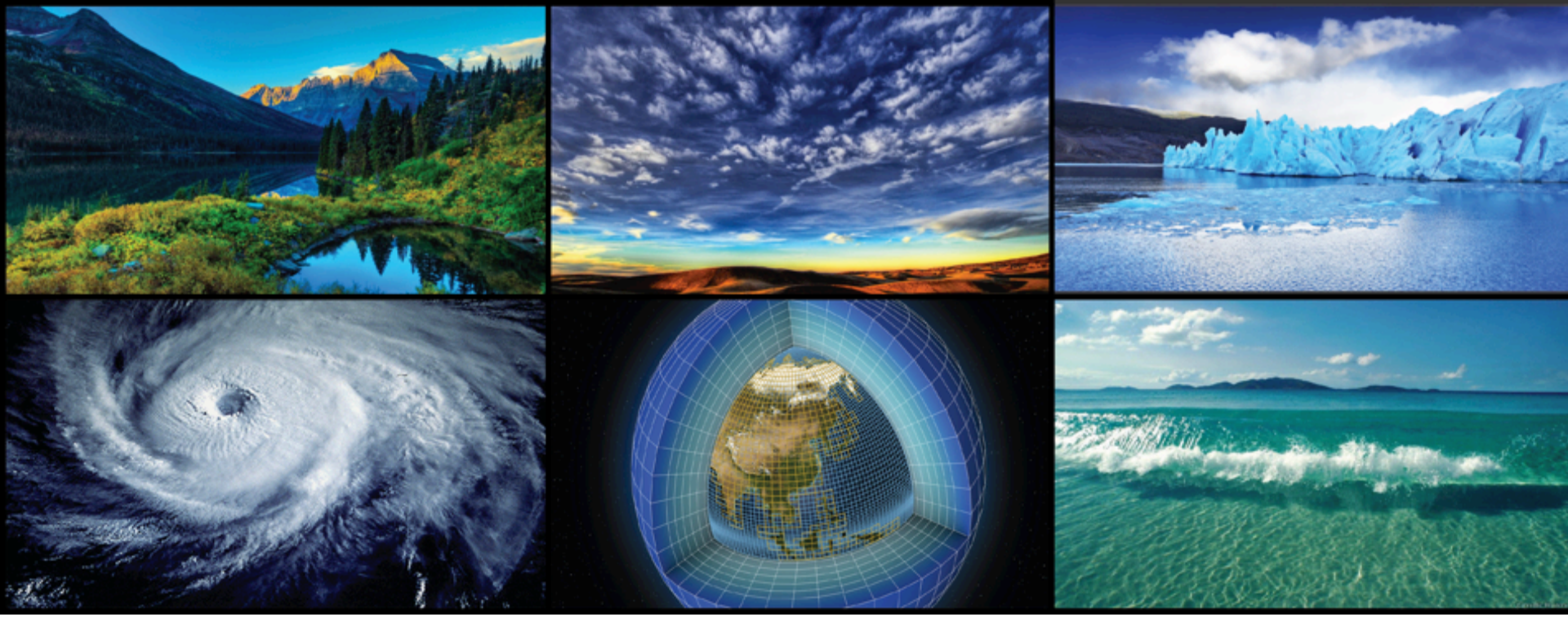

WORLD CLIMATE RESEARCH PROGRAMME

Current and Future Priorities for Climate Research

Boram Lee (blee@wmo.int)
WCRP
16 January 2017
Jeju, Republic of Korea

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WCRP's mission….

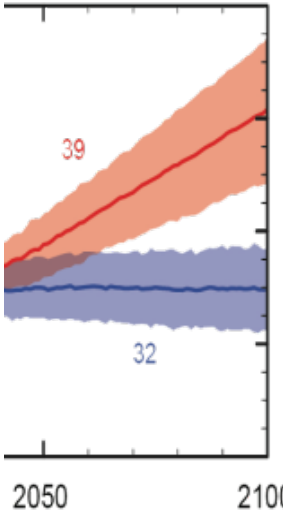
… is to facilitate analysis and prediction of Earth system variability and change for use in an increasing range of practical applications of direct relevance, benefit and value to society.

