



SEACLID

CORDEX-Southeast Asia

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Addressing future climate change information gaps and data needs in the Southeast Asia region through the Southeast Asia Regional Climate Downscaling (SEACLID)/CORDEX Southeast Asia Project

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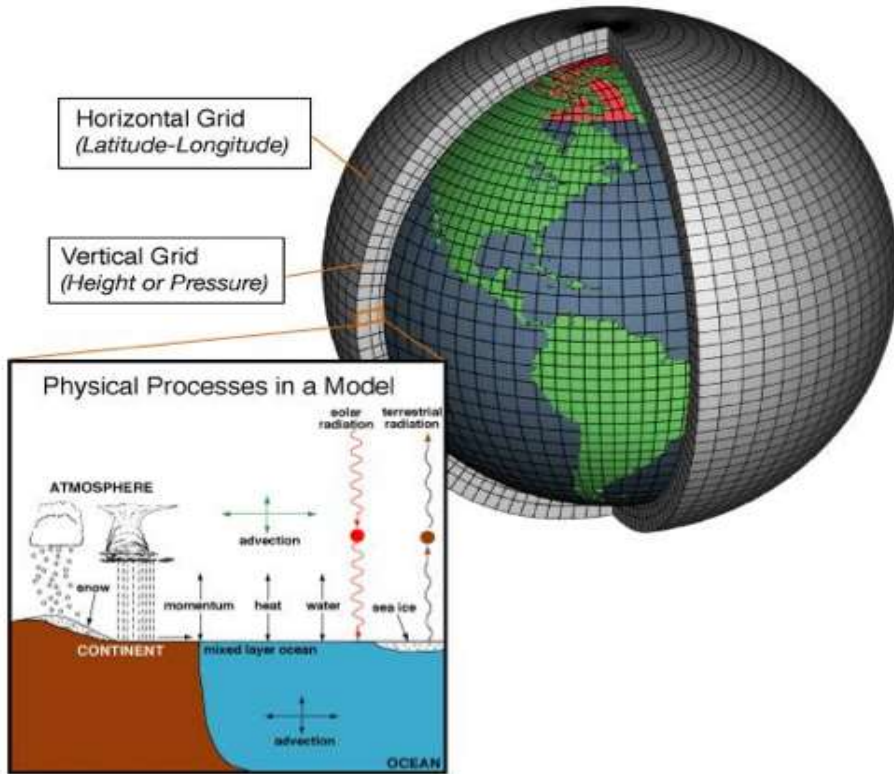


22-24 August 2017, Putrajaya International Convention Centre, Putrajaya, Malaysia

Addressing Climate Change & Its Impacts

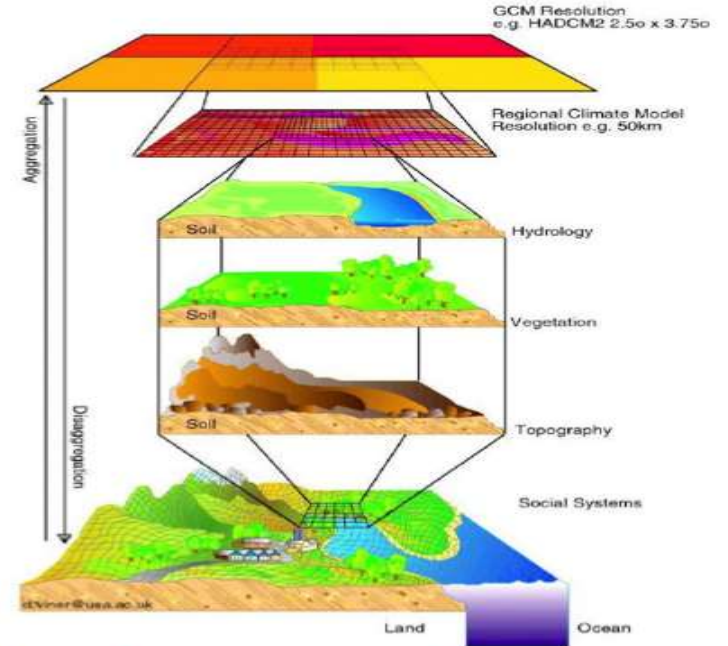
- Human induced climate change is unequivocal (IPCC 2013)
- Adapting to climate change impact is crucial since the success of mitigation remains uncertain
- While mitigation is global in nature, adaptation is implemented locally
- Implementing adaptation measures on critical sectors (e.g. water resources) requires robust climatic information at the local scales
- Climate information varies temporally and spatially; Hence geospatial analysis is relevant
- Information on past and present climate is insufficient; Need to understand future climate under changing GHG emission scenarios; Climate modeling is required
- Future climate information is provided by GCM which operates at coarser resolution
- There is a need to “refine” this information to resolve complex topography, coastlines, local processes etc.; this is known as regional climate downscaling.
- Regional climate downscaling: Statistical Downscaling and Dynamical Downscaling

CONCEPTUAL STRUCTURE OF A GCM



Source: National Oceanic and Atmospheric Administration (NOAA), 2012

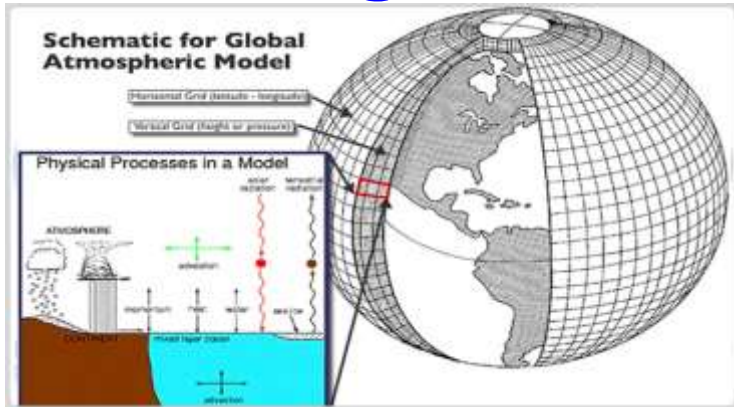
THE CONCEPT OF SPATIAL DOWNSCALING



Many of the processes that control local climate, e.g., topography, vegetation, and hydrology, are not included in coarse-resolution GCMs. The development of statistical relationships between the local and large scales may include some of these processes implicitly.

