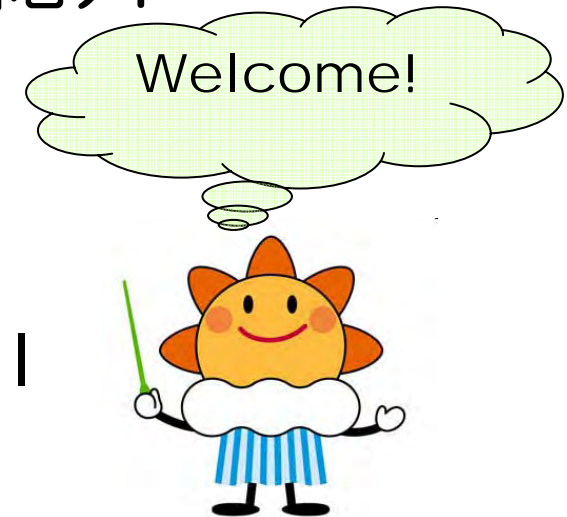


Introduction of MRI (Meteorological Research Institute) in JMA (Japan Meteorological Agency)

気象庁気象研究所の紹介

29 Jul. 2009

Hiroshi TAKAHASHI
(Planning Office)



Mascot of JMA "Harerun"

MRI's Organizational Position in JMA

気象庁のなかの気象研究所

JMA

Director-General

About 5700 workers in JMA

Deputy Director-General

Headquarters

Administration
Department

Counsellor

Forecast Department

Observations Department

Seismological and
Volcanological Department

Global Environment and
Marine Department

Local Offices

District Meteorological
Observatory (5)
Okinawa Meteorological
Observatory

Local Meteorological
Observatory (47)

Weather Station

Aviation Weather Service
Center (4)

Aviation Weather Station

Marine Observatory (4)

Auxiliary Organs

Meteorological
Research Institute

Meteorological
Satellite Center

Aerological Observatory

Magnetic Observatory

Meteorological College

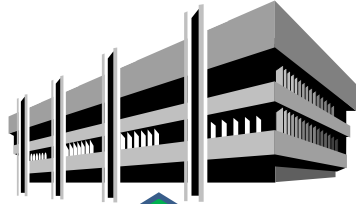
MRI

About 140
researchers
and 33 officers
in MRI

MRI's role

気象研究所の役割

JMA



WMO, IOC, etc.

Reports
Research Programs
Disaster mitigation Programs

etc.

Technical Support

Contribution

MRI (9 Res. Dep.)



Meteorological Satellite and
Observation System
Research

Oceanographic Research

Forecast Research

Climate Research

Typhoon Research

Physical Meteorology Research

Atmospheric Environment and
Applied Meteorology Research

Seismology and
Volcanology Research

Geochemical Research

65yr History of MRI 気象研究所の歴史

Feb.1946

The Central Meteorological Observatory Research Division (CMORD) was established.

Apr.1947

The **Meteorological Research Institute** (MRI) was reorganized from CMORD.

Apr.1960

The **Typhoon Research Department** was established.

