



# GEWEX GHP – CORDEX Synergies

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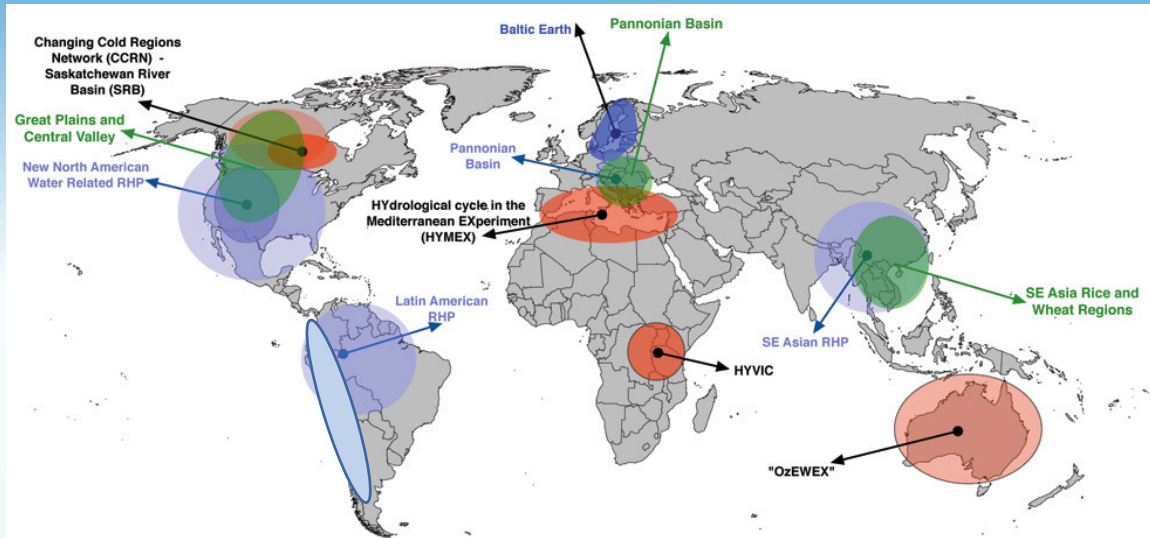
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# GEWEX GHP



GHP aims to address the GEWEX (and WCRP) Science Questions from a **regional** and integrated perspective.

- The **Regional Hydroclimate Projects (RHPs)** bring together various disciplines on water issues.
- The **Cross-Cut projects (CC)** allow GHP to propagate knowledge from one region to another and synthesize results at the global scale. They also allow development and testing of applications developed with the new knowledge (actionable science).
- **Global Data Centers** provide the necessary input for spreading data for research.

# GHP Structure

## Regional Hydroclimate Projects (RHPs)

### RHP Active:

#### Europe:

HyMEx (2010-2020): High-impact weather events, societal response

BalticEarth(2016-): Sea and land changes, biogeochemical processes

#### Australia:

OzeWex (2015-) Water and energy cycle in Australia

#### Africa

HyVic(2015-2024): Hydroclimatic variability over Lake Victoria basin

#### North America:

CCRN(2014-2018): Cryospheric, ecological, hydrological interactions

### Prospective:

#### Europe

PannEx(2018?-): Agronomy, air-quality, sustainability & water mgnt

#### South America

AndEx (2019): Andes hydroclimate, high impact events, cryosphere...

# GHP Structure

## Cross-cut Projects (CCs)

### Currently active

INTENSE (Sub-daily precipitation)

Cold/Shoulder Season Precipitation Near 0°C

INARCH (Mountain Hydrology)

### Proposed

Including water management in large scale models

### Potential

GDAP integrated product regional evaluation

MOUNTerrain (Mountainous Terrain rainfall)

Evapotranspiration determination.

