WORLD CLIMATE RESEARCH PROGRAMME

Michel Rixen
WDAC8
20-21 March 2019
Marrakesh, Morocco

WORLD METEOROLOGICAL ORGANIZATION
United Nations Educational, Scientific and Cultural Organization
Intergovernmental Oceanographic Commission
International Science Council
WCRP World Climate Research Programme

WCRP's mission….

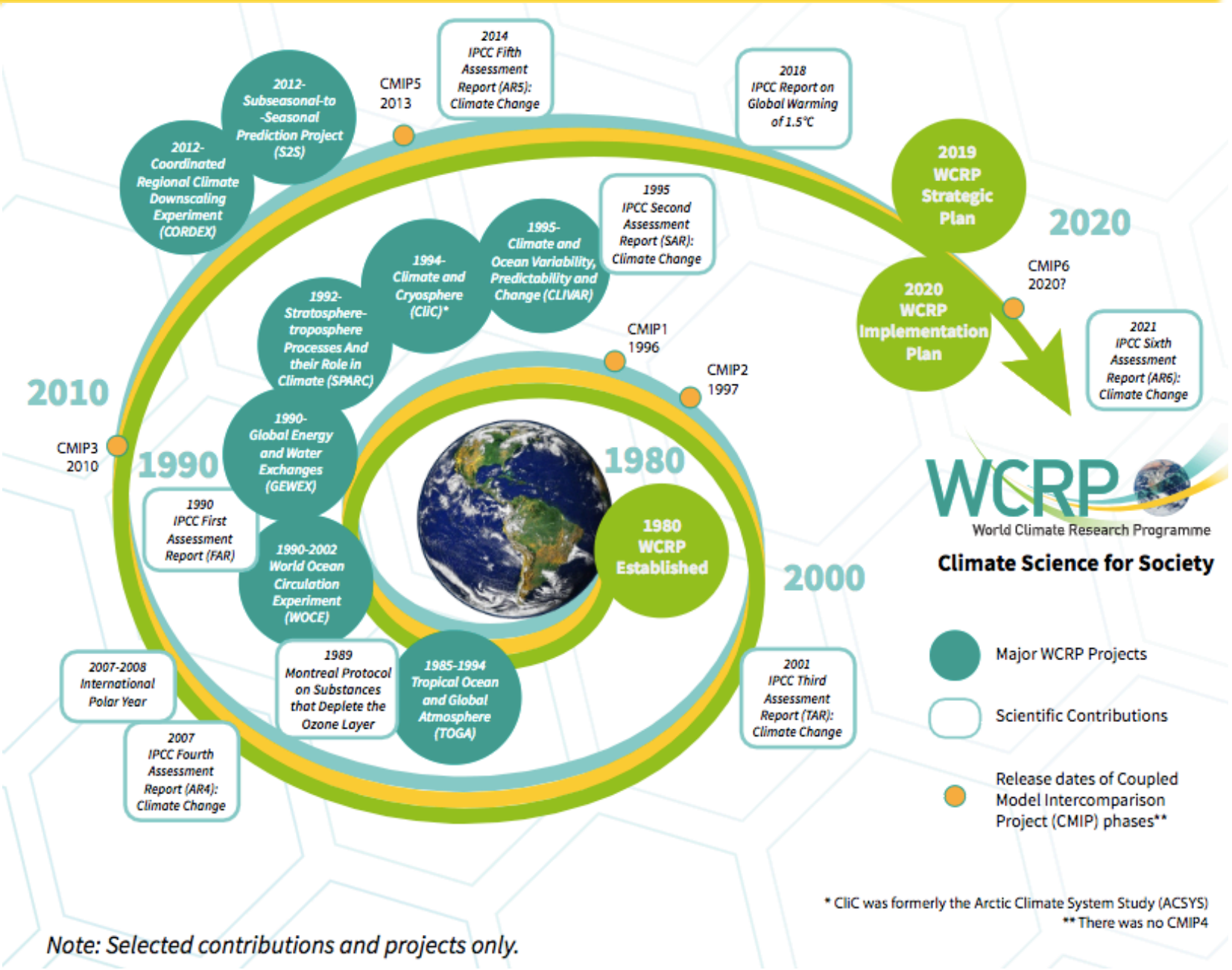
… is to facilitate analysis and prediction of Earth system variability and change for use in an increasing range of practical applications of direct relevance, benefit and value to society.

