Coordinated Regional Downscaling Experiment (CORDEX)

William J. Gutowski, Jr.
Iowa State University
on behalf of the
CORDEX Science Advisory Team (SAT)

Pan-WCRP

WCRP CORDEX

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

Pan-WCRP

WCRP CORDEX

Goal: Link with process & method evaluations (observations & metrics)

- **Added value**

  Internal variability & added value as functions of scale; Bias correction uncertainties and consistency; User-oriented metrics

- **Human element**

  Coupling of regional climate and coastal megacities; Bridging with urban parameterisation development; Land use change

- **Coordination of regional coupled modelling**

  Ocean-ice-atmosphere; Lakes; Dynamic land surface; Cryosphere; Natural fires; Atmospheric chemistry; Carbon cycle; Aerosols; Marine biogeochemistry

- **Precipitation**

  Convective systems; Coastal storm systems; MJO/Monsoon

- **Local wind systems**

  Wind storms; Strong regional winds; Wind energy

☞ Identified within the CORDEX community

☞ Want to address in a more systematically

WCRP CORDEX

Goal: Further inform CORDEX as 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 (status?)

Coordination: ScenarioMIP, HighResMIP, VIACS AB, . . .

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]

WCRP CMIP6
World Climate Research Programme

WCRP CORDEX

Pan-WCRP

Goal: Clarify CORDEX links within AR6 (via CMIP)

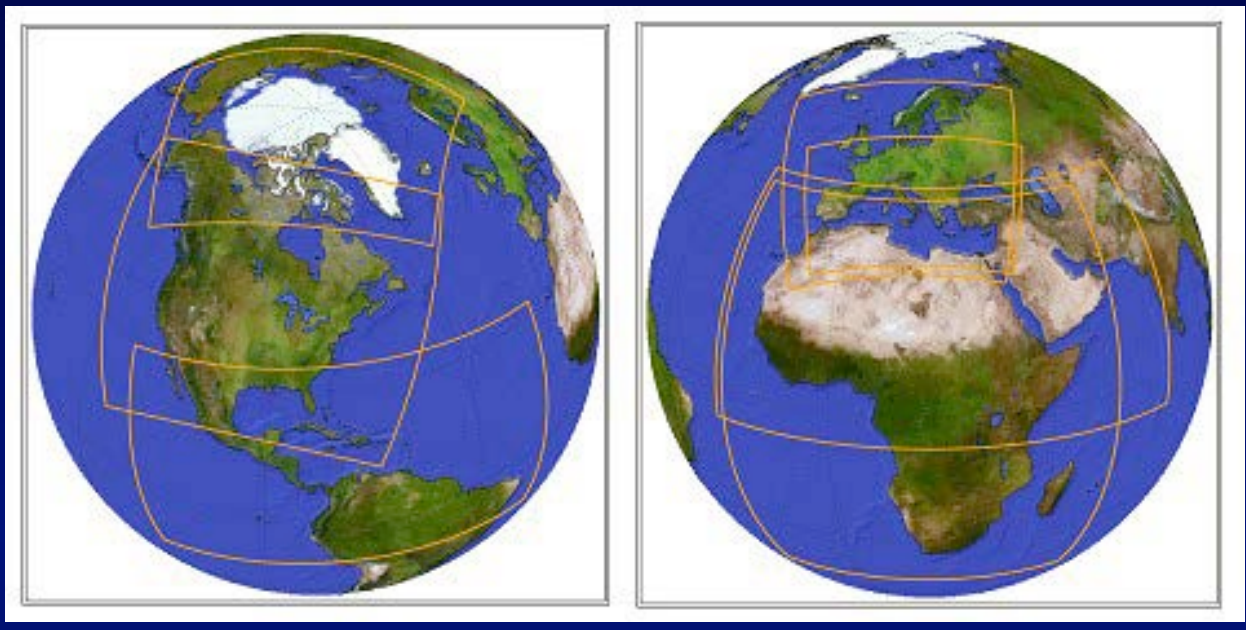
CORDEX Coordinated Output for Regional Evaluations (CORDEX CORE)

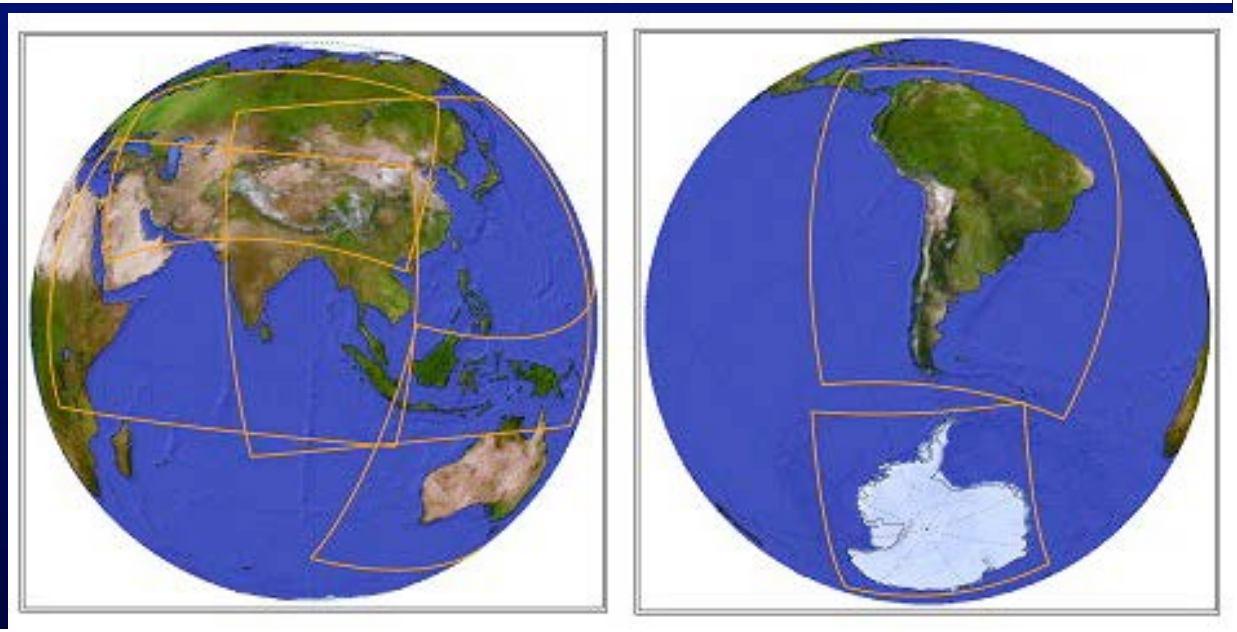
- Motivated by
  - IPCC Workshop on Regional Climate (Sept. 2015)
  - WCRP Scoping Workshop on a framework for reg. studies (Oct. 2016)
  - Regional focus in AR6 WGI (3 chapters)
- Elements
  - Succinct set of downscalings for each region
  - Provide a core foundation for additional work by others
  - Span plausible range of climate change => 3 distinct GCMs?
  - CMIP5 & CMIP6: Historical + RCP8.5 + additional RCP
  - Downscaling: 3-4 RCMs; ESD methods?
  - Resolution?

