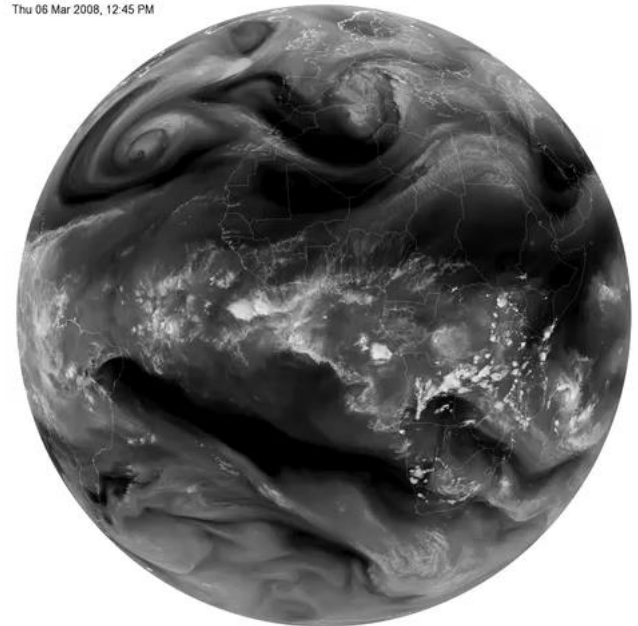


COORDINATED REGIONAL CLIMATE DOWNSCALING EXPERIMENT

Thu 06 Mar 2008, 12:45 PM



Christopher Lennard
Climate System Analysis Group, University of Cape Town
CORDEX-Africa Coordinator
Scientific Advisory Team member (SAT)

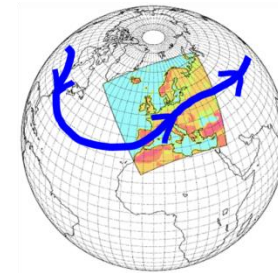
Why CORDEX?

The CORDEX vision is to advance and coordinate the science and application of regional climate downscaling through global partnerships

1. To better understand relevant regional/local climate phenomena, their variability and changes, through downscaling.
2. To evaluate and improve regional climate downscaling models and techniques
3. To produce coordinated sets of regional downscaled projections worldwide
4. To foster communication and knowledge exchange with users of regional climate information

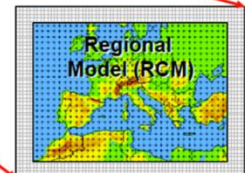
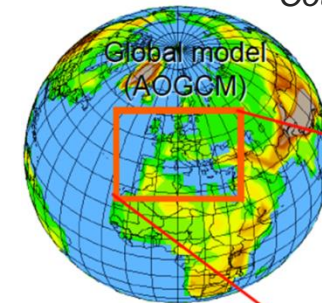


