



February 2007 in Jakarta, Indonesia




MEXT Special Coordination Funds  
for Promoting Science and Technology  
Asia S&T Strategic Cooperation Program

# **International Research for Prevention and Mitigation of Meteorological Disasters in Southeast Asia**

**Shigeo YODEN**  
*Kyoto University*

**Emmy Suparka and Tri Wahyu Hadi**  
*Institut Teknologi Bandung*

# Motivations

- Risk of high-impact weather is potentially increasing
    - economical development and urbanization
    - global warming and climate change
  - Research environment is rapidly changing
    - [growth of computer power](#)
    - improvement of internet infrastructure
- 
- It would be a good timing for us to start an international research project for prevention and mitigation of meteorological disasters in Southeast Asia



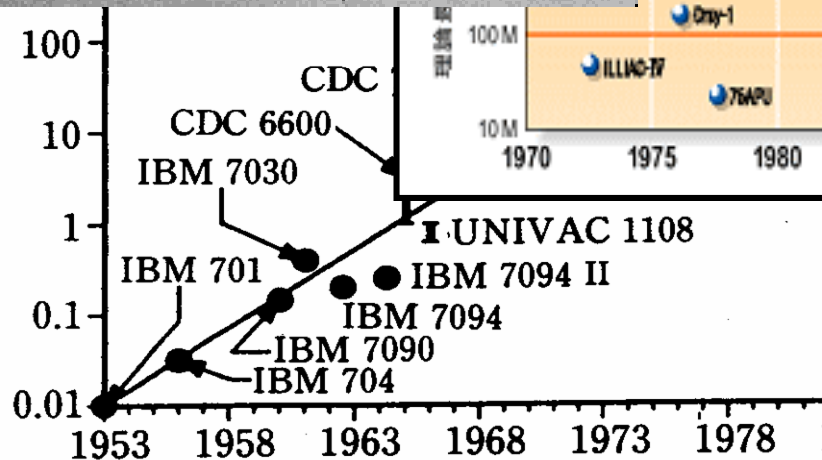
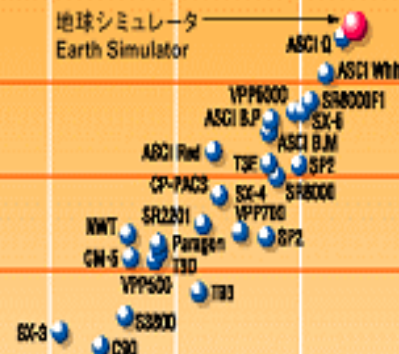
# Advances in computer technology

- Exponential growth in the last half century
  - computational speed
  - memory size

These years are exciting period in NWP and climate simulations!



Earth Simulator Center



<http://www.es.jamstec.go.jp/esc/jp/index.html>



# ● An example in climate change simulations

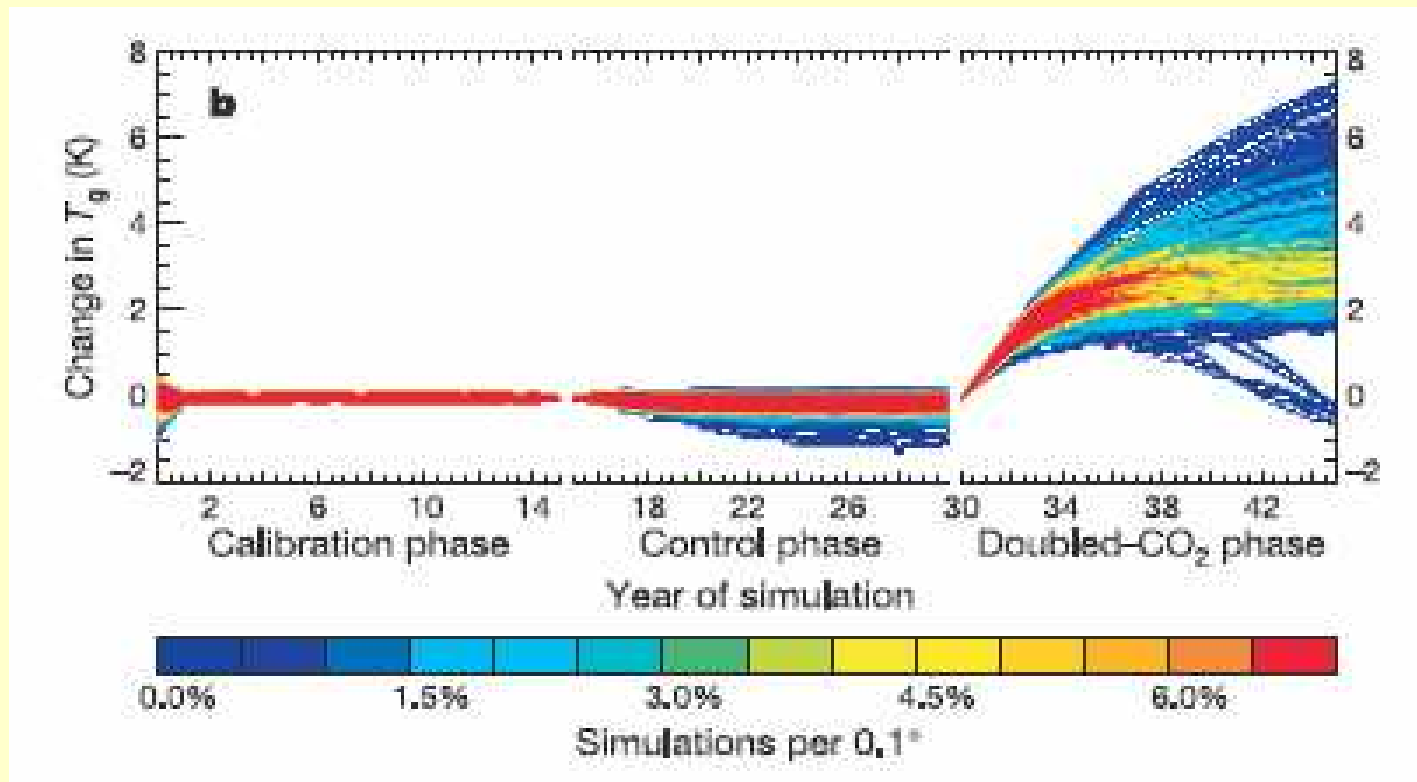
## ➤ Climateprediction.net

<http://www.climateprediction.net/>


108,000 participants from 188 countries (as of February, 2007)

## ➤ Stainforth et al. (2005)

“Uncertainty in predictions of the climate response to rising levels of greenhouse gases”. *Nature*, **433**, 403-406



# Motivations

- Risk of high-impact weather is potentially increasing
    - economical development and urbanization
    - global warming and climate change
  - Research environment is rapidly changing
    - [growth of computer power](#)
    - improvement of internet infrastructure
- 
- It would be a good timing for us to start an international research project for prevention and mitigation of meteorological disasters in Southeast Asia