The two overarching objectives of WCRP are:

to determine the predictability of climate

to determine the effect of human activities on climate

WCRP History and Milestones



2015: A landmark Year

PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

UN World Conference on
Disaster Risk Reduction
2015 Sendai Japan

- Over 190 countries signed up to reduce emissions, with the target to stay within a 2ºC world.
- 15-year agreement for the substantial reduction of disaster risk and losses in lives, livelihoods and health.
- 2030 agenda with 17 goals to end poverty and hunger, improve health and education, making cities more sustainable, combating climate change, and protecting oceans and forests.

Understanding and Quantifying Weather and Climate Risk are at the Core of these Actions

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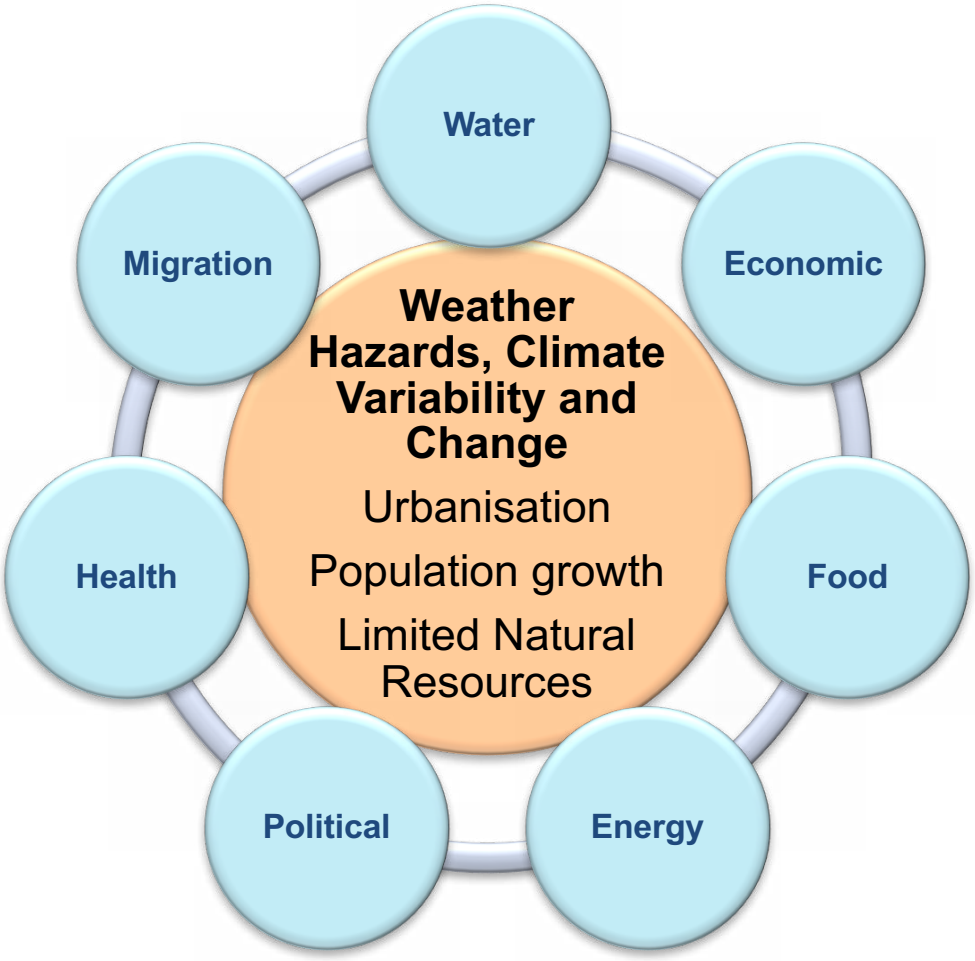
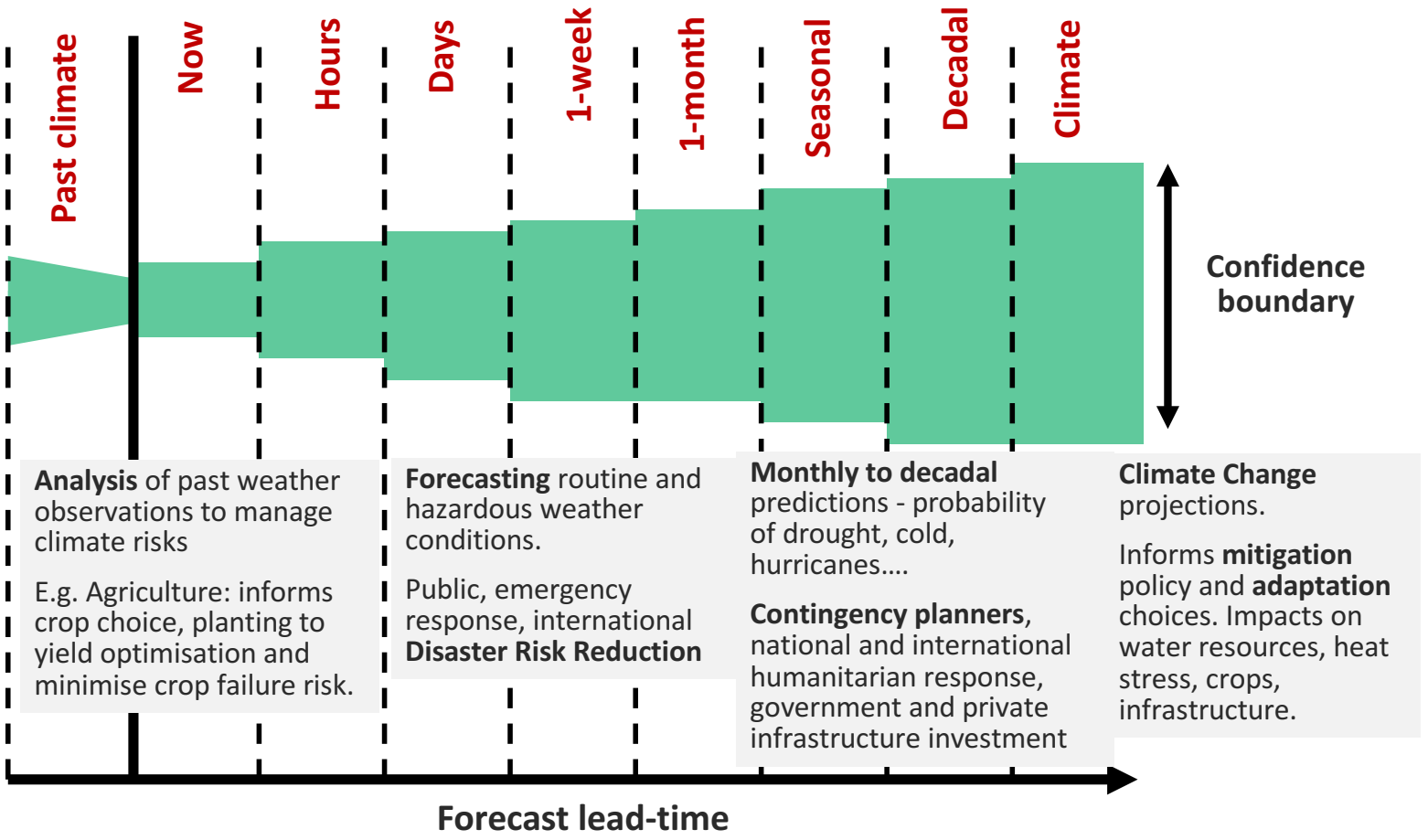
21st Century challenges in an interconnected world

