U.S.-Taiwan Workshop on the Advancement of
Societal Responses to Mega-Disasters afflicting Mega-Cities

Introduction of Taiwan Typhoon and Flood Research Institute

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國家實驗研究院
National Applied Research Laboratories

Outline

1. Mission
2. Strategic Positioning
3. Organization and Staffing Plan
4. Core Technology and Facilities
5. Research & Development
6. Future Work

1. Mission

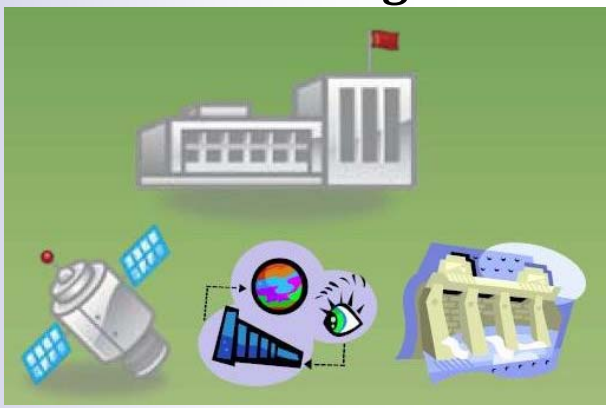
R&D：**Improve and integrate critical forecast technologies for typhoon and flood disasters**

Service：**Establish core facilities and the platform for testing and evaluation of academic research and technology transfer to government agencies**

Education：**Cultivate interdisciplinary science talents while supporting and integrating collaborative efforts of the government and the academia**

2. Strategic Positioning

Government Agencies

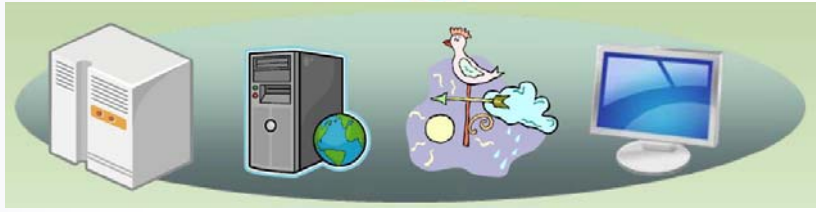


Academia

Observation Data
Tech. Transfer

Integrated Research
Tech. Evaluation

Taiwan Typhoon and Flood Research Institute



Forecast Technologies Integration

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3. Organization and Staffing Plan

Organization \ year	2010	2011	2012	2013	2014
Director General's Office	2 (2)	3	3	3	3
Atmospheric Modeling Division	7 (6)	8	11	14	17
Meteorological Analysis and Forecast Division	7 (7)	9	11	14	17
Hydrologic Systems Division	7 (5)	9	11	14	17
Facilities Support Division	7 (6)	9	10	11	12
General Affairs Division	5 (4)	7	9	9	9
Total	35 (30)	45	55	65	75

The number in parenthesis ( ) indicates the current number of employees as of today.

4. Core Technology and Facilities

- **Core Technology Improvement**
  - Quantitative Precipitation Estimate/Forecast(QPE/QPF)
  - Observation
  - Hydrological Modeling
  - Numerical Weather Modeling
- **Facilities**
  - Mobile Rain Radar Observing System
  - Atmosphere & Hydrology Flux Observation Instruments

