AAMP Modeling

Akio Kitoh (MRI/JMA)

- JRA-55 & AMY-RA
- TIGGE and MJO
- High-resolution climate models
- CMIP5 and AAMP
  - Asian Monsoon Metrics

Overview of JRA-55

60-km resolution global climate data set

Phase 1 (2009~2012)

JRA-55 (1958~2012)

Reanalysis of past observations using a constant state-of-the-art data assimilation system

Boundary fields

Phase 2 (2013~2015)

Regional downscaling over Japan (1958~2012)

Details to be determined

High-resolution (~5 km) climate data set over Japan

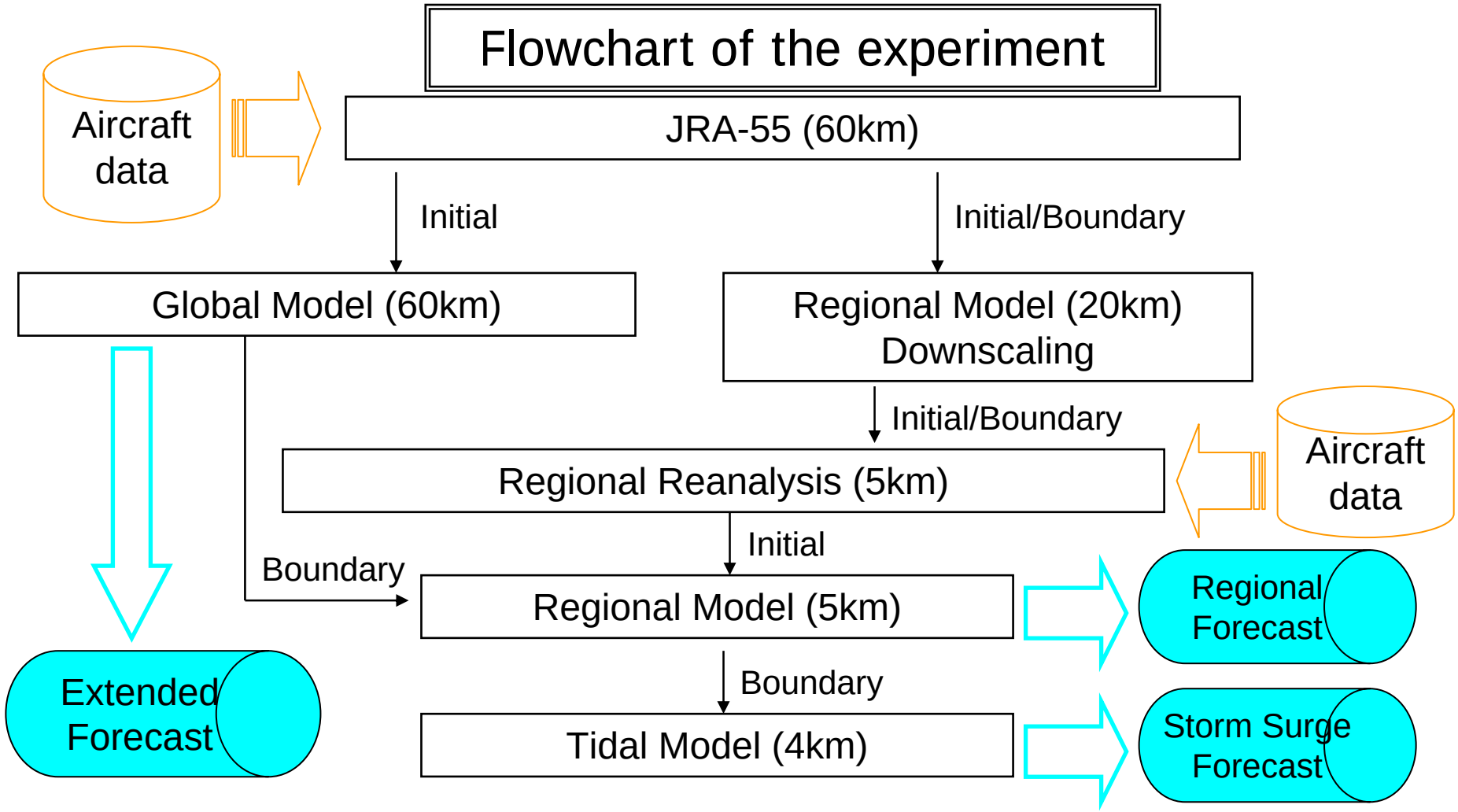
providing a fundamental data set for

- researches on climate change and decadal variability in the last half century
- real-time climate monitoring
- verification of seasonal forecast and climate models
- atmospheric forcing fields for ocean data assimilations
- chemical transport simulations
- carbon cycle simulations
- water resource management
- estimation of renewable energy resources
- severe weather risk assessment