Exposure to extreme weather and climate events threatens economic development and social welfare across the globe



New Tools : Seamless Prediction Across Timescales



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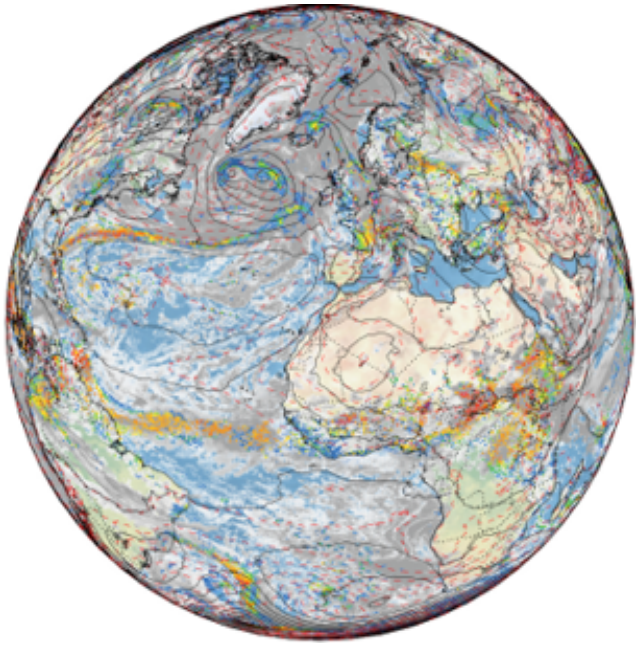
New Tools : Seamless Prediction Across Space scales



