International Challenges: 2yr – Decadal Predictions

Shanna Pitter Combley
NWS/International Activities Office

June 6, 2019

Outline

- Relevant WMO activities
- Existing WCRP Groups
- The New WCRP Strategic Plan 2019-2028
- WCRP Grand Challenge- Near Term Climate Predictions (Key activities)

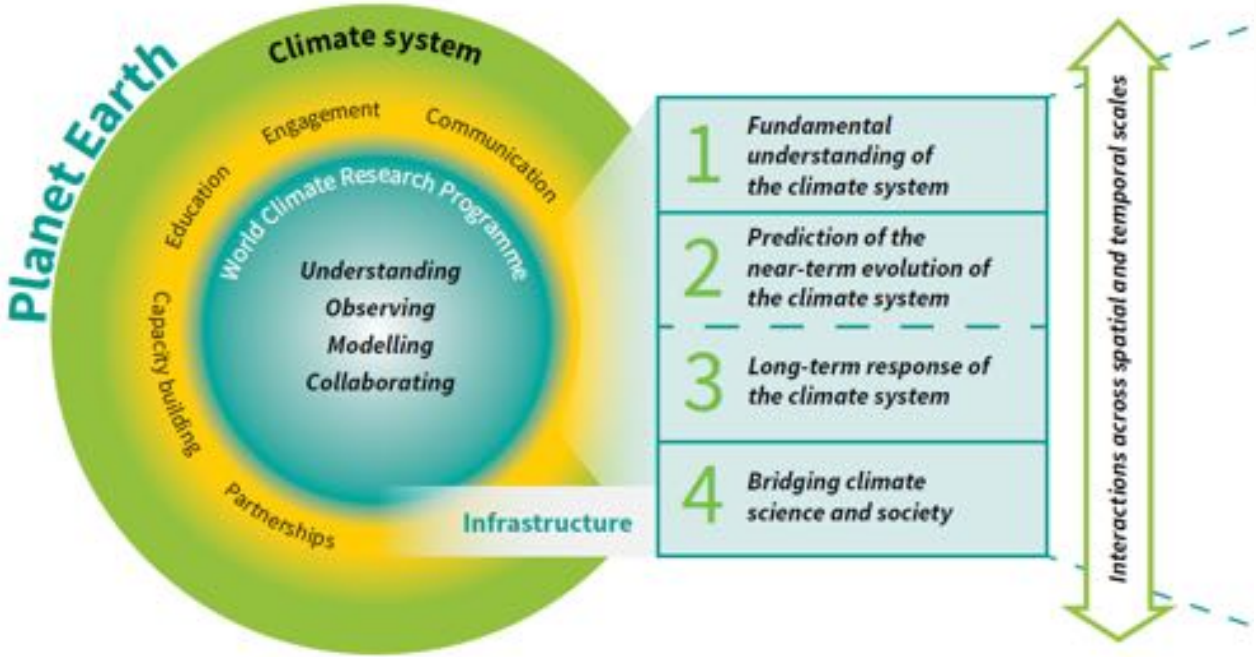
WMO Activities

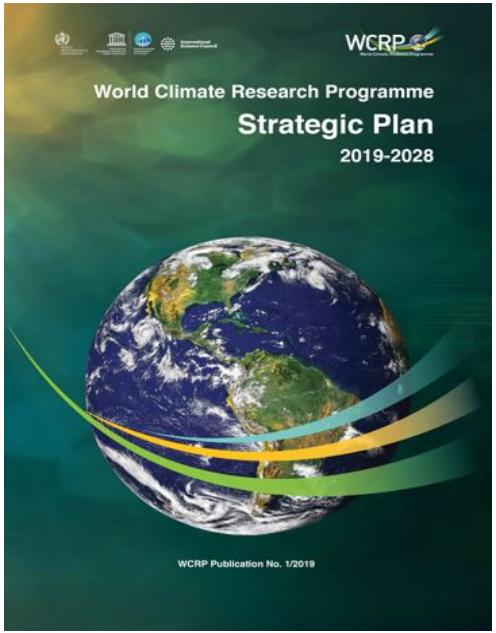
- The New WMO Strategic Plan
  - Being discussed at the ongoing WMO Congress (CG-18)
  - Objective 2.3 Enable access and use of numerical analysis and Earth system prediction products at all temporal and spatial scales from the WMO seamless Global Data Processing and Forecasting System
  - Objective 3.1 Advance scientific knowledge of the Earth system
- New Seamless Research Structure for WMO
- WMO Reform

Existing WCRP Working Groups

- **The Working Group on Coupled Modelling (WGCM) -** Foster the development and review of coupled climate models.
- **The Working Group on Subseasonal to Interdecadal Prediction (WGSIP) -** numerical experimentation for subseasonal-to-interdecadal variability and predictability, with an emphasis on assessing and improving predictions.
- **WCRP Coupled Model Intercomparison Project (CMIP) -** better understand past, present and future climate changes arising from natural, unforced variability or in response to changes in radiative forcing in a multi-model context.
- **The Working Group on Numerical Experimentation (WGNE) - f**ostering the development of atmospheric circulation models for use in weather, climate, water and environmental prediction on all time scales and diagnosing and resolving shortcomings.