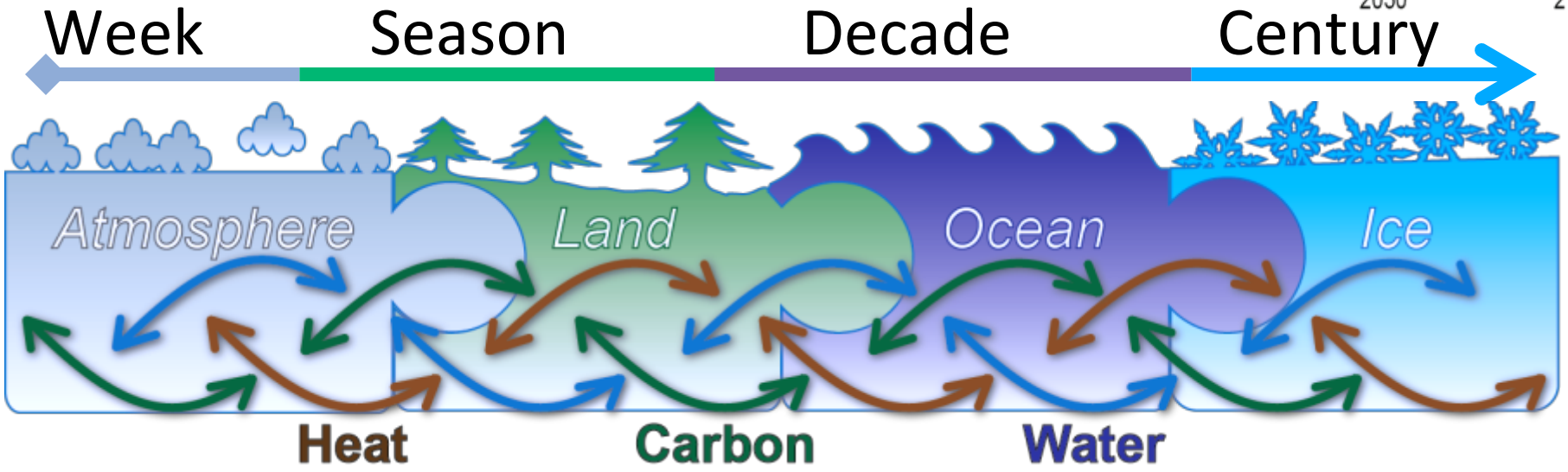
The two overarching objectives of WCRP are:

to determine the predictability of climate

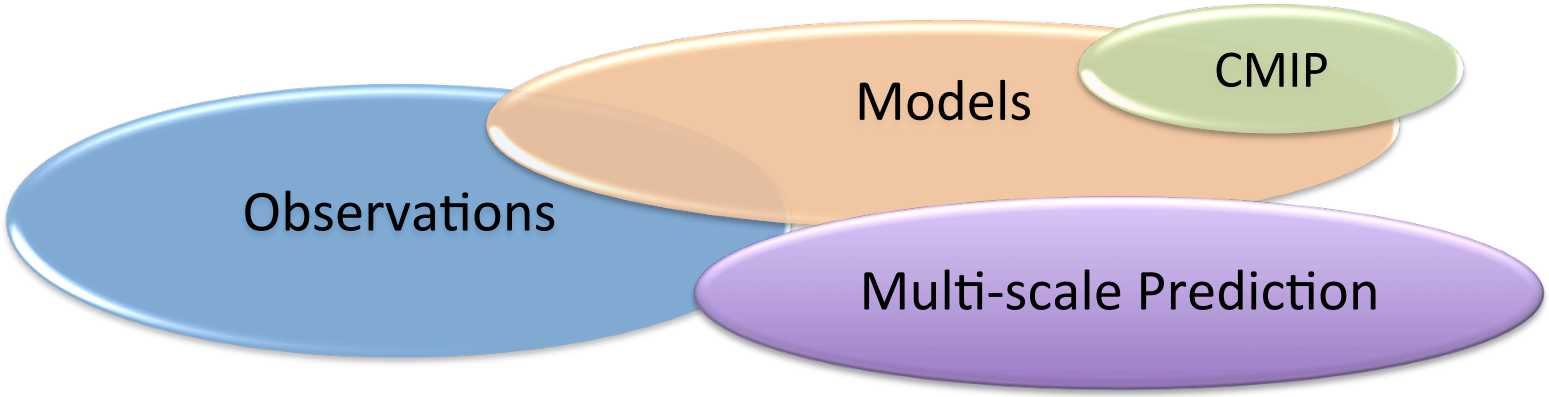
to determine the effect of human activities on climate