N x Global predictions at ~10km with lead times of days to years:

Synoptic drivers

<N x Regional predictions at <1km with lead times of hours to years:

Local meteorology

Probability of local hazards:

Impact Scenarios & Narratives

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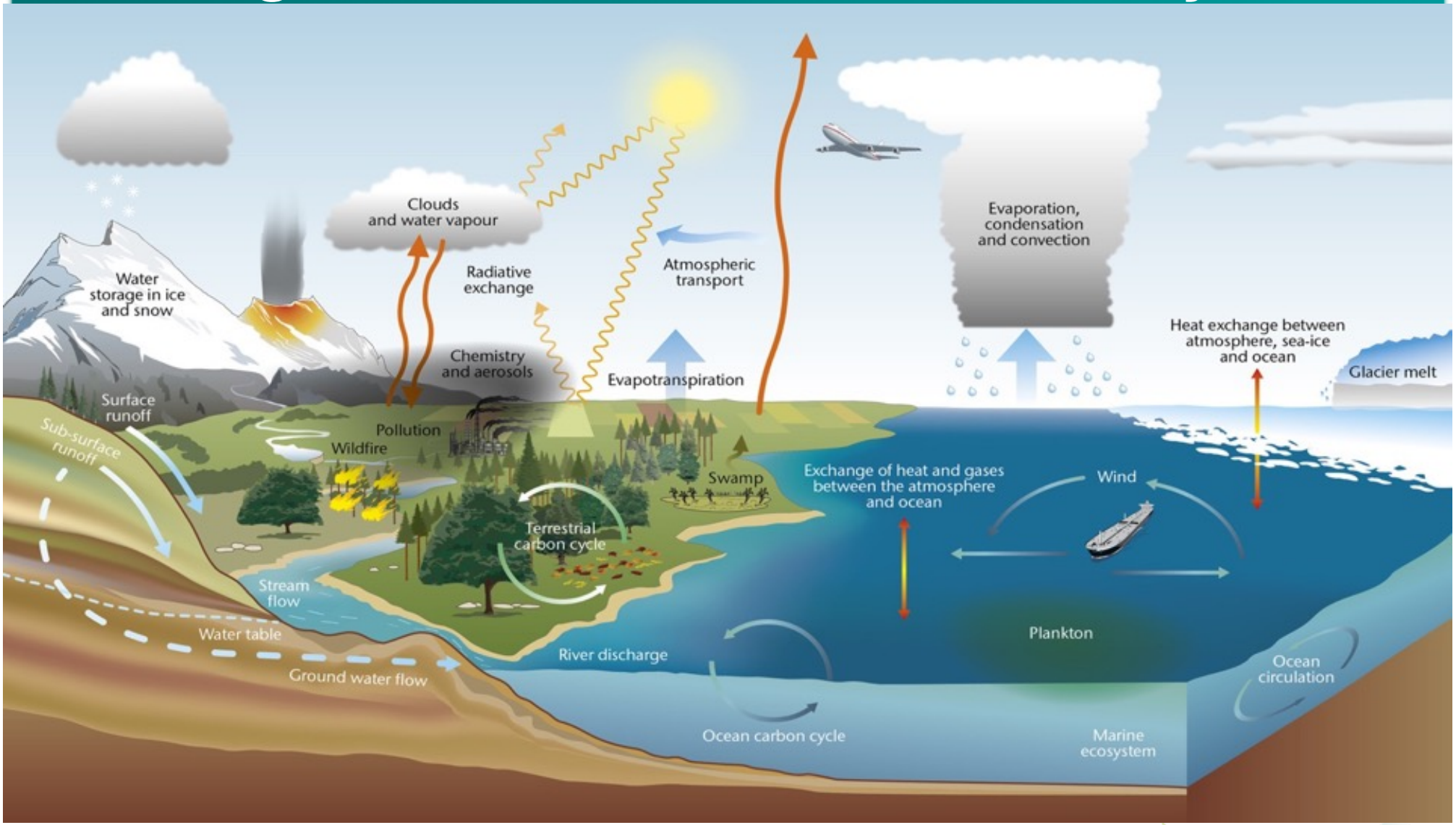
Taking a holistic view of the Earth System



