



# Overview of Early Warning Systems and the role of National Meteorological and Hydrological Services

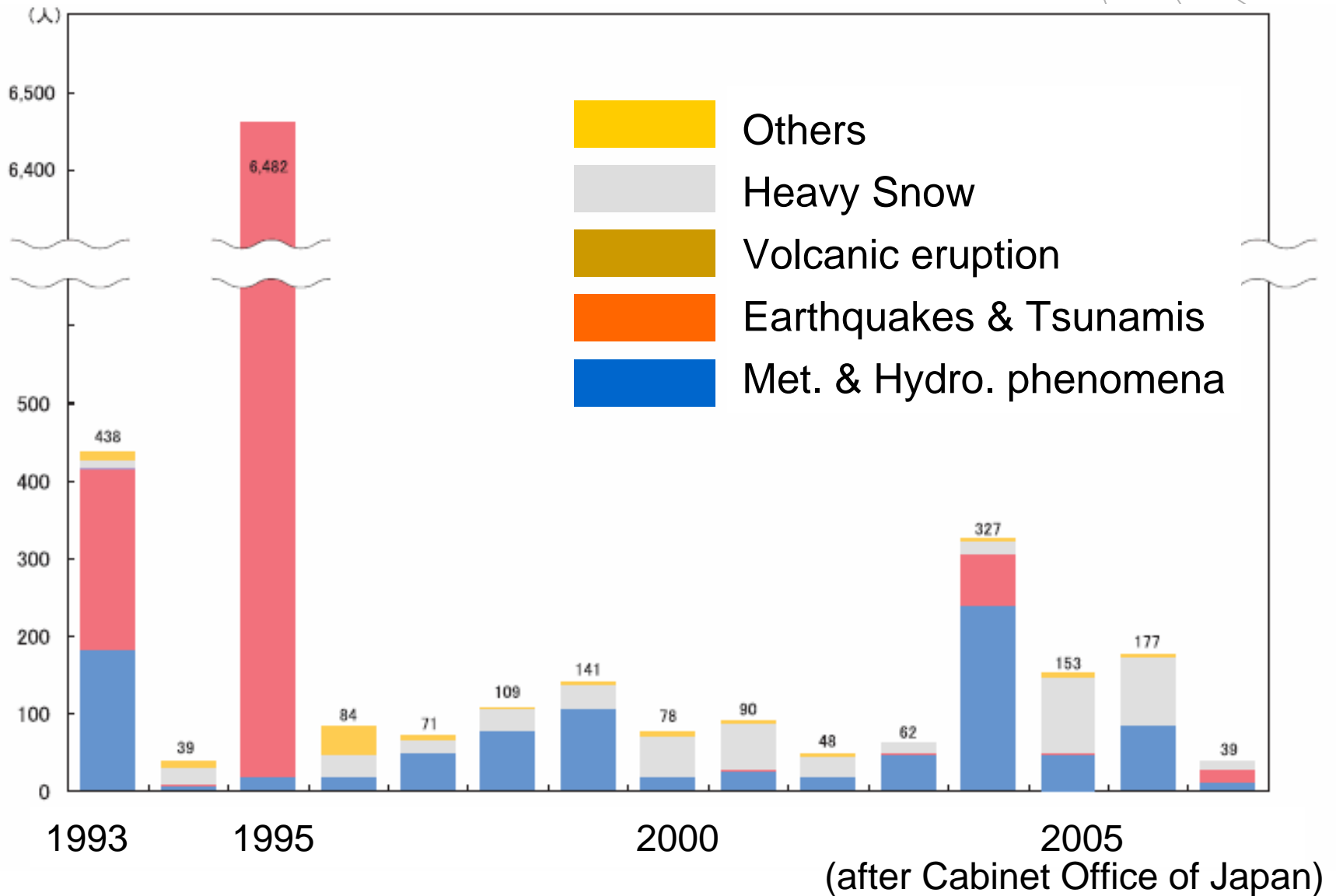
## Japan



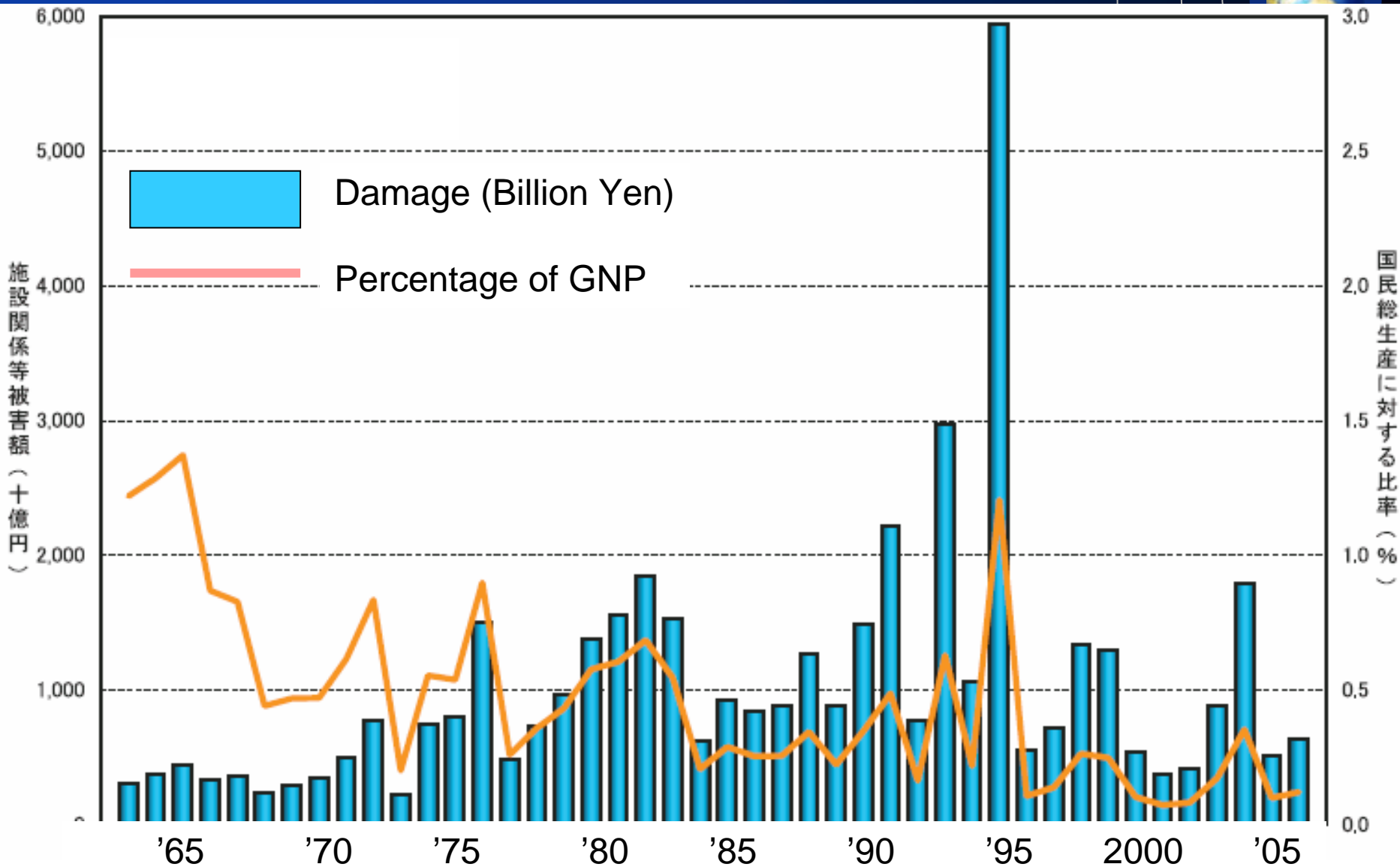
DOI, Keiji  
TERAKAWA, Akira

Japan Meteorological Agency (JMA)  
International Centre for Water Hazard and Risk Management (ICHARM)

# Death by Natural Disasters



# Damage of property



(after Cabinet Office of Japan)

# Inundation caused by Flood and High Tide by Typhoon in 1959 (Nagoya)



From the web-site of Nagoya city