and much more

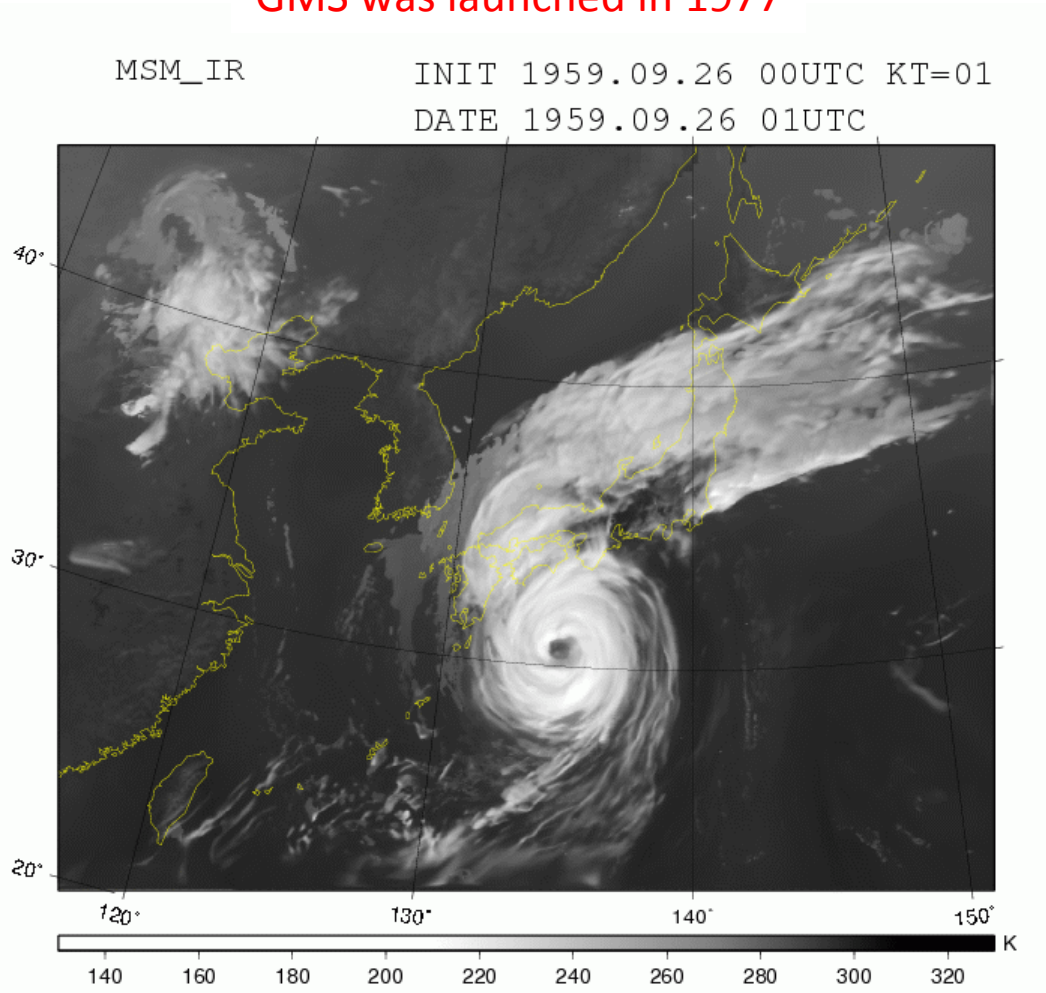
Application of JRA-55
Isewan Typhoon Reanalysis and Reforecast

Isewan Typhoon(Vera) 21 - 27 Sep. 1959
Deadliest Typhoon in 20 Century Japan which killed 5098



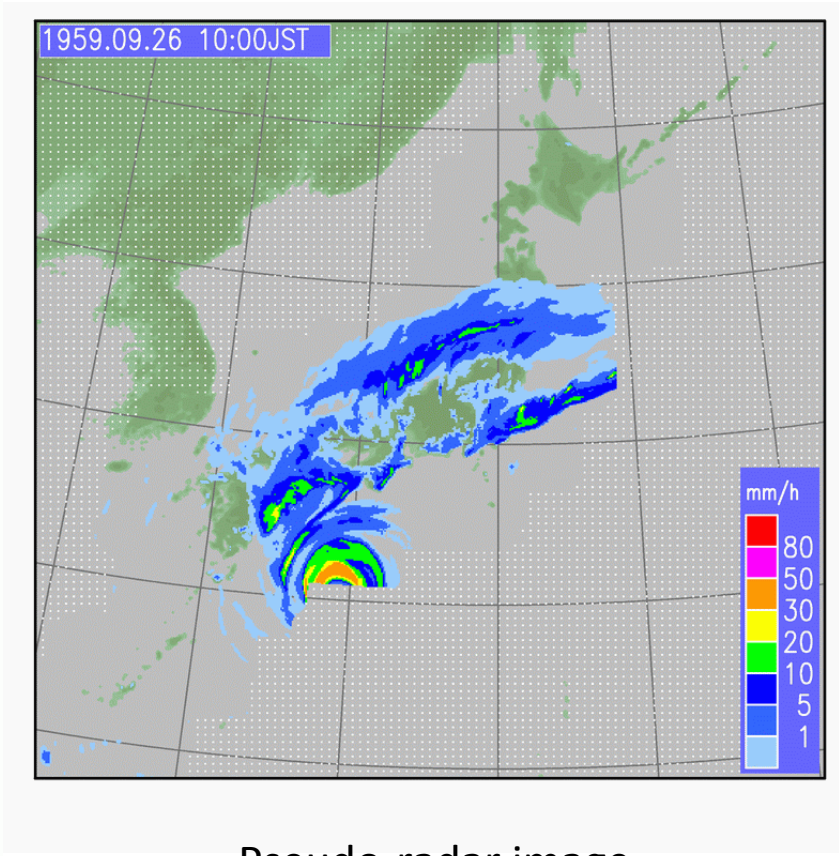
Typhoon Vera (Pseudo Images)

JMA's first satellite,
GMS was launched in 1977



Pseudo-satellite image (IR)

