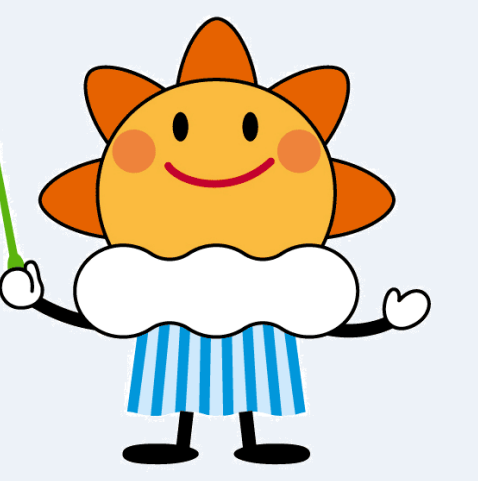




# TCC/JMA as RCC and Collaborative Researches using MRI Regional Climate Model



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## Introduction

- The Tokyo Climate Center (TCC) and the Meteorological Research Institute (MRI) of the Japan Meteorological Agency (JMA) are providing scientific support to developing countries from the operational and research viewpoints respectively.
- TCC, serving as a Regional Climate Center (RCC)\* of the World Meteorological Organization (WMO) in Asia since 2009, assists climate services of National Meteorological and Hydrological Services (NMHSs) in the region through providing capacity development programs as well as climate data/information including climate change monitoring and projection information.
- MRI further collaborates with other research organizations in Japan and overseas, and actively contributes to international bodies such as the Intergovernmental Panel on Climate Change (IPCC) and collaborative research with countries mainly in Southeast Asia.

\* WMO/RCCs are centres of excellence that create regional products including long-range forecasts that support regional and national climate activities, and thereby strengthen the capacity of WMO Members in a given region to deliver better climate services to national users.

## Tokyo Climate Center (TCC)

### Annual training seminars

- ✓ TCC has organized and hosted annual one-week training seminars since 2008 attended by a dozen invited experts from NMHSs in the Asia-Pacific region. As of 2017, a total of **127 experts** have participated in the seminars.
- ✓ Participants learn about state-of-the-art climatological knowledge and information provided by JMA not only in classroom lectures but in practical exercises in order to improve their skills for operational climate services.
- ✓ At the end of the seminar, all participants are requested to give presentations on achievements of their own exercises.
- ✓ In January 2015, TCC held the annual seminar, focusing on the generation of global warming projection information for the participants' countries, by using data produced in the Program for Risk Information on Climate Change (SOUSEI Program).

#### Schedule of Training Seminar on Global Warming Projection Information (26 – 30 January 2015)

Day 1	Introduction
AM	Lecture: Necessity of Global Warming Projection Information
PM	Lecture: Introduction to IPCC AR5 Lecture: Introduction to Global Warming Projection
Day 2	Lecture: Introduction to JMA's reanalysis data Lecture and exercise: Introduction to handling Grid Point Data Lecture: How to make Global Warming Projection for own countries Lecture and exercise: Checking of Reproducibility Lecture and exercise: Assessment of Future Climate Change Lecture and exercise: Uncertainty Check of the Results
Day 3	AM Exercise: Global Warming Projection for own countries PM Exercise: Global Warming Projection for own countries (cont.)
Day 4	AM Exercise: Global Warming Projection for own countries (cont.) PM Exercise: Global Warming Projection for own countries (cont.)
Day 5	AM Presentation by participants

Sufficient time is allocated for Practical Exercises.



Lecture and exercise session in 2015



Presentation and discussion on the achievements from the seminar in 2015

## Meteorological Research Institute (MRI)

### International contribution by using NHRCM\*

- ✓ The international collaborative research with developing countries is conducted by the MRI to produce the detail structure of the future climate change projection in tropical and sub-tropical Asian regions.
- ✓ MRI has been also providing climate models to Southeast Asian countries to support producing local climate change projection data on their own. Future plans will be shared as good practices that are broadly applicable to other countries and regions.

