon
Rainfall
Field
Experiment
Microphysics
Aerosol
QPE / QPF
Terrain
effect
Mei-Yu
Climate/
Monsoon
Typhoon
Track/Movement
Rainband/Structure
Rapid Intensification

TAHOPE/PRECIP/T-PARCII observations



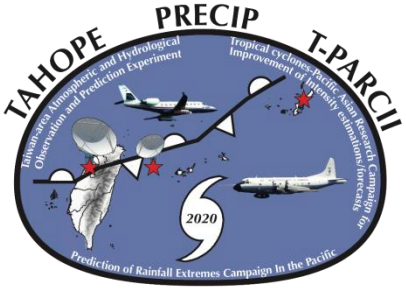
Field Campaign Timeline



2020 Field Campaign Schedule

- Experiment facilities
  Taiwan facilities: C-pol (NARL), Team-R (NCU), X-pol (NTU), Wind profiler (NARL), Radiometer (NARL), Dropsonde and Operational stations (CWB)
  U.S. facilities: S-PolKa & SEA-POL radars, and P3 aircraft
- Japan facilities: radar, profiler, and aircraft (T-PARCII)
- Previous Taiwan-US-Japan joint meetings: 2017/10 at ICMCS (Taipei, Taiwan), 2018/06 at AOGS (Hawaii, USA), 2019/03 after ICMCS (Okinawa, Japan).

Expected Achievements



- Complete the first field experiment on typhoons affecting Taiwan with integrated new radar network and airborne radar.
- Complete the first field experiments with unmanned and manned aircraft measurements for both Mei-yu fronts and typhoons.
- Verify hypotheses of various rainfall mechanisms/enhancements in different systems and improvement on state-of-the-art modeling skill of severe rainfall.
- Improve operational QPE and QPF and forecast skill of violent winds in the Mei-yu systems and typhoons for decision making.
- Provide cross validations among a variety of observations and their error characteristics for data assimilation purpose.
- Transfer the research outcome into government operational agencies like Central Weather Bureau, and Water Resource Agency to benefit the society.
- Publish scientific journal articles and books
- Train future talents (students) in universities and government agencies
- Promote the visibility of Taiwan in international scientific communities.