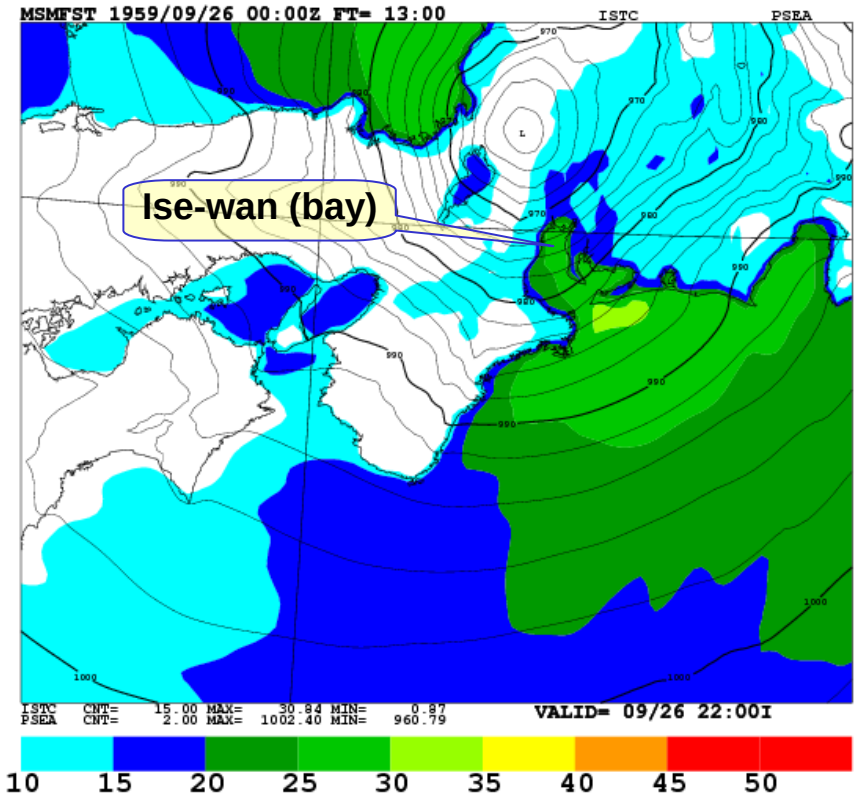
S-band radar on Mt. Fuji
started observation in 1964



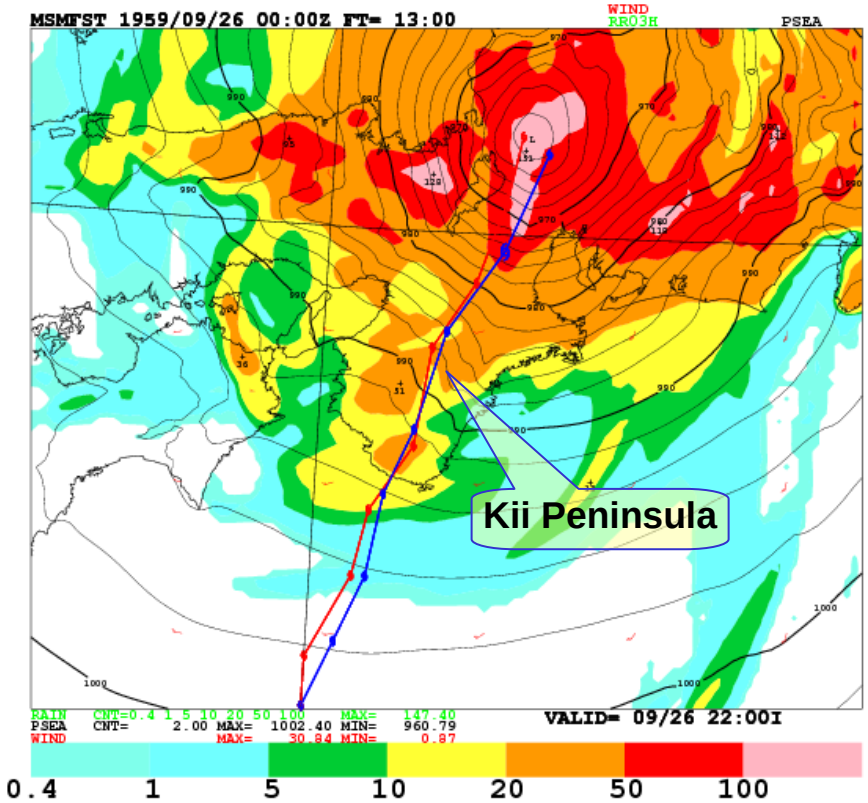
Pseudo-radar image

Forecast of wind and rainfall (17-22 JST)

Wind speed (m/s)



3-hour rainfall amount (mm/h)