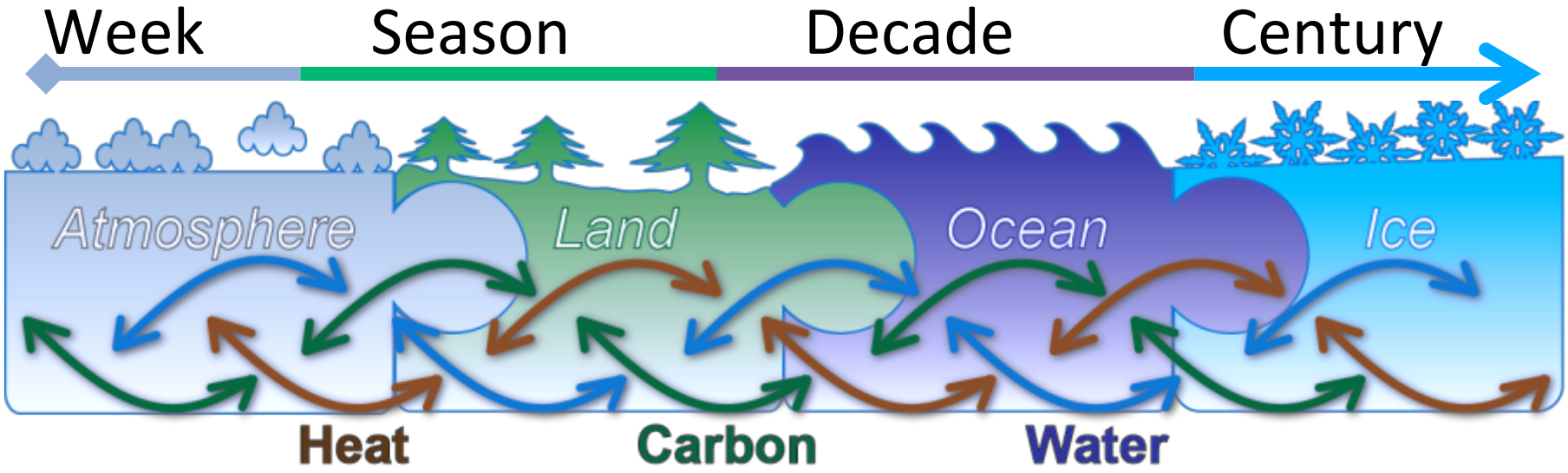
Role of WCRP


39
32
2050
2100


Week
Season
Decade
Century
Atmosphere
Land
Ocean
Ice
Heat
Carbon
Water

Role of WCRP


CMIP
Models
Observations
Multi-scale Prediction


Week
Season
Decade
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Atmosphere
Land
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Ice
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Carbon
Water

Post COP-21 Science

COP-21: A major political achievement, based in large part on the knowledge provided by the scientific community.

For our scientific community:

After decades of active investigations (e.g., WCRP) and the efforts to communicate the findings (e.g., IPCC):

1. **The science is now *widely accepted***:
   All key nations accept the concept of human-induced climate change, even if some large uncertainties remain.

2. The focus of the research must *evolve* from "making the case" for "greenhouse warming" **to the development and dissemination of information for regions** needed to minimize risks and to build resilience.

a strong fundamental research component

integrating Interdisciplinary knowledge

A future of WCRP: thinking out of box…

Three primary questions in defining key topics confronting the research community:

(WCRP "out of box" workshop, June 2016)

- **Where will the carbon go?**
- **How will weather vary with climate?**
- **How will climate change impact the habitability of our planet and its regions?**

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WCRP Structure

Joint Scientific Committee

Joint Planning Staff

Modeling Advisory Council

Data Advisory Council

Working Groups on: Numerical Experimentation (WGNE), Seasonal to Interannual Prediction (WGSIP), Coupled Modeling (WGCM), Regional Climate (WGRC)