Source: Viner, 2012

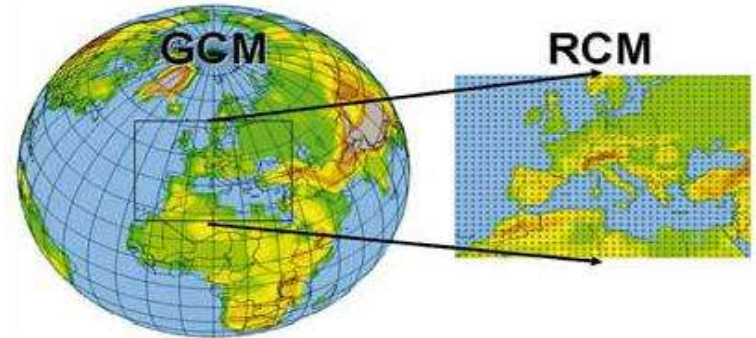
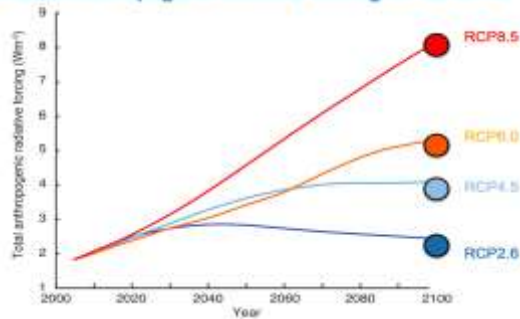
General Circulation Model (GCM) vs. Regional Climate Model (RCM)



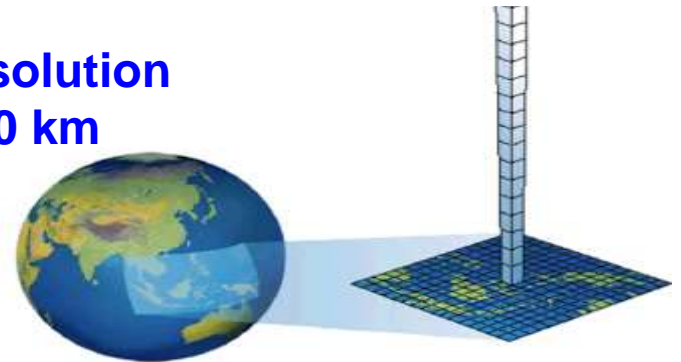
CMIP3,5; Resolution 100 - 300 km

RCPs

Indicative anthropogenic radiative forcing for the RCPs



Resolution < 50 km



Regional Climate Downscaling

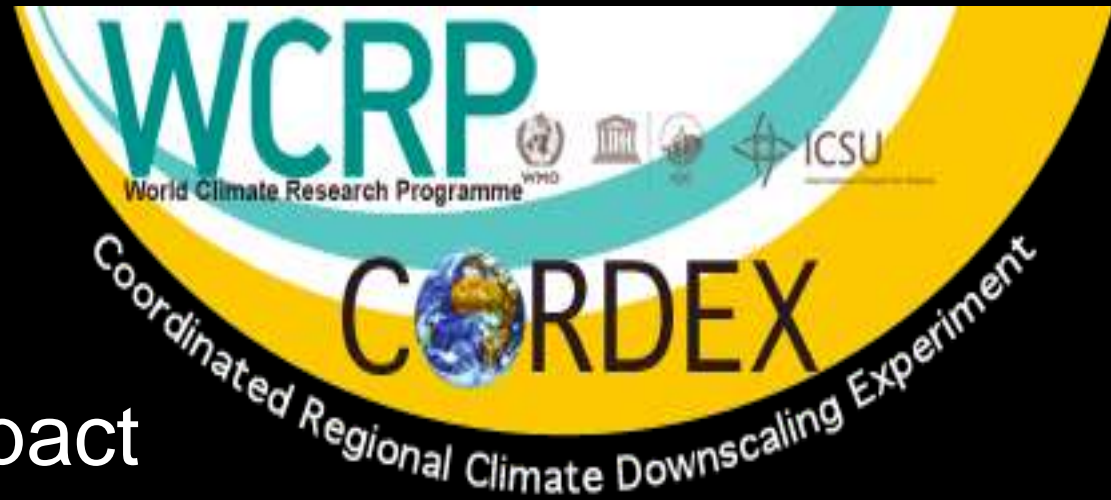
The amount of information supporting conclusion regarding observed and projected impacts

Sector	Topics/issues O = Observed impacts, P = Projected Impacts	North Asia		East Asia		Southeast Asia		South Asia		Central Asia		West Asia		
		O	P	O	P	O	P	O	P	O	P	O	P	
Freshwater resources	Major river runoff	/	x	/	/	/	/	/						x
	Water supply	x	x	x	x	x	x	x	x					x
Terrestrial and inland water systems	Phenology and growth rates	/	/	/	/	x	x	x						x
	Distributions of species and biomes	/	/	/	/	x	x	x						x
	Permafrost	/	/	/	/	/	x	/						x
	Inland waters	x	x	/	x	x	x	x						x
Coastal systems and low-lying areas	Coral reefs	NR	NR	/	/	/	/	/						/
	Other coastal ecosystems	x	x	/	/	x	x	x						x
	Arctic coast erosion	/	/	NR	NR	NR	NR	NR						NR
Food production systems and food security	Rice yield	x	x	/	/	x	/	x						/
	Wheat yield	x	x	x	x	x	x	x						/
	Corn yield	x	x	x	/	x	x	x						x
	Other crops (e.g., barley, potato)	x	x	/	/	x	x	x						/
	Vegetables	x	x	/	x	x	x	x						x
	Fruits	x	x	/	x	x	x	x						x
	Livestock	x	x	/	x	x	x	x						x
	Fisheries and aquaculture production	x	/	x	/	x	/	x						x
	Farming area	x	/	x	/	x	x	x						x
	Water demand for irrigation	x	/	x	/	x	x	x						x
	Pest and disease occurrence	x	x	x	x	x	x	x						x
Human settlements, industry, and infrastructure	Floodplains	x	x	/	/	/	/	/						x
	Coastal areas	x	x	/	/	/	/	/						x
	Population and assets	x	x	/	/	/	/	/						x
	Industry and infrastructure	x	x	/	/	/	/	/						x
Human health, security, livelihoods, and poverty	Health effects of floods	x	x	x	x	x	x	/						x
	Health effects of heat	x	x	/	x	x	x	x						x
	Health effects of drought	x	x	x	x	x	x	x						x
	Water-borne diseases	x	x	x	x	/	x	/						x
	Vector-borne diseases	x	x	x	x	/	x	/						x
	Livelihoods and poverty	x	x	/	x	x	x	/						x
	Economic valuation	x	x	x	x	/	/	/						x

Critically lack of studies on impacts of climate change in Southeast Asia region

Table 24.2 IPCC AR5 WGII

CORDEX provides global coordination of
Regional Climate
Downscaling
for improved
regional
climate change
adaptation and impact
assessment