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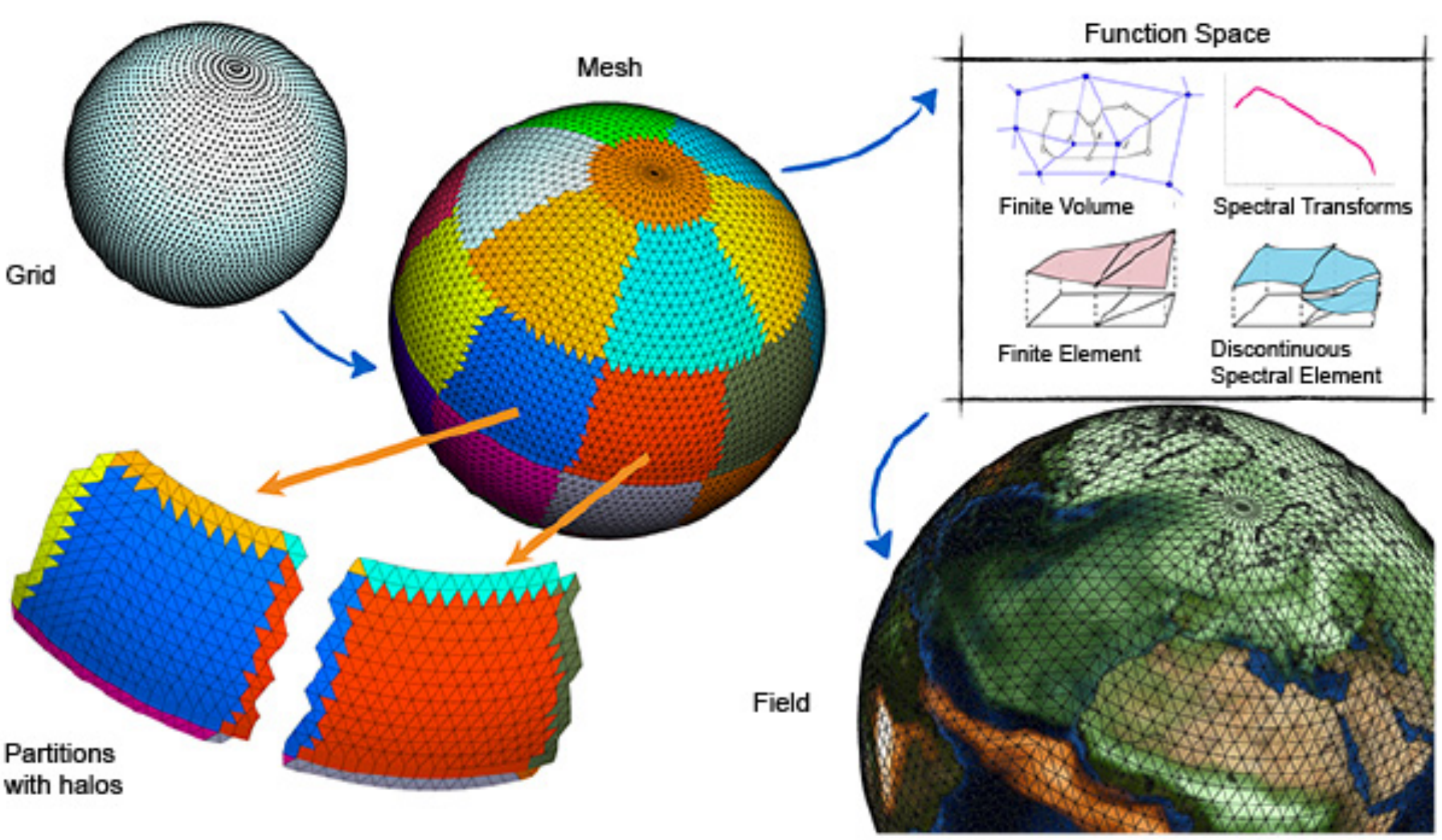
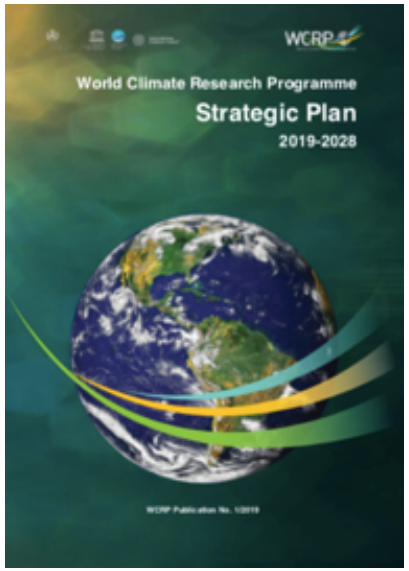
Next Generation Codes, Exascale Computing