CliC

Cryosphere

CLIVAR

Ocean-Atmosphere

GEWEX

Land-Atmosphere

SPARC

Troposphere - Stratosphere

CORDEX

Regional Climate Downscaling

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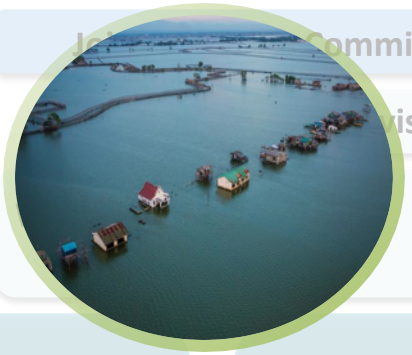
WCRP Grand Science Challenges



Regional Sea Level & Coastal Impacts

Water for Food Baskets

Melting Ice & Global Consequences

focused

measurable

innovative

collaborative

Near-Term Prediction

Clouds, Circulation & Climate Sensitivity

Climate & Carbon

Weather & Climate Extremes

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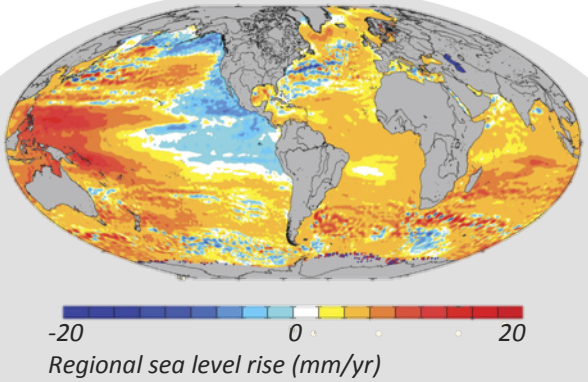
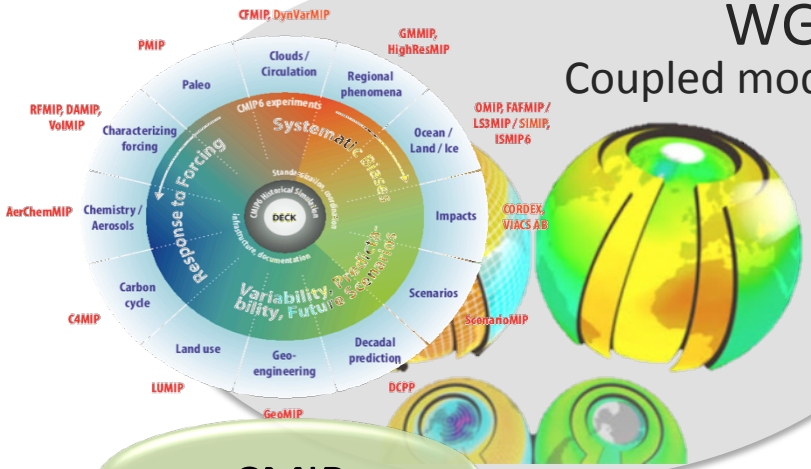
WG Working Groups

Numerical Experimentation
WGNE



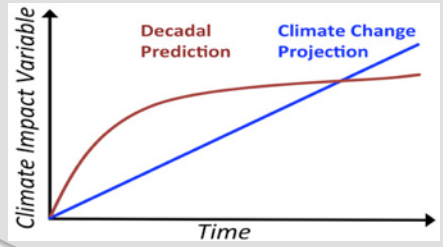
Regional Climate
WGRC



CMIP

WGCM
Coupled modeling

WGSIP
Subseasonal to Interdecadal Prediction



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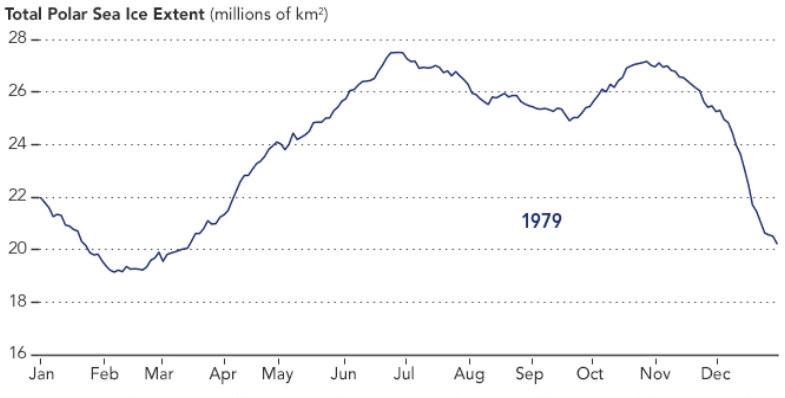
CliC
Climate and Cryosphere