CORDEX Management

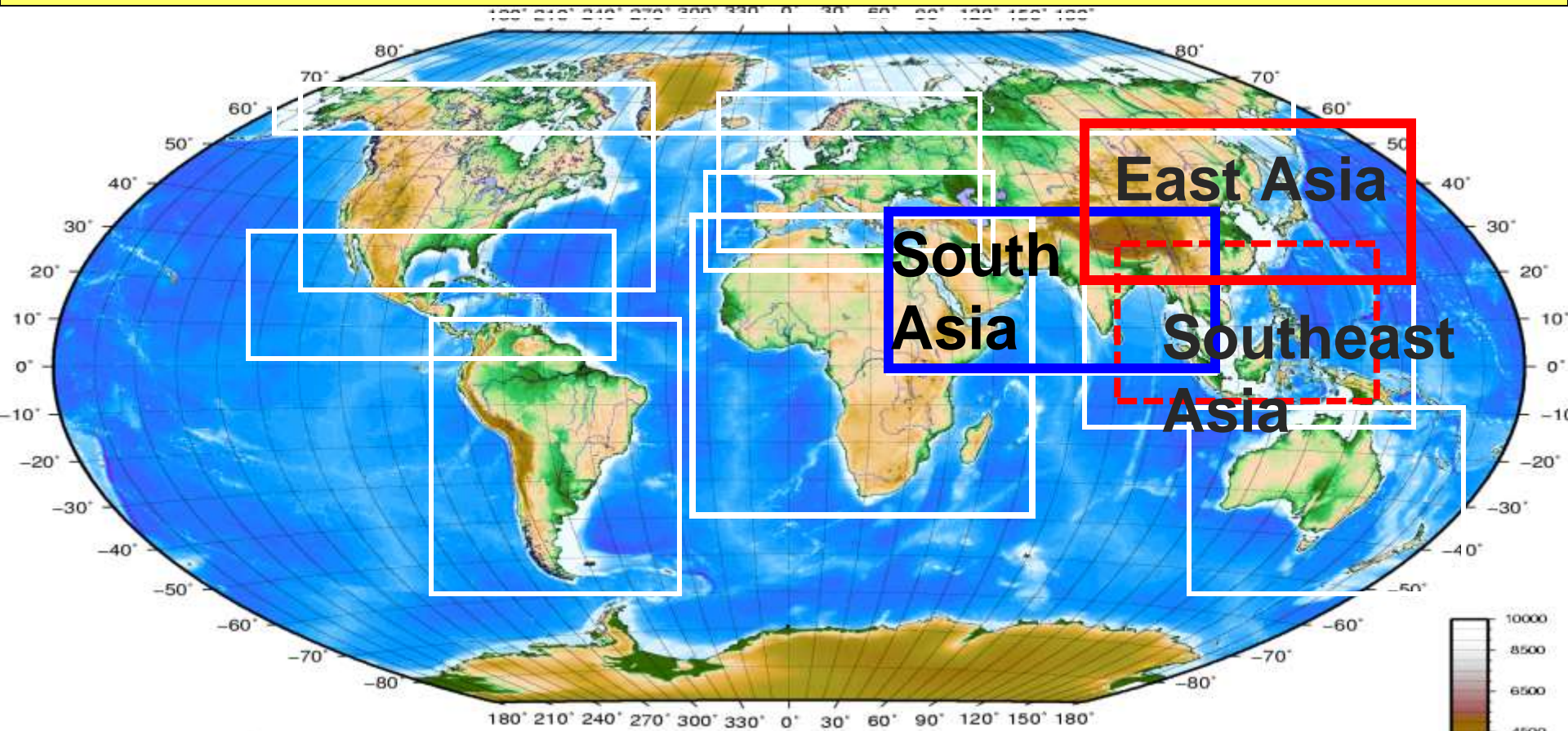
- CORDEX Science advisory team (SAT), 12 members



SAT-2 meeting
SMHI (Sweden)
25-27 Feb., 2015

- International Project Office for CORDEX (IPOC) hosted at SMHI since January 2015 (E. O'Rourke Head).
- CORDEX archiving coordinated by IS-ENES
- Regional points of contact (POCs), 2-3 per region

CORDEX domains



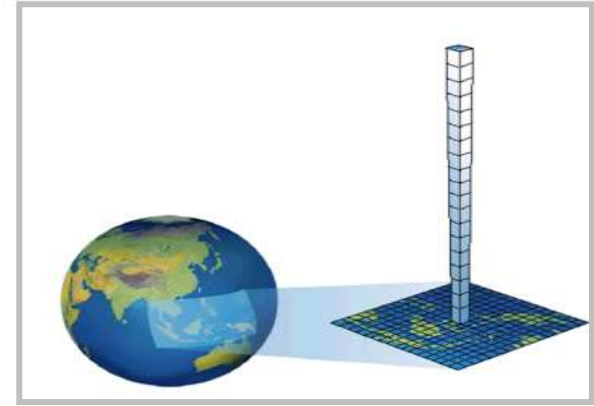
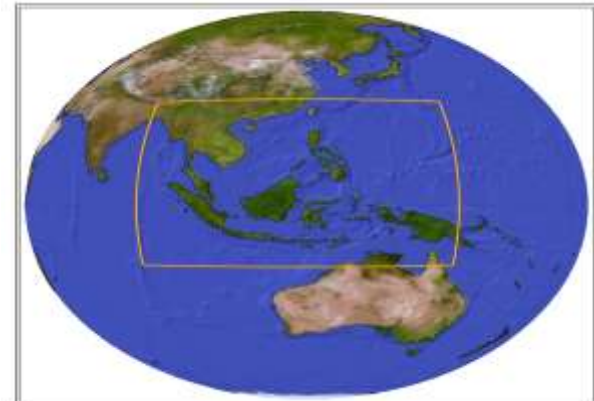
SEACLID

CORDEX-Southeast Asia

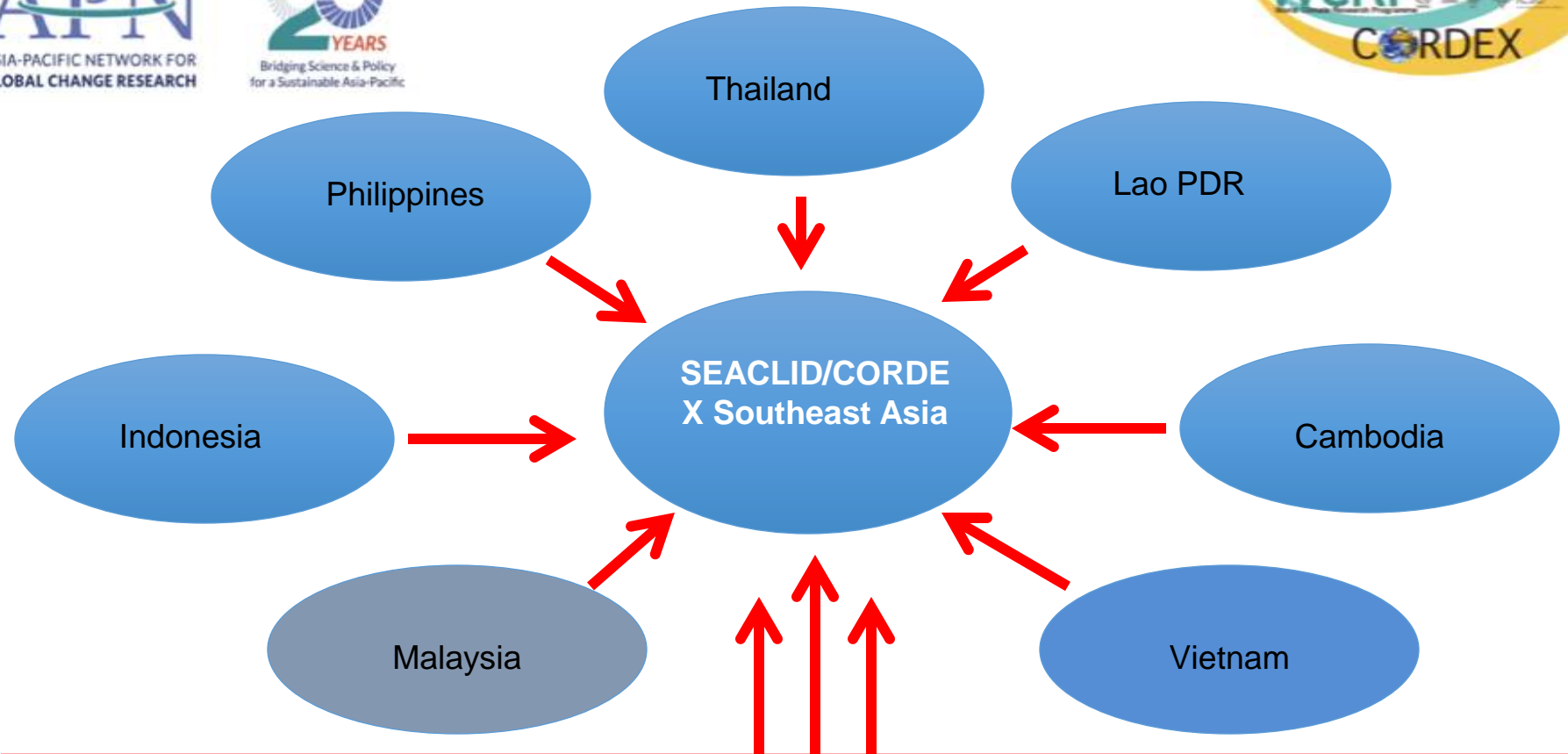
The Southeast Asia Regional Climate Downscaling (SEACLID) / CORDEX Southeast Asia Project