GCM

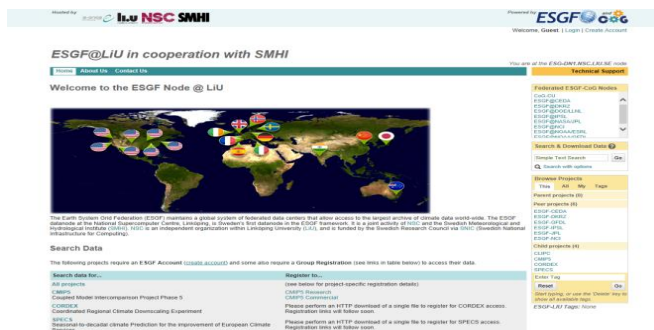


RCM

Courtesy; Justin Glisan

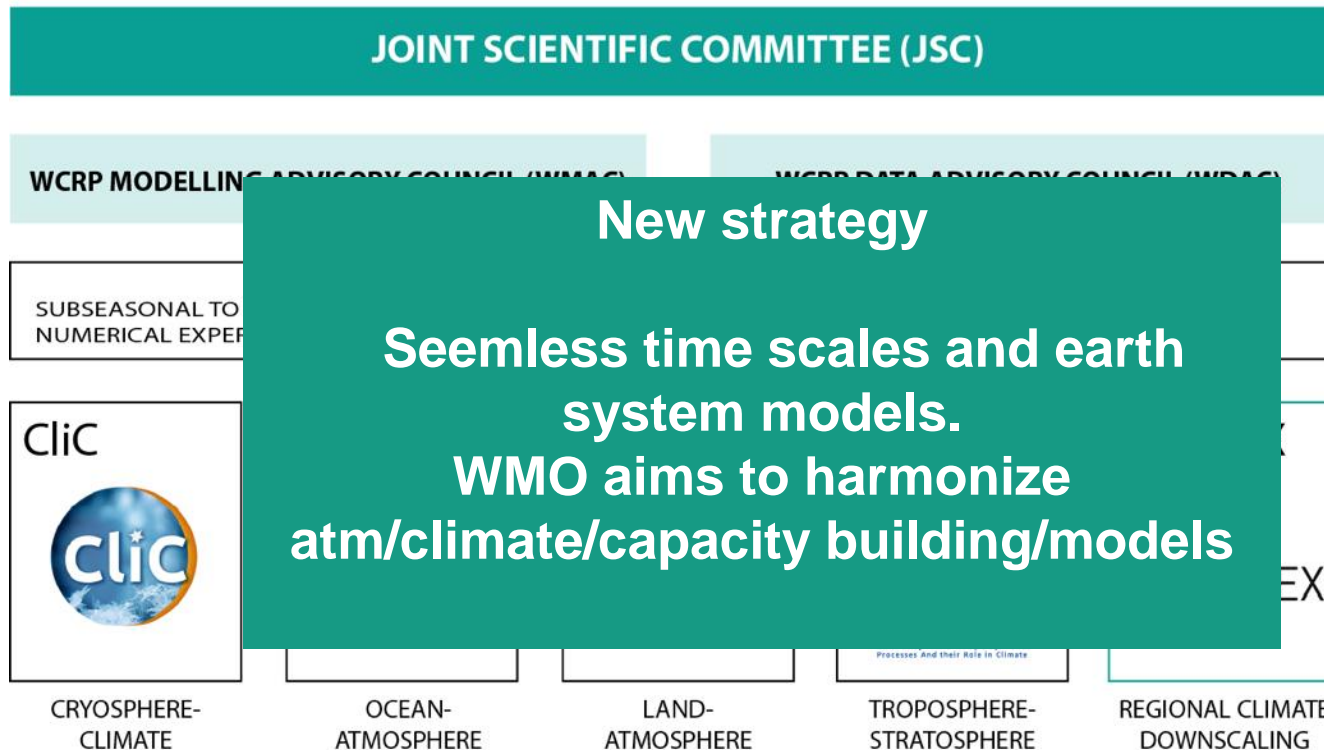


Earth System
Grid
Federation
(ESGF)



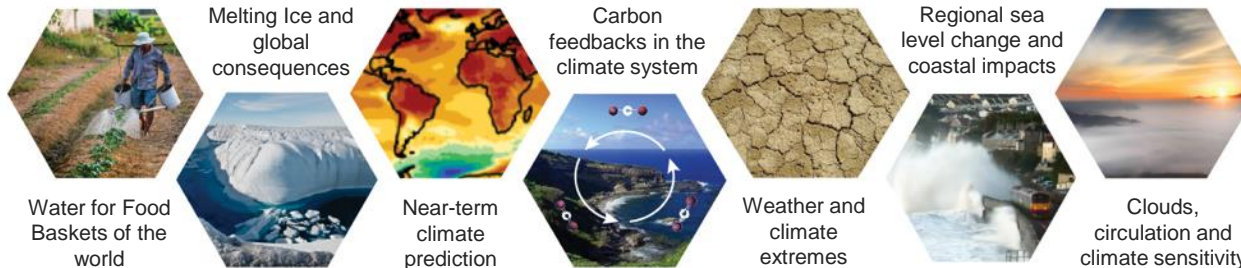
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WCRP Structure



JOINT PLANNING STAFF (JPS)

GRAND CHALLENGES



INTERNATIONAL
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WCRP
World Climate Research Programme

CORDEX Structure

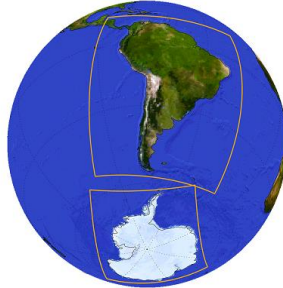
- 14 domains with Points of Contacts (POCs) – coordination, communication/cooperation within the domain
- International Project Office for CORDEX (IPOC)
- Science Advisory Team (SAT)