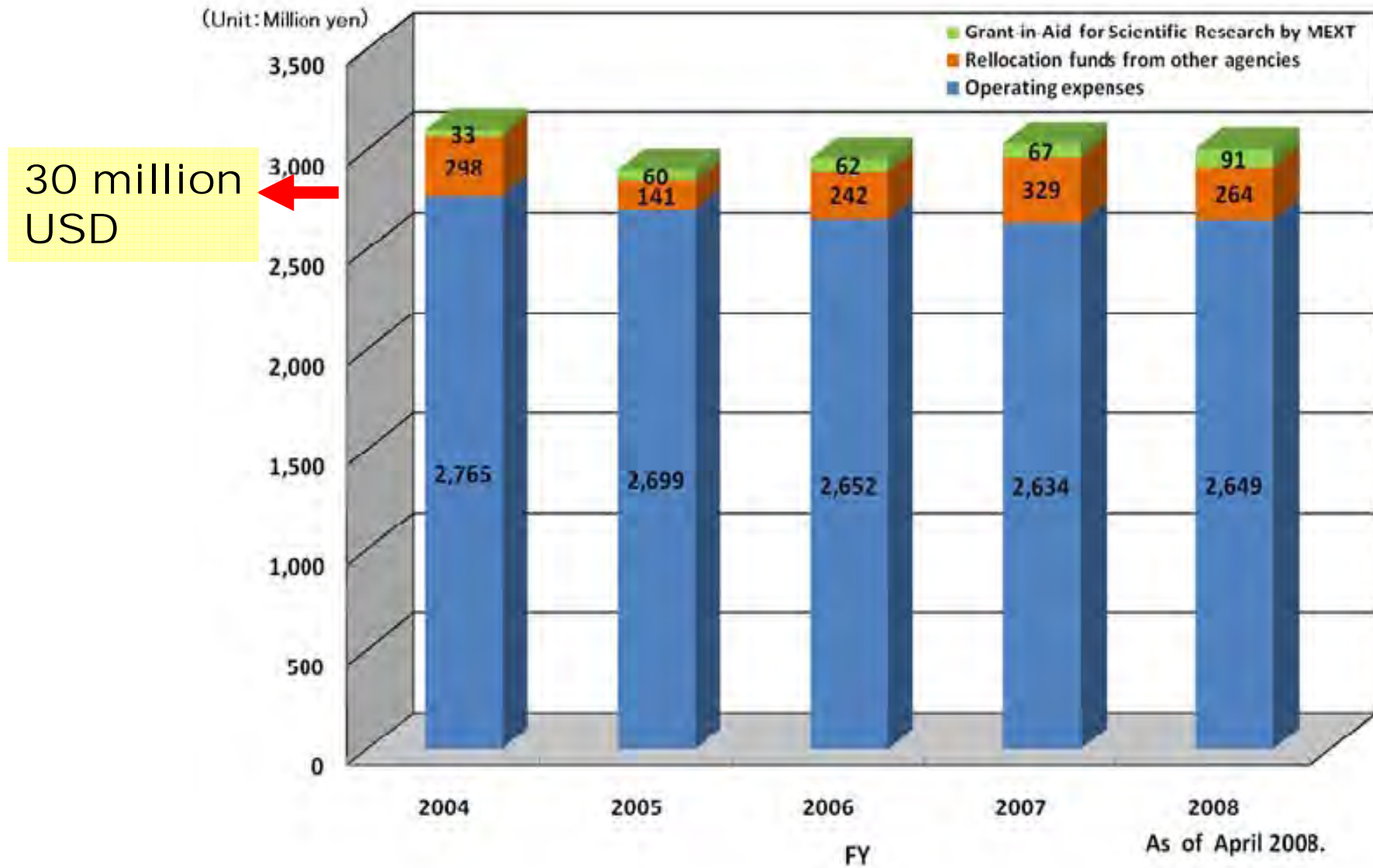
Jun. 1980

MRI moved to Tsukuba city from Tokyo.

May 1987

The **Climate Research Department** and the **Meteorological Satellite and Observation System Research Department** was established.

Budget of MRI 気象研究所の予算



Three Major Research Activities

主な研究内容

Monitoring, detecting, modeling, forecasting, predicting...

- Severe Weather

Numerical studies of heavy rain using nonhydrostatic model (NHM/MRI)

Studies of Detecting Meso-cyclone using Doppler weather radar, tornado, etc.

- Climate Change

Sensitivity and projection studies of global warming using a with GCM

Climate change projection around Japan

- Earthquakes and Volcanoes

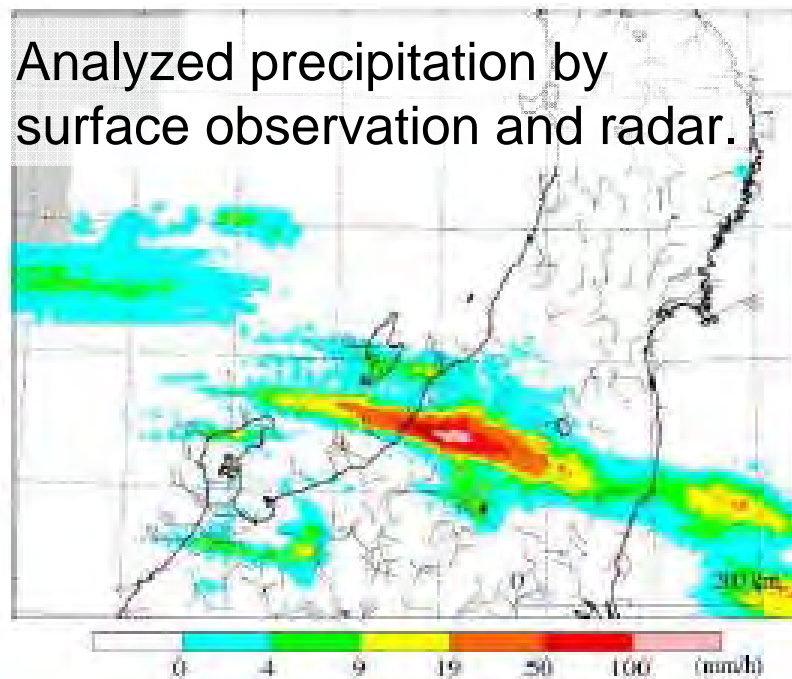
Studies to improve accuracy of forecasting the Tokai earthquake

Tsunami simulation

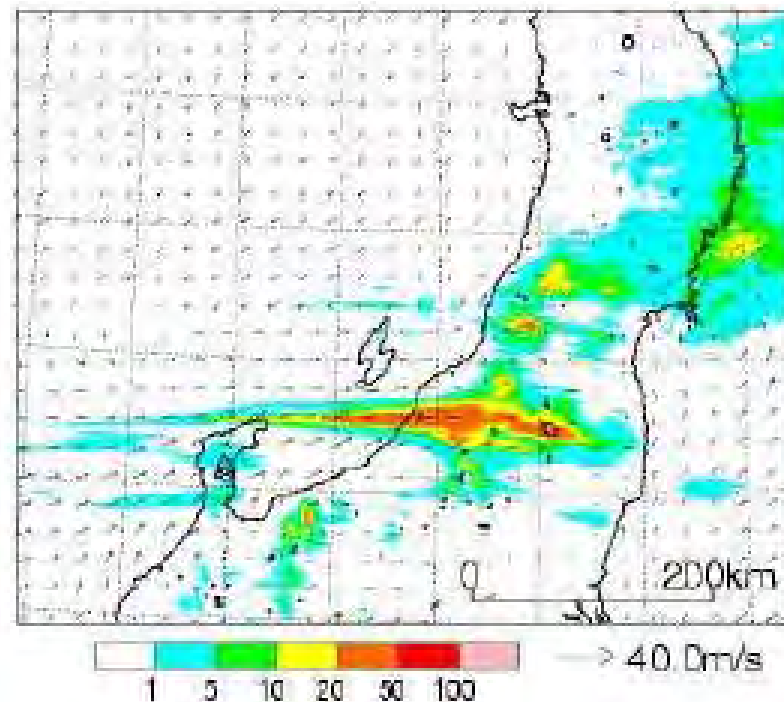
Severe Weather 1/3:

Numerical studies of heavy rain using nonhydrostatic model (NHM/MRI)

Observation



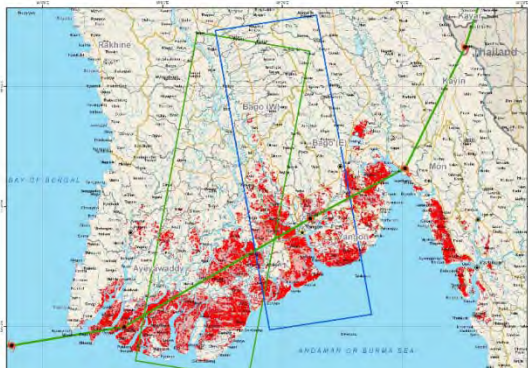
Simulation



3 hours precipitation (9am-12am, 13 Jul 2004)
simulated with 1.5km mesh NHM/MRI.

Severe Weather 2/3:

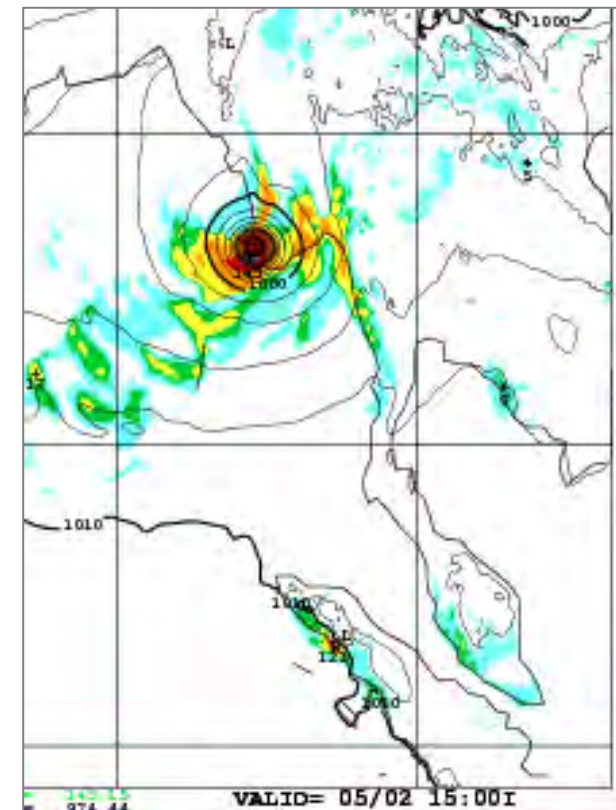
Forecast Experiment of Myanmar cyclone Nargis