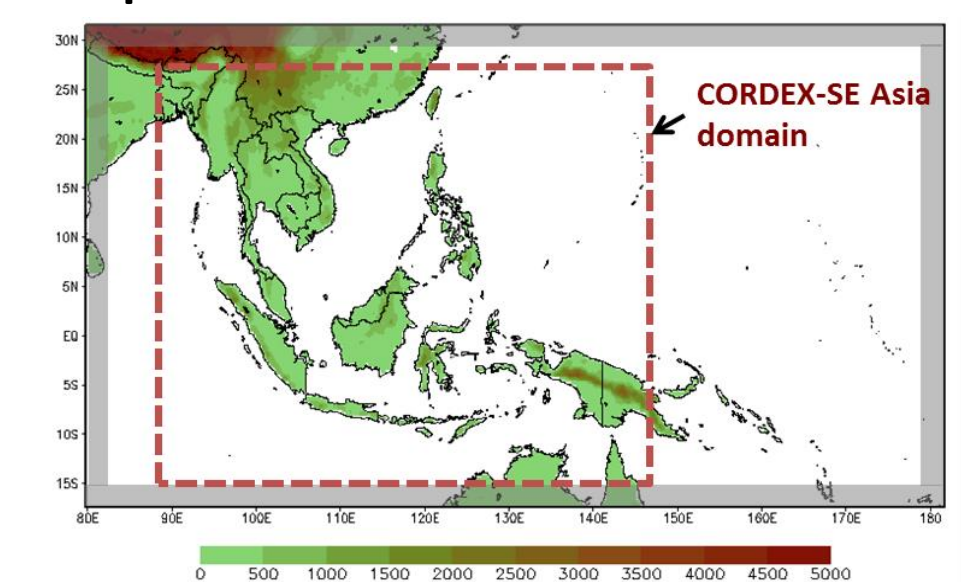
\* NHRCM: Non-Hydrostatic Regional Climate Model

#### Climate change projection in vulnerable areas

- Collaborative research with countries in Southeast Asia (CORDEX-SE Asia)
- Support to climate change projection in vulnerable areas
- Human resource development in foreign countries
- Evaluation of future water resource availability

#### International comparison of climate change projection

- Participation in High-Res-MIP
- Participation in CORDEX-EA
- Comparison with other countries



CORDEX: Coordinated Regional Climate Downscaling Experiment

#### The invited researchers for NHRCM

	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
1 FY2012												
2												
3 FY2013												
4												
5												
6 FY2014												
7												
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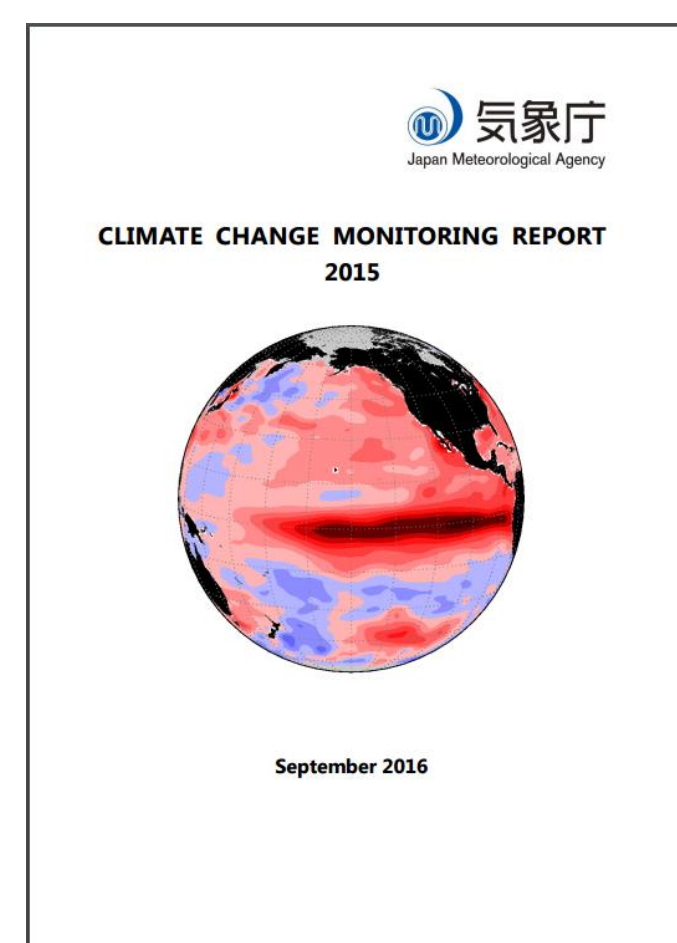
Fund: ■ SOUSEI ■ own ■ Ministry of land infrastructure and truisim ■ Japan society for the promotion of science



## Provision of information and products

TCC website provides a variety of climate information. Regarding the climate change, two series of publications issued by JMA, named "Global Warming Projection (GWP)"\* and "Climate Change Monitoring Report", are available on TCC website\*\*. These reports are intended to provide up-to-date information on climate change and global warming, and raise public awareness and understanding of the science behind them.