5. Technology R&D (1)

- **Integrated Forecast Technologies**

0~6 hrs：**application of radar data from observation**

3~48 hrs：**statistical (climatology) modeling & forecast**

24 hrs~：**numerical modeling & forecast**

5. Technology R&D (2)

Application of Radar Data

- **Goals**

  0~6 hrs forecast: QPE/QPF

  Data assimulation: improvement of numerical modeling & forecast

  - **Advantage: high resolution (spatial and temporal)**

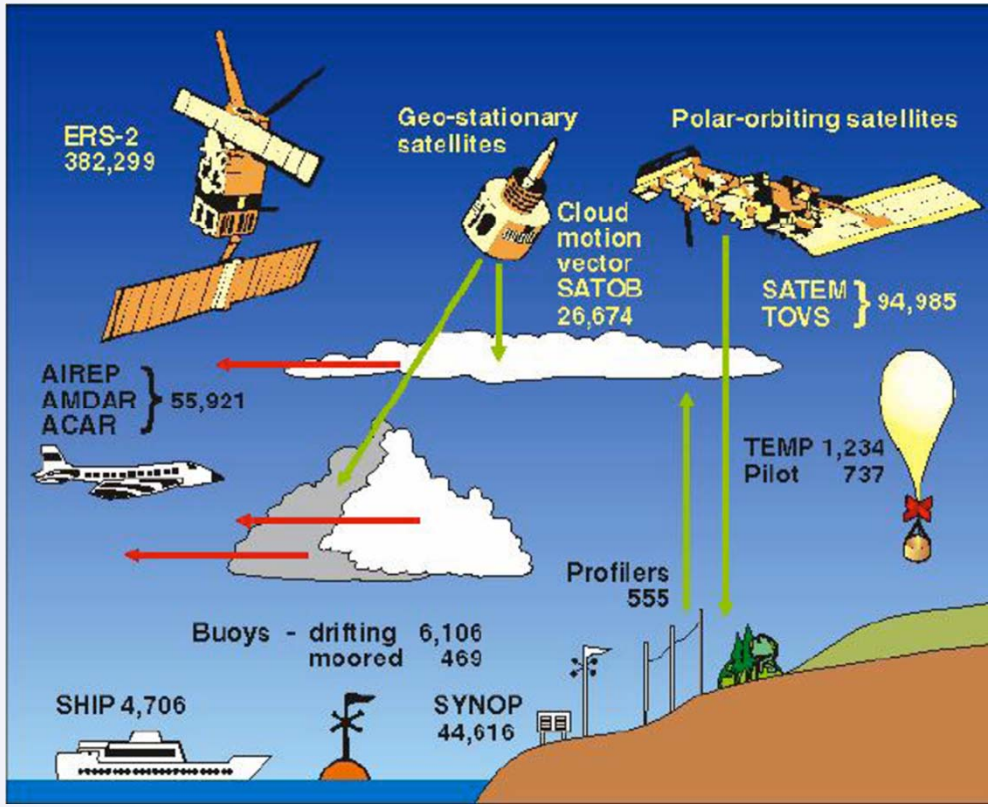
5. Technology R&D (3-1)

Numerical Modeling & Forecast

- **Purpose**: To revise a modeling system that accommodates the complexities and geographical distinctiveness
  - Improvement of initial condition
  - Physical processes
  - Air-sea interaction
  - Ensemble forecast

5. Technology R&D (3-2)

Data Assimilation
(3DVAR, 4DVAR, EnKF, Hybrid)

