**International Tropical Cyclone Collaborative Research Guide (2025)**

1. **Synopsis**

The Asia-Pacific Typhoon Collaborative Research Center (AP-TCRC) is a newly-established international joint typhoon research unit located in the Lingang Special Area of Shanghai, China. It is supported by the ESCAP/WMO Typhoon Committee (the Committee) and hosted by the Shanghai Municipal Government of China and the China Meteorological Administration.

The International Tropical Cyclone Collaborative Research Guide provides information on both long-term (1 year, could be extended) and short-term (2-3 months) research areas on tropical cyclones (TCs) to be supported by AP-TCRC. These include TC observing, understanding, modeling and prediction, marine meteorology and related new technologies.

1. **Research Areas**
2. **Typhoon Structure and Intensity Change and Associated Impacts**

* Observing technologies: Develop and refine manned and unmanned ground-based, airborne, seaborne and space-borne measurement strategies and technologies for improved monitoring of typhoon position, intensity, structure, environment & associated impacts
* Physical process studies: Improve the understanding of physical processes that affect typhoon behavior before, during, and after landfall
* Forecast improvement: Develop modeling capabilities for improved forecasting of typhoons and their impacts

1. **Subseasonal, seasonal, and climate-scale prediction for landfalling typhoons**

* Development of a multi-scale diagnostic analysis system for typhoons
* Monitoring and projection of landfalling tropical cyclone activities in the Asia-Pacific region under the background of global warming
* Identification of sub-seasonal characteristics of and development of prediction techniques for landfalling tropical cyclones in the Asia-Pacific region
* Construction of a dataset of landfalling tropical cyclones in the Asia-Pacific region
* Publication of a Landfalling Tropical Cyclone Climatological Atlas in the Asia-Pacific region

1. **Typhoon Early Warning multidisciplinary research**

* Establish databases on typhoon disasters, typhoon associated disaster prevention and mitigation strategies in the Asia-Pacific region
* Construct a pre-disaster risk assessment system for typhoon impacts on mega-cities
* Conduct international collaborative research on possible typhoon disaster risks under different climate change scenarios

1. **International science and technology exchanges and training**

* Regular invitation of TC prevention and mitigation personnel to conduct technical training for members of the ESCAP/WMO Typhoon Committee.
* Invitation of international scientists as guest editors of special topics for the international journal Tropical Cyclone Research & Review (TCRR).
* Invitation of top international scientists from different disciplines to work in AP-TCRC on a short- or long-term basis.
* Recruitment of TC researchers from the Asia-Pacific region as guest researchers in AP-TCRC to conduct collaborative research.
* Conduction of international scientific forums to raise the knowledge level of TC forecasters and researchers of members of the ESCAP/WMO Typhoon Committee.

1. **Priority Funding Missions for 2025**
2. **Typhoon Structure and Intensity Change and Associated Impacts** 
   1. R&D on new manned and unmanned platforms and instruments suitable for observing TC conditions and an assessment of their applicability.
      1. Platform and instrument development
      2. Targeting/observing strategies
      3. Artificial Intelligence algorithms for data analysis
   2. Research on TC structure and intensity change processes, precipitation and microphysics, and PBL structure and evolution pre- and post-landfall.
      1. Genesis and rapid intensification
      2. Storm size and secondary eyewall formation/eyewall replacement cycles
      3. Rainfall and microphysics
      4. PBL structure pre- and post-landfall
   3. Develop modeling capabilities for improved forecasting of typhoons and their impacts
      1. Typhoon air-sea coupled model development
      2. Data assimilation techniques
      3. Physical parameterization evaluation and improvement
      4. Verification techniques for TC models
   4. The application of Artificial Intelligence in the research and forecasting of tropical cyclones
      1. AI forecast model
      2. AI application in observation and data analysis
      3. AI application in Data assimilation and modeling
   5. Special Research about High Impact Tropical Cyclones all over the world during past two years

High Impact Tropical Cyclone list:

Typhoon Yagi, Typhoon Shanshan, Typhoon Doksuri, Hurricane Milton, Hurricane Helene, Tropical Cyclone Fred, Tropical Cyclone Chido

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2. **Disaster mitigation techniques**
   1. TC-induced inundation model development.
   2. Research on anomalous TC characteristics under climate change.
   3. Understanding the mechanisms of changes in landfalling TC activity under climate change.
   4. Seasonal and subseasonal TC forecast techniques.
   5. Forecast techniques of TCs in Urban environments
   6. Research on the disasters induced by various high-impact tropical cyclones, across all basins