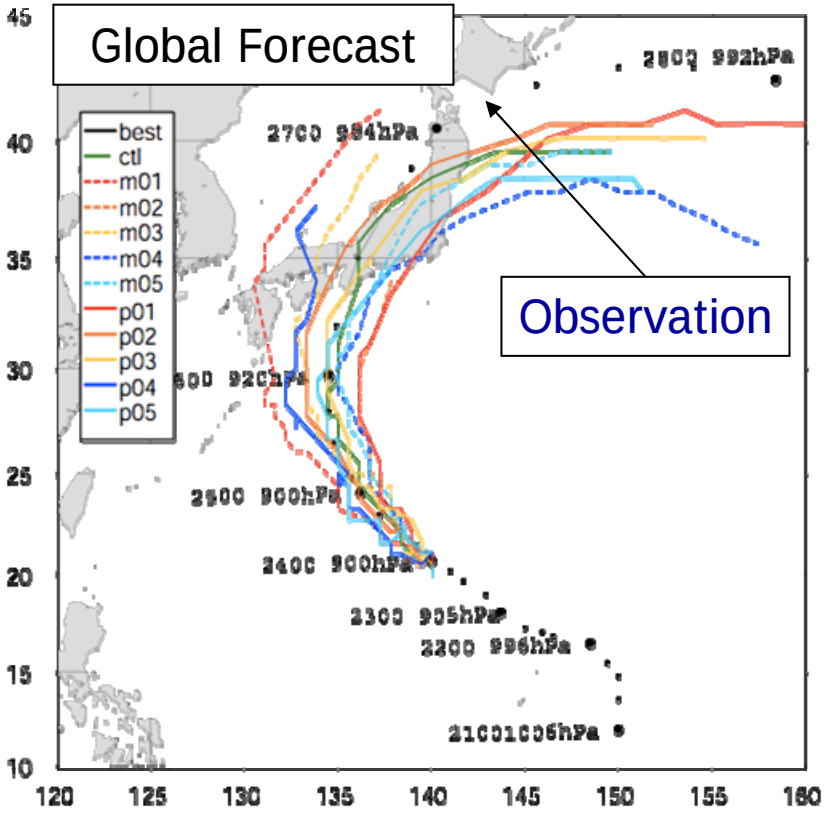
Strong wind
- southern off shore and deep inside bays (Ise-wan, etc)
- inland after landing

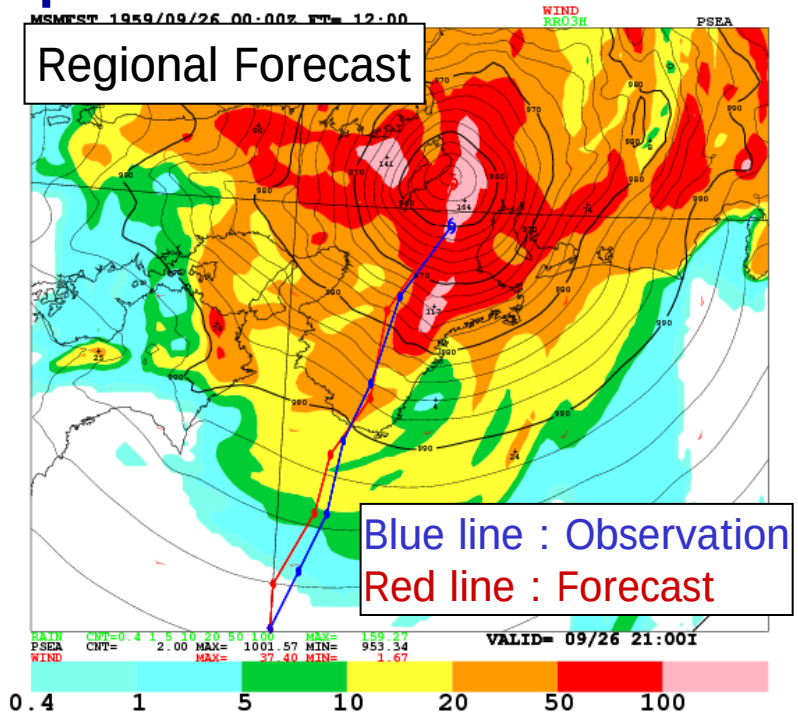
Heavy rain

mainly affected by the land

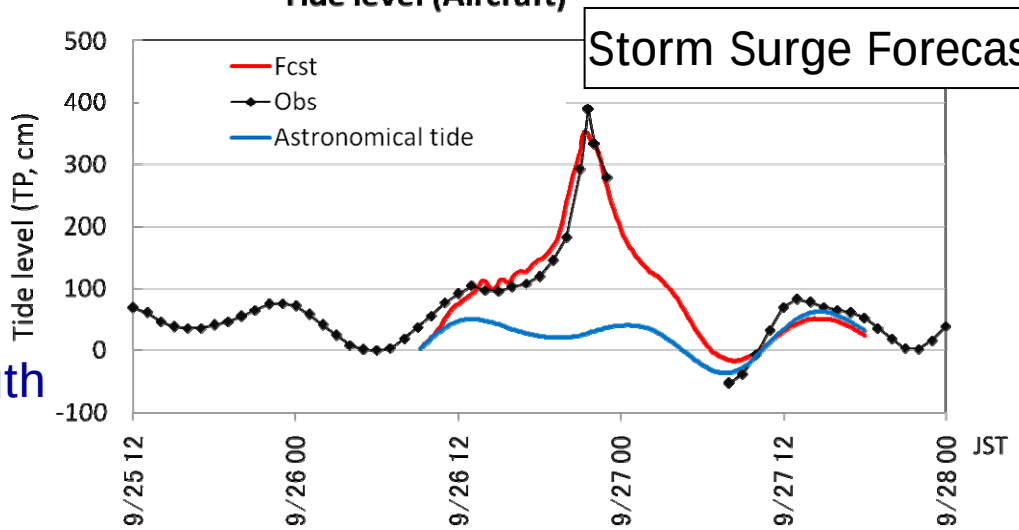
ex. Kii Peninsula (above 100mm/3h)

Results of Experiment





Tide level (Aircraft)