Understanding the changing cryosphere and its climate connections

Overarching research needs guiding CliC activities:

- Improved understanding and quantification of the **role of the cryosphere in the global climate system**, its variability and change
- Improved utilization of **cryospheric observations** as indicators of global and regional climate change
- Improved understanding of the physical, chemical and other **processes** that govern behavior of the cryosphere, and the **representation of these processes in Earth System Models**
- Improved ability to make **quantitative predictions and projections** of the cryosphere in a changing climate



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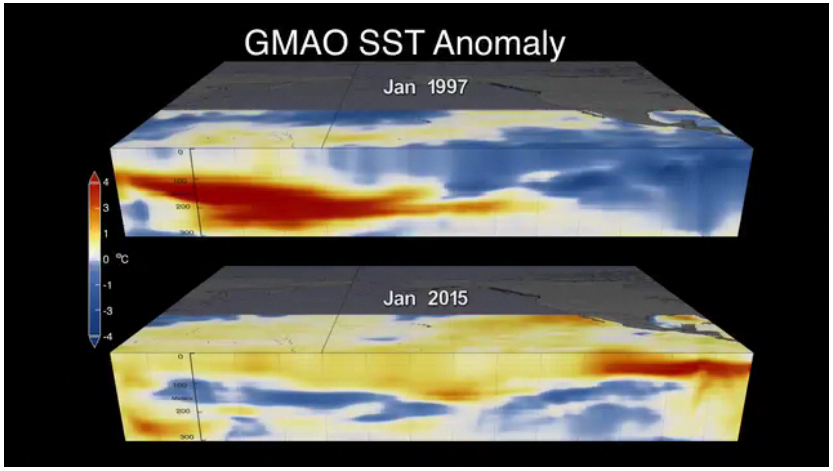
CLIVAR

Climate and Ocean: Variability, Predictability and Change

Understanding the dynamics, the interaction and the predictability of the coupled ocean-atmosphere system

Research Foci:

- **Decadal variability and predictability** of ocean and climate variability
- Marine **biophysical interactions** and dynamics of upwelling systems
- **Regional sea level change** and coastal impacts
- Consistency between planetary energy balance and **ocean heat storage**
- **ENSO** in a changing climate
- Intraseasonal, seasonal and interannual variability and **predictability of monsoon systems**



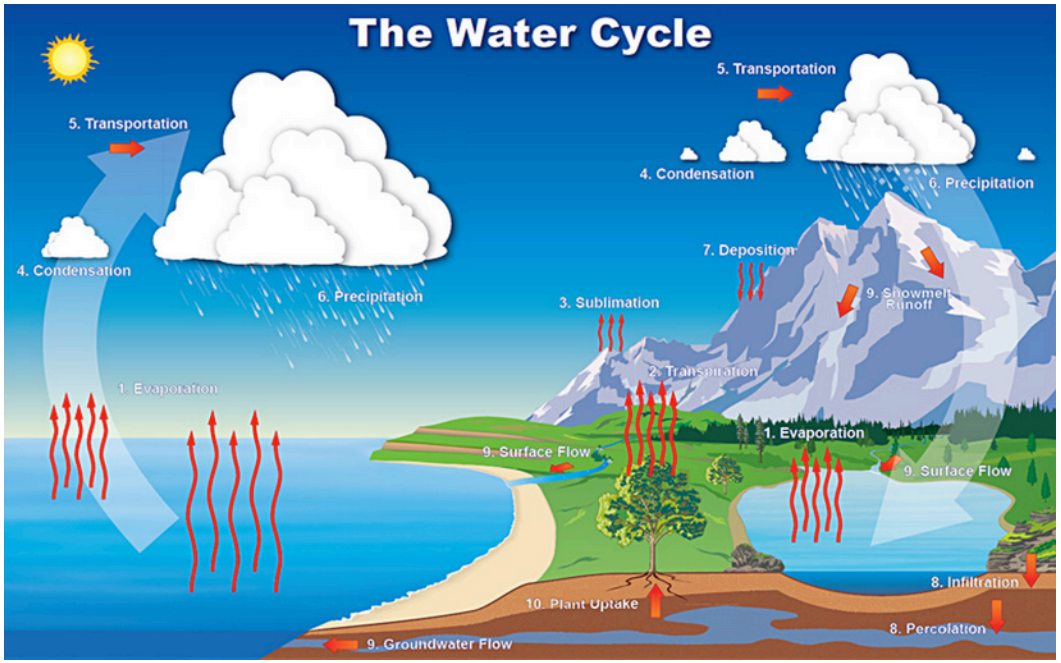
El Nino comparison 1997 vs. 2015, NASA Visualization Lab

