## Dynamical downscaling over Taiwan using NHM-5km

Masuo Nakano (JAMSTEC) masuo@jamstec.go.jp



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- Model and experimental design
- Results
- Summary

## Introduction

 New version of 5-km-mesh regional climate model is developped in KAKUSHIN Program. (Nakano et al. 2012 JMSJ printing)



Successfully reproduced Meiyu precipitation

## Introduction

• RCM intercomparison projects are going on.



To ensure the model transferability is important!

## Introduction

KAKUSHIN-TCCIP collaboration

 Dynamical downscaling over Taiwan region



# Model and Experimental design

### **Experimental design**

#### Emission Scenario: A1B



Present-day: 1979-2003 : HadISST

#### Future: 2075-2099

Annual variation from HadISST + Trend + difference (F-P)

(Mizuta et al.2008)

#### **Climate Experiments**



Present-day climate : 1990-1999 Future climate : 2086-2095

## Specification of NHM-5km

Basic Equations	Full compressible system
Advection	Flux form forth-order with advection correction
Turbulent closure	Improved Mellor-Yamada(MYNN) Level3
Cloud in radiation process	Partial condensation scheme
Land surface flux	Beljaars and Holtslag(1991)
Grid points	380 x 400 x 55 (Top 26.9 km)
Convective parameterization	Kain-Fritsch
Cloud Physics	3-ice bulk scheme (Murakami 1990)
Spectral coupling	Spectral nudging (u, v, theta; wavelength > 1000km) above 7km height

#### Model domain and Topography



# Results

#### SLP simulated by AGCM-20km



AGCM-20km well simulates observed SLP patterns.



Chen et al. (1999 BAMS) Accumulated precipitation over Taiwan and surface wind at Penhu during 1993-96.

Little change in surface wind



Monthly averaged surface wind over Taiwan

#### Typhoon tracks

#### Successfully downscaled



#### Number of approaching TC(TC/year)



#### Seasonal mean precipitation



NHM-5km





#### Seasonal mean precipitation

**OBS-1km** 



AGCM-20km



[mm/day]





## **Precipitation Analysis**



APHRO underestimate precipitation amount over Taiwan except for Middle area.





#### PDF of daily precipitation



Freq of heavy rainfall will increase in Meiyu.



## Future change in TC precipitation per 1 TC footprint



We need more careful examination.

## Summary

# Dynamical downscaling experiments are performed over Taiwan using NHM-5km

- NHM-5km and AGCM-20km tend to overestimate precipitation amount on the eastern slope of the central mountain range.
- NHM-5km improved spatial distribution of precipitation simulated by AGCM-20km.
- PDF of daily precipitation amount shows that frequency of heavy precipitation will increase in Meiyu and Autumn.
- We need high-resolution observed data to check performance of the model in more detail.



1990-1999 Preci avg(mm/day), OBS



**4**0

v-arid

x-grid

v-arid

M 1990-1999 spri)0-1999 sumi0-1999 autumn pred



**OBS-1km** 