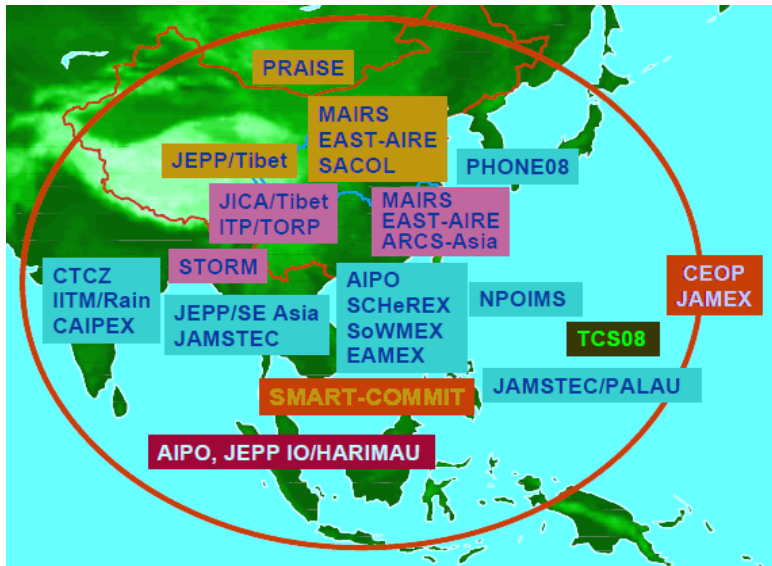


Global model (upper left figure)
  All members predict landing
Regional model (upper right figure)
  Accurate prediction of track and strength
Tidal model (lower figure)
  Accurate prediction of storm surge

AMY-RA

- AMY-RA performed at MRI/JMA
- With all AMY-IOP observations as possible
- Target Period: Jan2008~Dec2009
- Resolution: ~ 60km, 3hour

  dynamical downscaling to 20km also planned
- Product distribution in FY2012



Use of TIGGE data

THORPEX Interactive Grand Global Ensemble

The Observing System Research and Predictability Experiment under WWRP

To improve the accuracy of 1-day to 2 week high-impact weather forecasts

Ensemble forecast data from 10 global NWP centers

TIGGE: THORPEX Interactive Grand Global Ensemble

THORPEX
A World Weather Research Programme

Welcome to a gallery of THORPEX Interactive Grand Global Ensemble (TIGGE)!

The TIGGE is a key component of the THORPEX project, which provides operational global ensemble forecast data quasi-operationally (2 days behind). The TIGGE portals provide the TIGGE data freely for research and education purposes. For details, see WMO THORPEX website or TIGGE website. This page is operated for an advertisement of TIGGE by Dr. Mio Matsueda (JAMSTEC, Japan) in cooperation with Dr. Tetsuo Nakazawa (MRI/JMA). This page is updated every day (4 days behind).

Enjoy the TIGGE data!

LastUpdate:Thu, 06 May 2010 02:33:57 GMT

Information of TIGGE data

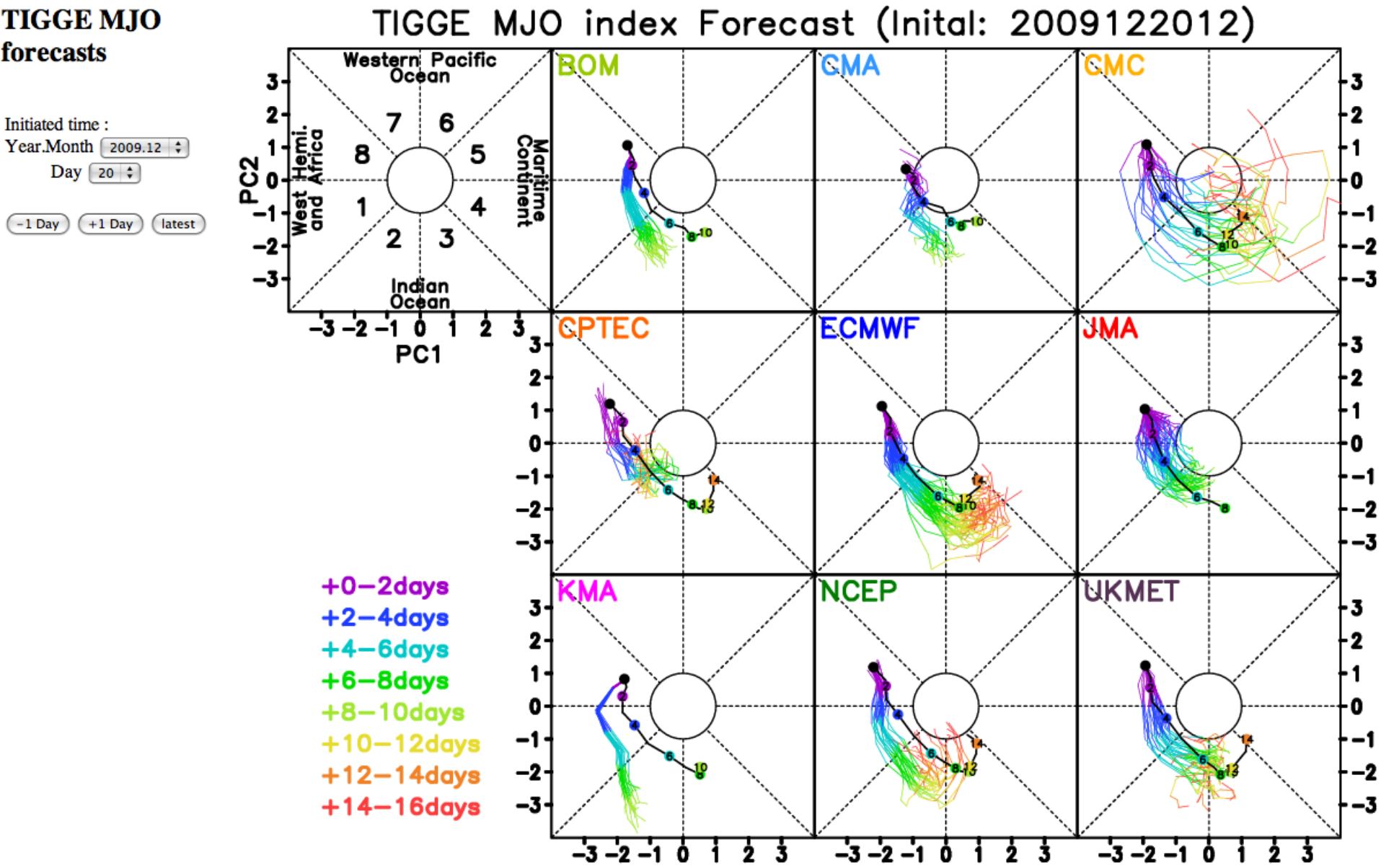
- Latest details of operational global ensemble prediction system in TIGGE portals [pdf]