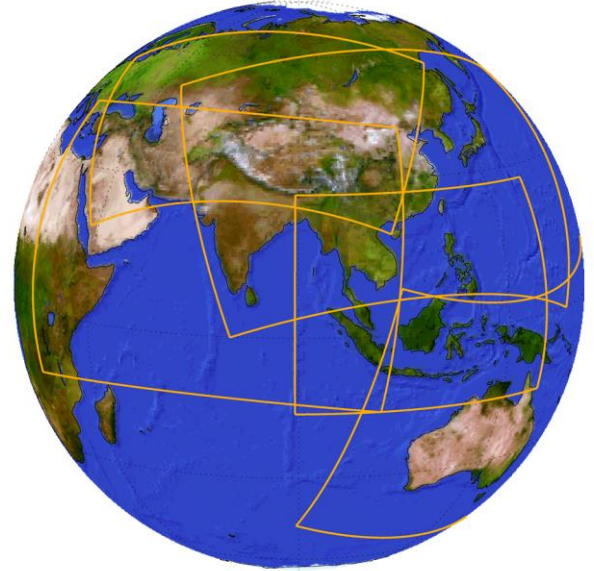
- Arctic CORDEX
- North America CORDEX
- Central America CORDEX



- EURO-CORDEX
- MED-CORDEX
- CORDEX Africa
- MENA-CORDEX



- South America CORDEX
- CORDEX Antarctica



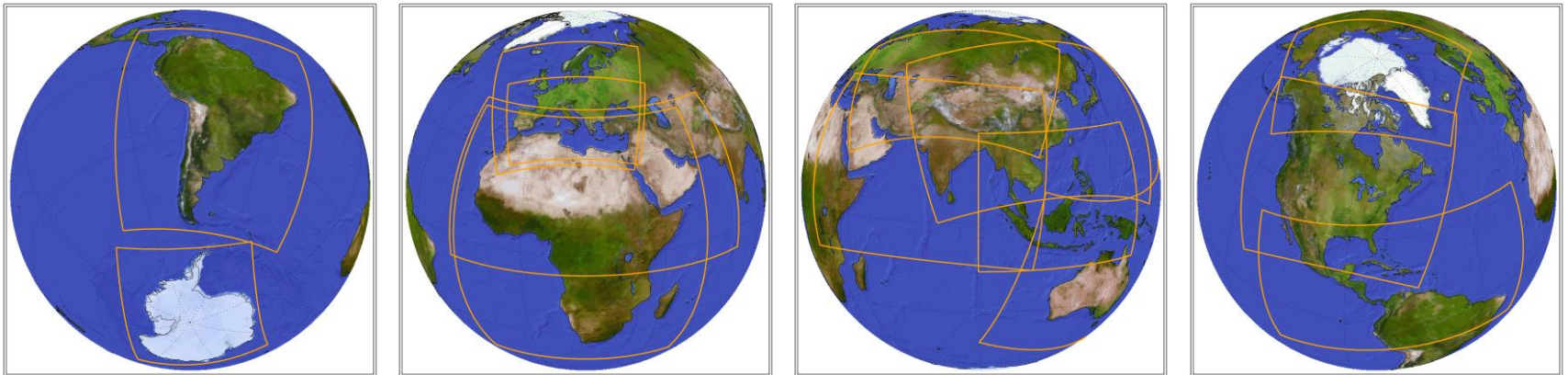
- Central Asia CORDEX
- South Asia CORDEX
- East Asia CORDEX
- South East Asia CORDEX
- Australasia CORDEX

www.cordex.org

CORDEX Phase 1

- Focus on downscaling ERA and the CMIP5 models
- Dynamical (RCM) and statistical downscaling (ESD)
- RCM: about 40 groups in the CORDEX RCM list (+ 30 unregistered)
- ESD: 13 groups registered for the 1st ESD experiment (+ 30)

14 CORDEX domains



CORDEX simulation data can be accessed using:

1. Earth system Grid Federation (ESGF)
2. Data Portals (Med-CORDEX, South/East Asia, North America)

- **CORDEX-Adjust:** bias-adjusted simulations on ESGF (Oct 2016)

CORDEX Phase 1 Experiment design

Model Evaluation
Framework

Climate Projection
Framework

Multiple regions (Initial focus on Africa)
50km resolution (higher in some regions, Europe: 12km)