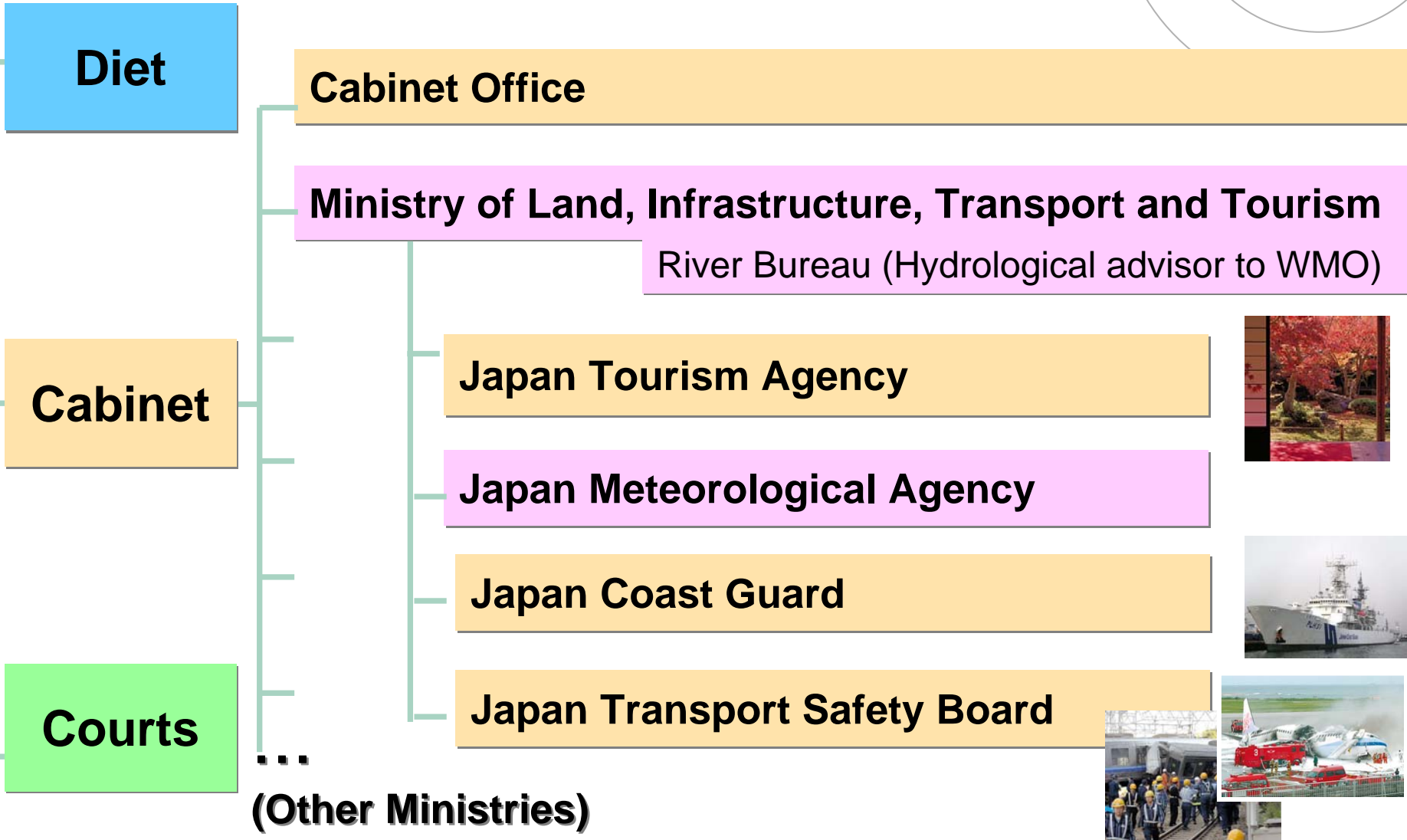
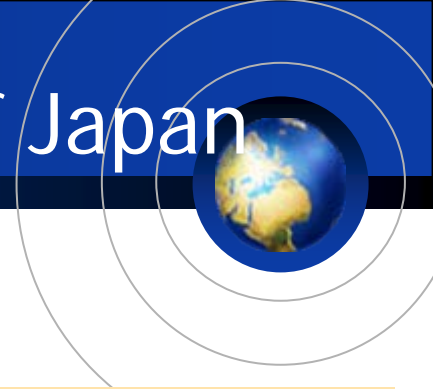
# Disaster Countermeasures Basic Act



- Definition of responsibilities for disaster management
- **Disaster management organizations**
- **Disaster management planning system**
- **Disaster prevention and preparedness**
- **Disaster emergency response**
- **Disaster recovery and rehabilitation**
- **Financial measures**
- **State of disaster emergency**



# Organization of the Government of Japan



# Mission of JMA



JMA provides meteorological information for...