Fredolin Tangang
Coordinator, CORDEX Southeast Asia

- 14 Countries, 20 Institutions
- 25 km x 25 km
- ~3yrs [Nov 2013 – Dec 2017]
- Funded by APN and funds from individual countries; Second phase 2016 - 2019



(<http://www.ukm.edu.my/seaclid-cordex>)



UK

Australia

Sweden

South Korea

Hong Kong

Germany

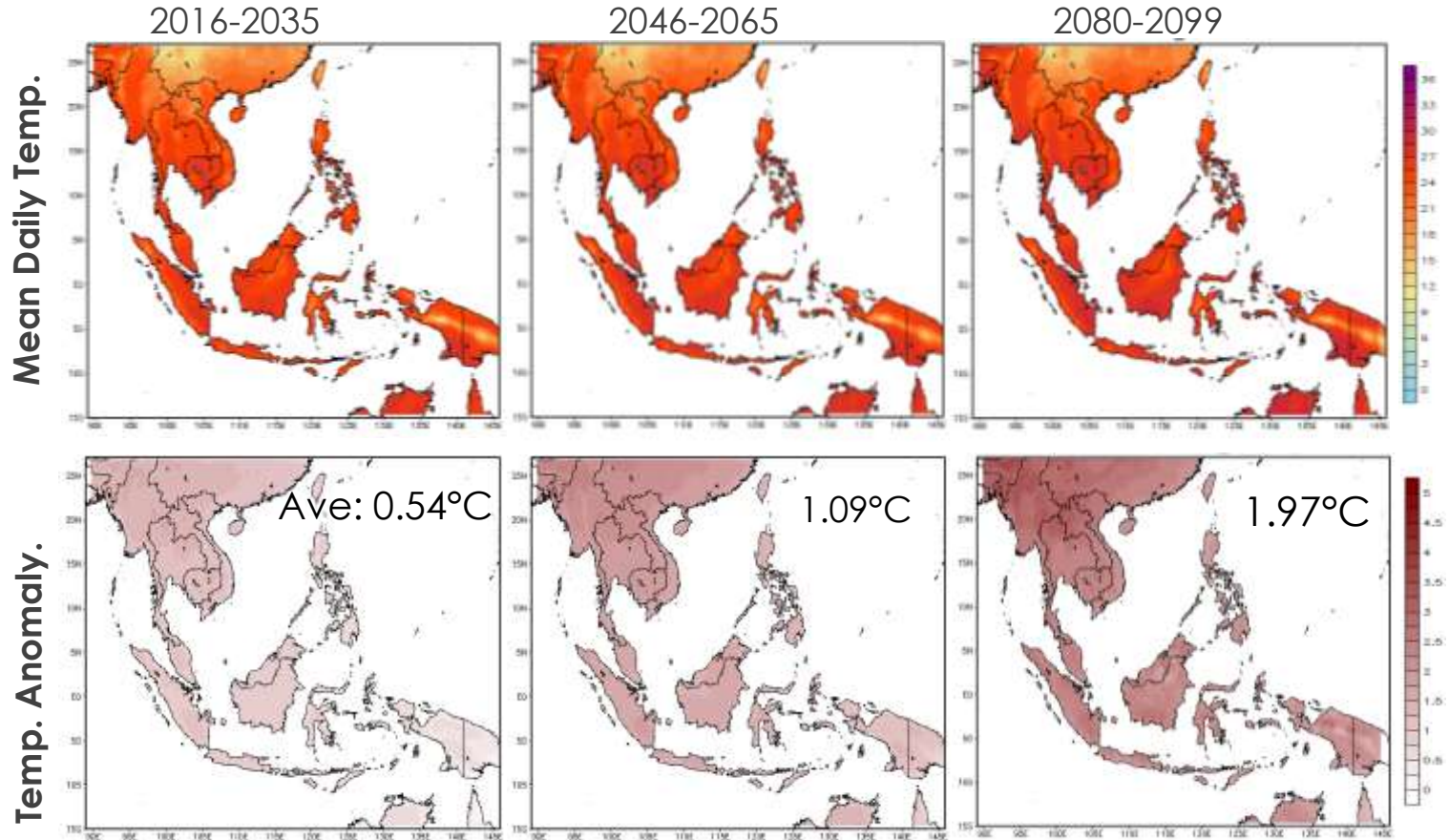
Japan

GCMs, RCMs, RCPs and Country Assignments

Country	GCM	Institution & Country developed the GCM	RCP	RCM
Vietnam	CNRM-CM5	Centre national de Recherches Meteorologiques, France	RCP8.5, 4.5	RegCM4
Philippines	HadGEM2	Hadley Centre, UK	RCP8.5, 4.5	RegCM4
Thailand	MPI-ESM-MR	Max Planck Institute for Meteorology, Germany	RCP8.5, 4.5	RegCM4
Thailand	EC-Earth	EC-Earth consortium	RCP8.5, 4.5	RegCM4
Indonesia	CSIRO MK3.6	CSIRO, Australia	RCP8.5, 4.5	RegCM4
Malaysia	CanESM2	Canadian Centre for Climate Modeling and Analysis, Canada	RCP8.5, 4.5	RegCM4
Malaysia	IPSL-CM5A-LR	Institute Pierre-Simon Laplace, France	RCP8.5, 4.5	RegCM4
Malaysia	GFDL-ESM2M	GFDL, USA	RCP8.5, 4.5	RegCM4
South Korea	HadGEM2-AO	Hadley Centre, UKMO	RCP8.5, 4.5	WRF
Sweden	CNRM-CM5	Centre national de Recherches Meteorologiques, France	RCP8.5, 4.5	RCA3
Sweden	HadGEM2-ES	Hadley Centre, UKMO, UK	RCP8.5,4.5	RCA3
Australia	CNRM-CM5	Centre national de Recherches Meteorologiques, France	RCP8.5	CCAM
Australia	CCSM4	NCAR, USA	RCP8.5	CCAM
Australia	ACCESS1.3	CSIRO, Australia	RCP8.5	CCAM
Hong Kong SAR	CCSM4 or CESM	NCAR, USA	RCP8.5, 4.5	WRF
United Kingdom	HadGEM2-ES	Hadley Centre, UKMO	RCP8.5, 4.5	PRECIS
Germany	MPI-ESM-LR	Max Planck Institute for Meteorology, Germany	RCP8.5, 4.5	ROM
Japan	MRI-AGCM3.2	Meteorological Research Institute, JMA, Japan	RCP8.5,4.5	NHRCM