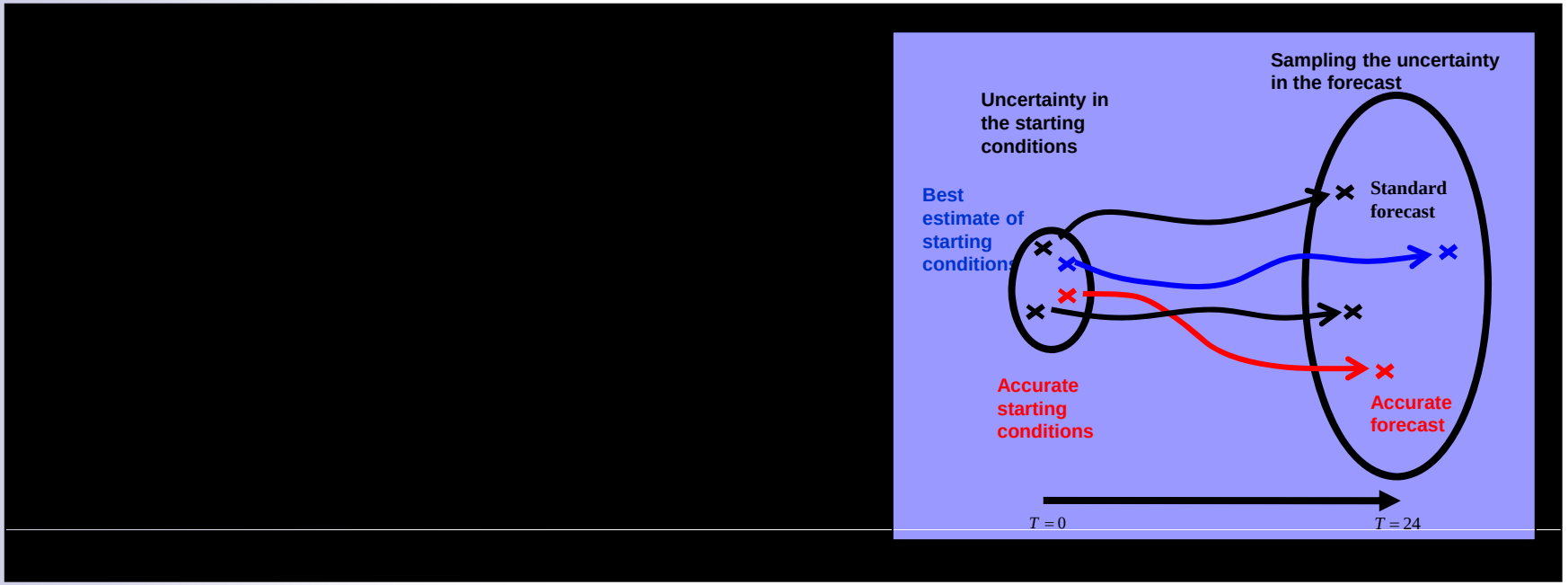


5. Technology R&D (3-3)

Ensemble forecasting

Ensemble members: m_1, m_2, m_3, …

Observed rainfall at a model grid point: *O* Total sample size: *N* Forecast difference: *r*



5. Technology R&D (4-1)

Statistical Modeling & Forecast

- **Goal:** To provide a system that can provide rainfall forecast rapidly

  - During the warning period, the Typhoon Rainfall Climatology Model (TRCM) provides the spatial and temporal distribution of rainfall .
  - The TRCM is established based on the historical typhoon rainfall data for each river basin.

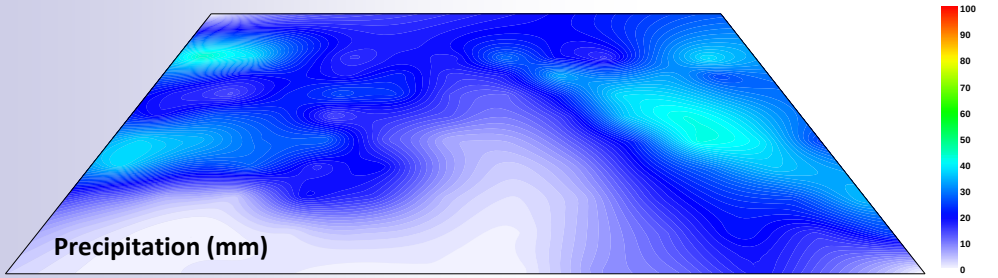
5. Technology R&D (4-2)

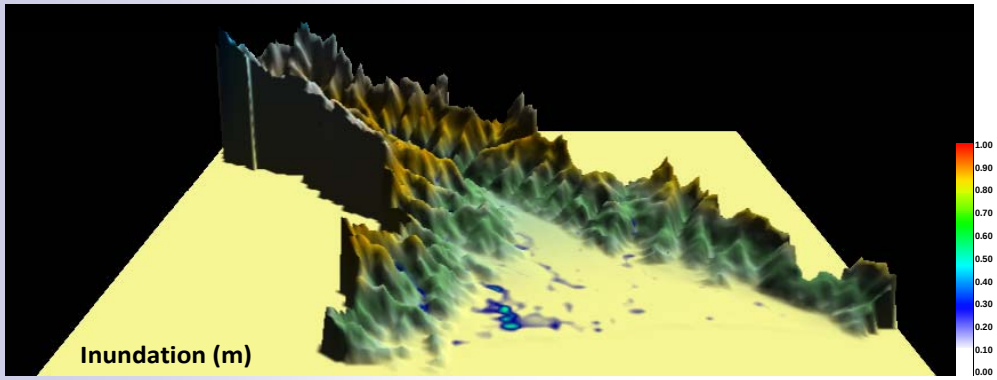
Kalmaegi (24 hours) Jul 17 - Jul 18					
	Dan-Shau river	Da-an river	Touqian River	Jhunan River	
Observation	41	281	121	162	
Typhoon rainfall model	155	185	180	185	
FungWong (24 hours) Jul 28 - Jul 29					
	Dan-Shau river	Tailuge River	Lanyang river	Kao-Ping river	Zhuoshui River
Observation	91	304	190	302	210
Typhoon rainfall model	150	295	265	310	230
Sinlaku (48 hours) Sep 13 - Sep 15					
	Dan-Shau river	Da-an river	Touqian River	Jhunan River	
Observation	436	856	642	537	
Typhoon rainfall model	570	720	680	640	
Jangmi (48 hours) Sep 28 - Sep 30					
	Dan-Shau river	Lanyang river	Da-Cha river	Tseng-wen river	Kao-Ping river
Observation	214	238	378	399	391
Typhoon rainfall model	570	270	430	400	365