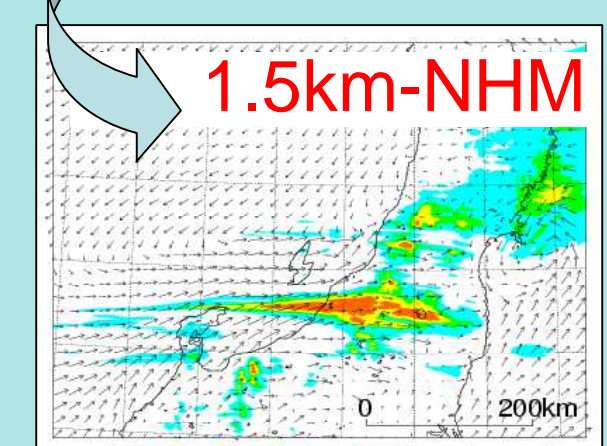
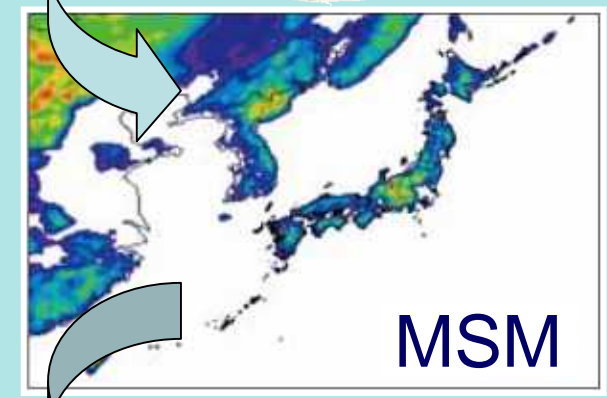
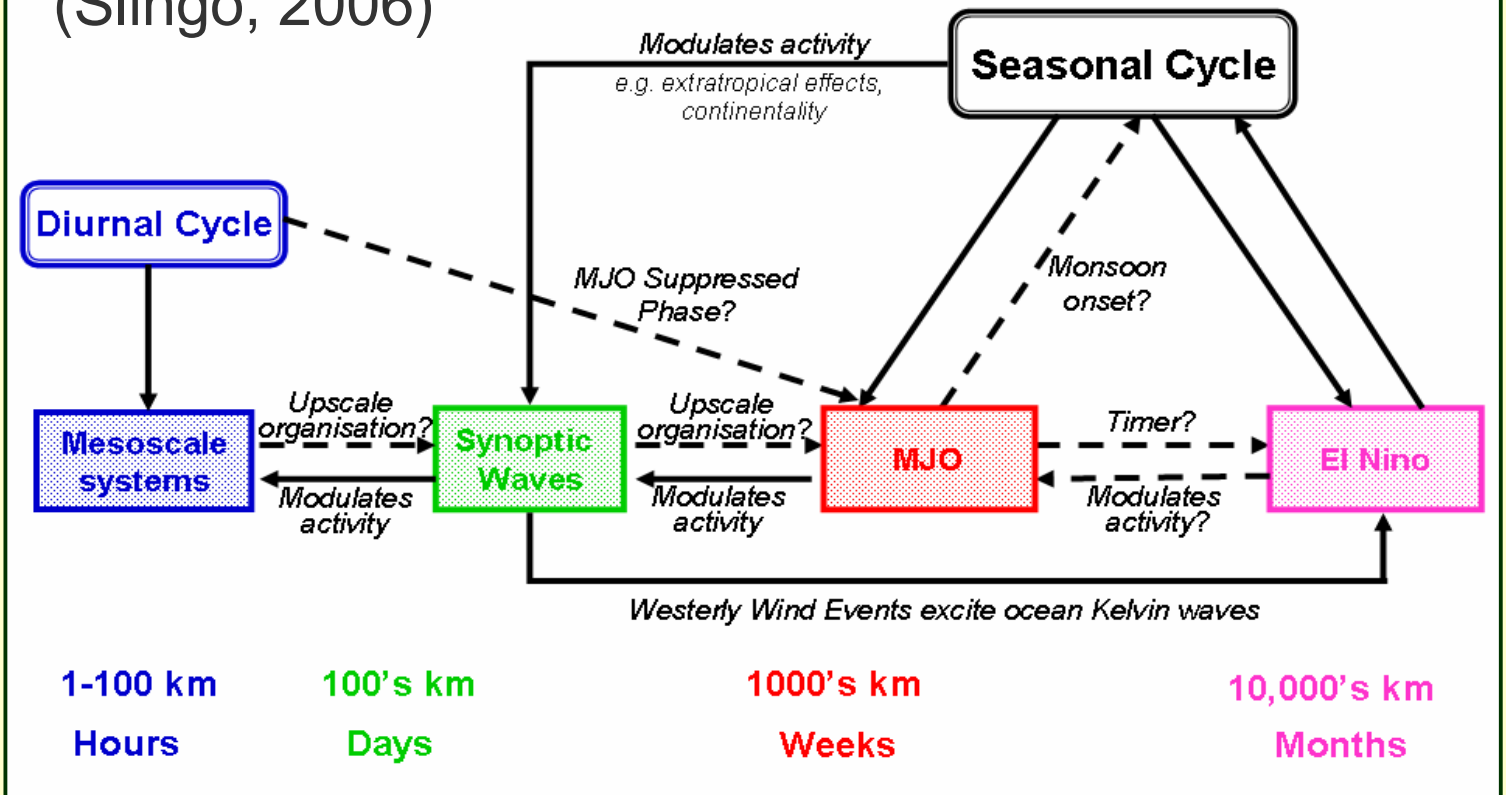
## Major Research Subjects

- (a) Experimental downscale numerical weather predictions (NWP) in the tropics with regional meso-scale models
- (b) Assessments of the impact of new observational data on the improvement of NWP with advanced data assimilation schemes
- (c) Development of a unified data base and decision support system for prevention and mitigation of meteorological disasters

# (a) Experimental downscale NWP in the tropics with regional meso-scale models

Interactions between space and time scales of tropical convection: Linking THORPEX and WCRP

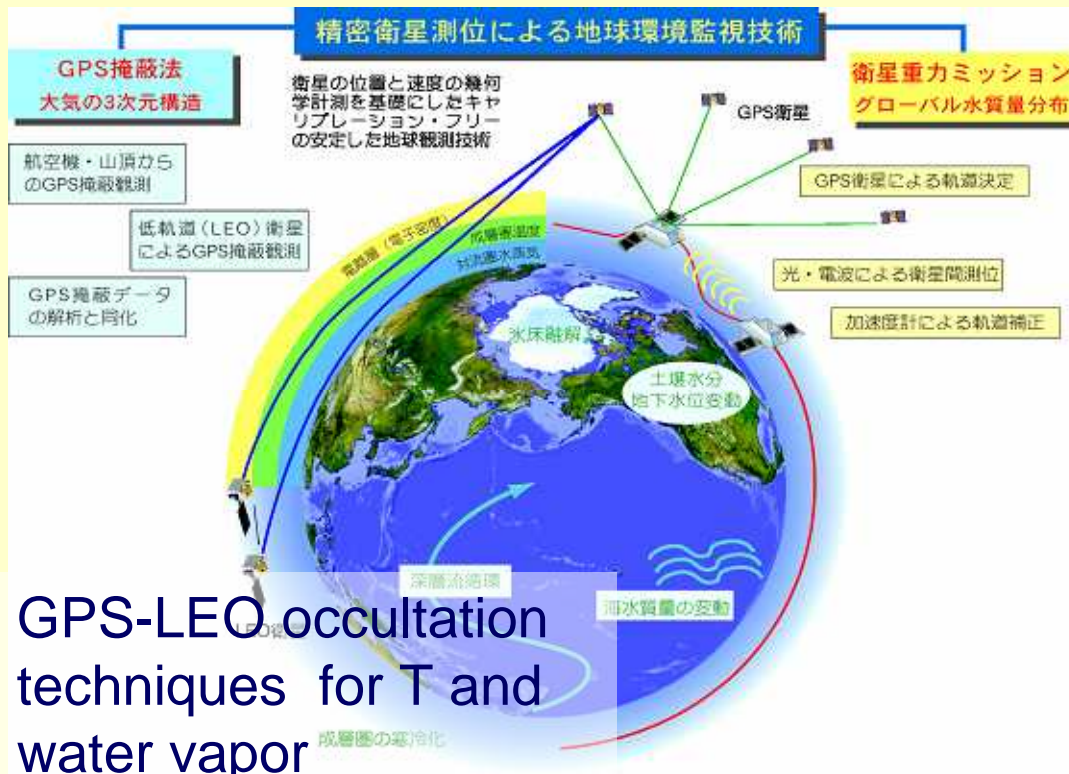
(Slingo, 2006)