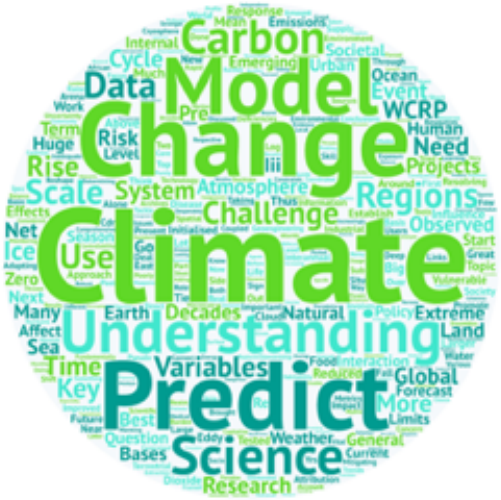


Courtesy: ECMWF

WCRP Strategic Plan

- WCRP is developing a new Strategic Plan, covering a 10-year time horizon (2019-2029)
- Takes into account the outcomes of the co-sponsors review (finalized in June 2018)
- Importance of bedrock science, seamless approach (time, space, ESM, R-O) and links to services and policy emphasised
- Accompanying Implementation Plan under development





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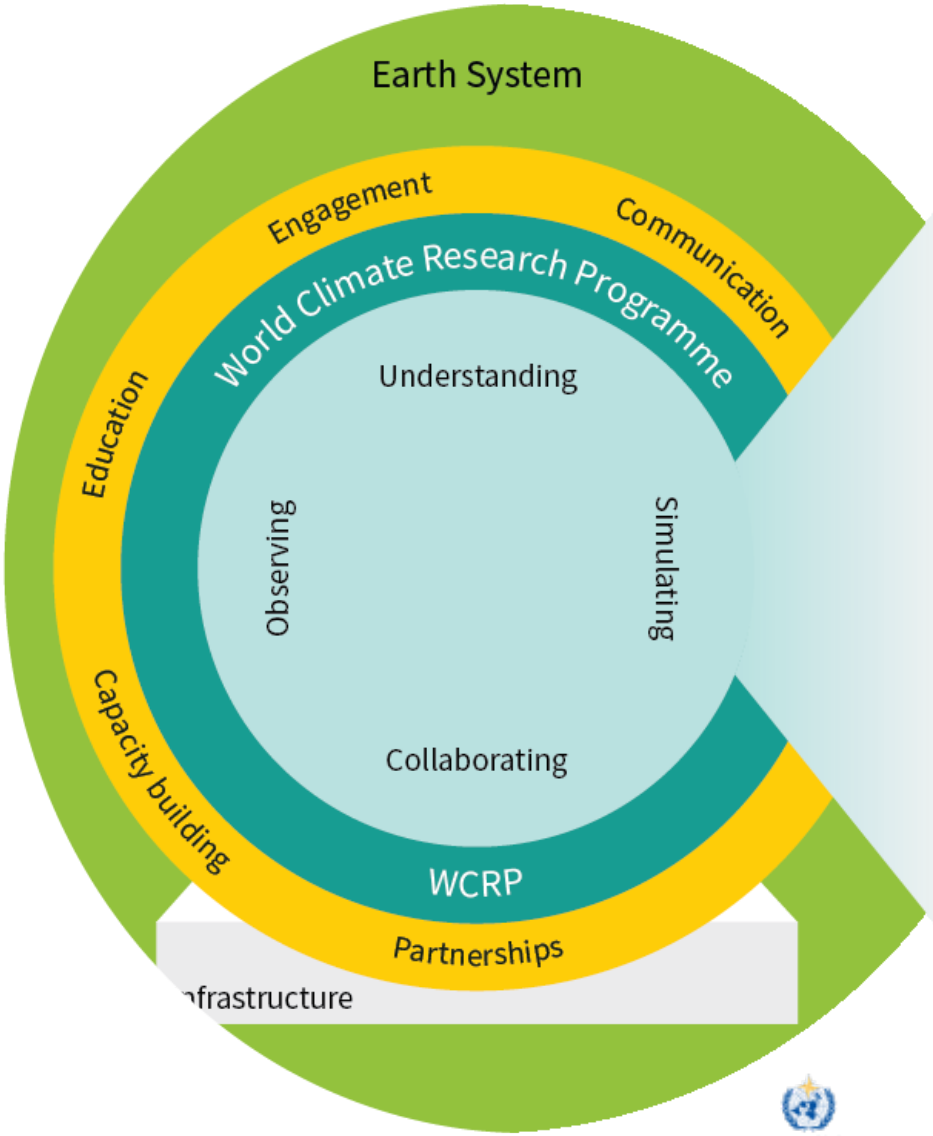
WCRP Strategic Plan