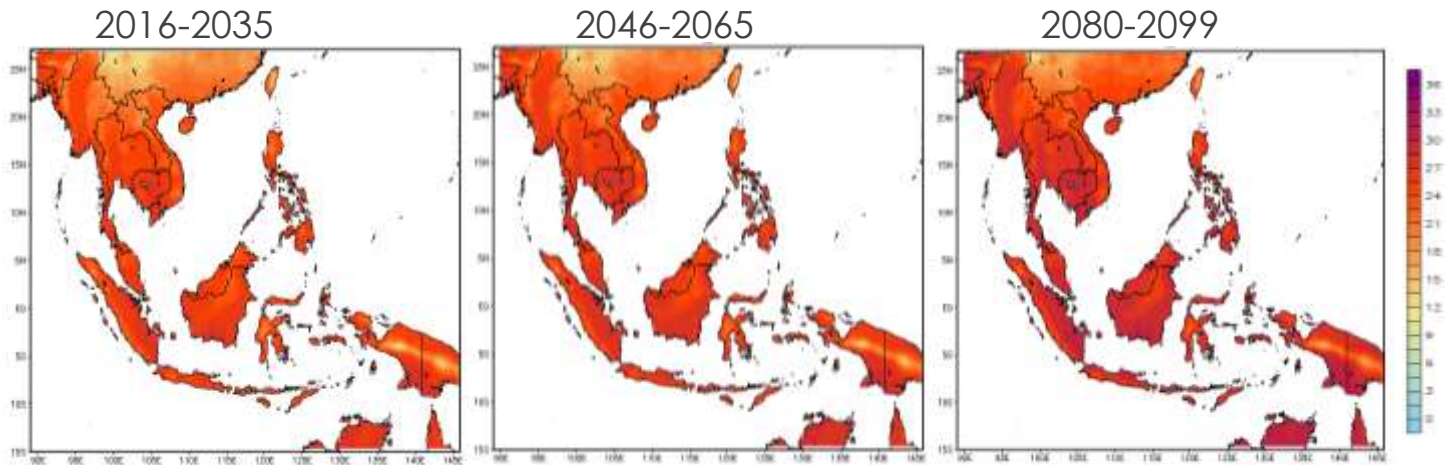
Temperature

Projected Temperature for RCP 4.5

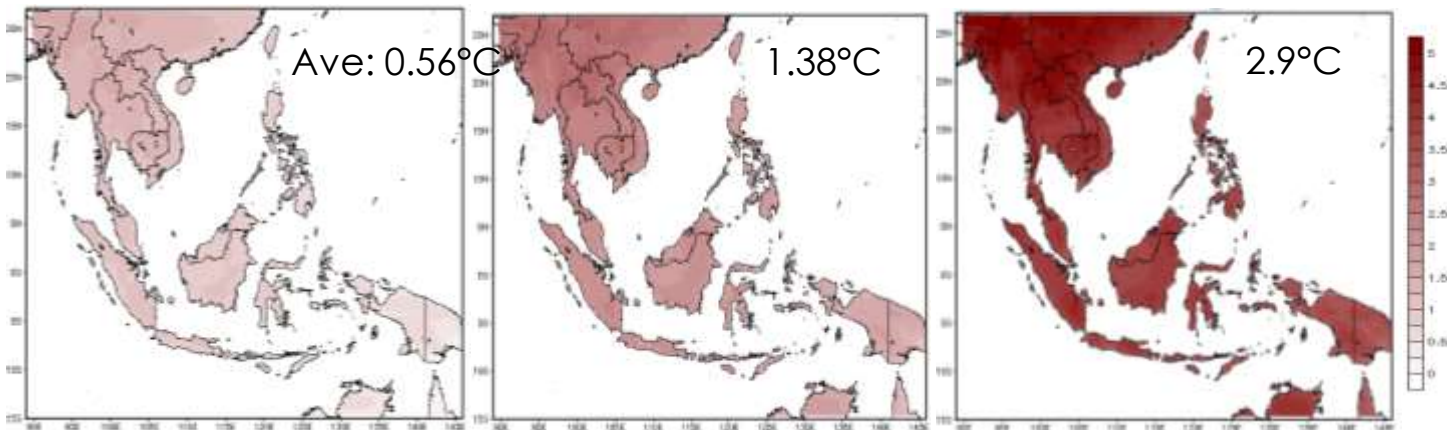


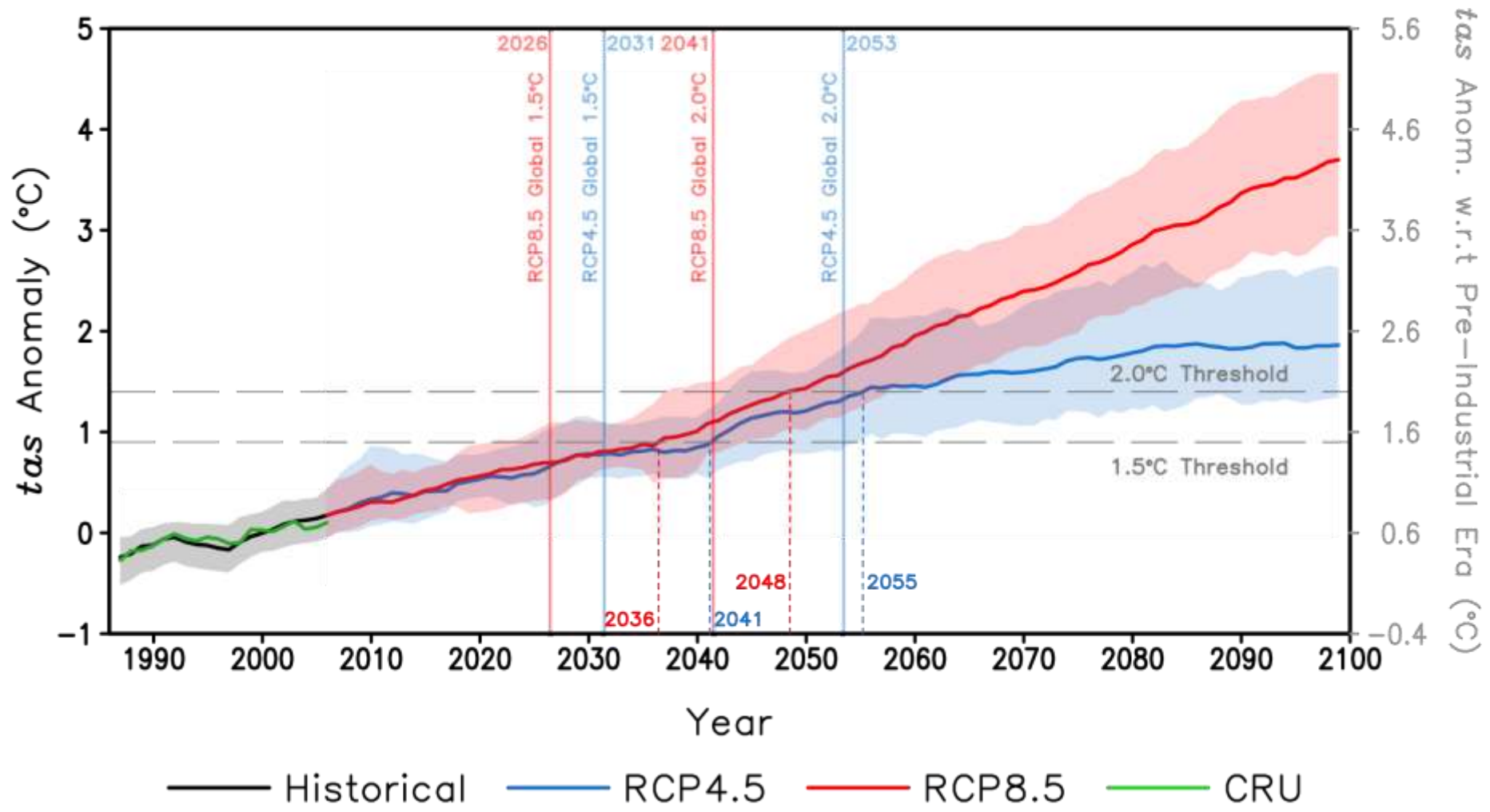
Projected Temperature for RCP 8.5

Mean Daily Temp.



Temp. Anomaly.





Precipitation

DJF Mean Rainfall Future changes (% of mean rainfall during historical period)

GCM

RCM

Early Century

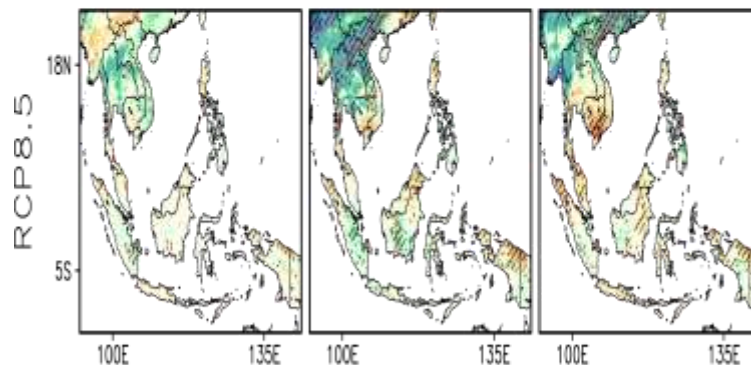
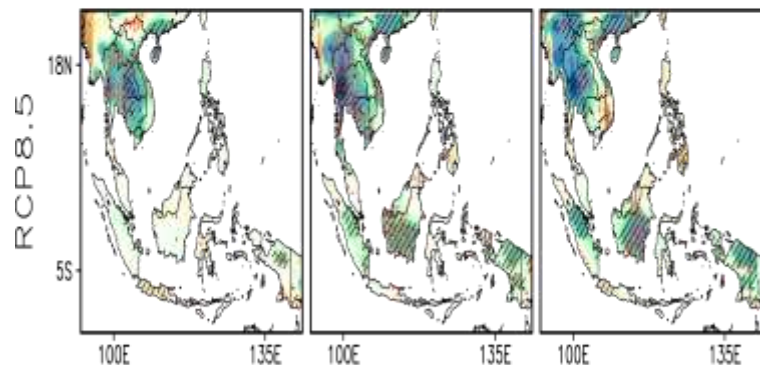