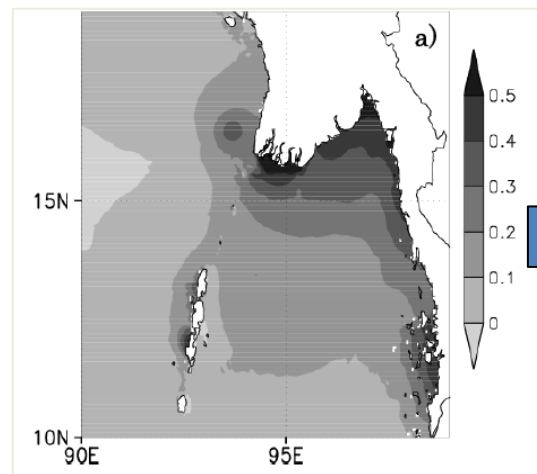
Area damaged by storm surge



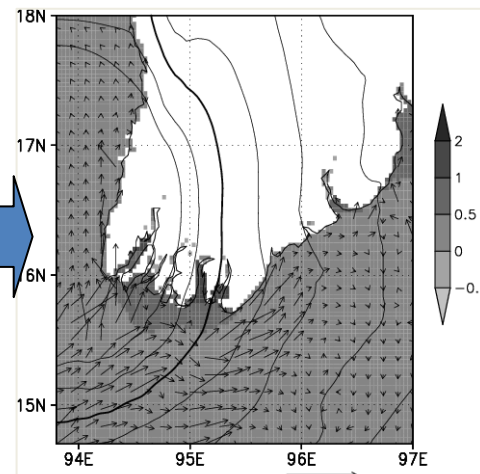
Numerically reproduced Nargis



0.4 1 5 10 20 50 100 8



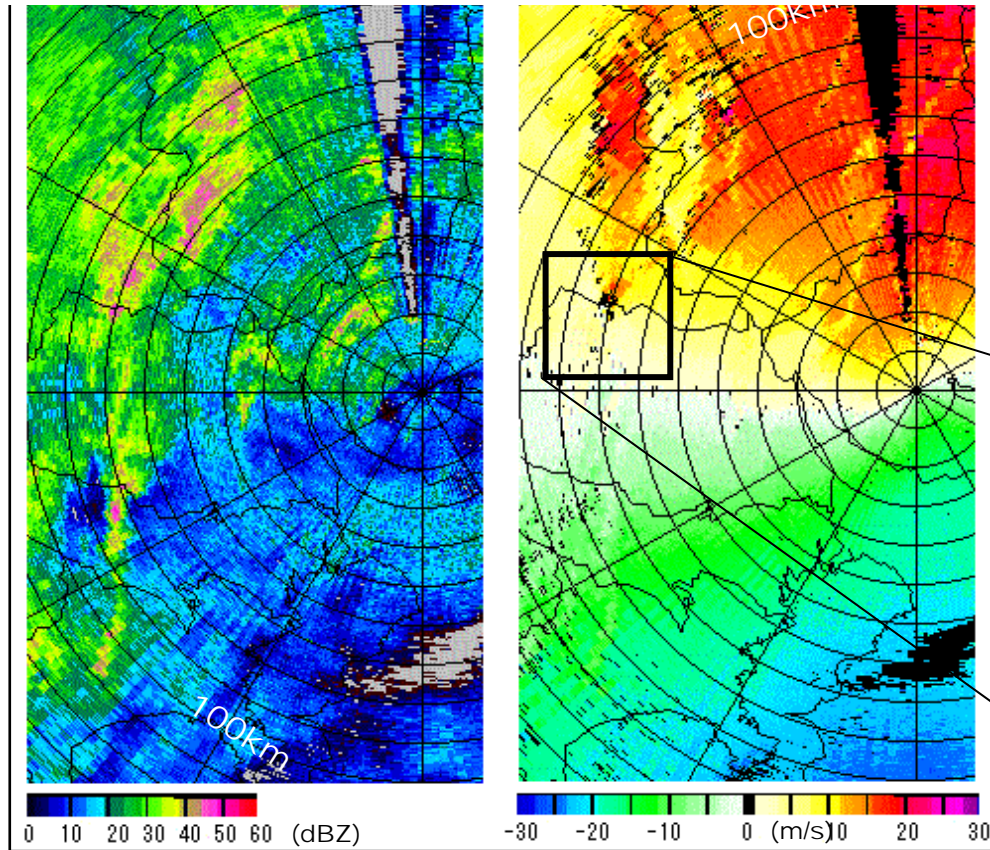
Low resolution



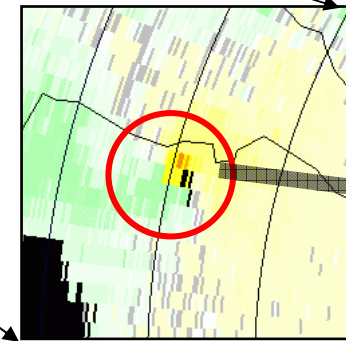
High resolution

Storm surge simulation by ocean model

Severe Weather 3/3: Studies of Detecting Meso-cyclone using Doppler weather radar



PPI display of radar reflectivity (left) and Doppler velocity (right) obtained from MRI Doppler radar at 16:08 on 10 July, 2002. Meso-cyclone signature, inside the solid rectangle, is detected in Doppler velocity field.



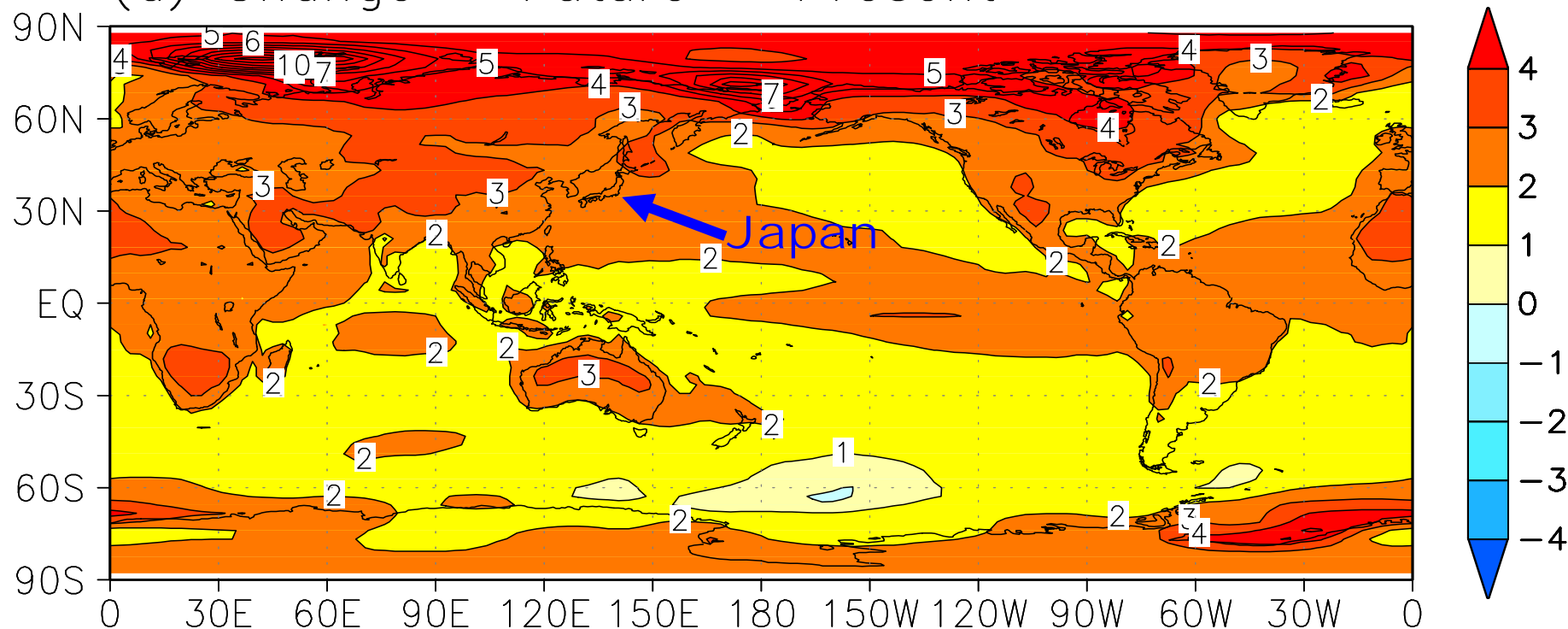
PPI display of Doppler velocity field (elevation 0.1 degree) relative to storm motion obtained by MRI Doppler radar at 16:08.