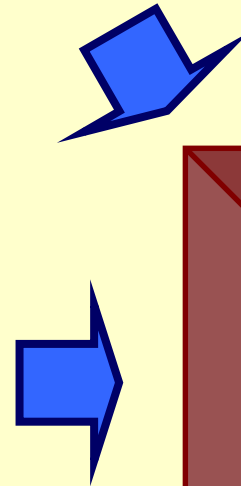


# (b) Assessments of the impact of new observational data on NWP with advanced data assimilation schemes

## Kyoto Univ. EAR at Koto Tabang, West Sumatra, Indonesia

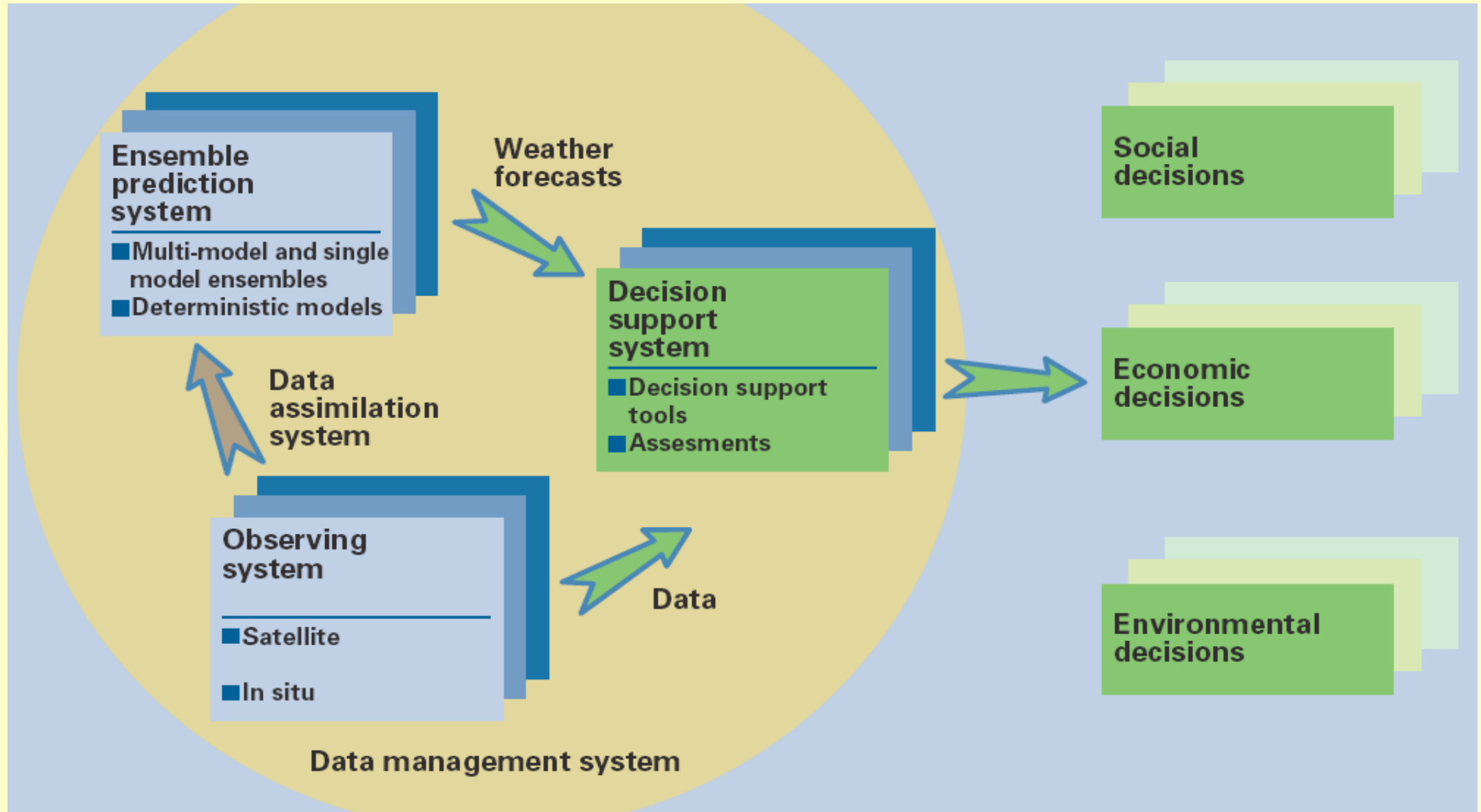


GPS-LEO occultation techniques for T and water vapor



Advanced Data Assimilation with 4D-VAR or EnKF

# (c) Development of a unified data base and decision support system for prevention and mitigation of meteorological disasters



# Research Groups

## (1) Fundamental Research and System Development

### **Kyoto University**

- downscale NWP experiments
- advanced data assimilation schemes
- assessments of the impact of new observational data on NWPs
- decision support system for the mitigation of meteorological disasters

## **International Scientist-Network for Prevention and Mitigation of Meteorological Disasters in SE Asia**

## (2) Operational Model

### Development

### **MRI/JMA**

- improvement of the JMA NHM
- international collaborations on NHMs
- data assimilation in the tropics

## (3) Real-Time Experiment

### **ITB and others**

- near-real time downscale NWPs in SE Asia
- international collaboration center based on ITB

## Purpose

- Through these research and development activities, we will establish  
“International Scientist-Network for Prevention and Mitigation of Meteorological Disasters in S-SE Asia”
- with participation from Bangladesh, Cambodia, India, Indonesia, Laos, Malaysia, Nepal, Philippine, Saudi Arabia, Singapore, Thailand, Vietnam, .....



# Research Collaborations between KU and ITB



# Historical Backgrounds

- Kyoto University has a unique tradition in field survey in Asia and Africa (natural science and liberal arts)
- MOU on collaborations in research and education between Kyoto Univ. and ITB in 2006





# KAGI21 International Summer School

## ● KISS on Active Geosphere Science

- two-week program at ITB for every summer from 2004
- ~ 180 people from 20 countries for 4 years





# Workshops and Geological Field Survey



International Workshop on  
Regional Models for the Prediction  
of Tropical Weather and Climate  
in March 1~3, 2006  
at Sheraton Bandung