**Prevention  
and mitigation  
of natural  
disasters**



**Safety of  
transportation**



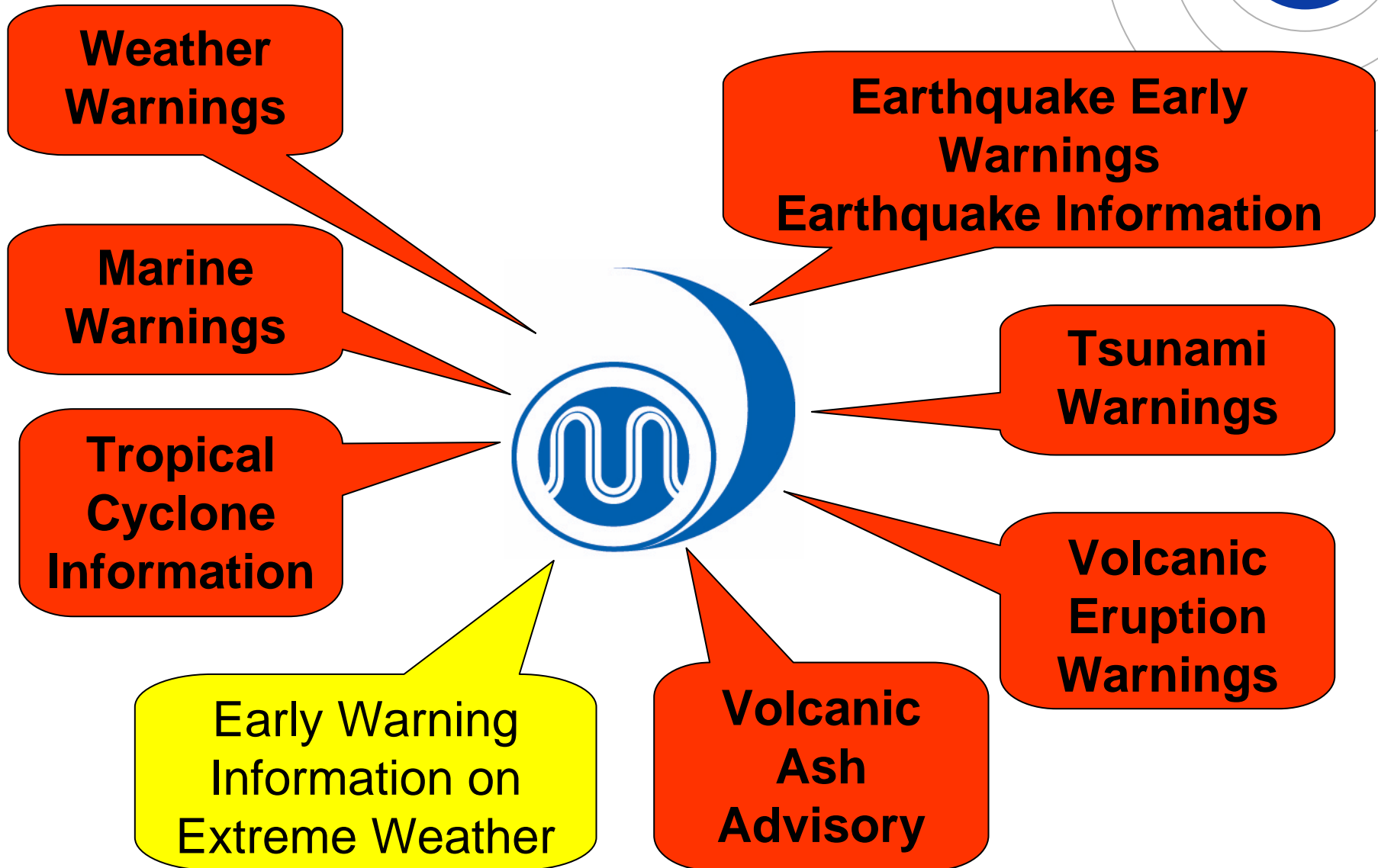
**Development  
and prosperity  
of industry**