ERA-Interim
1989-2008
later: 1979-2010

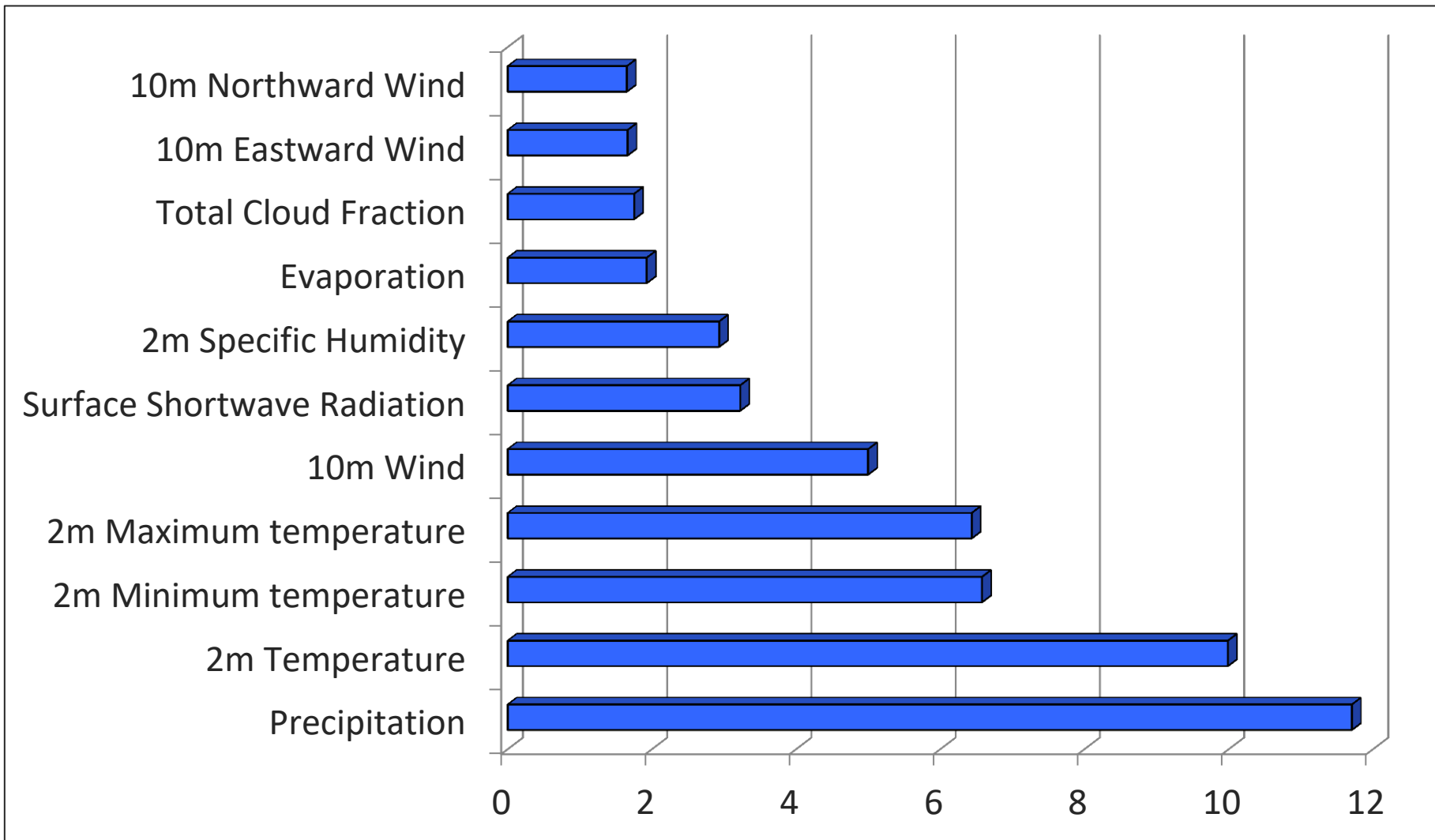
Multiple CMIP5 AOGCMs
Historical (1950-2005)
RCP4.5, RCP8.5 (2006-2100)

Regional Analysis
Regional Databanks
ESGF



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Most popular variables CORDEX