Survey of limestone caves in Indonesia



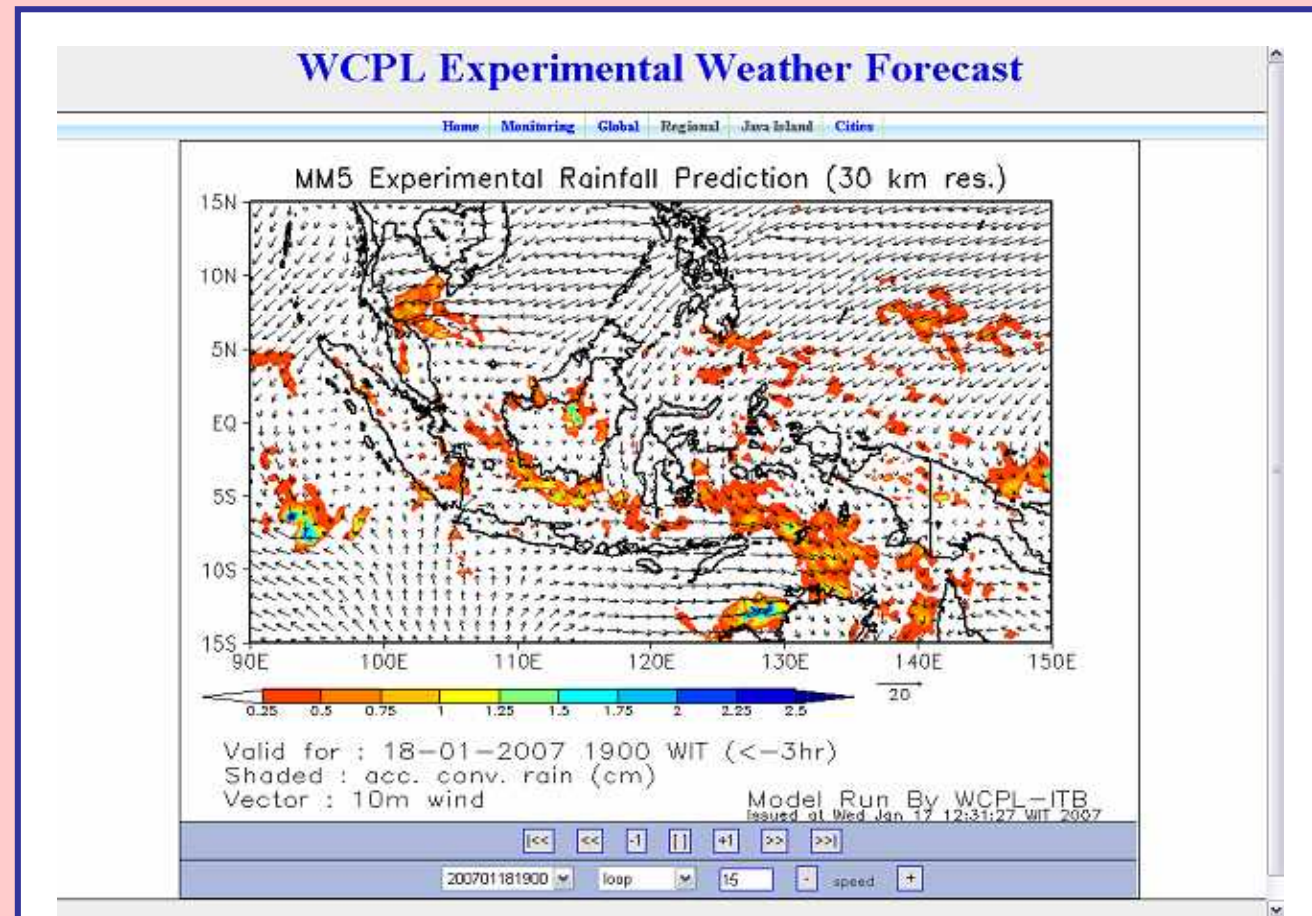


# Experimental NWP's at ITB

# Recent attempt by Pak Tri at ITB



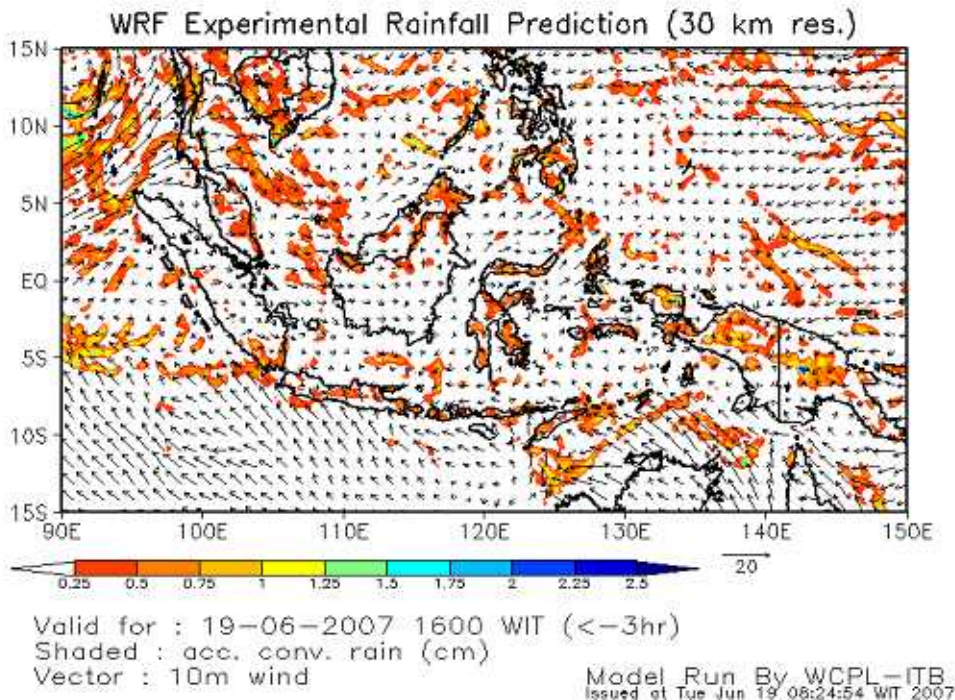
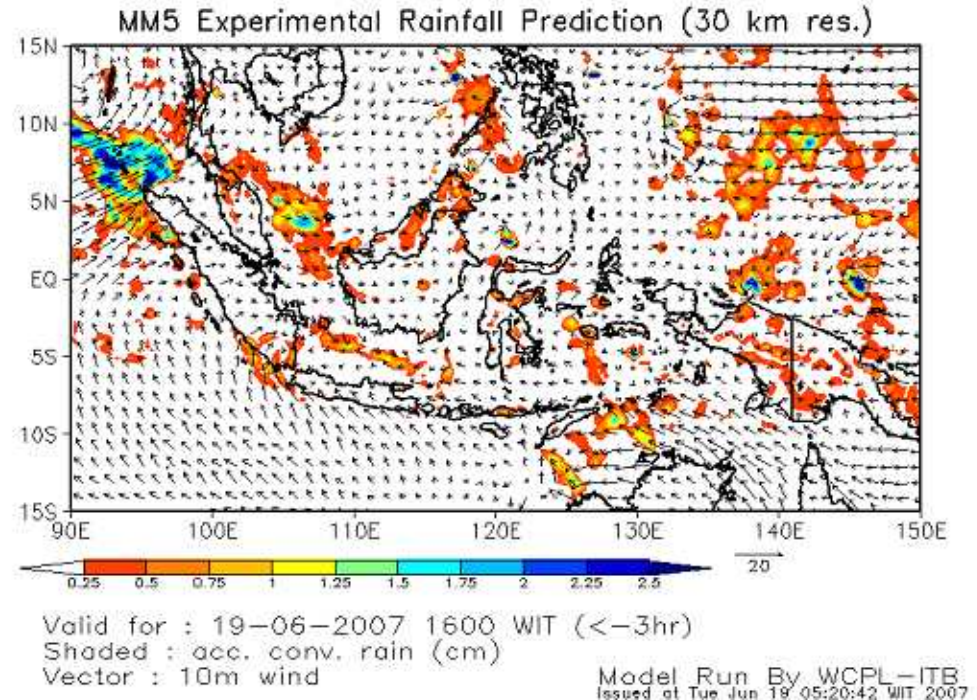
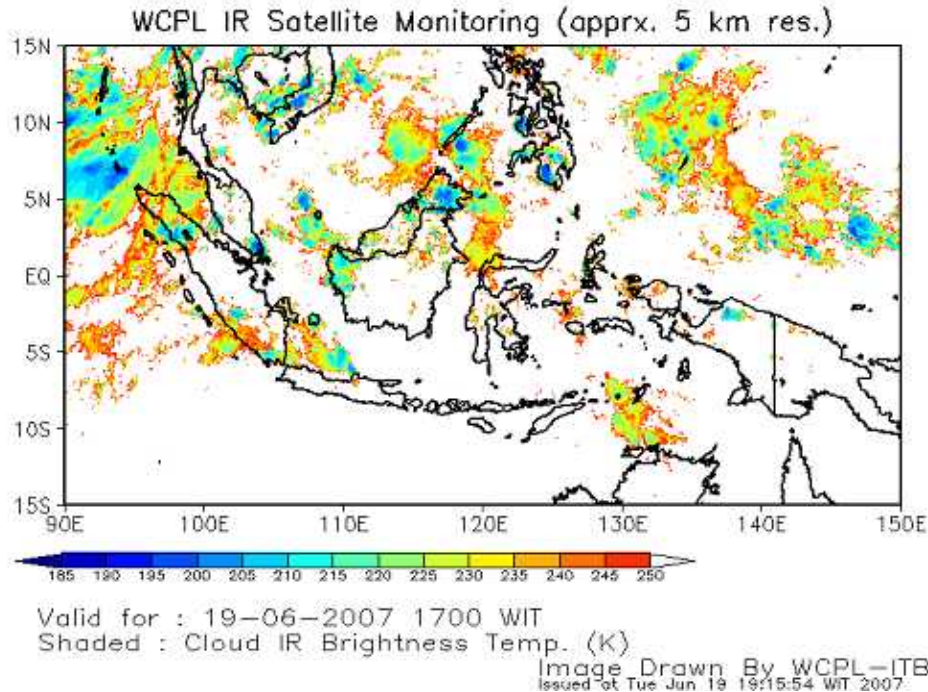
Dr. Tri W. Hadi and his PC cluster (ITB)