**International cooperation**



# Early Warnings provided by JMA



**Weather Warnings**

**Marine Warnings**

**Tropical Cyclone Information**

**Early Warning Information on Extreme Weather**

**Earthquake Early Warnings  
Earthquake Information**

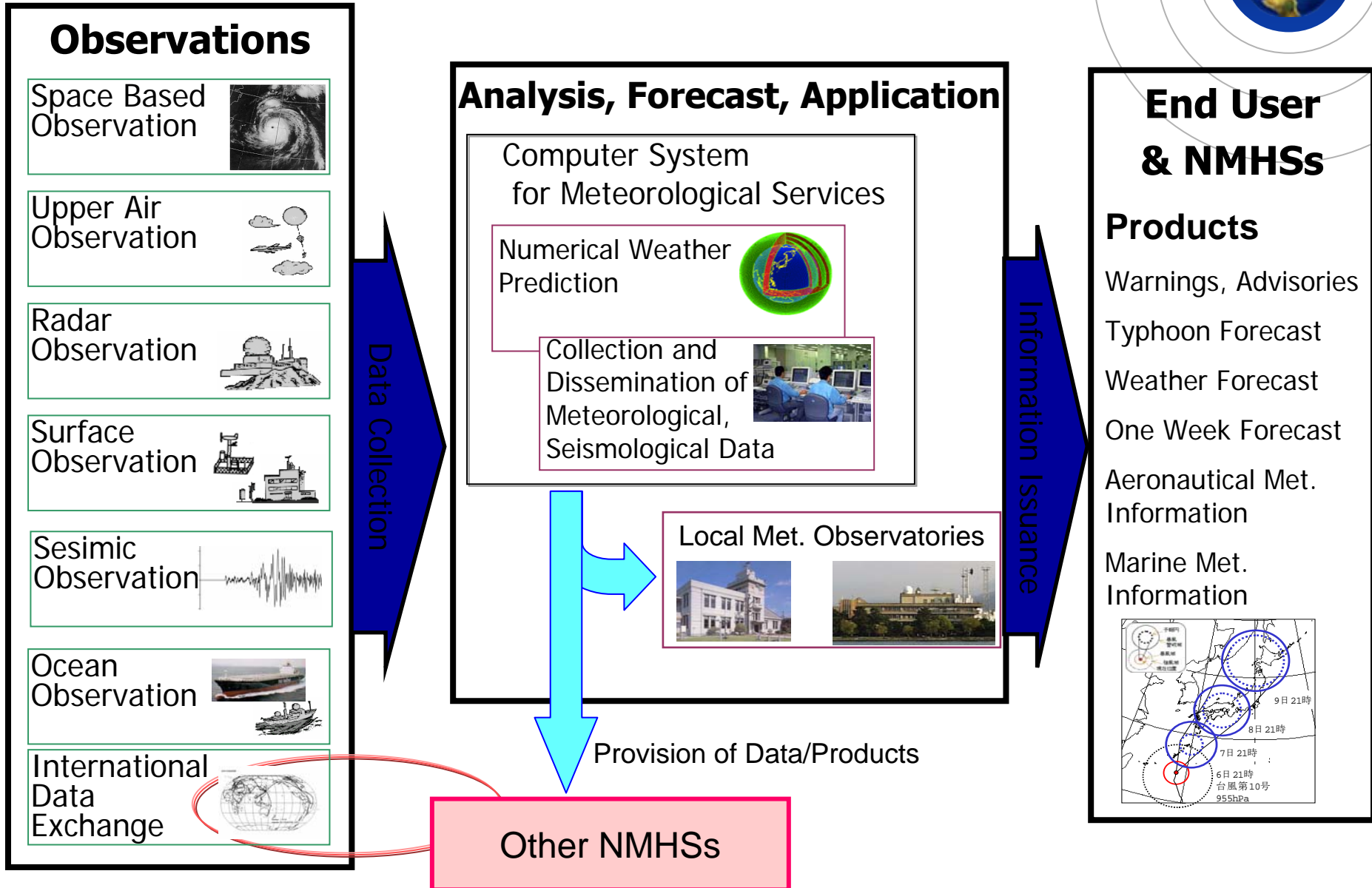
**Tsunami Warnings**

**Volcanic Eruption Warnings**

**Volcanic Ash Advisory**



# JMA's operational services

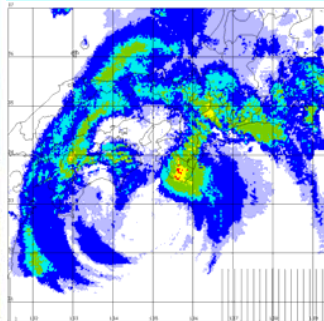
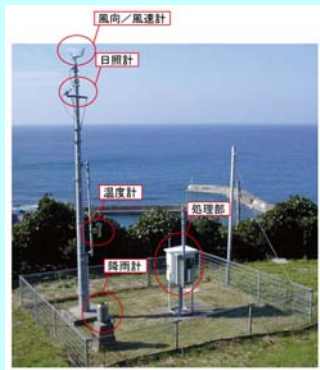


# Partnership with Hydrological Services for Flood Warning



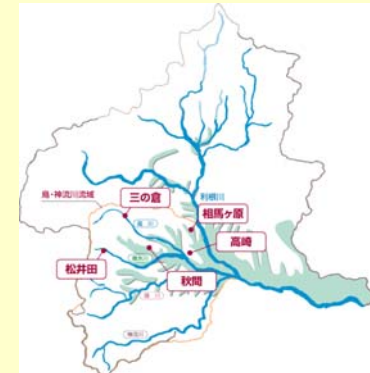
JMA

Weather Situation  
Rain Gauge  
Forecast



Hydrological Service

River Situation  
Rain Gauge  
Water Level



(example)

Fuji River Flood Warning  
xx September 2008

Rainfall prediction

Water level prediction

Issued for each river

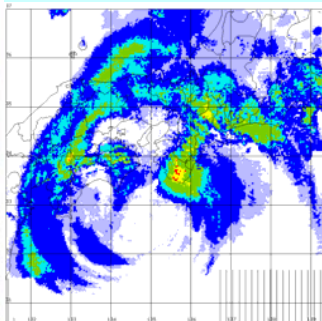
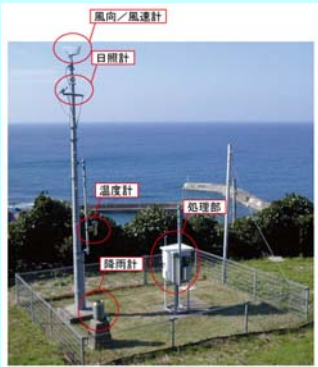
Users

# Partnership with Prefectures for Sediment Disaster Alert



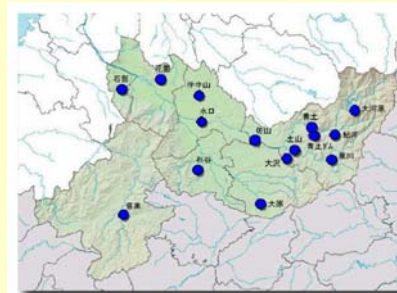
JMA

Weather Situation  
Rain Gauge  
Forecast



Prefecture

Sediment Situation  
Rain Gauge  
Hazard map



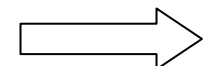
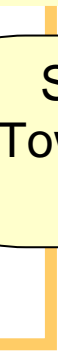
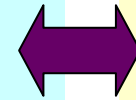
(example)  
Tokyo Sediment Disaster Alert  
xx September 2008