WCRP Overarching Science Objective Themes

1 *Fundamental understanding of the climate system*

2 *Prediction of the near-term evolution of the climate system*

3 *Future evolution of the climate system*

4 *Bridging climate science and society*

Interactions across spatial and temporal scales

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WCRP Strategic Plan

Objective 1

Advancement of sciences that enable an integrated and fundamental understanding of the climate, its variations and its changes, as part of a coupled physical, biogeochemical, and socio-economic system.

Emphases:

- Climate dynamics: past and future global and regional changes in oceanic and atmospheric circulations
- Reservoirs and flows: radiative, hydrologic, cryospheric and biogeochemical changes on energy, water, carbon, and other climate-relevant compounds

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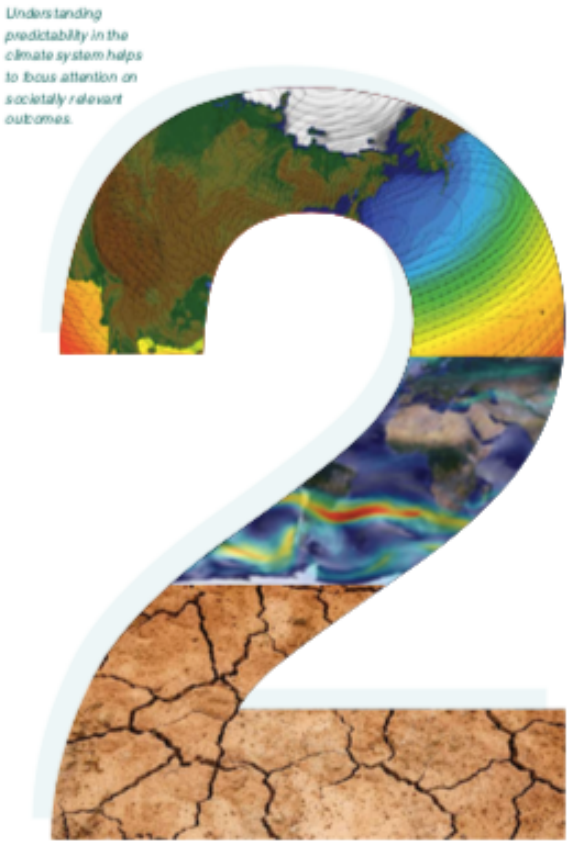
Objective 2



Frontiers of predictions and quantify the associated uncertainties for sub- seasonal to decadal time scales across all climate system components.

Emphases:

- Simulation capabilities of component systems and their coupling. Deterministic, statistical and machine learning approaches. Data assimilation and ensemble generation
- Predicting extreme events: regional climate hotspots and potential for crossing thresholds. Interactions between fact and slow extremes

WCRP Strategic Plan

Objective 3

Quantify the responses, feedbacks and uncertainties intrinsic to the changing climate system on longer timescales.

Emphasis:

- Earth system models. Development and integration. Representation of complex interactions between aquifers, vegetation and soil carbon, between permafrost, glaciers, and ice-sheets. Dynamical and statistical downscaling

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Objective 4

Innovation in the generation of decision-relevant information and knowledge about the evolving Earth system.

Emphasis:
Interactions with social systems: Social processes and emergent behaviour in the Earth System. Interactions and feedbacks between climatic and socioeconomic systems
Engaging with society: Actionable climate information, scientific assessments, educational approaches and public communication strategies.