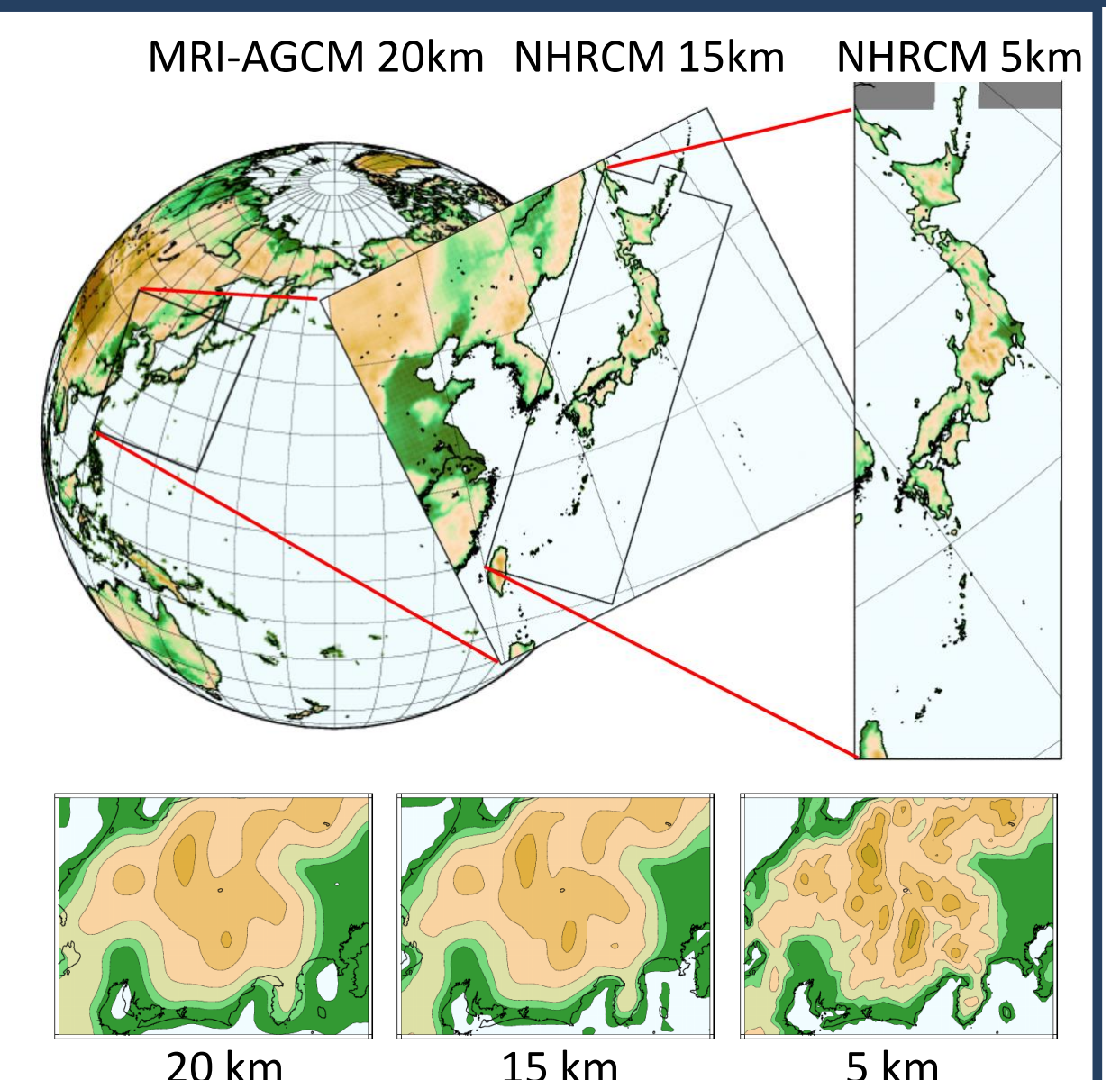
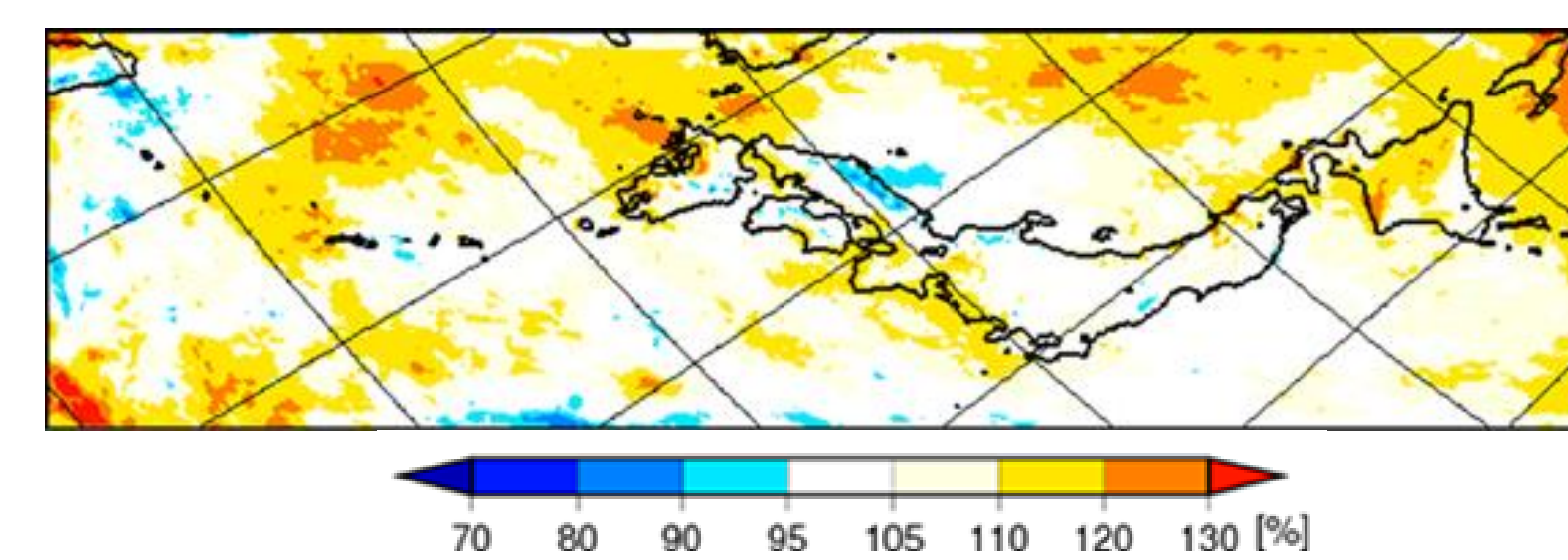
\* Future projections in GWP Vol. 8 are based on the result of numerical experiments using NHRCM developed at Meteorological Research Institute of JMA.  
\*\* <http://ds.data.jma.go.jp/tcc/tcc/products/gwp/gwp.html>