Climate 1/5:

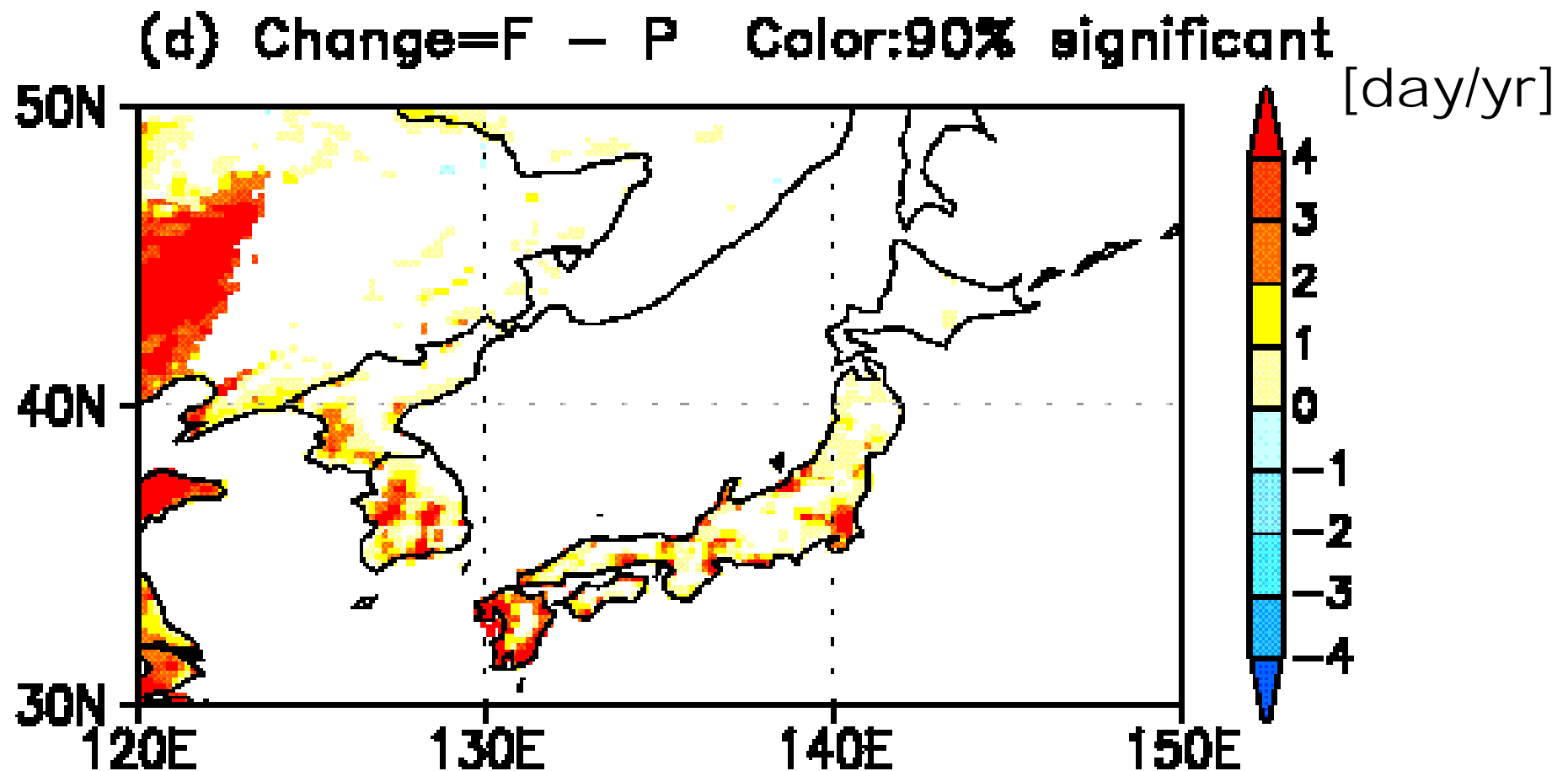
Global annual surface temperature change A1B (2090-2099) – Present (1979-1998)

Surface Air Temperature (C) MRI–CGCM2.3.2 Season= ann
Present(h2):1979–1998 Future(A1B):2080–2099 5 mem