WEB page of Climate Prediction Laboratory (WCPL) <http://weather.geoph.itb.ac.id/>



# A Model Comparison Project

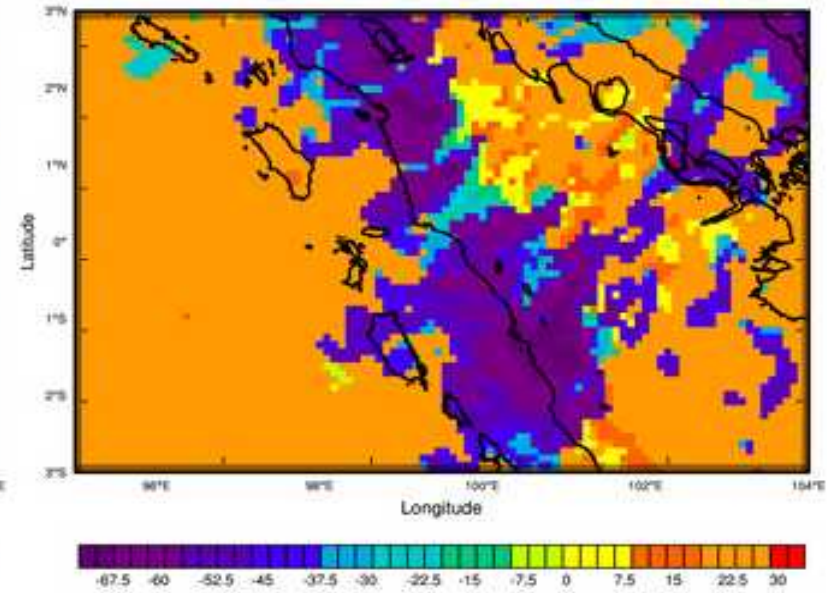
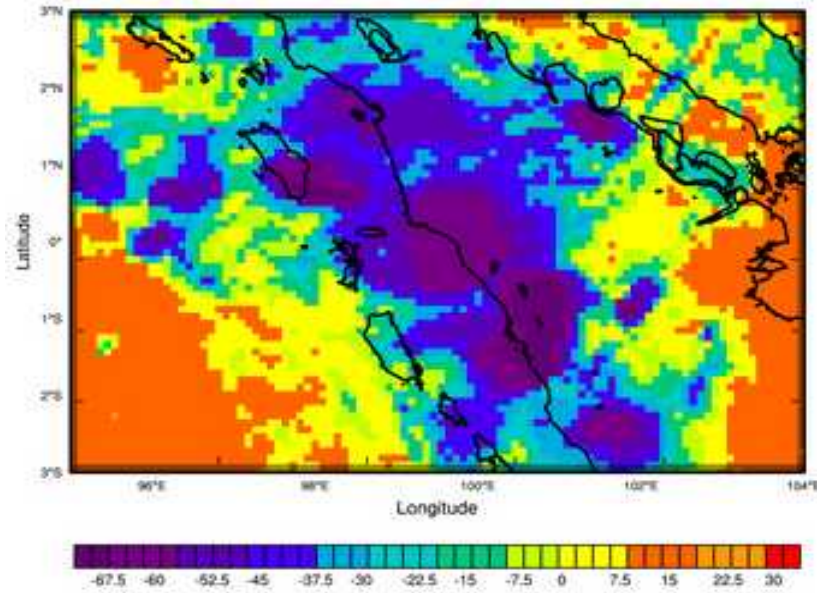


- JMA-NHM will be added this year
- Different models produced different prediction
- Require improvement on initial condition
- Ensemble prediction should be considered

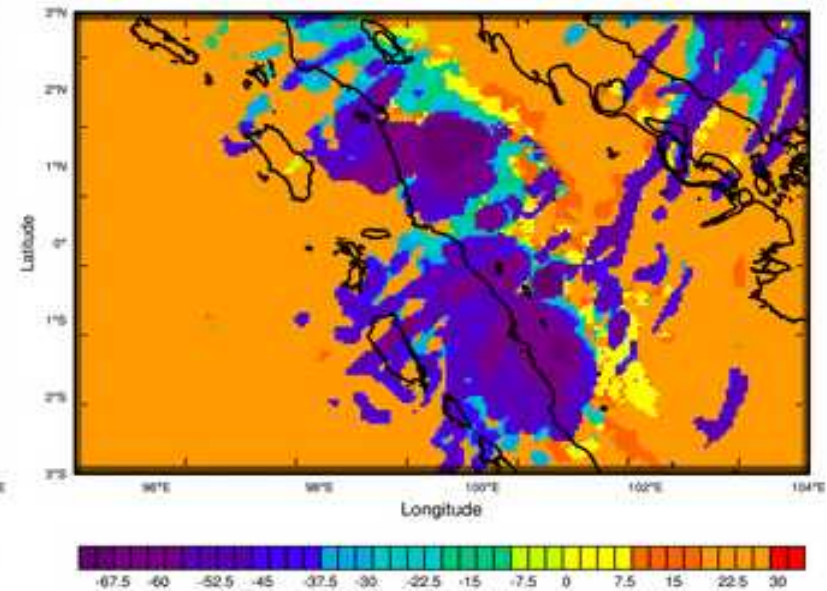
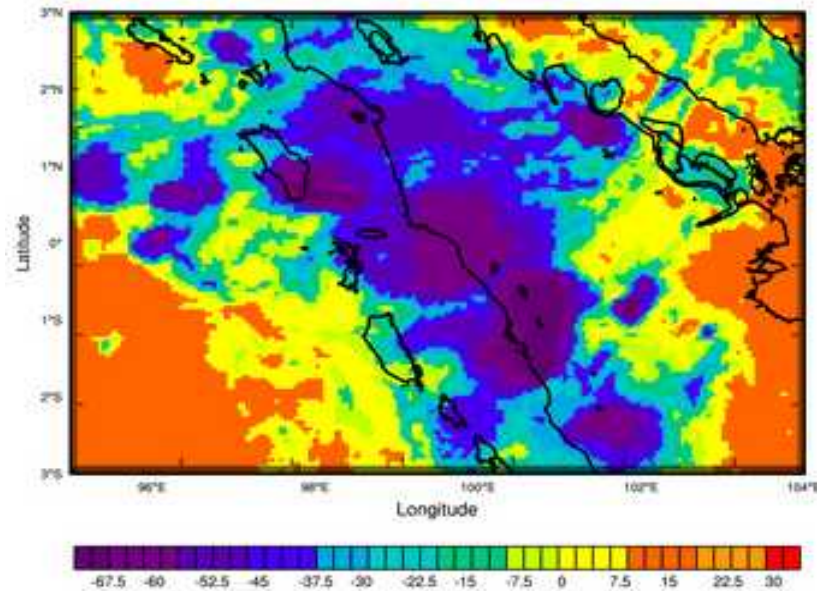