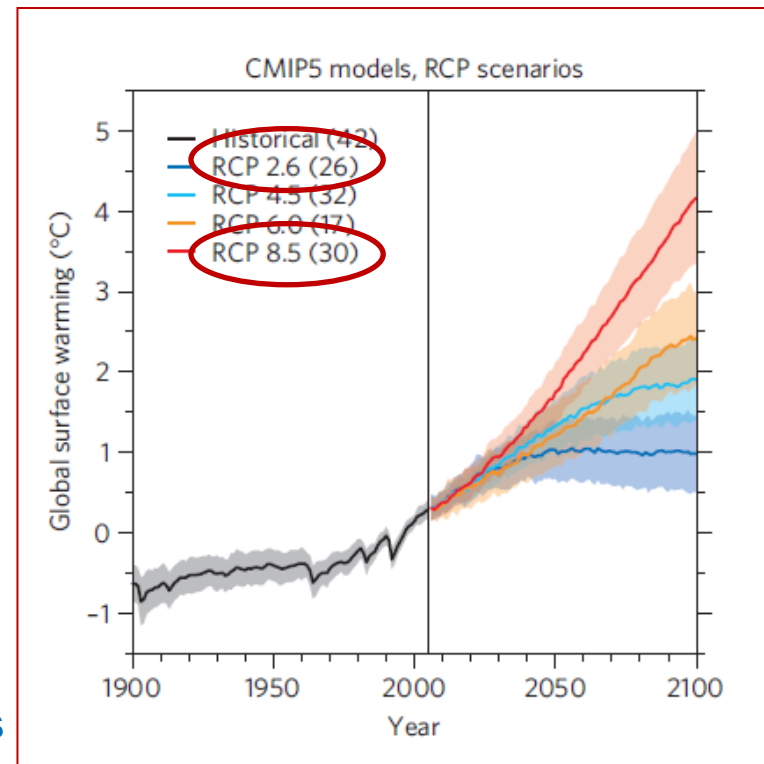
CORDEX CORE (Coordinated Output for Regional Evaluations) (Phase 2)



Motivated by IPCC workshop on regional climate (September 2016) to develop a consistent set of downscaling for all CORDEX regions

Large demand for information based on low emission scenarios even if climate will not stabilize there

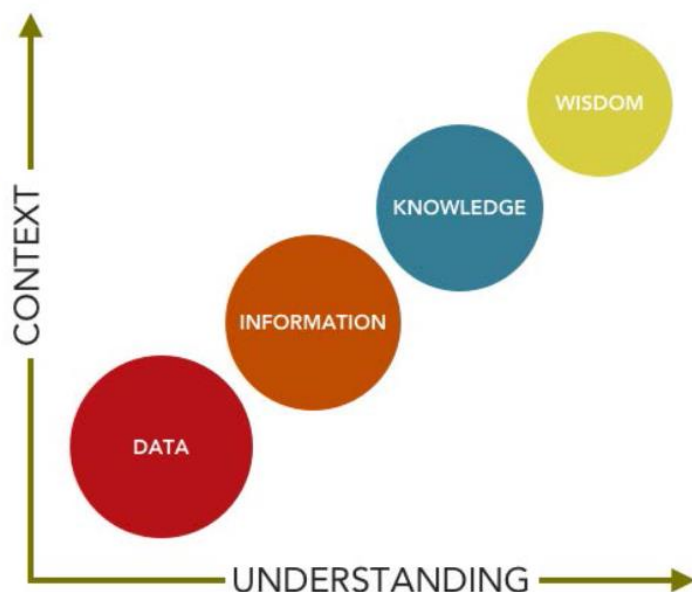
- Plausible range of climate change => 3-5 GCMs (selection ?)
- CMIP5 (CMIP6 supplement): **RCP8.5, RCP2.6**
- 3-4 RCMs (about 10 CORDEX domains) ? ESD methods?
- Resolution: 10-25 km (minimum 20-25 km)
- Still under discussion:
 - heavy production, a lot of resources are needed
 - no funding
 - only for large modelling groups but small ones may also contribute
 - not enough RCM groups at moment



Global Framework for Climate Services (GFCS)

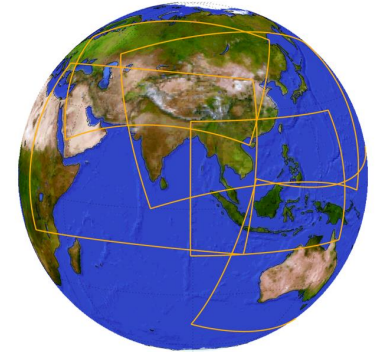
Enable better management of the risks of climate variability and change and adaptation to climate change, through the development and incorporation of science-based climate information into planning, policy and practice on the global, regional and national scale

Data or information?