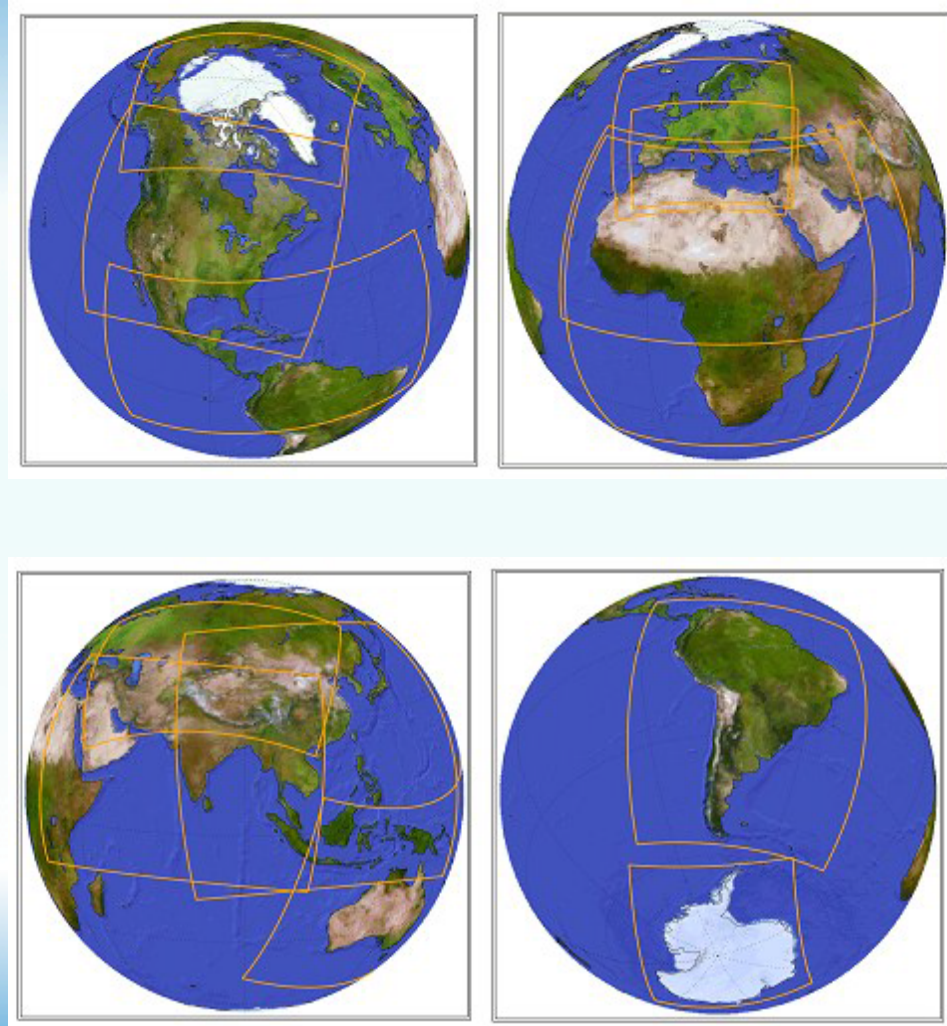
TPE Water Security

*Need for high resolution  
information*

# CORDEX: COordinated Regional Downscaling EXperiment

## CORDEX aims:

- ❖ Link regional expertise
- ❖ Build on prior experiences with regional simulations and processes
- ❖ Engage all forms of downscaling (RCM, ESD, variable res GCM)
- ❖ Cover all major land masses + Arctic
- ❖ 14 CORDEX Domains



# CORDEX Scientific Vision

To advance and coordinate the science and application of regional climate downscaling through global partnerships

## **Goals:**

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

# CORDEX Scientific Challenges

- Six key challenges to help drive CORDEX forward.
- Five cross cutting themes to focus activities across the CORDEX domains, promote cross domain interaction, and allow for close interaction with the VIA and climate service community.

Cities (effects of climate change, heat islands, LULC, bridging with urban parameterization community)

Wind energy (wind-farm feedbacks, sfc winds, PBL)

Inland waters (large lakes) and regional seas

Small Islands (island-generated climatology, storm surge)

Organized convective systems (coastal storm systems, tropical storms, mesoscale convective systems)

High mountain environments (glaciers, snow...)

Added Value (variability / as a function of scales, biases/uncertainties, ESD, user metrics)

Human factor / VIA issues

Convection-permitting Modelling

Coupled Models (ocean-ice-atm, lakes, carbon cycle, aerosols...)