GEWEX
Global Energy and Water Cycle Exchanges

Understanding Earth's water cycle and energy fluxes at the surface and in the atmosphere

GEWEX science questions:

- Observations and predictions of **precipitation**
- Global **water resources** systems (land use and hydrology)
- Changes in **extremes** (esp. droughts, flood, heat waves)
- **Water and energy** cycles and processes



GEWEX Panels: Gobal Land/Atmosphere System Study (GLASS), Global Atmospheric System Studies (GASS), Hydroclimatology Panel (GHP), GEWEX Data and Assesments Panel (GDAP)

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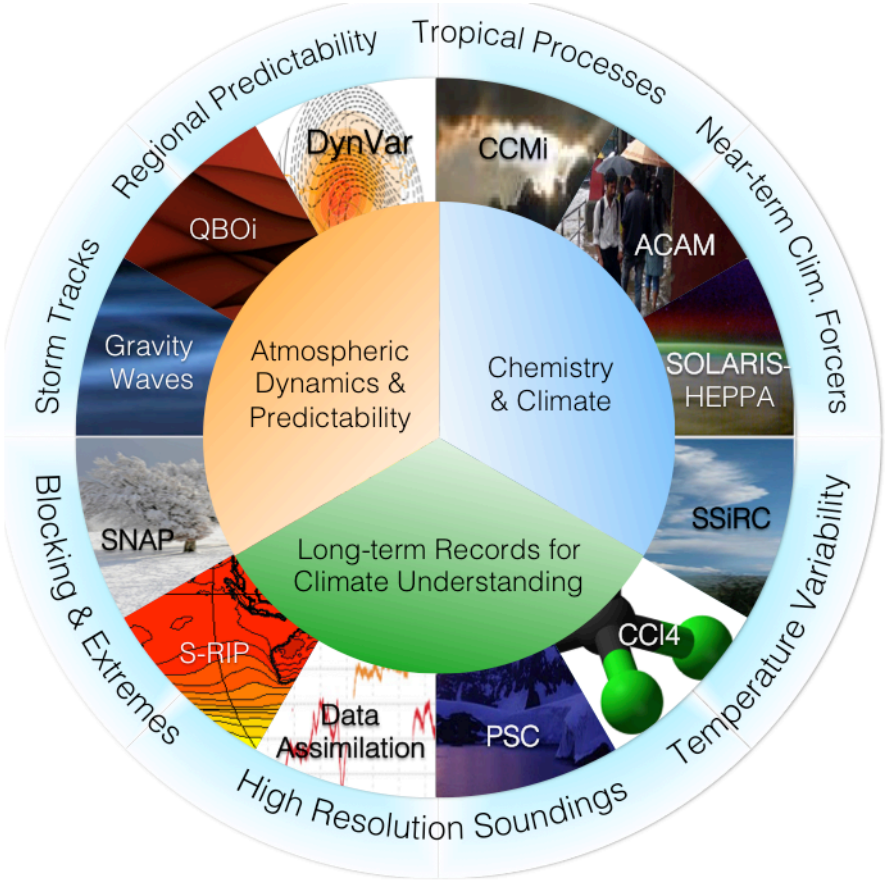
SPARC