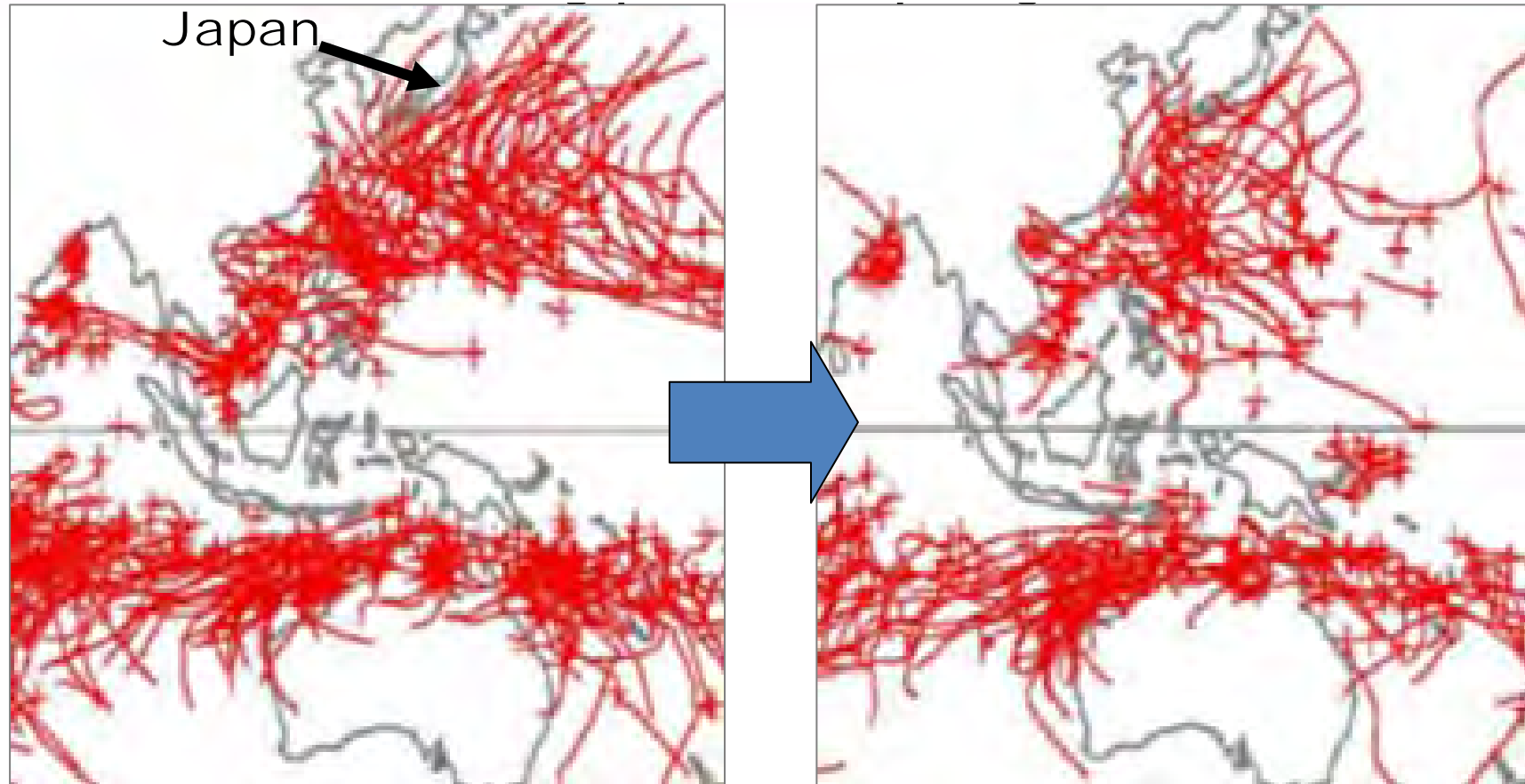
(a) Change = Future – Present



Climate 2/5:
Change of Extreme hot day (max >35°C)
Future (2075-2099) – Present



Climate 3/5: Future Typhoon projection

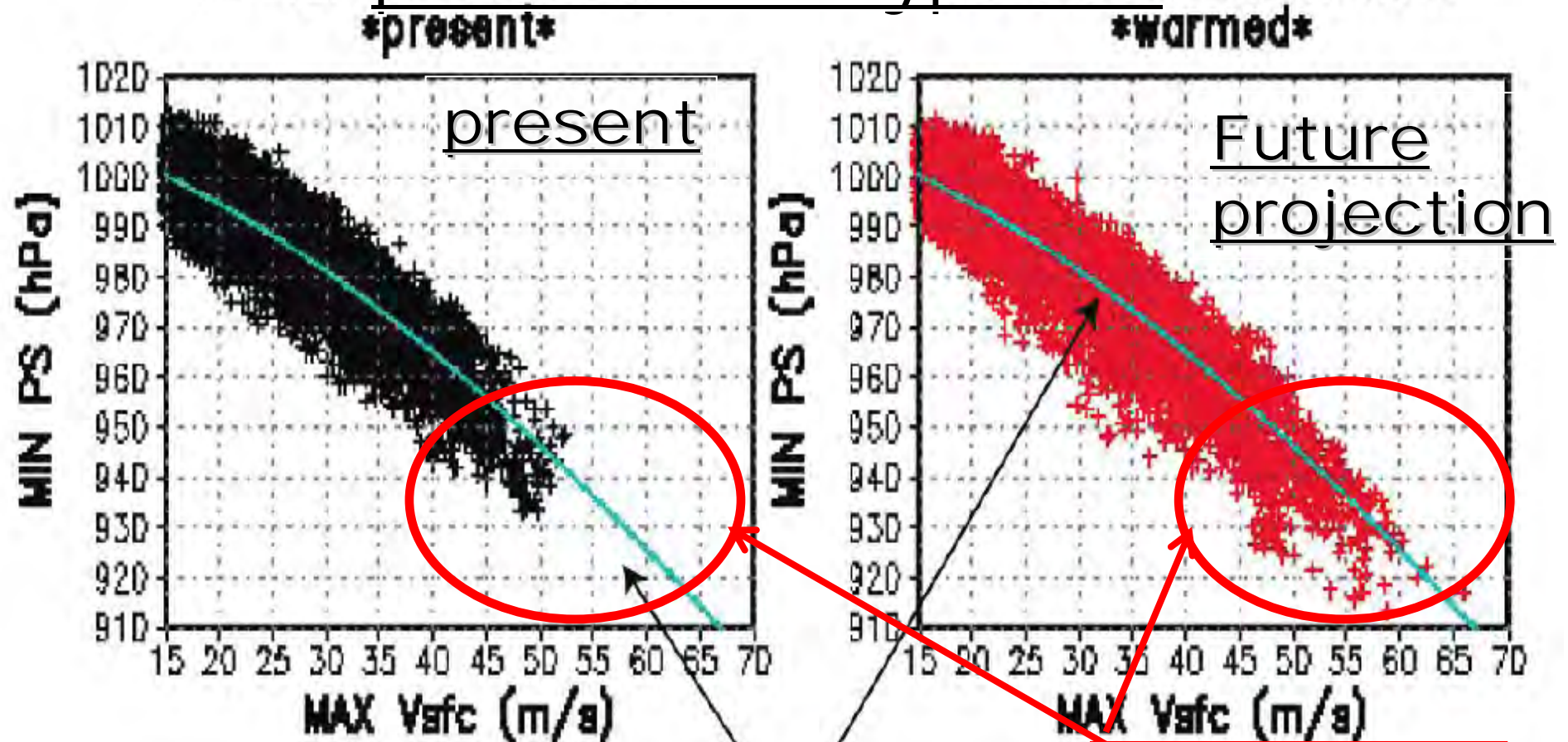


Early period of 21st C.

End of 21st C.

30% decrease in the number
(But, increase in the strength?)

Climate 4/5: Maximum wind speed vs. center pressure of Typhoon



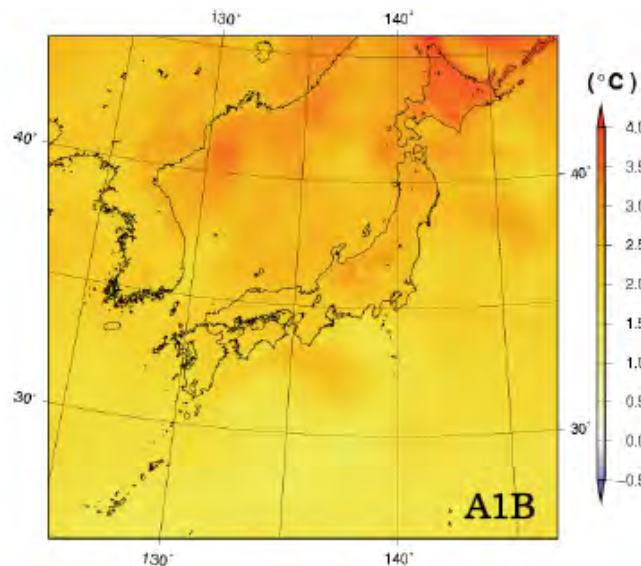
$$V_{sf c} = 6.7(1010 - PS)^{0.844}$$

Severe typhoon
will increase!

Climate 5/5: Climate change projection around Japan

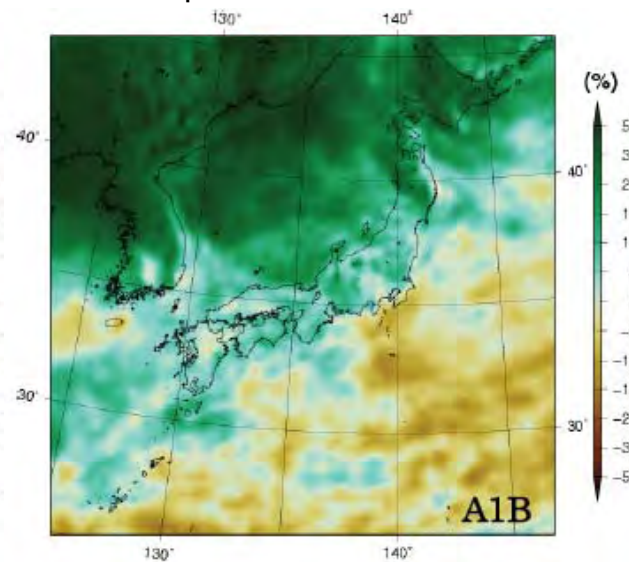
Using the Coupled atmosphere-ocean Regional Climate Model (CRCM) developed by JMA's Meteorological Research Institute (MRI)