Capacity building

# Flagship Pilot Studies (FPS)

- Coordinate developments in convective-permitting climate simulations with strong basis on:
  - ◆ Fine-scale processes important to region's climate (physical basis)
  - ◆ Observational basis for verification (analysis basis)
  - ◆ User applications (VIA basis)
- Potential connection with other WCRP programs, e.g., **GEWEX**



# Flagship Pilot Studies (FPS)

## EUR+MED:

- ✓ Convective phenomena at high resolution over Europe and the Mediterranean
- ✓ Impact of land use changes on climate in Europe across spatial and temporal scales
- ✓ Role of the natural and anthropogenic aerosols in the Mediterranean region: past climate variability and future climate sensitivity
- ✓ Role of the air-sea coupling and small scale ocean processes on regional climate

## SAM:

- ✓ Extreme precipitation events in Southeastern South America: a proposal for a better understanding and modeling

## Africa:

- ✓ Coupled regional modelling of land-atmosphere-ocean interactions over western-southern Africa under climate change
- ✓ ELVIC - Climate Extremes in the Lake Victoria Basin

# CORDEX – A CMIP6 Diagnostic MIP

## Primary CMIP6 Question Addressed:

How can we assess future climate changes given climate variability, predictability and uncertainties in scenarios?

## Primary WCRP Grand Challenges Addressed:

1. Weather and climate extremes
2. Regional climate information

Gutowski et al., 2016: WCRP Coordinated Regional Downscaling Experiment (CORDEX): A Diagnostic MIP for CMIP6. *Geoscientific Model Development* [doi:10.5194/gmd-9-4087-2016]



# CORDEX CORE

## CORDEX Coordinated Output for Regional Evaluations

- **Motivated and further promoted by**
  - IPCC Workshops on Regional Climate (Sept. 2015; May 2018)
  - WCRP Scoping Workshop on a framework for reg. studies (Sept. 2016)
  - Regional focus in AR6 WGI (3 chapters)
- **Elements**
  - ◆ Succinct set of downscalings for each region
  - ◆ Provide a core foundation for additional work by others
  - ◆ Span plausible range of climate change:  $\geq 3$  distinct GCMs
  - ◆ CMIP5 (CMIP6): Historical + RCP2.6 & RCP8.5 (to 2100)
  - ◆ Downscaling: currently 5 RCMs + ESD methods
  - ◆ Resolution: 12.5 – 25 km

# CORDEX in the New WCRP Strategic Plan

## Emphasis-5. The regions in the climate system

CORDEX and regional climate phenomena at the nexus of two key strategic plan issues:

- The product of multi-scale interactions between large-scale processes and smaller-scale processes
- A direct link between climate and communities impacted by climate variability and change