Rainfall prediction

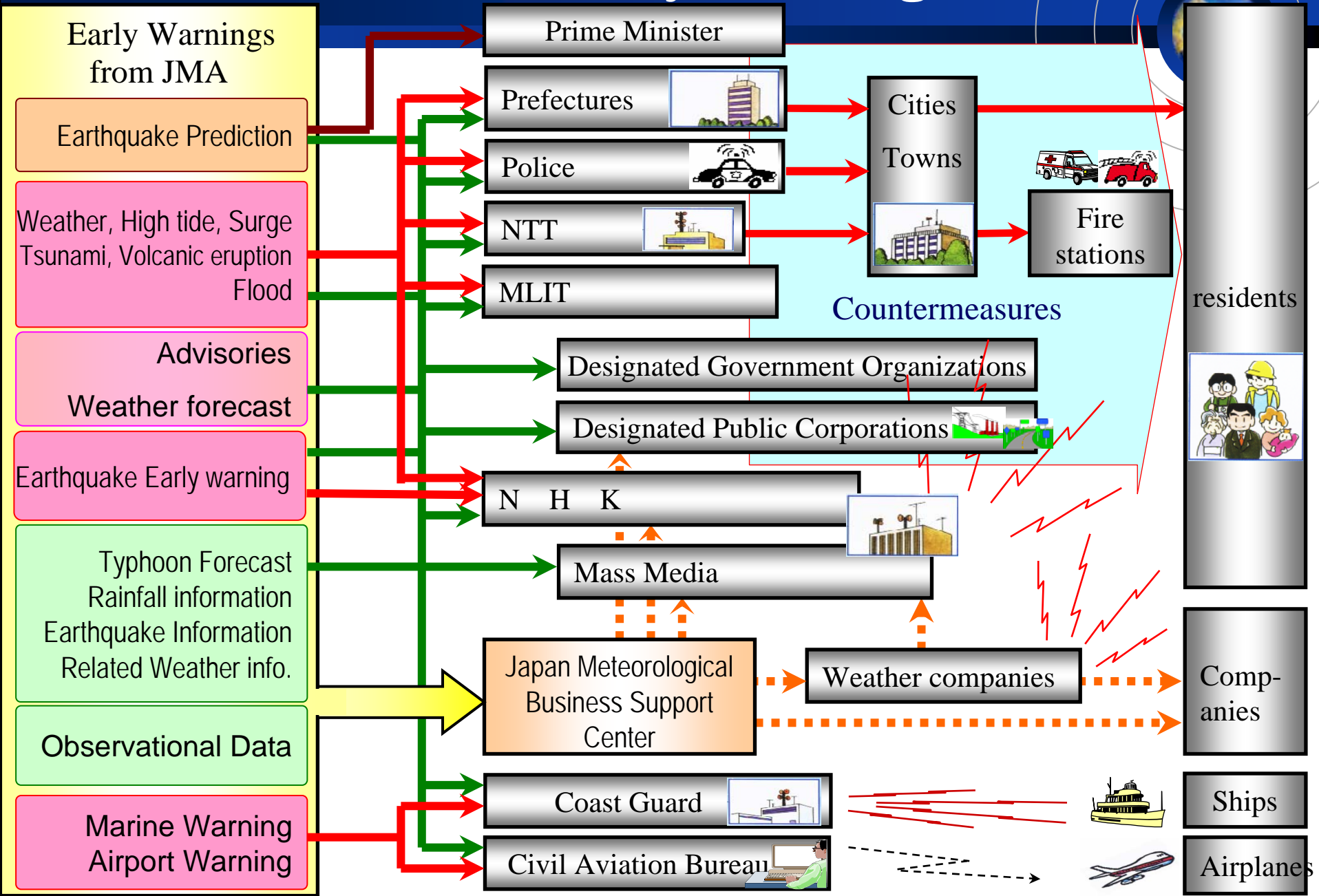
Areas under warning

Specify Cities,  
Towns, Villages to  
be on Alert

Users



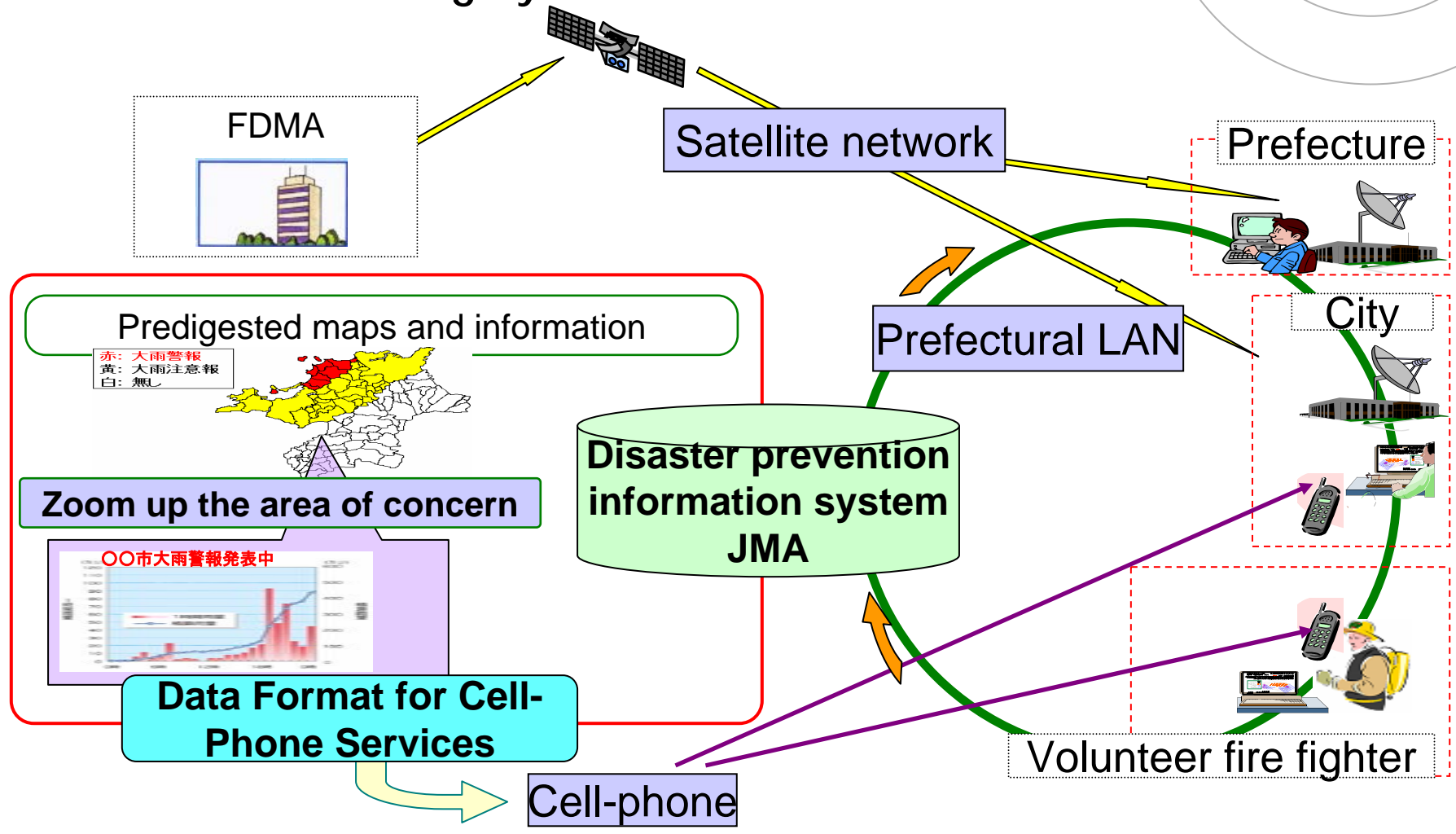
# Dissemination of Early Warnings



# Meteorological Information Exchange for Disaster Prevention



## Information Sharing System based on Advanced IT Infrastructure





# Tornado : Hokkaido in 2006

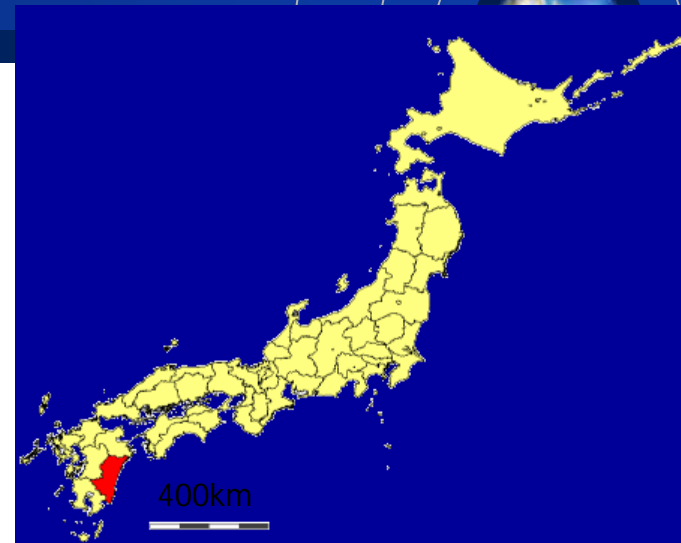


# Tornado Watch (March 2008~)

Issued in text format when hazardous winds are expected to occur.

Targets are tornados, downbursts and other gust winds which accompany cumulonimbus.

Target area is a prefecture (average area is about 7,000 km<sup>2</sup>)