Surface air temperature in winter



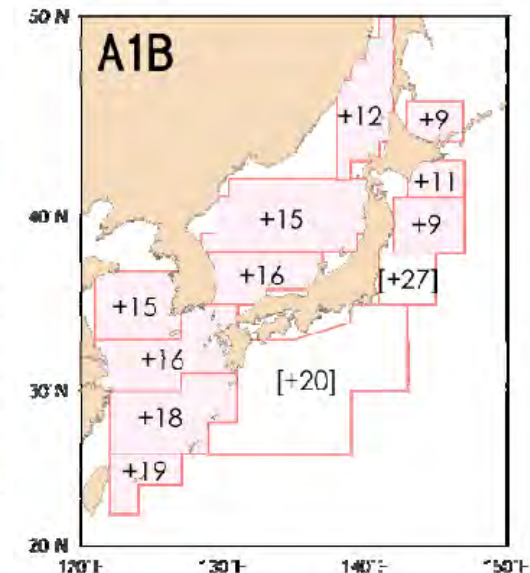
Projections of changes in mean surface temperature in winter (December - March) for scenarios A1B for the period 2081 - 2100 relative to the period 1981 - 2000

Precipitation in winter



Projections of changes in precipitation in winter (December - March) for the scenarios A1B for the period 2081 - 2100 relative to the period 1981 - 2000

Sea Level



Projected 100-year linear trends (1981 - 2100) in annual sea levels around Japan calculated using the NPOGCM for scenarios A1B (cm / 100yr)

[*] denotes the value is not statistically significant, and a value with [] denotes that the value is uncertain.