Monitor and verification pages of TIGGE data

- Spaghetti diagram, ensemble mean, and ensemble spread for Z500 over NH Updated every day!
- Seasonal RMSE and ensemble spread for Z500 over NH and SH (verification scores [pdf])
- Daily RMSE and ensemble spread for Z500 over NH and SH
- Scatter diagram between daily RMSE and ensemble spread for Z500 over NH
- Seasonal-mean Z500 bias over NH and SH
- Blocking frequency in NH (blocking index [pdf])

http://tparc.mri-jma.go.jp/TIGGE/

TIGGE: THORPEX Interactive Grand Global Ensemble



http://tparc.mri-jma.go.jp/TIGGE/tigge_MJO.html

High-resolution models

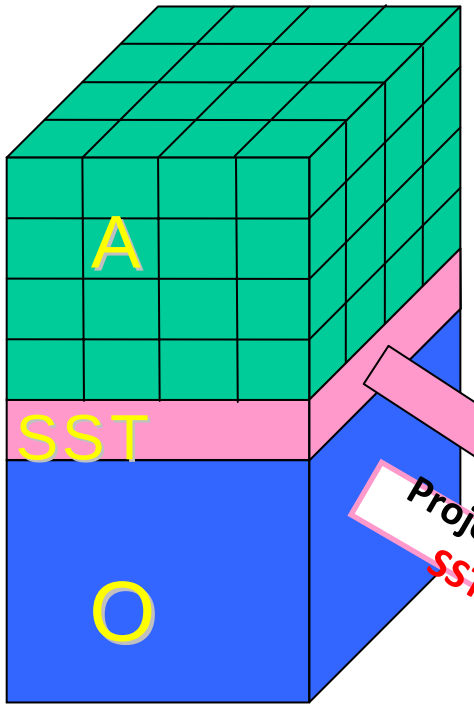
Time-Slice Experiments