Goal: link regional expertise across the programs

CORDEX domains:

- Cover all major land masses + Arctic
- Build on prior experiences with regional simulations and processes

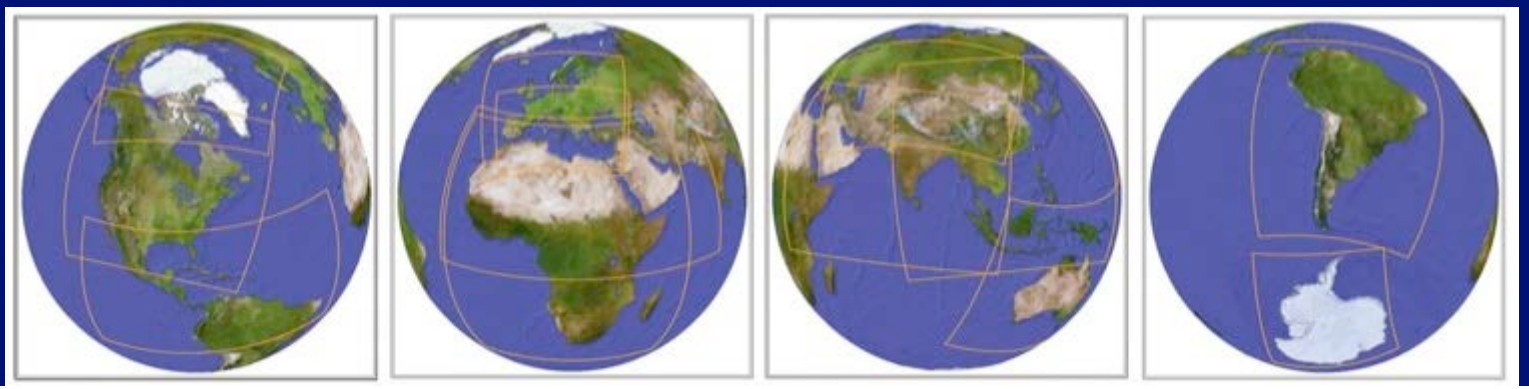




Pan-WCRP

Goal: Coordinate progress in Flagship Pilot Studies (FPS) with other WCRP programs

- Coordinate developments in conv.-permitting climate sim.
- Should have strong basis in
  - 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, esp. GEWEX
- Details: www.cordex.org

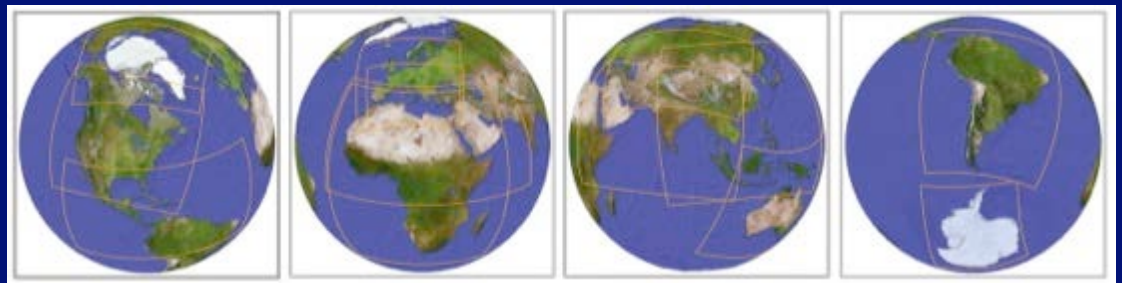


Flagship Pilot Studies (FPS)

Five now established:

- ✓ EUR+MED: High resolution convective phenomena
- ✓ EUR: Impact of land use changes
- ✓ S. AM: Extreme precipitation events.
- ✓ MED: Role of natural and anthropogenic aerosols
- ✓ MED: Role of air-sea coupling and small-scale ocean processes

Two more we are working with.



Goal: Explore potential links with other WCRP programs

SPARC - Tropical convection

- High latitude storm tracks
- Arctic tropopause?

GEWEX - subdaily precipitation

CLIVAR - Large-scale processes (teleconnections) linked to fine-scale regional climate

- Coupled atmos-ocean regional modeling

Pan-WCRP

WCRP CORDEX

Thank You!

Pan-WCRP