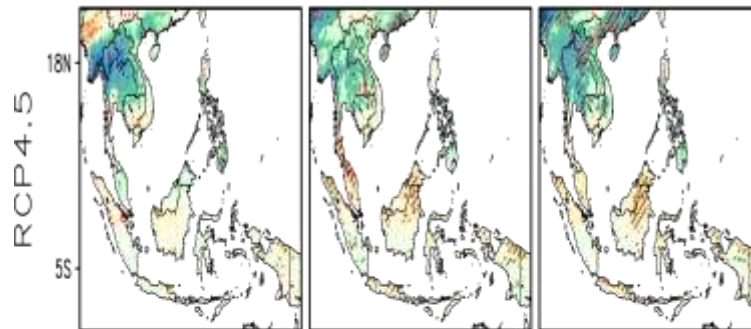
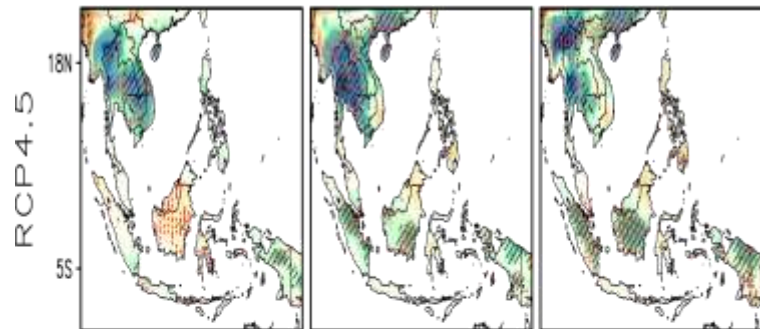
Mid Century

Late Century

Early Century

Mid Century

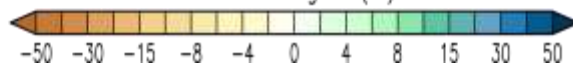
Late Century



DJF Changes (%)



DJF Changes (%)



◆ Wetter condition is projected over mainland SEA region

◆ Becoming drier over Maritime Continent

JJA Mean Rainfall Future changes (% of mean rainfall during historical period)