# Diurnal Convection over Sumatra Island : Observed and Simulated Cloud Top Temperature by WRF

10 km  
resolution



5 km  
resolution

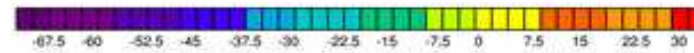
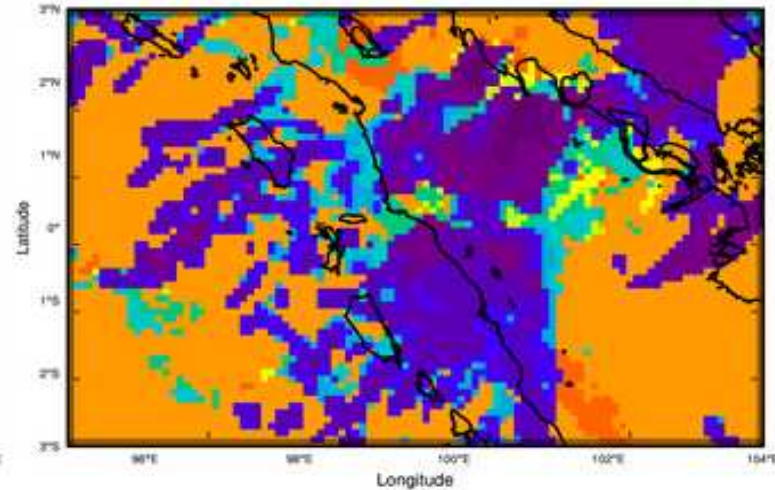
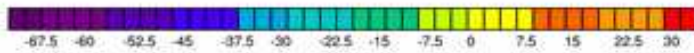
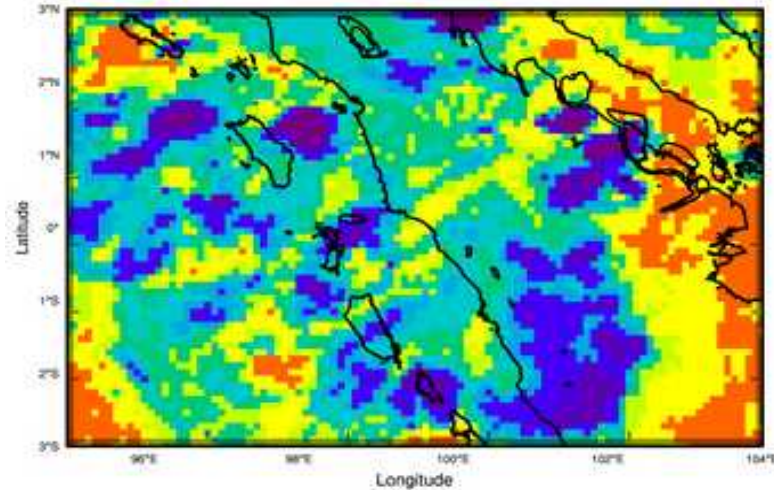


Fairly **good** case

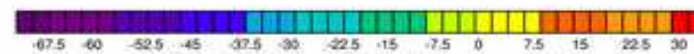
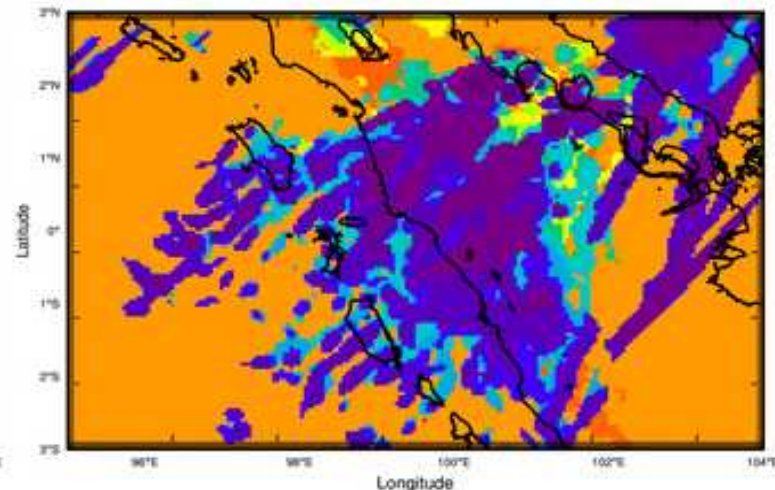
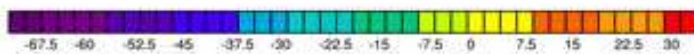
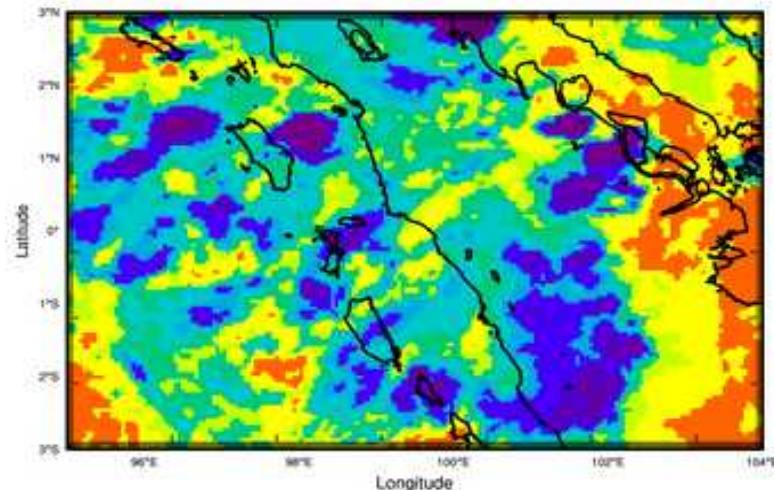