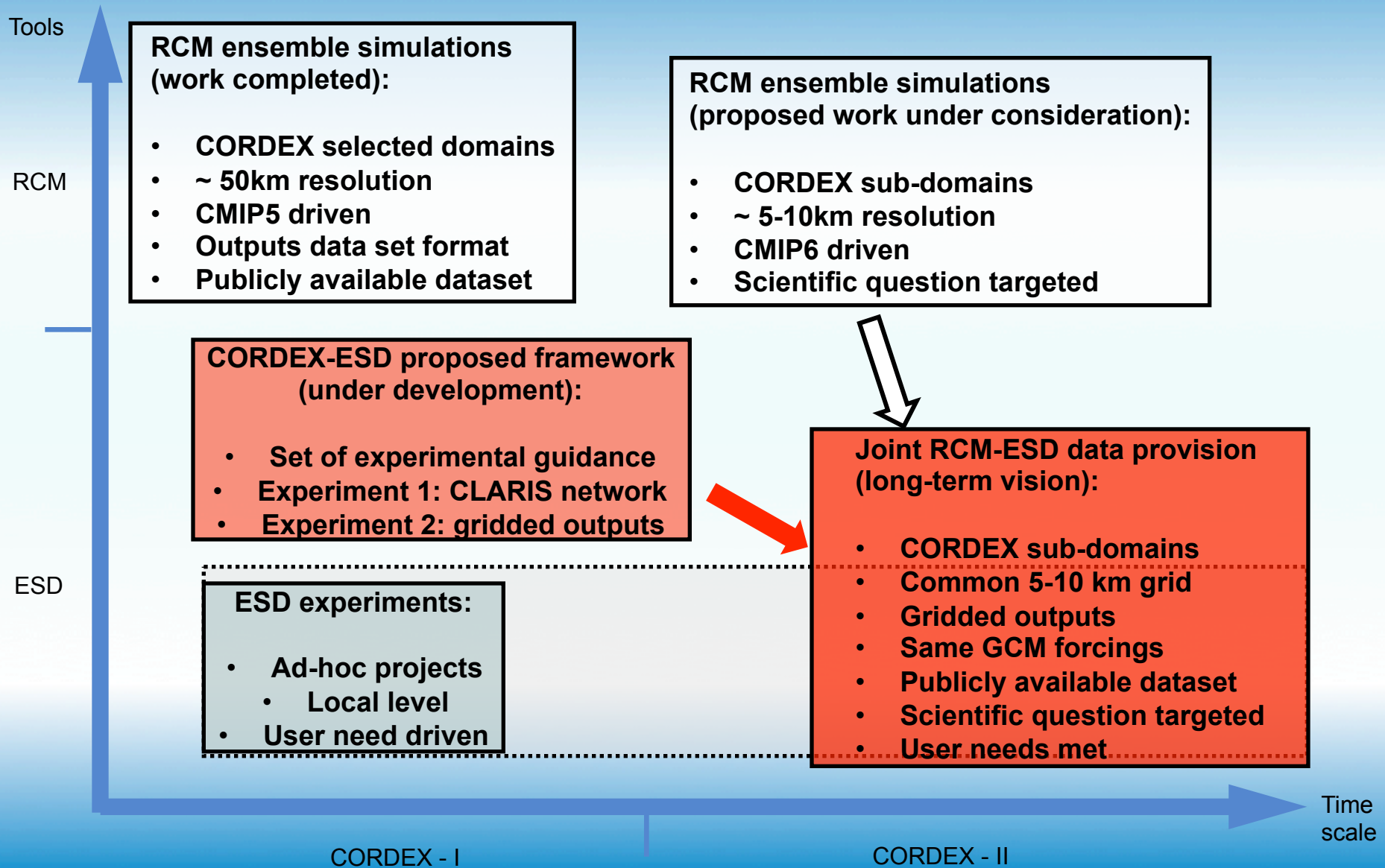
# CORDEX in the Strategic Plan

## E-5. The regions in the climate system – Goals:

- Regional analysis of global coupled models and the variety of downscaling tools
- Some focuses: convective systems, frontal behavior and processes driven by topography, land-water cover and land-use.
- Processes producing regional “hotspots” that have strong global impacts or are particularly sensitive to large-scale forcings
- Advance the production of regional climate information
- **KEY NEED:** high quality, fine scale, multivariate observations

# CORDEX future plans

## Integrating RCM and ESD outputs



# GHP-CORDEX

## Common Research interests:

Hydroclimatic variability  
Water Security  
Mountain Hydrology  
Sub-daily precipitation  
High-impact weather events

## Regional perspective

Cryosphere      Hydrological interactions  
Water cycle at regional scale  
Mountainous Terrain rainfall

Need for coordinated  
High-resolution  
Modelling strategy  
including coordinated  
Convection-Permitting  
approaches

**CORDEX**

Flagship Pilot studies  
CORDEX Phase 2  
CORDEX CORE



## Opportunities:

1. Discussion of new strategic plan
2. Input on implementation plan





# ICRC-CORDEX 2019

- Objectives for ICRC-CORDEX 2019 in Beijing

Some recurring challenges and opportunities were identified at the ICRC-CORDEX2016 and will thus be part of the objectives for ICRC-CORDEX 2019:

- lack of observations,
- distillation of information from data, resolution versus computational costs,
- risk analysis and uncertainties,
- the need for earth system models,
- representing and projecting extremes at useful scales for users,
- the scale mismatch of models and observations and of models and impact-assessment needs,
- possibilities in facilitating and planning model and method inter-comparison and assessment.

The effort to further streamline and coordinate the work and information sharing in the CORDEX domains continues and is of essence for a unified voice towards users.

# Thank You!