GCM

RCM

Early Century

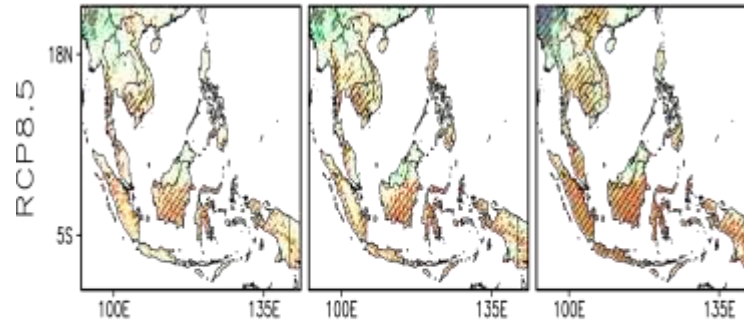
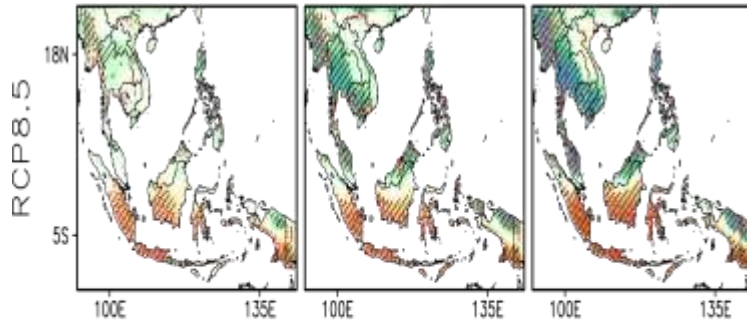
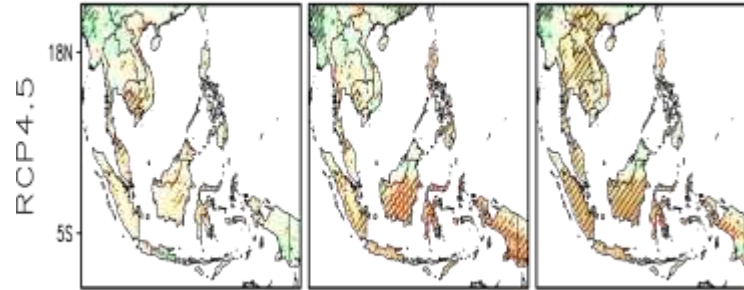
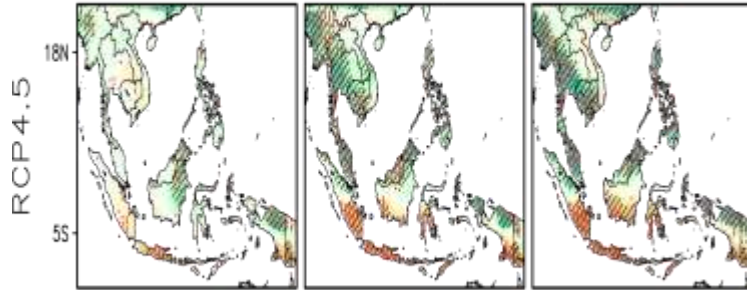
Mid Century

Late Century

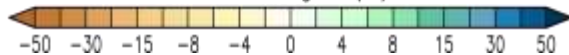
Early Century

Mid Century

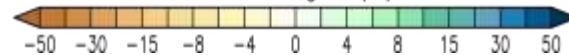
Late Century



JJA Changes (%)



JJA Changes (%)

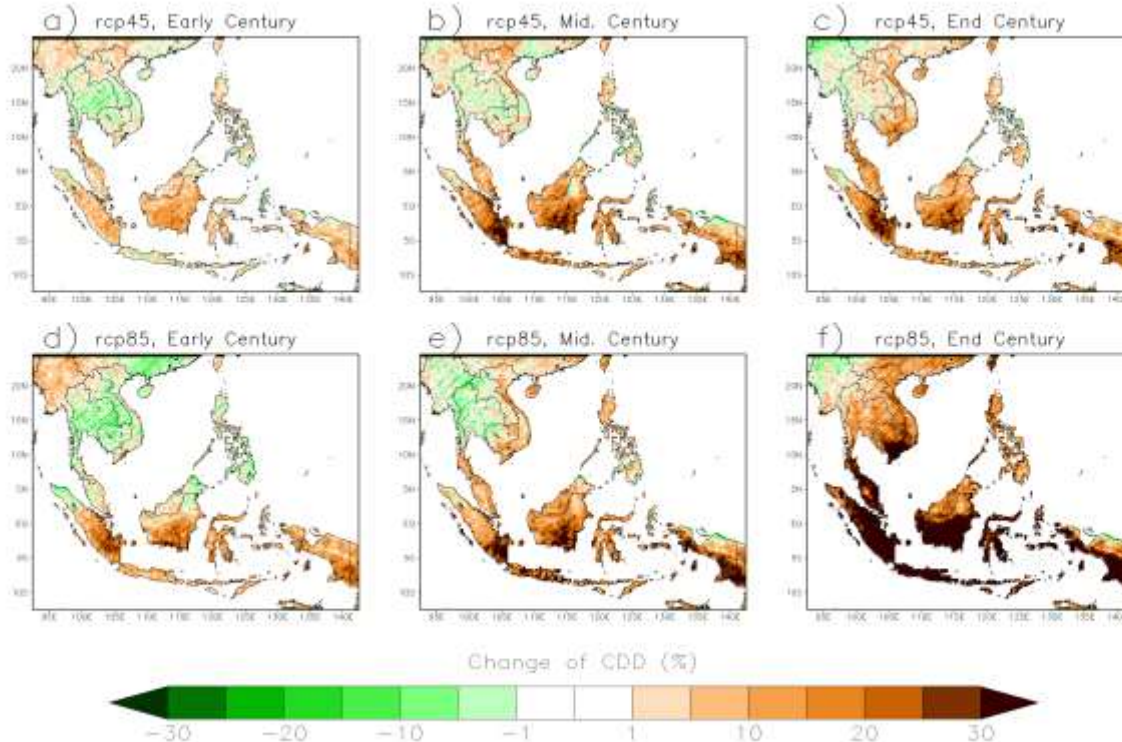


- ◆ Slightly wetter / drier Wetter condition is projected over mainland SEA region
- ◆ Significantly drier over Maritime Continent

Extremes

Annual CDD Future changes (% of mean CDD during historical period)