5. Technology R&D (5)

Coupled Weather-Hydrology System

Typhoon Longwang (AM:0900, Oct., 02nd, 2005)

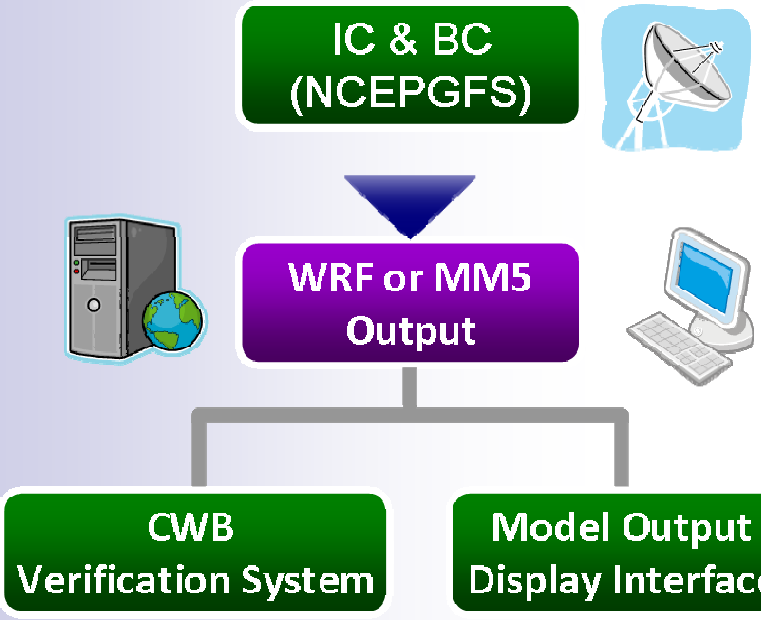




TTFRI examined flood simulations using precipitation from mesocale numerical weather prediction systems.
[For examples, WRF Model]
The hydrology and hydraulic modeling are going to be conducted by WASH123D numerical model.

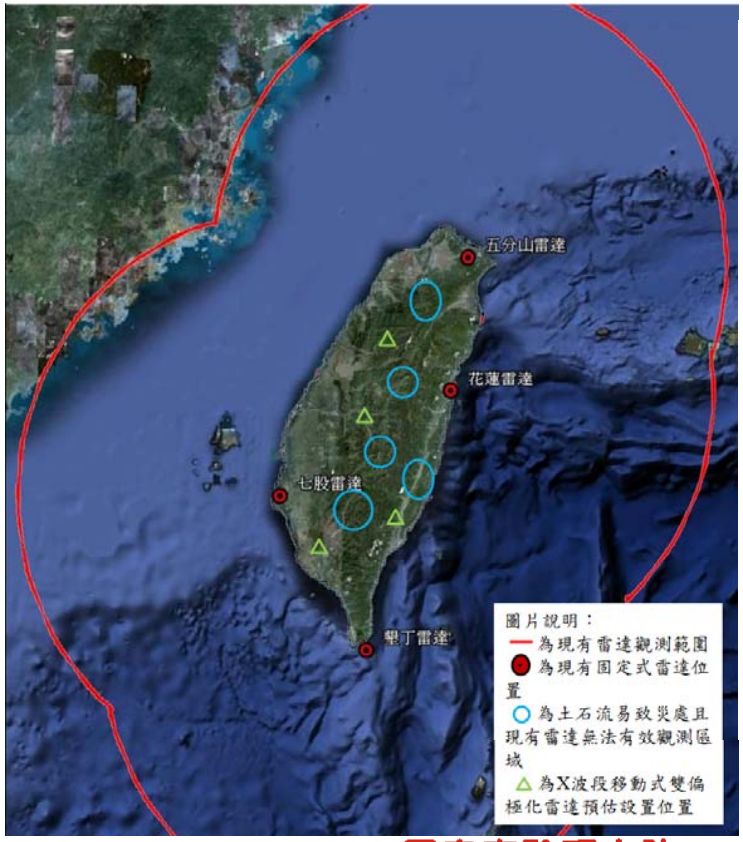
6. Future Work

- **Construction of the preliminary test-bed for real-time forecast evaluation**



Threat Score,	SLP, Wind,
Correction Coefficient,	Geopotential Height,
RMS,	Vorticity,
Mean Error, BIAS, etc.	Typhoon Track, etc.

- **Construction of movable rainfall radar observation system**



Thank you!