# Diurnal Convection over Sumatra Island : Observed and Simulated Cloud Top Temperature by WRF

10 km  
resolution



5 km  
resolution

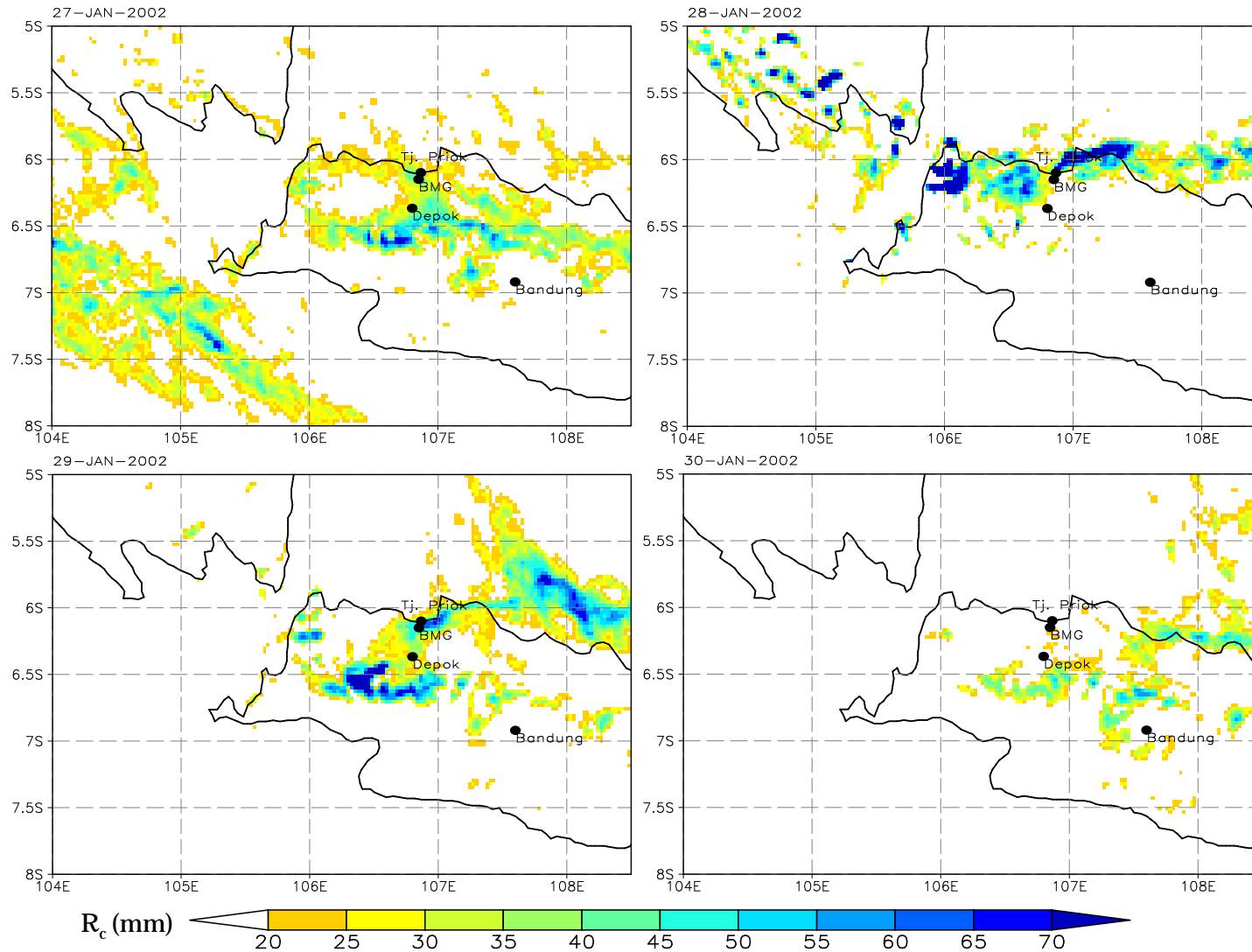


Fairly **bad** case



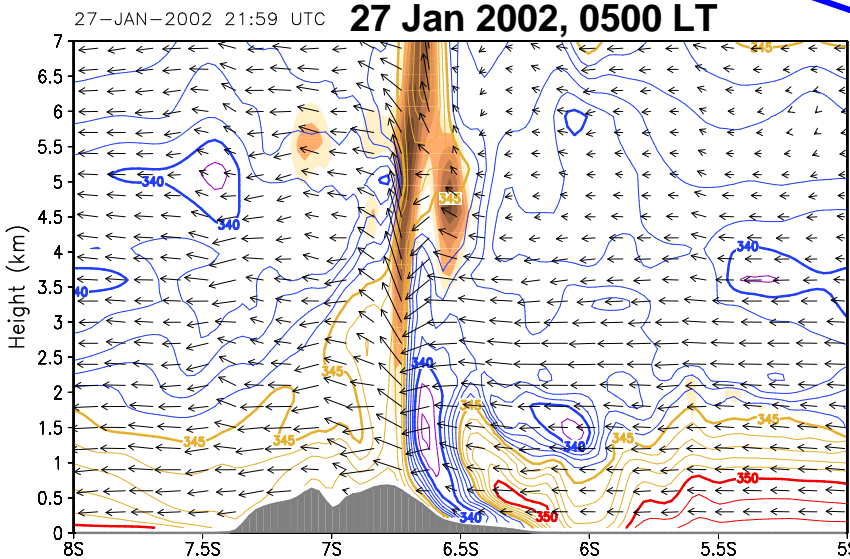
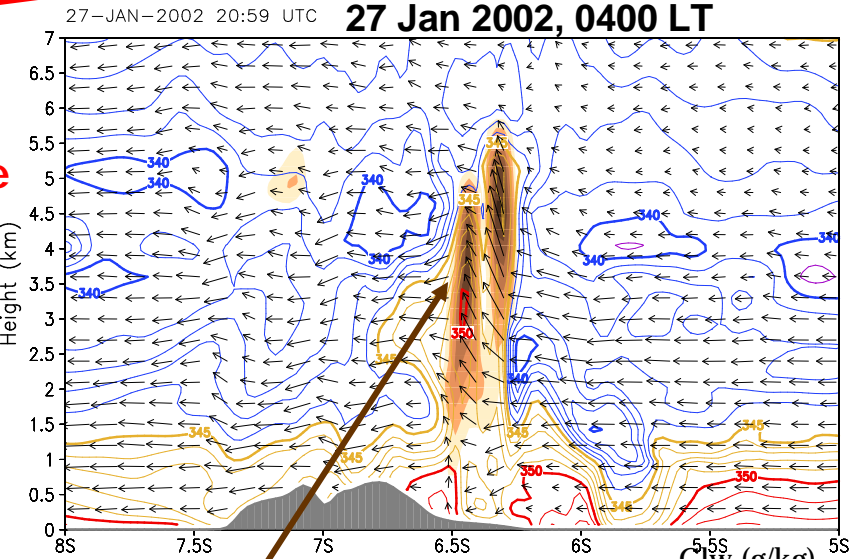
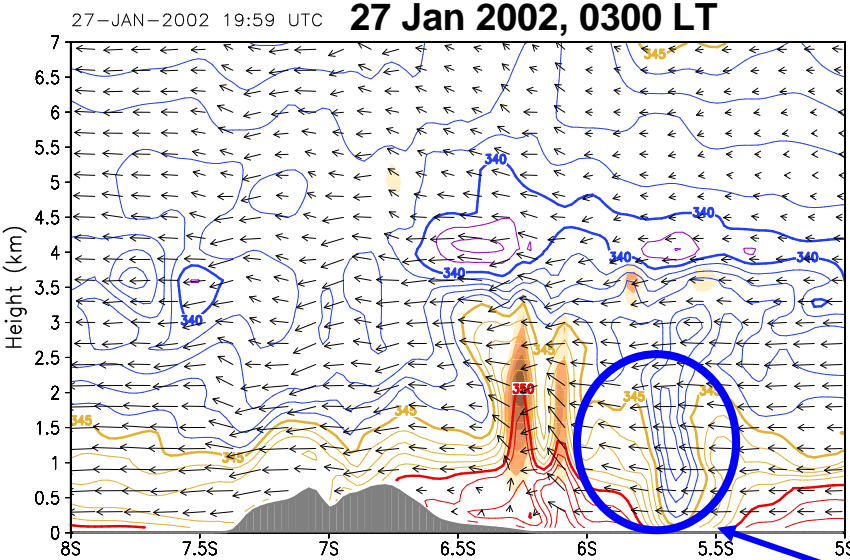
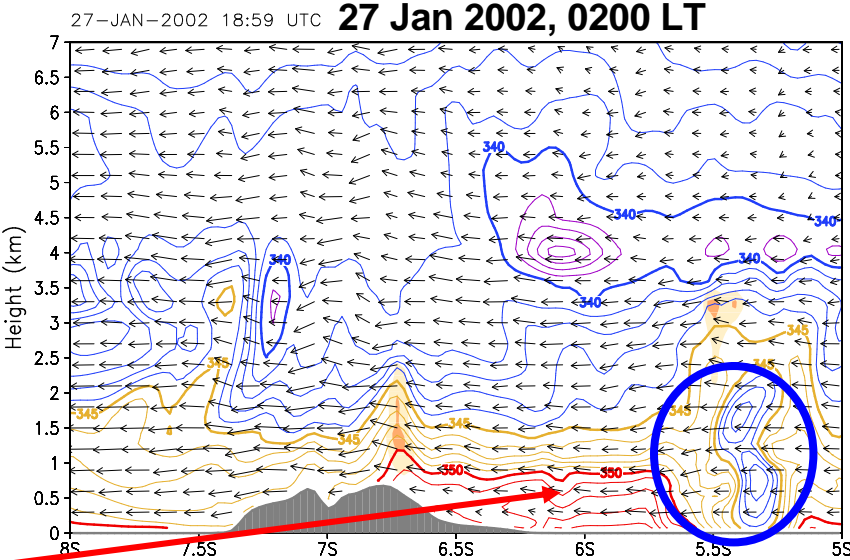
even sophisticated models cannot yet capture all of the important aspects of diurnal convection