Stratosphere-trosphere Processes And their Roles in Climate

Coordinating international efforts to bring knowledge of the atmosphere to bear on issues regarding climate variability and prediction

Themes:

- **Atmospheric Dynamics and Predictability**
  climate variability, near-term climate predictions, stratosphere-troposphere interactions
- **Chemistry and Climate**
  coupling of climate-dynamical-radiative processes, gas emissions
- **Long-term records for Climate Understanding**
  construction, analysis, and interpretation of long-term climate records



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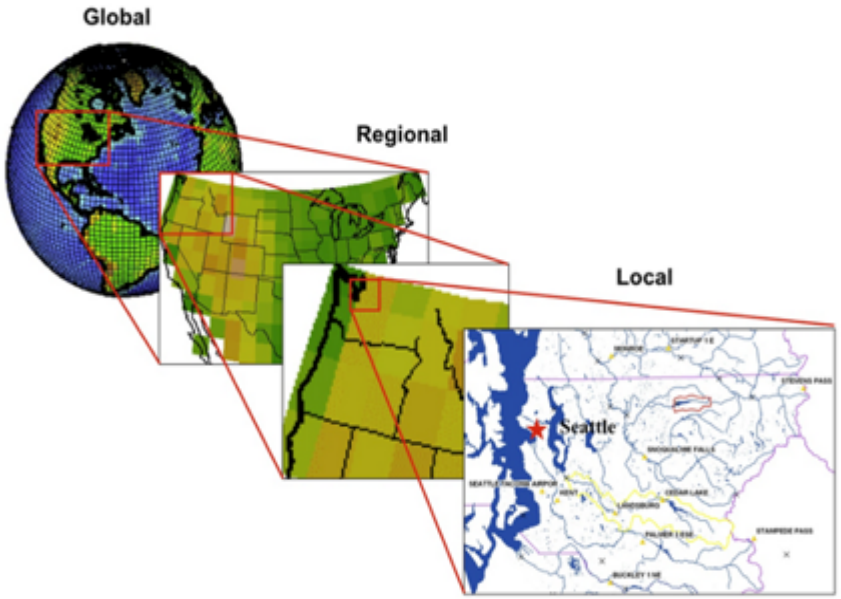
CORDEX
Coordinated Regional climate Downscaling Experiment

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

CORDEX scientific challenges:

- **Added value** of downscaling, scales, bias and uncertainties, user-oriented metrics
- Understanding and simulating **human elements**, e.g. land use, urban development, climate and coastal cities
- Coordination of regional **coupled modeling**
- Precipitation, e.g. convective systems, monsoon
- Local wind systems



Capacity Development for future science leadership

- Continuing focus to support future science leadership
  - Results of Offenbach workshop (Oct'15): ECR position paper on future Earth System science published (http://journals.ametsoc.org/doi/abs/10.1175/BAMS-D-16-0025.1)
  - WCRP-WWRP-GAW support for YESS: a coordination office being established (Argentine Met Service)
  - Extending and linking with ECR networks (NoN, etc.)
- Direct and substantial involvement of ECRs in WCRP activities
  - Actively recruiting and engaging ECRs in WCRP strategic discussions (regional scoping, trans-disciplinary discussions, etc.)

CLIVAR Open Science Conference

"**Charting the course for climate and ocean research**"
CLIVAR Open Science Conference on 16-23, September, 2016 in Qingdao, China

608 Participants
234 Poster presentations by early career scientists
108 Plenary and parallel session talks
50 Countries represented
42 Percent of early career scientists and students attending
21 Developing countries represented
20 Years since CLIVAR was established
11 Town halls
5 Days of meetings
3 Days for the Early Career Scientists Symposium
1 International CLIVAR

Open Science Conference plus Early Career Symposium as well as CLIVAR panel meetings

Special upcoming issue of CLIVAR Exchanges highlighting outcomes… www.clivar.org

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Capacity Development for future science leadership

Early Career Scientists Symposium at CLIVAR OSC

(18 and 24-25 September 2016, Qingdao)