NWP models as climate models

CMIP3 AOGCMs

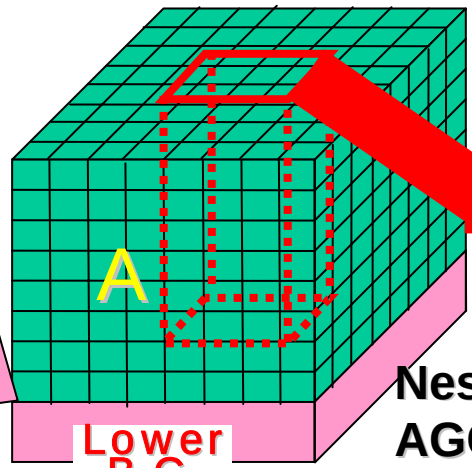
Time slice experiments

Projection of regional climate by one-way nested NHM



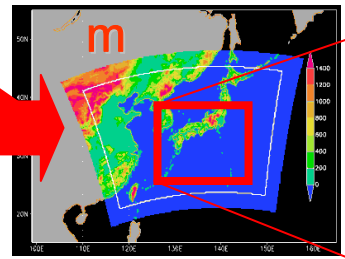
Projected SST

20km,60km AGCM

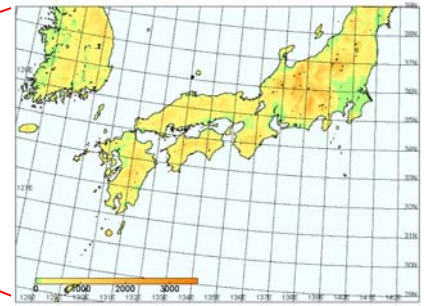


Regional Climate Model

NHM5k

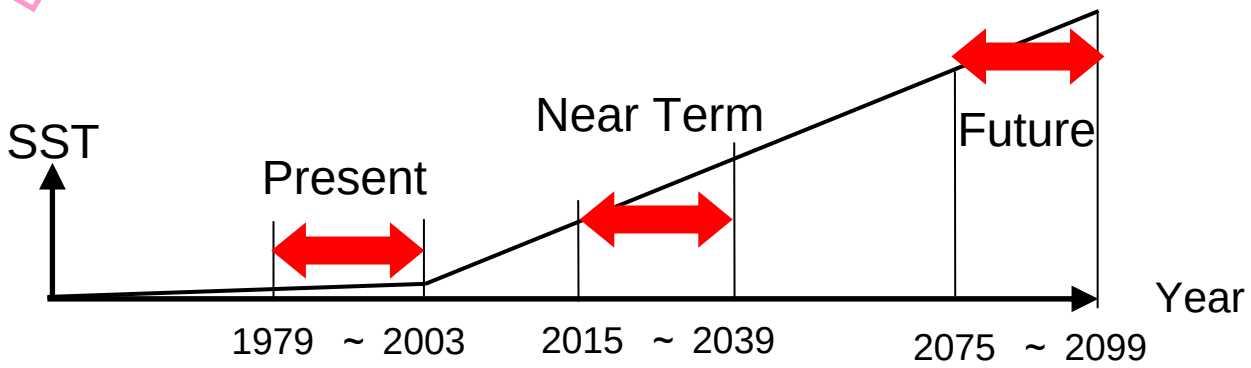


NHM2/1km

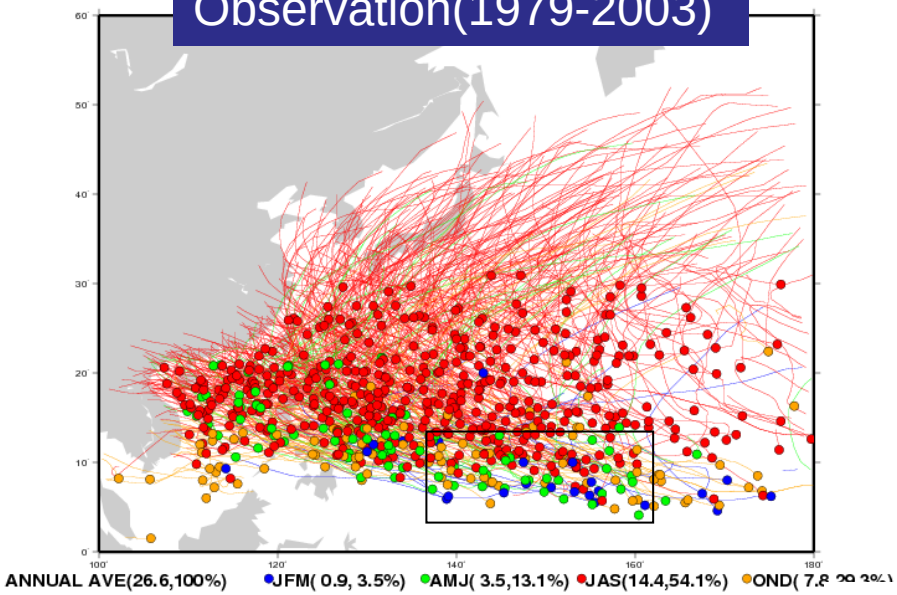


Nested in the AGCM20km

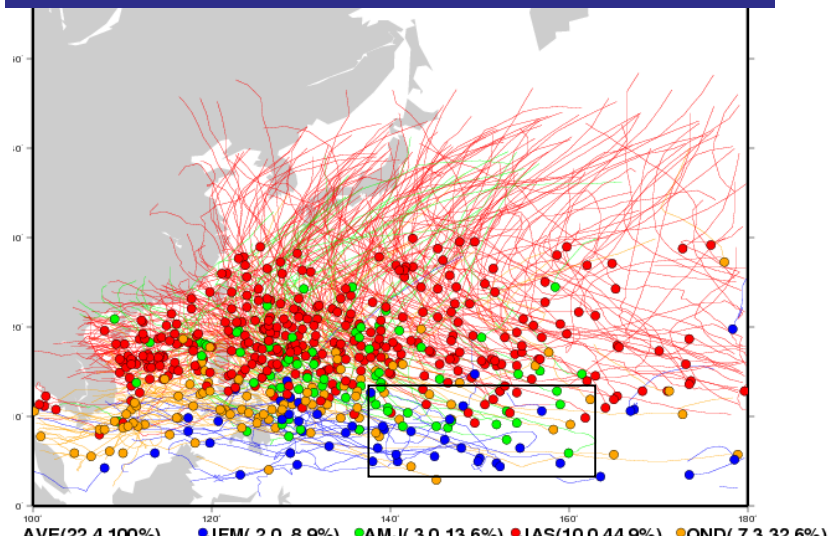
Nested in the NHM5km



Observation(1979-2003)



20km Updated Model (1979-2003)

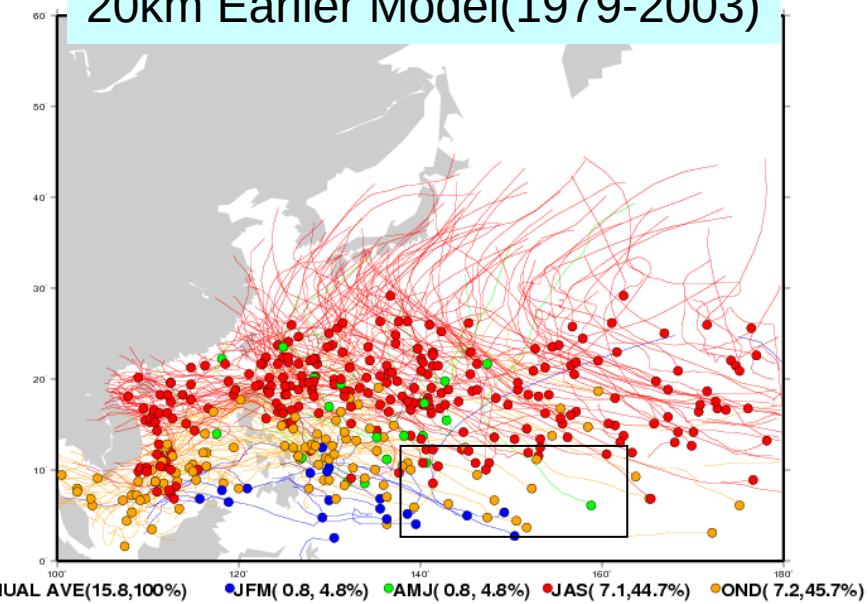


Blue : January - March
Green : April- June
Red : July-September
Orange : October - December