## **Tornado Watch No.1**

Issued by Miyazaki Local Meteorological Observatory at 12:07 Sep. 18, 2008

There is a risk that a hazardous wind may occur in Miyazaki prefecture.

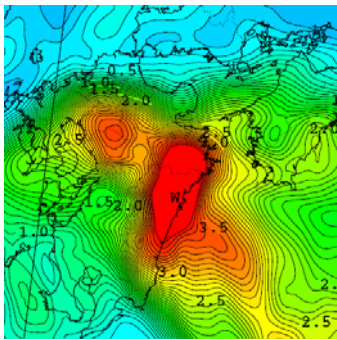
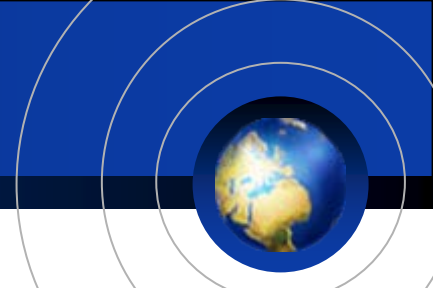
Tornados occur under cumulonimbus.

When there is a sign of thunderstorm, protect yourself in solid structures.

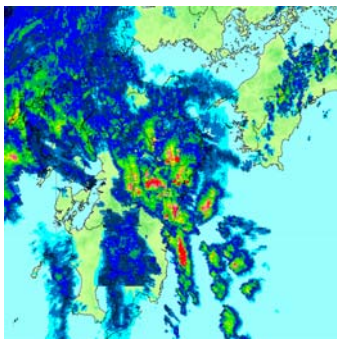
This information remains in effect for one hour after issued.

Target areas: Miyazaki, Nishinan-Kushima, Miyakonojyo, Kobayashi-ebino, Saito-Takanabe

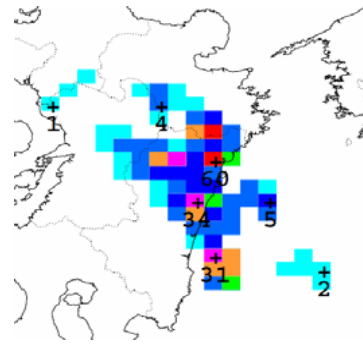
# Techniques for forecasting of hazardous winds