- Climate information for regions is not data but an understanding that builds messages of relevance to the concerned users that are backed by clear and robust physical scientific analyses.

Recent activities in CORDEX Asia domains



- Central Asia CORDEX
- South Asia CORDEX
- East Asia CORDEX
- South East Asia CORDEX
- Australasia CORDEX

- Australasia: More simulations on ESGF coming.
- CORDEX-Australasia meeting on potential Flagship proposals and a "NextGen projection
- Australian Meteorological and Oceanographic Society National Conference - Session on projections and applications"
- East Asia: Simulation and projection on warming of 1.5C planned in 2018.
- Preparation of ESGF data node for EA domain
- Asia: Regional downscaling session in AOGS2017, Singapore and AOGS2018, June 2018, Honolulu Hawaii
- CORDEX South East Asia (SEA), <http://www.ukm.my/seaclid-cordex/#>
Five workshops on writing articles, simulation training Scientific focus: Capacity building/training in Southeast Asia.
- Southeast Asia Regional Climate Change Information System (SARCCS)
- South Asia: Apply bias-correction to the CORDEX South Asia RCM outputs, publish on CCCR-IITM ESGF data node as CORDEX-Adjusted datasets
- South Asia: Future Climate Change Projections over India assessed using CORDEX South Asia RCM outputs (<http://cccr.tropmet.res.in/home/reports.jsp>)
- CORDEX South Asia information contributing to the Hindu Kush Himalayan Monitoring and Assessment Programme (HIMAP; <http://www.icimod.org/himap>)
- Global high resolution (27km) atmospheric version of the IITM Earth System Model for future downscaling activities
- Science/training workshop on "Climate Change over the High Mountains of Asia (HMA)" October 2018
- Asia CORDEX and regional downscaling session in CORDEX-Asia ESD session and project meeting during the International Workshop on Climate Downscaling Studies, October 2017, Tsukuba, Japan.

What can the domain contribute with and gain from regionally/globally?

- Simulations CMIP/CORDEX
- Flagship Pilot Studies
 - To implement the regional challenges; **local/regional focus, transferrable to other regions, implementation, One call a year - in February. Seven endorsed + one demonstrator**
 - Very positive net-working effect from the FPS-studies, attracting 'new' experts to the community
- Capacity building, workshops, many peer-reviewed articles
- AR6 opportunities and the domain's interest in/contribution to CORDEX CORE; simulations to support AR6
- Local/regional knowledge engagement and expansion

Create more focused activities

Cooperation between domains and with vulnerability-, impact- and adaptation communities

Transferrable to other regions

Implemented through Flagship Pilot Studies (FPS) – fine scale processes –

Use FPSs to expand the 'research portfolio' with
more local/regional studies on convection,
climate signals depending on scale, long-term
effects of El Niño etc

Cities
bridges

Win

Inla

Sma

Org
trop

High

Capacity building

ICRC-CORDEX 2016 : CORDEX contributed vastly to development and production of regional climate data and information, still knowledge and coverage gaps, further development of models, infrastructure, tools and knowledge exchange are needed.



14th - 18th OCTOBER 2019 BEIJING, CHINA

ICRC-CORDEX 2019

International Conference on Regional Climate



The global collaborative initiative “Coordinated Regional Climate Downscaling Experiment” (CORDEX) aims to develop and provide detailed, regional climate information necessary for vulnerability, impact and adaptation studies at local and regional levels.

CORDEX is working to meet the increasing need for reliable regional climate information communicated in a manner enabling effective impact and adaptation planning.

Some of the topics that will be highlighted at The International Conference on Regional Climate (ICRC)-CORDEX 2019 are: benefits of downscaling, including biases and uncertainties; further development of earth system models; the human factor and impacts and applications. The conference will also provide a platform for scientists and users from all parts of the globe to meet and advance capacity development, training and knowledge exchange as well as to build new and enhance existing co-operations.