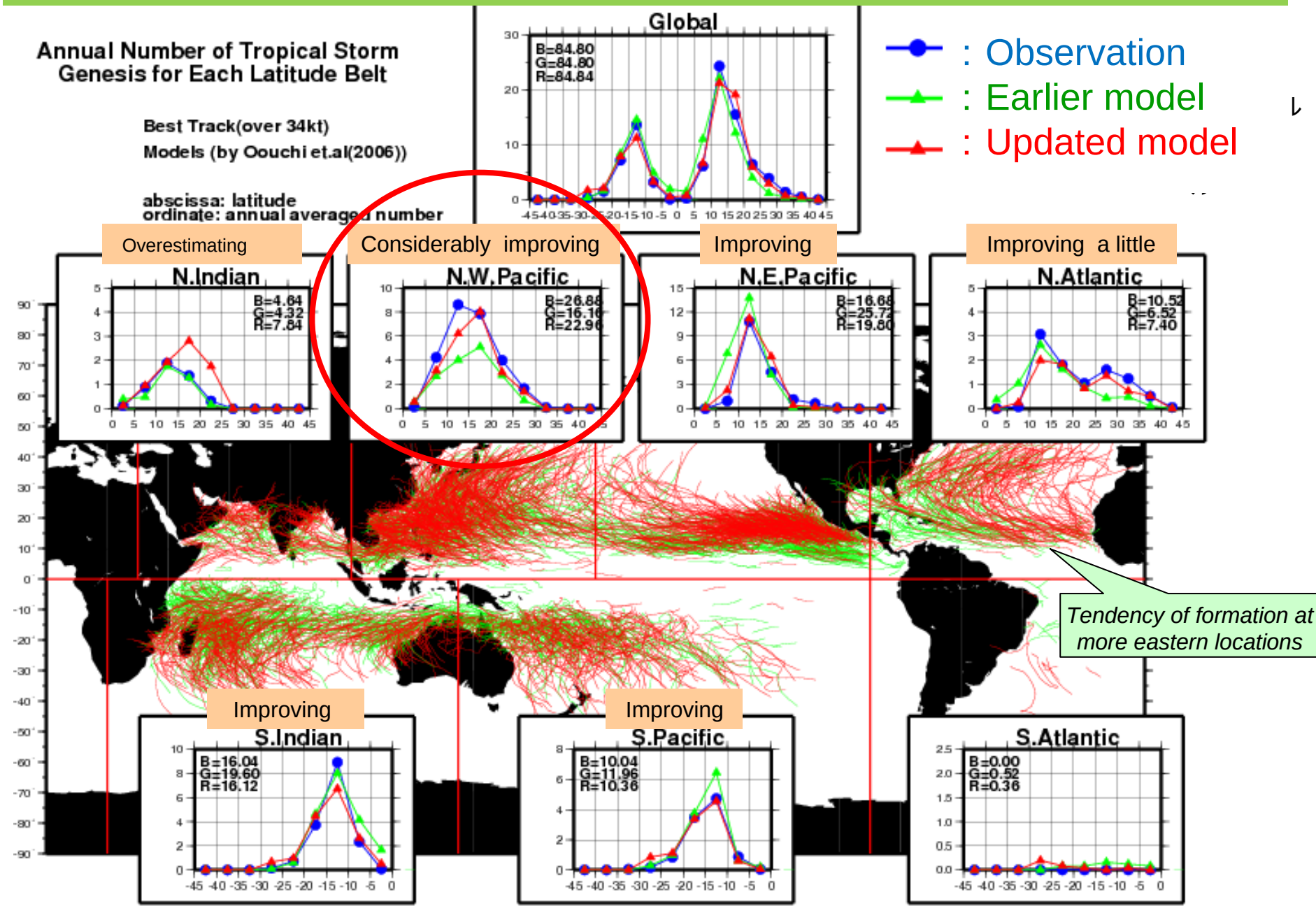
Western North Pacific

※TC detection is adjusted so that total global number of formations is equal to that of observed number

20km Earlier Model(1979-2003)



Present climate simulation of TC formation & tracking distribution by 20km Atmos. Model (25 years)



Regionally detail climate modelling

applied to adaptation studies

Super-high resolution (20 km) global atmospheric modelling

<by MRI group under a MEXT project>

Earth Simulator

IPCC

Assessment Reports (AR4 & AR5)

Synthesis Rep.

Woking Group III

Working Group II *(IAV*)*

Working GroupI *(Physical Science*

Some of major outcomes

- ***Projection of increased strength of Typhoons & Hurricanes (new finding)***
- ***Projection of regionally detail extreme events (heat waves, droughts, etc.) under sufficient regional geographic effects***
- ***Projection of temporally detail behaviour such as diurnal precipitation change***

Sound Scientific Basis for Adaptation Measures

Adaptation Studies

[WB funds, JICA funds]

(* IAV = Impact, Adaptation and Vulnerability)