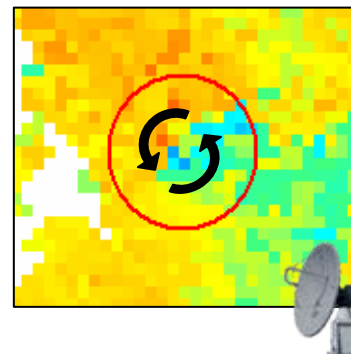
Potential indices using NWP



Radar echo intensity



Hazardous wind index



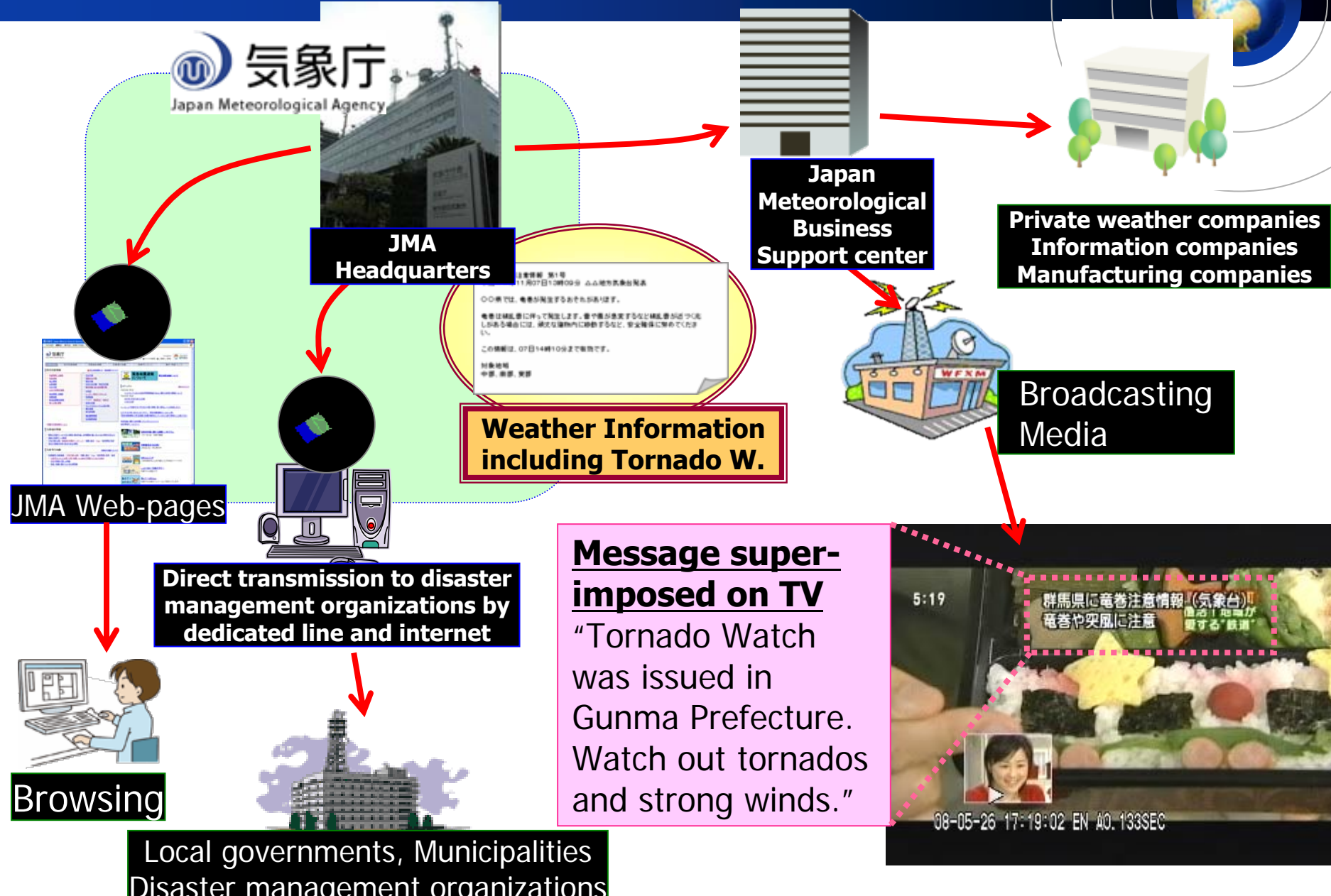
Detection of mesocyclones using Doppler radar

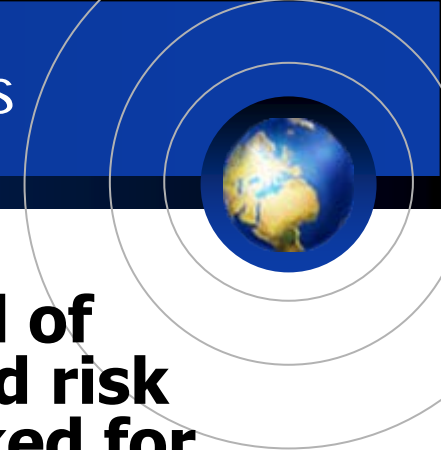
Tornado Watch



Prediction of hazardous wind occurrence based on the left two methods

# Dissemination of the information





- **Set up an advisory committee composed of professors of meteorology, sociology and risk management, and media people and asked for advice on information contents and how to convey the risk of hazardous winds.**
- **Sought opinions from potential users such as construction firms, schools, railway companies**

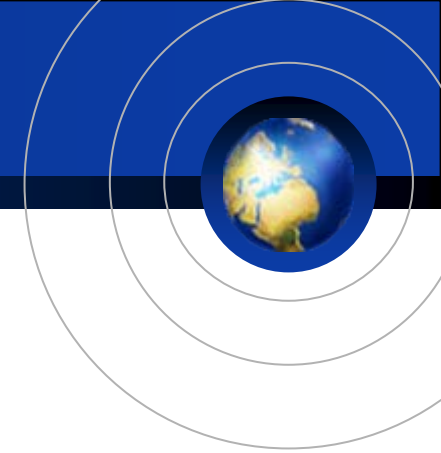
## Outcomes from the discussion

- ▶ Name of the information  
The word *tornado* should be included, because this word draws people's attention for its risk, while the information of downbursts and gust fronts is also included.
- ▶ Valid time period of the Watch  
Indication of the valid time period of the Watch (one hour) helps to understand exactly when people should pay attention to severe weather.
- ▶ Support this service  
The JMA should provide the information, even if the accuracy is rather low; the information can save people's lives when used properly.