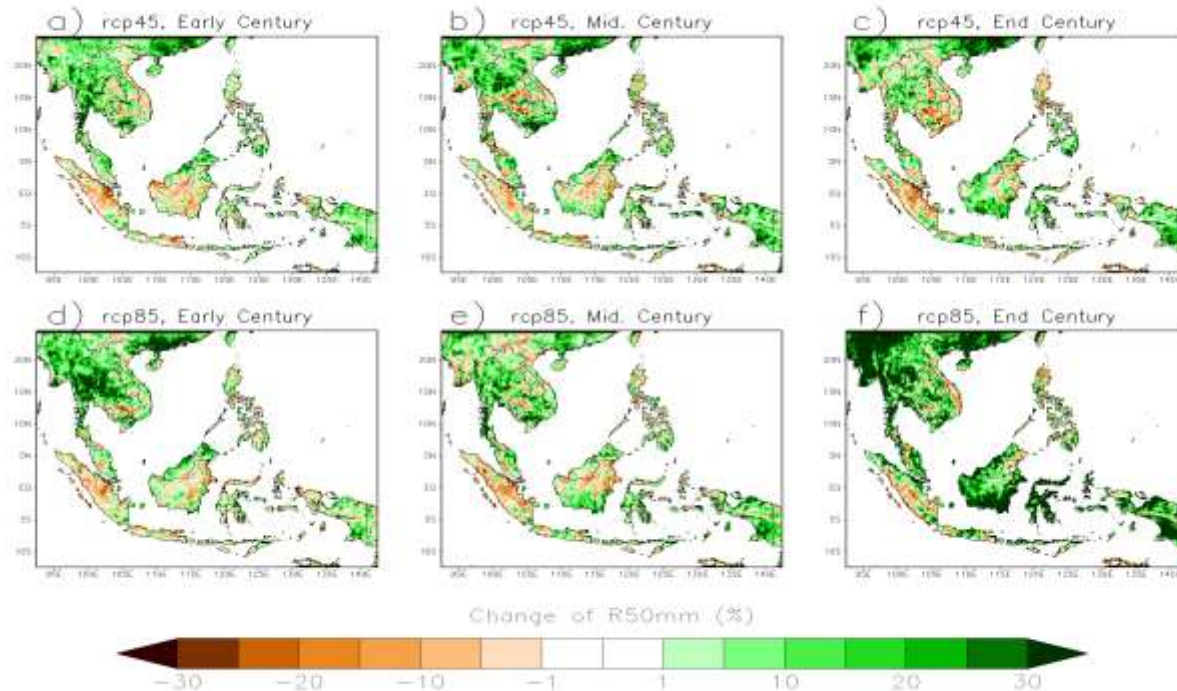
CDD – Consecutive Dry days i.e. duration; Indicator of dryness



- ◆ CDD is projected to increase especially over Maritime Continent
- ◆ This annual dryness is mostly contributed by boreal summer season

Annual R50mm Future changes (% of mean R50mm during historical period)

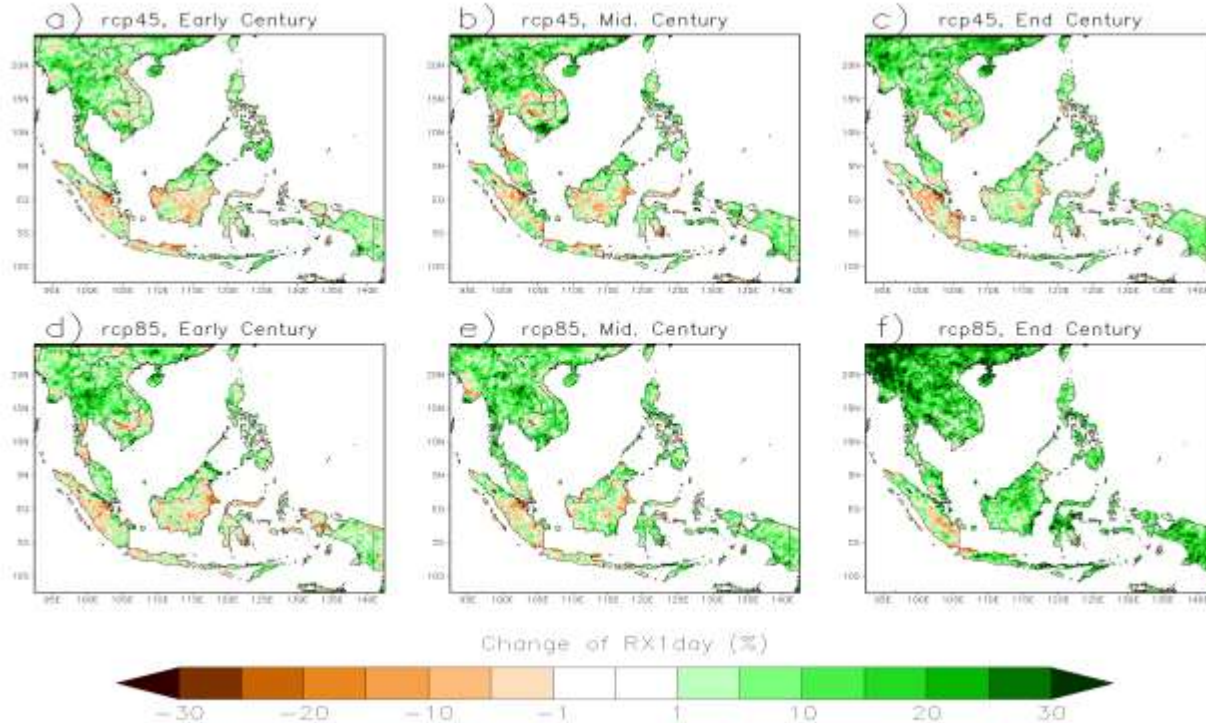
R50mm – No. of days exceeds daily rainfall 50mm; Indicator of frequency of extreme rainfall



- ◆ Frequency of extreme rainfall is projected to increase
- ◆ Over Maritime Continent, despite mean rainfall is projected to decrease, frequency of extreme rainfall is projected to increase

Annual RX1Day Future changes (% of mean RX1Day during historical period)

RX1Day – Monthly maximum 1-day precipitation; Indicator of intensity of extreme rainfall



- ◆ Intensity of extreme rainfall is projected to increase
- ◆ Over Maritime Continent, despite mean rainfall is projected to decrease, intensity of extreme rainfall is projected to increase

SEACLID/CORDEX Southeast Asia contributes significantly

- ◆ **Enhanced networking in regional climate modeling**
- ◆ **Enhanced capacity building in regional climate simulation (PhD, MSc)**
- ◆ **Enhanced scientific understanding of regional climate change**
- ◆ **Enhanced visibility in scientific publications of regional climate change (~targeting 20 publications)**
- ◆ **Establishment of database from this project to be accessible freely by user community**
- ◆ **Report for policy makers from key scientific findings of this project**
- ◆ **Some project members directly involved in providing scientific to the government**



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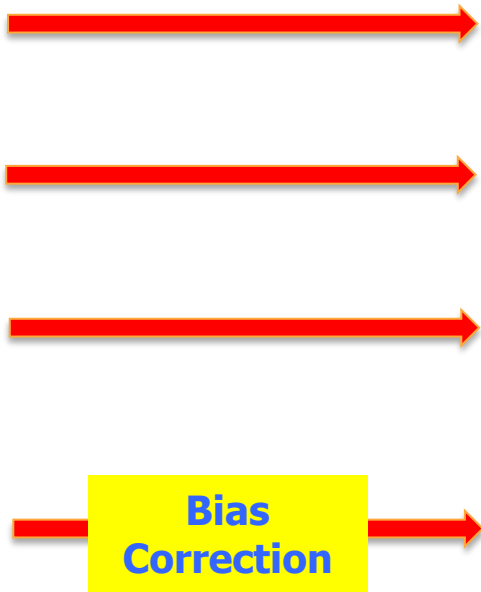
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CORDEXSEA Tags: None



SEACLID/CORDEX Southeast Asia



**Bias
Correction**

**RU-CORE
SEACLID/CORDEX Southeast Asia
ESGF Node**



IAV Groups



Thank you

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