# High (3 km) Resolution Simulation of Convective Rainfall Related to the Jakarta Flood Event of Jan/Feb 2002



Concentration of rainfall over Jakarta region is well represented

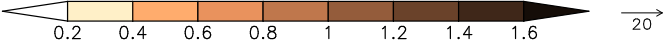
# Simulated Processes Related to Morning Convection over Land



High  
equivalent  
potential  
temperature  
(moist  
air)

“Cold  
pool”

convective cloud



# Near Future Events



# Kyoto University International Symposium on Active Geosphere Science

- July 26-28, 2007
- at ITB and Sheraton  
in Bandung, Indonesia
- Invited speakers:  
H. Kanamori, M. Kono,  
S. Manabe, P. Mayers,  
T. Palmer, G. Philander,  
K. Satake, H. Xu, ...

Sponsored by Kyoto University  
with supported from  
KAGI21, Institut Teknologi Bandung, and Science Council of Japan

**Active Geosphere Science"**

July 26 - 28, 2007  
Bandung, Indonesia

Solid & C

**Mini field trip to Lembang fault**

**Sessions**  
*Fluid Session on the Active Geosphere Science*  
*Indonesia as an Important Region for the Active Geosphere Science*  
*Solid Session on the Active Geosphere Science*  
*Coupling Session of the Active Geosphere Science*  
*The Active Geosphere Science from Asia and Oceania to the World*

**Field Trip**  
*Active-Geosphere Mini Field Trip  
to Tangkuban Prahua volcano and Lembang Fault*

**Contact Address**  
URL: <http://kagi.coe21.kyoto-u.ac.jp/en/meetings/>  
KAGI21 Office | Email: [kagi-i2@kugi.kyoto-u.ac.jp](mailto:kagi-i2@kugi.kyoto-u.ac.jp) / TEL+FAX: +81-75-753-4299

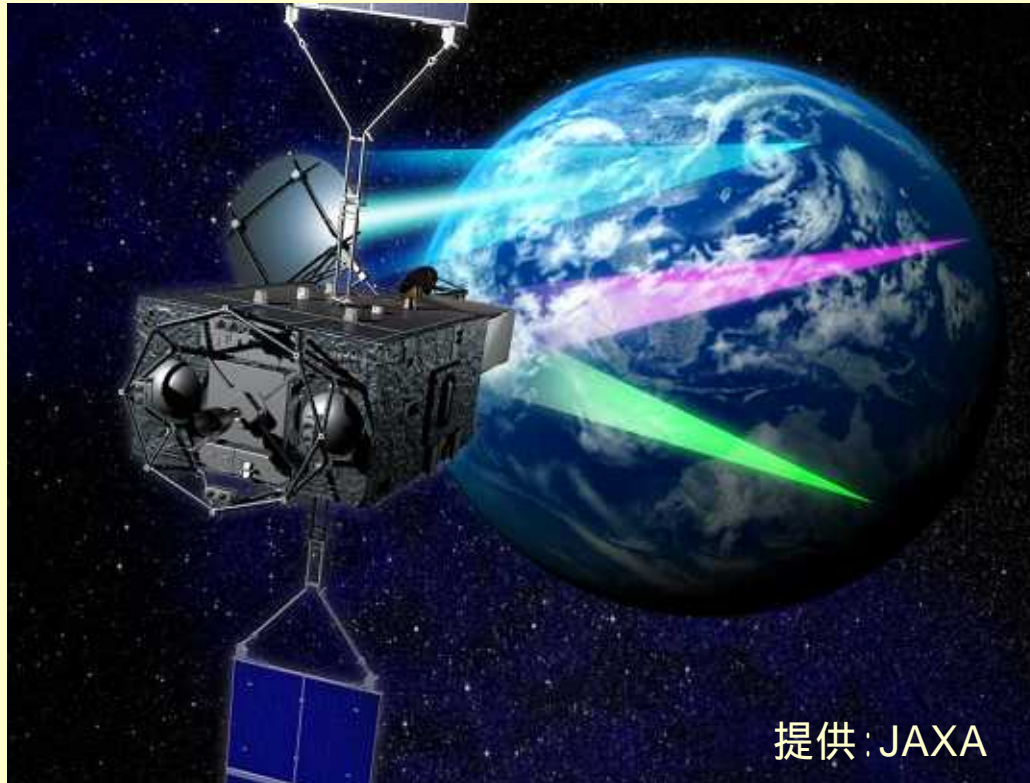
The 10th Kyoto University International Symposium

KYOTO UNIVERSITY  
FOUNDED 1869

SCIENCE COUNCIL OF JAPAN

# Improvement of Internet Infrastructure

- **WINDS** (Wideband InterNetworking engineering test and Demonstration Satellite)
  - will be launched in 2007
- test use to transfer global grid point value data of ensemble forecasts for downscale NWP



## Our Dream

- Establishment of  
“South East Asian Center for Research and Forecasts  
on Weather, Environment, and Climate”  
**SEACeRF\_on\_WEC**
- It will be a research and operational center  
~  
(U.S. National Center for Atmospheric Research +  
European Centre for Medium-range Weather Forecasts)

END