WCRP Strategic Plan 2019 - 2028





https://www.wcrp-climate.org/wcrp-sp

WCRP Grand Challenge:
Near-Term Climate Prediction

1. To improve the quality of initialized decadal climate information and prediction;
2. To collect, collate, and synthesize prediction output and tailor information toward services that address stakeholder needs;
3. To develop processes to assess and communicate the degree of confidence and uncertainty in the predictions.

The primary goal is to produce a skillful and reliable forecast of the actual evolution of both externally forced and internally generated components of the climate system.

NTCP Key activities

- Promote international collaboration and intercomparison studies.
  - CMIP6 activities
  - Decadal Climate Prediction Project activities:
    - retrospective decadal climate predictions will be created and made available for analysis.
    - Ongoing production of real-time decadal predictions that would be translated into real-time, operational forecasts.

Towards operational predictions of the near-term climate
Kushnir et al, *Nature Climate Change* **9**, 94–101 (2019)

NTCP Key activities

- **Establishment of internationally agreed mechanisms to provide operational decadal predictions.**
  - Standards for WMO Global Producing Centers of Annual to Decadal Predictions (GPCs-ADCP).
  - Designating a WMO Lead Center for Annual to Decadal Climate Prediction (LC-ADCP) – UK Met Office: collects and provides hindcasts, forecasts and verification data from a number contributing centers worldwide.
  - WMO produced Global Seasonal Climate Update (pre-operational)

Towards operational predictions of the near-term climate
Kushnir et al, *Nature Climate Change* **9**, 94–101 (2019)

NTCP Key activities

- **Initiation and issuance of a yearly, real-time Global Annual to Decadal Climate Update** [within the framework of accredited WMO Global Producing Centres]
  - Synthesize the output from real-time predictions in a standard report that will include an overview of the current observed state of the climate system and the external forcing agents, as well as predicted time series of key indices and maps for selected climate variables.
  - An assessment of the skill and verification of previous predictions
  - Two current initiatives:
    1. UK Met Office multimodel decadal prediction exchange
    2. Max Planck Institute for Meteorology decadal prediction effort, MiKlip.

Towards operational predictions of the near-term climate
Kushnir et al, *Nature Climate Change* **9**, 94–101 (2019)

NTCP Key activities

- **Production of standards, verification methods and guidance for near-term predictions**
  - Amendments to the WMO 2017 *Manual on the Global Data Processing and Forecasting System* being decided upon at the WMO Congress - standards and protocols regarding the provision of decadal prediction by GPCs-ADCP and LC-ADCP

Towards operational predictions of the near-term climate
Kushnir et al, *Nature Climate Change* **9**, 94–101 (2019)

NTCP Key activities

- **Promote and provide the new NTCP information to society.**
  - NTCP provides a key building block to satisfy the existing need for a broad end-to-end prediction system
  - multiple centers producing near-term predictions will help in the characterization of forecast uncertainty and the determination of areas of agreement across predictions.
  - Identify prediction strengths and weaknesses and the appropriate degree of confidence in providing reliable guidance for prediction users.
  - Coordinate with the Global Framework for Climate Services (GFCS) to extend its services by adding NTCP to the seasonal-to-interannual predictions and century-long, anthropogenic climate change projections it currently uses to provides climate information = Highly Recommended Function of a WMO Regional Climate Center

Towards operational predictions of the near-term climate
Kushnir et al, *Nature Climate Change* **9**, 94–101 (2019)

Thank you for your attention

NTCP Grand Challenge
Research Goals of Objective 1

- Characterize and understand sources of decadal predictability; evaluate and improve simulation of decadal variability in global models; understand decadal variability in observations; and quantify prediction skill
- Improve methods of model initialization and specification of external forcing agents (in particular solar variability, aerosols and volcanoes)
- Reduce the impact of initialization shock, model drift and model biases
- Advance methods for drift, bias adjustment and downscaling necessary for region-specific, user relevant output.

NTCP Grand Challenge
Research Goals of Objective 2

- Explore ensemble hindcast and forecast outputs to examine the relationship between internal variability and externally forced variations and trends
- Determine how best to use ensemble forecast output to predict the risk of extreme events on timescales out to decadal
- Engage with users, national meteorological and hydrological services and WMO Commission for Basic Systems (CBS)-Commission for Climatology (CCl) to determine best presentation and dissemination methods.

NTCP Grand Challenge
Research Goals of Objective 3

- Use multi-model ensemble hindcasts and observations to improve quantification of uncertainty in collaboration with modelling centres and forecast providers
- Assess scientific opinion on the degree of confidence that scientists have in the forecasts
- Provide recommendations on what sort of information on quality and confidence should accompany forecasts provided to users.