- 135 early career scientists from 34 countries
- ECS perspective on future of ocean & climate science:
  - **Improved understanding** of 1) regional climate change and variability, 2) internal variability, 3) ocean carbon and heat uptakes, and 4) climate processes and feedbacks
  - **Increased interdisciplinarity**
  - **Improving international collaboration**, bridging gap between global North and South, equal & open access to data and journals, exchange of scientists (visa issues)

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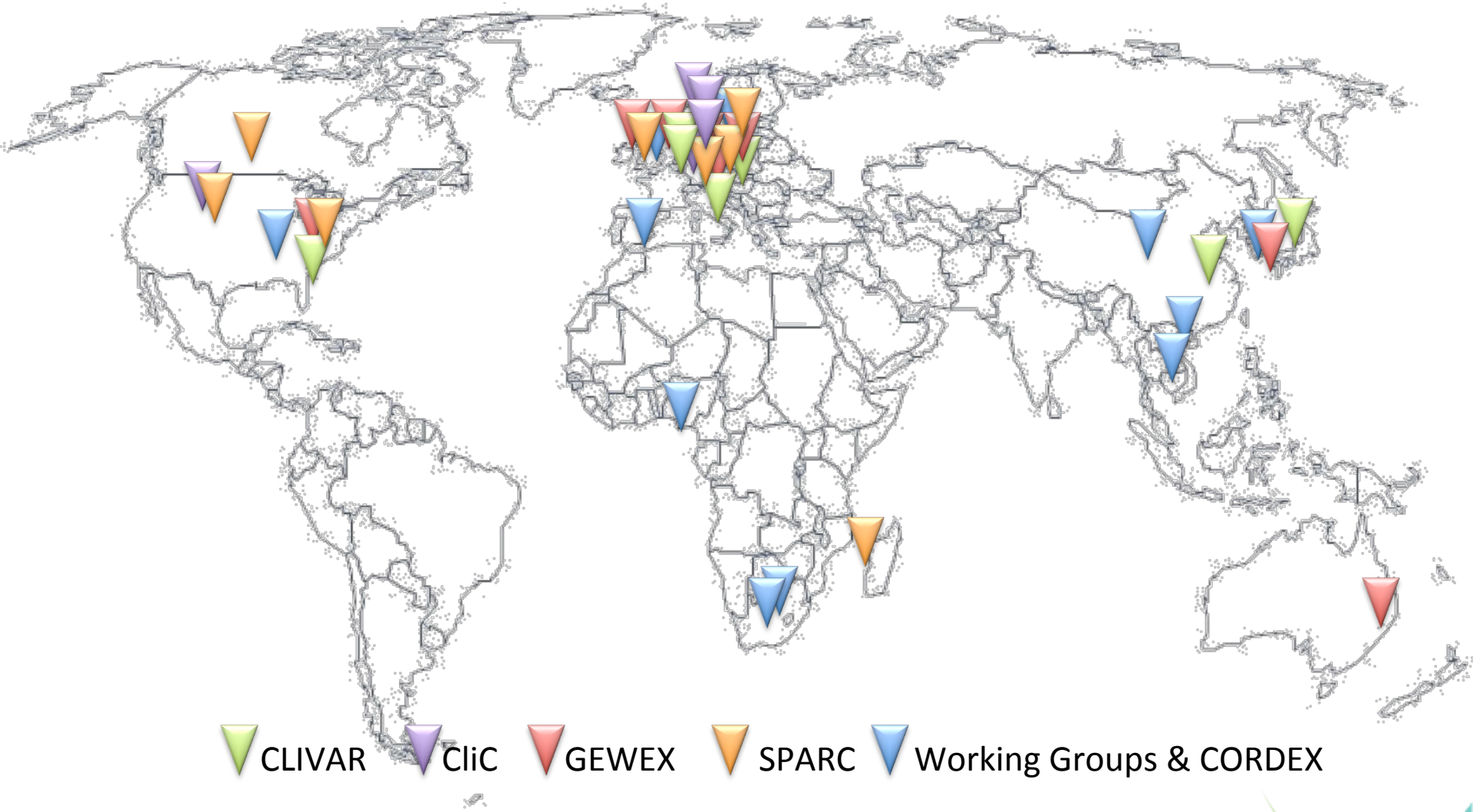
Capacity Development for regional climate research leadership



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Thank You

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http://wcrp-climate.org