Research Facilities

- Supercomputer system

The MRI computing system has high calculation performance (ranked about 100th in the world in 2009). This system is used for various researches.



- Meteorological observation tower
(213m height, under demolition work!)

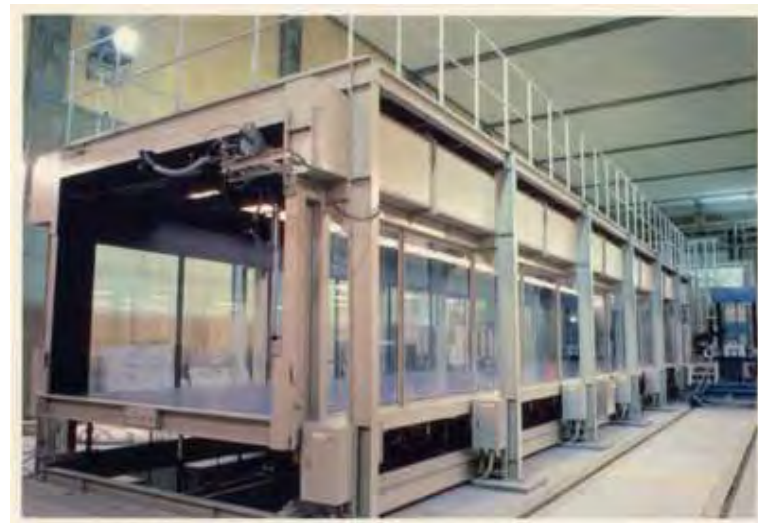
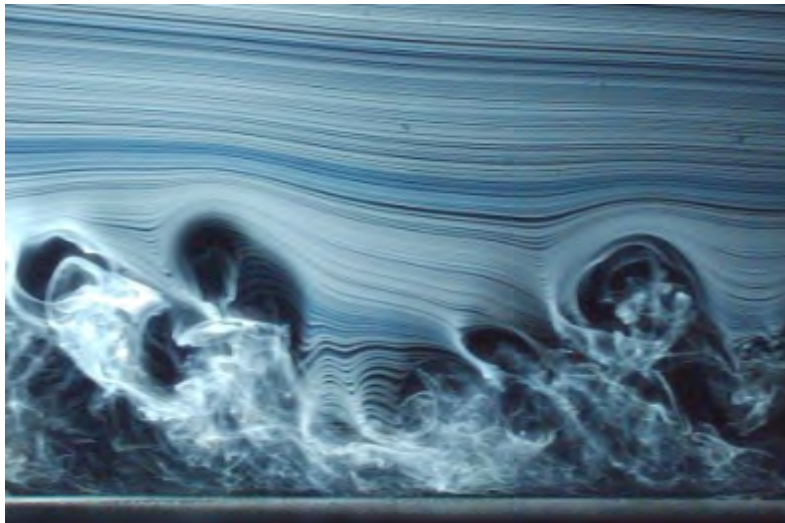


We are
here!

Research Facilities

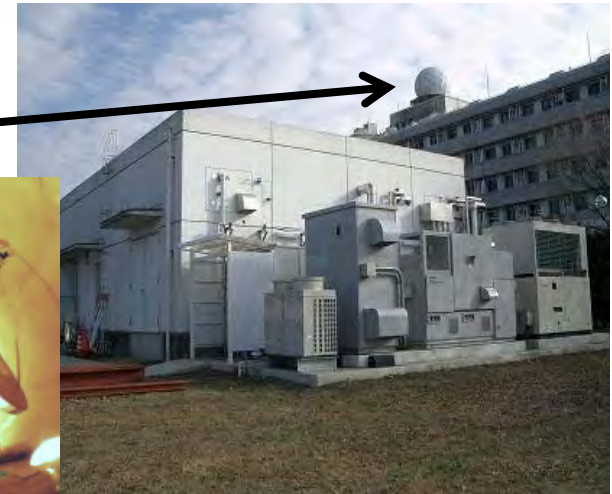
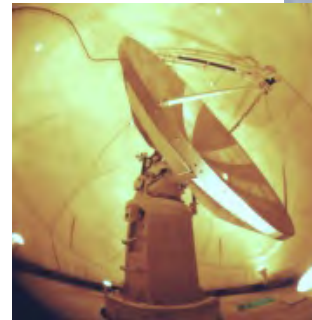
- Large meteorological wind tunnel

The MRI Large Wind Tunnel is one of the largest boundary-layer wind tunnels in Japan, with a long test section and heating/cooling systems. Since the maximum wind speed is high, this wind tunnel is also available for other purposes, e.g., development of meteorological instruments. The measurement system includes a hot-wire anemometer, a laser Doppler anemometer, a sonic anemometer, and a cold-wire anemometer.



Research Facilities

- Doppler weather radar



- Lidar



- Cold environmental simulator



etc.