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WCRP New Strategy

Critical Infrastructures

I. A hierarchy of modeling tools
II. Observations for process understanding
III. Sustained reference data
IV. High-end computing and data management

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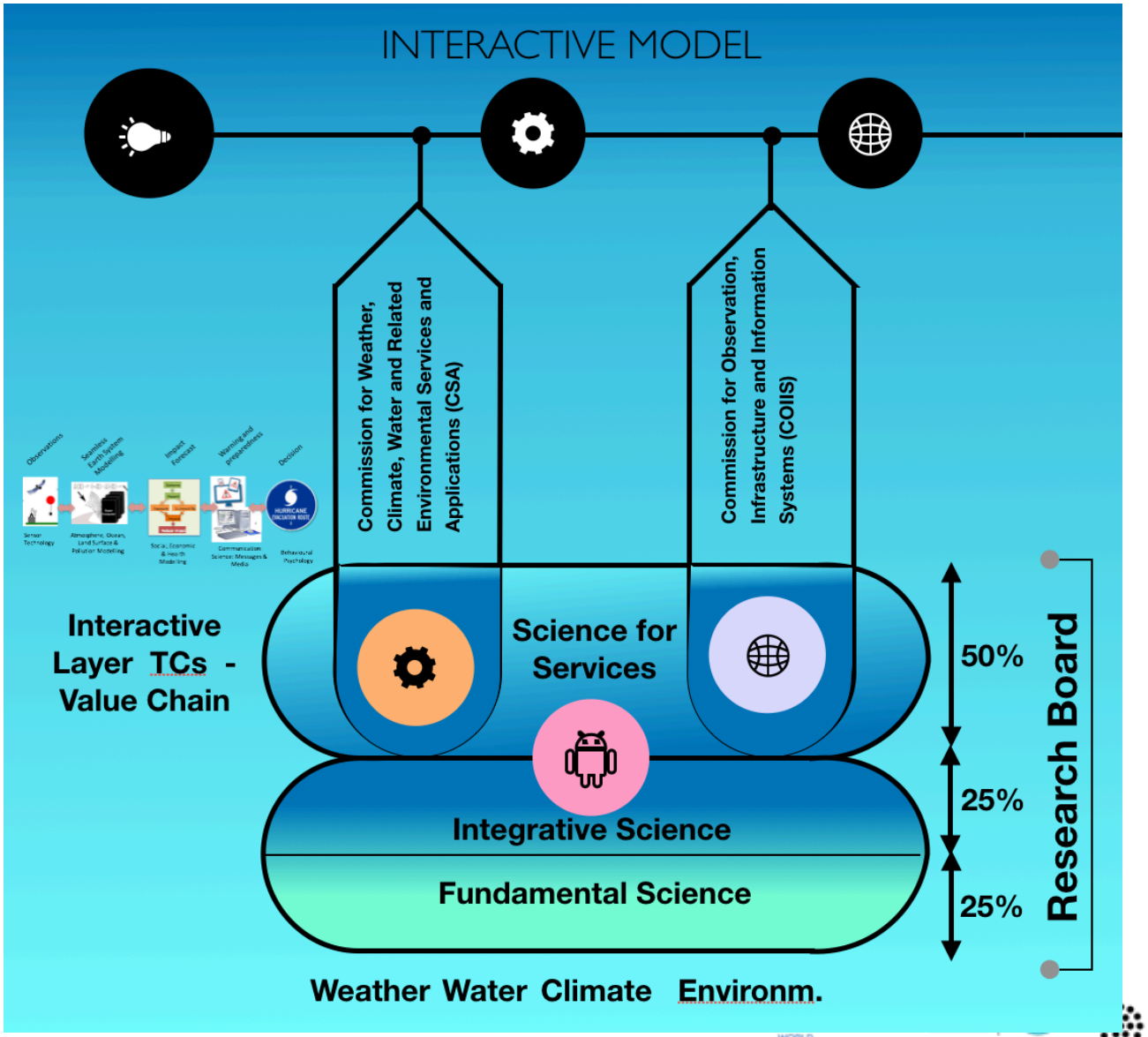
Integration, integration and more… integration



- Infrastructure
- Models
- Time
- Space
- Disciplines
- Communities
- Value cycle
- …

Relevant timeline

- WDAC8 Marrakesh

Feeding into:

- Retreat 4-5 May, Geneva: first brainstorm on TP/IP
- JSC40 6-10 May, Geneva: consolidation of inputs into TP/IP
- WMO 18th Congress, June'19: reform
- AGU Fall Meeting, 9-13 Dec 2019

Some key topics for WDAC8

- Integration, Earth System Reanalysis:
  - Disciplinary areas
  - Fluxes, modelling, observations
  - Need to accelerate research
  - Ref for model development & verification, process understanding, IC
  - Global Stocktake and much more
- Data assimilation, OSSE/OSE
- Data infrastructures, protocols, standards
- Data mining/machine learning
- Research-operations, links to C3S, space agencies, etc
- WCRP Obs/Data coordination mechanism in new IP


Thank You
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