Climate Change Monitoring Report

## Nesting method using NHRCM

NHRCM with a 15-km grid spacing (NHRCM15) is nested within a 20km AGCM to generate cloud water, cloud ice, and other cloud properties. Moreover, NHRCM05 is nested within NHRCM15.



## Expert visits

TCC arranges expert visits to NMHSs to support their climate services and the effective transfer of technology every year. As part of such efforts, TCC experts visited Thai Meteorological Department (TMD) and Sri Lanka's Department of Meteorology (DOM) in 2015 for follow-up of the training seminar on the generation of global warming projection information held in January 2015 (see the above part of "Annual training seminars").



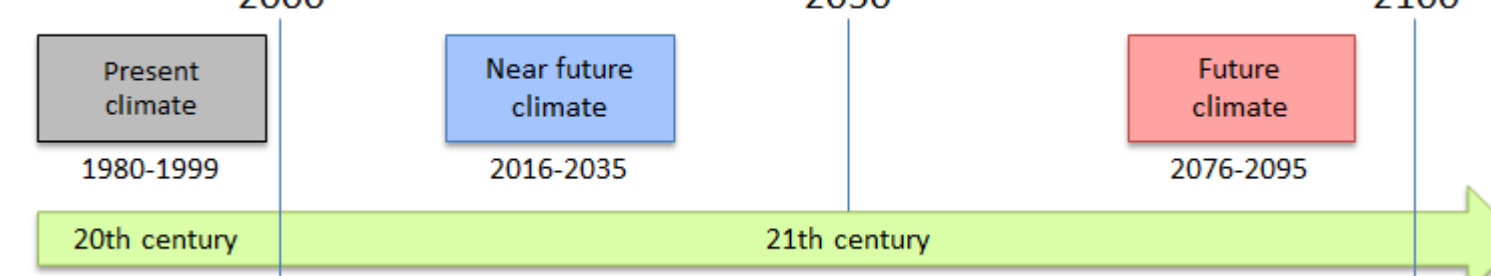
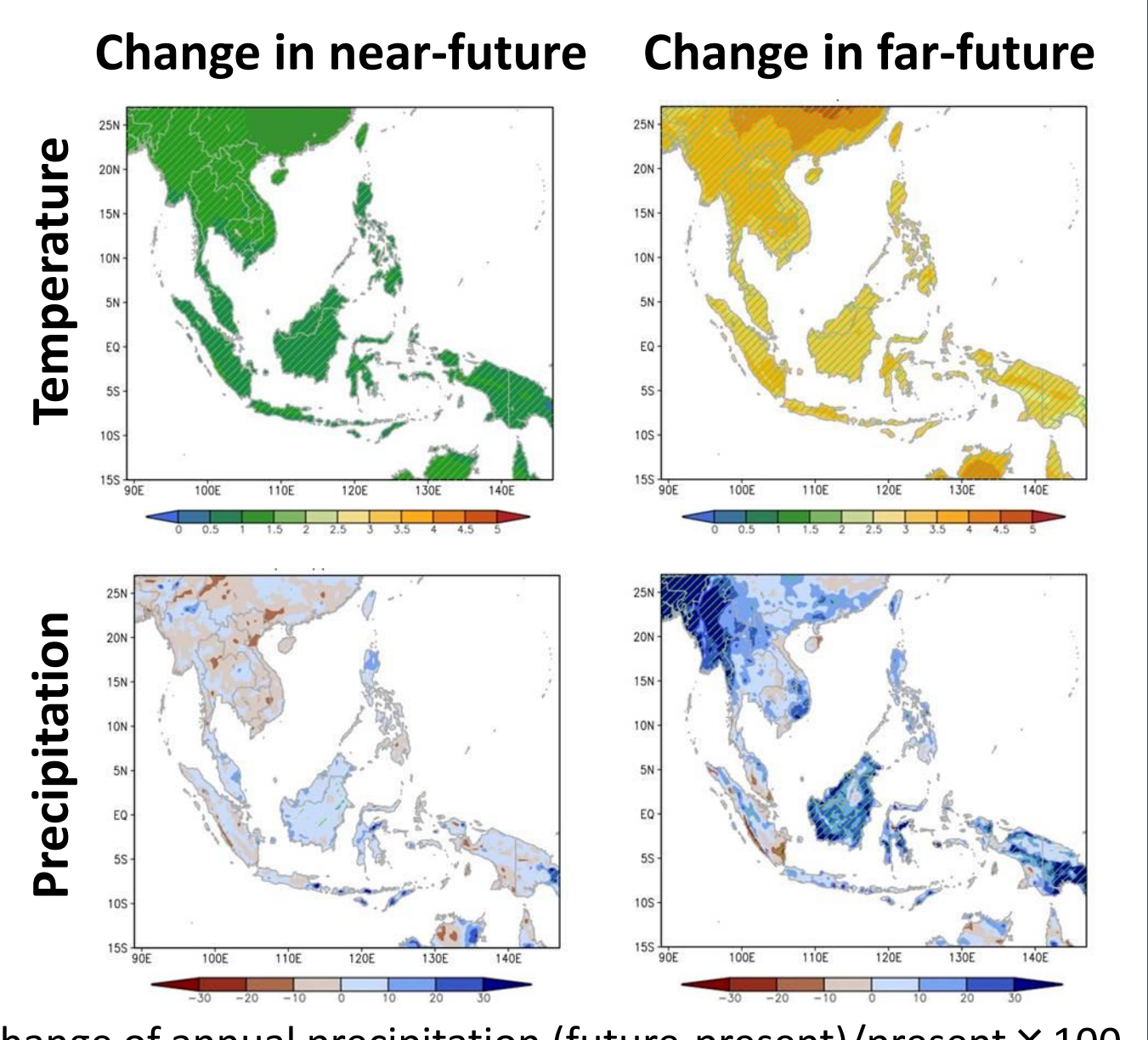
TCC expert visit at TMD



TCC expert visit at DOM

## Application of NHRCM over Southeast Asia

Under the RCP 8.5 scenario, the projected warming is up to 1.5°C in the near-future and 4°C in the far-future over the region. Hatched areas show the significant levels are 99% or higher in temperature and 95% or higher in precipitation.



Future change of annual precipitation (future-present)/present × 100