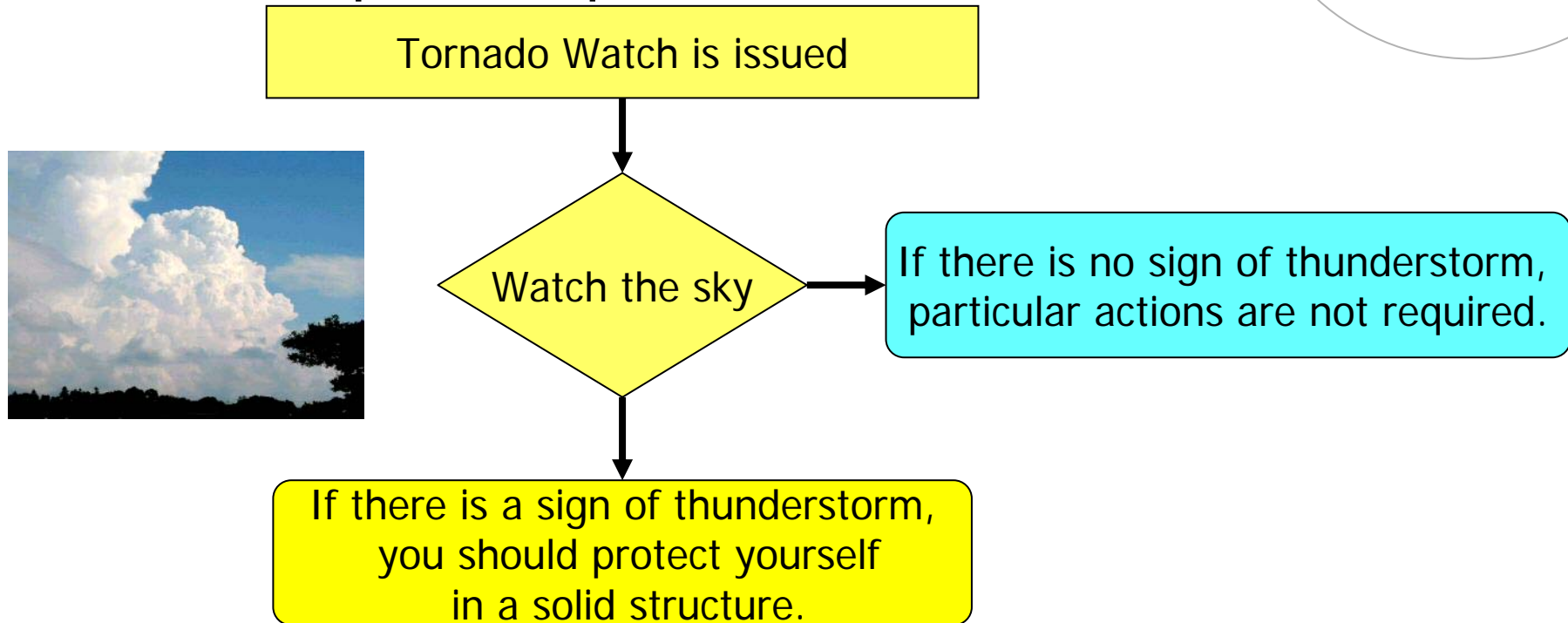


# How to utilize the Watch?

## Developing a guideline

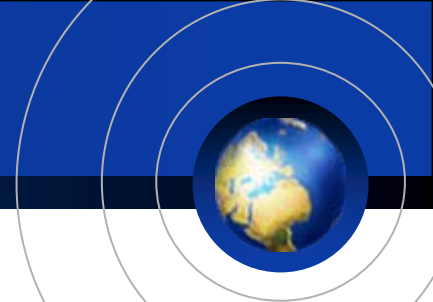


### ► Basic concept of required action



Only by paying more attention to the weather condition, we can reduce risk of damage to human life, without taking refuge in vain too frequently.

# How to utilize the Watch? Raising Public Awareness



## 竜巻から

竜巻注意情報

## 身を守る

「竜巻注意情報」は竜巻の発生する「危険な気象状況」をお知らせして、身を守るための準備を促すものです。

Guard yourself  
against Tornado

平成20年  
3月 から  
発表開始

Raising public awareness is a key issue to prevent disaster caused by hazardous winds.

- published and distributed a brochure, which includes
  - Meaning of the information issued by JMA
  - Required action to the information to guard yourself
  - Understanding the tornado
- gave lectures to media people, local government staff in charge of risk management.
- TV and radio programs to introduce this information and how to use.

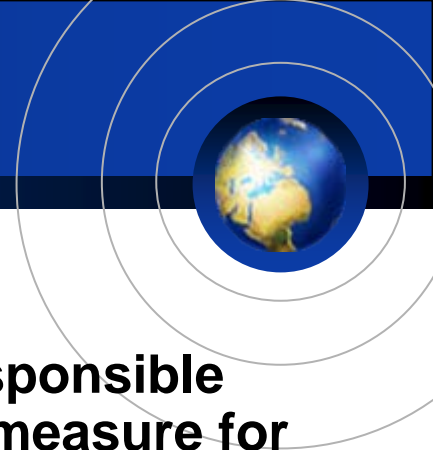
1999年9月に愛知県豊橋市で発生した竜巻(豊橋市提供)

気象庁



\* This brochure is published only in Japanese.

# Summary and Conclusion



- **JMA provides a lot of kinds of early warnings to responsible organizations as well as to the public, as a countermeasure for disasters caused by severe natural phenomena.**
- **JMA have made attempts to enhance the effectiveness of the early warnings;**
  - asking for advice to an advisory committee and potential users,
  - developing a guideline about how to use the information, and
  - raising public awareness about this information.
- **Several ways of dissemination of early warnings are prepared.**
- **JMA has been improving techniques for accurate observation and prediction of severe phenomena in collaboration with research institutes as well as River Bureau.**



Thank you for your attention.

# ► Possible Scenario

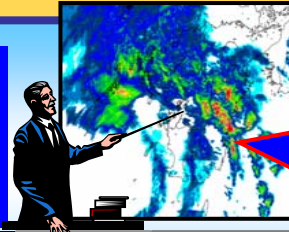


Local observatory

**1 – 0.5 day before**

Weather information referring to tornado, as a prior notice

weather explanation based on the latest radar observation (weather company)



When there is a sign of approaching a cumulonimbus and thunderstorm, protect yourself inside a solid structure and take security measures with other people. Watch out lightning, hail and heavy rain as well as tornados.

**A few hours before**



I should close windows, curtains and shutters before the storm...

**Thunderstorm advisory**

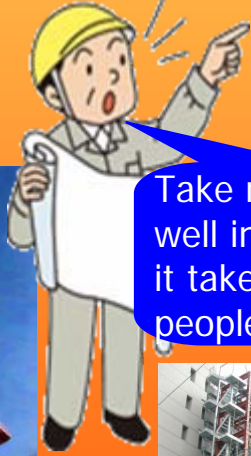


**0 – 1 hour before**

**Tornado Watch**

**Watch out Up in the sky**

Take security measures based on the latest weather observation such as radar echo.



Take necessary action well in advance where it takes time to make people evacuate.



**If there is a sign, protect yourself inside a solid structure**



Transportation Operation



Tornado occurs