The conference will be held in Beijing, China, 14-18 October 2019

Details will be announced soon on the CORDEX homepage; www.cordex.org



Objectives/priorities

- Bring community together!
- Added value of regional /local models/downscaling + uncertainties/biases, high mountain environments...
- Coupled models – inland waters/regional seas, ocean/ice, carbon cycle/aerosols
- Vulnerability, Impacts, Adaptation – food baskets, water resources, power generation implications, glacier retreat/sea level rise, land use/change, heat islands
- Capacity building, Training, tools and methods, sharing knowledge
- ECS-event, YESS representatives, supporting developing country young scientists

Possible TPE engagement, CORDEX - TPE collaboration

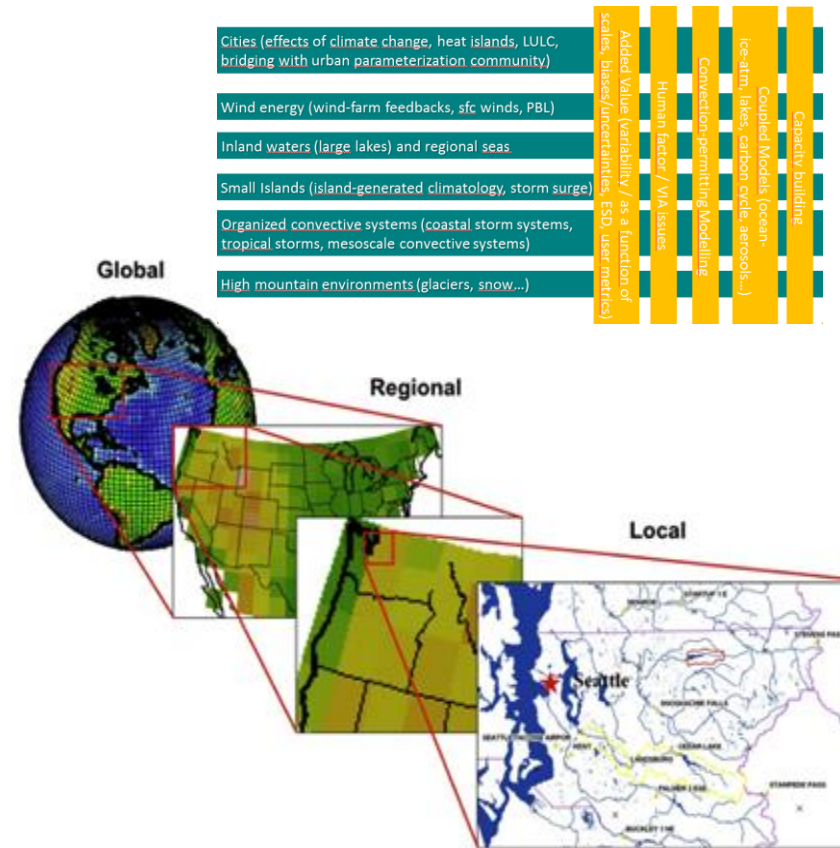
- TPE representation/sponsoring?
- TPE representatives in China involved?
- Himalayan region, monsoons,... – workshop sessions?
- TPE Training sessions?



Advancing the science and application of regional climate downscaling, for improved regional climate information

CORDEX scientific foci involve:

- **Added value** of downscaling, scales, bias and uncertainties, user-oriented metrics...
- Understanding and simulating **human elements**, e.g. land use (droughts...), urban development, climate and coastal cities (floods...)
- Coordination of regional **coupled modeling**; inland waters/regional seas, cryosphere (high mountain environments)...
- **Convective systems**; monsoons, tropical storms, precipitation...
- Local wind systems; wind energy,...



Model downscaling. NCAR dr. Andrew Wood

CORDEX-Africa

<http://www.csag.uct.ac.za/cordex-africa>



<http://www.csag.uct.ac.za/cordex-africa/cordex-africa-publications/>



Climate Atlas

Seasonal means

- *mean/maximum/minimum temperature, precipitation (mm/day, mm/season)*

ETCCDI metrics

SPI and SPEI

Hot days

- above 25°, 30, 35 and 38

Consecutive hot and dry days

Heat waves

- *Warm spell duration index*

Agriculture specific metrics

- *onset of rainfall, rainy season duration, dry spell duration,*
- *heat indices, consecutive hot days, degree days, killing degree days*

Agriculture Atlas

- EcoCrop **outputs a suitability index** for a particular crop given atmospheric variables from 0 (totally unsuitable) to 1 (totally suitable).
- EcoCrop needs as **input data**
- temperature in degrees celcius (monthly mean of tasmin and tas)
- rainfall monthly totals climatology (mm/month)
- Variables needed as a monthly climatology of the period being studied
- 9 RCM simulations x 3 scenarios (baseline, 2RCPs) x 5 crops = 135 EcoCrop simulations



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