WORLD CLIMATE RESEARCH PROGRAMME

42nd Session of the WCRP Joint Scientific Committee (JSC42)

WCRP Grand Challenge: Near Time Climate Prediction

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1. Highlights for JSC

- We have now met our original objectives to operationalise decadal prediction:
  - White paper Kushnir et al., Nat. Clim. Ch., 2019
  - WMO operational predictions: GPCs and Lead Centre
  - Global Annual to Decadal Climate Update

2. Future of the GC

- Now documenting applications of decadal prediction
- Finish at the end of 2021
- We think RIFS could take forward the regional use of decadal prediction information using WMO LC and CMIP6
- Legacy: operational decadal predictions + Global Annual to Decadal Climate Update + WMO Lead Centre
WMO Operational Annual to Decadal Predictions

WMO operational decadal predictions

The Met Office is a designated Lead Centre for Annual-to-Decadal Climate Prediction (LC-ADCP). The LC-ADCP collects and provides hindcasts, forecasts and verification data from a number contributing centres worldwide.

International effort

State of the science climate models

Climate predictions for next 5 years

www.wmolc-adcp.org

Global Annual to Decadal Climate Update

Target years: 2021 and 2021-2025

Executive Summary

This update presents a summary of annual to decadal predictions from the WMO designated Global Producing Centres and other contributing centres for the period 2021-2025. Latest predictions suggest that:

- Annual mean global (land and sea) mean near-surface temperature is likely to be at least 1°C warmer than pre-industrial levels (defined as the average over the years 1850-1900) in each of the coming 5 years and is very likely to be within the range 0.9 – 1.8°C
- It is about as likely as not (40% chance) that at least one of the next 5 years will be 1.5°C warmer than pre-industrial levels and the chance is increasing with time
- It is very unlikely (10% chance) that the five-year mean global near-surface temperature for 2021-2025 will be 1.5°C warmer than pre-industrial levels
- The chance of at least one year exceeding the current warmest year, 2016, in the next five years is 90%
- Over 2021-2025, almost all regions, except parts of the southern oceans and the North Atlantic are likely to be warmer than the recent past (defined as the 1981-2010 average)
- Over 2021-2025, high latitude regions and the Sahel are likely to be wetter than the recent past
- Over 2021-2023, there is an increased chance of more tropical cyclones in the Atlantic compared to the recent past
- In 2021, large land areas in the Northern Hemisphere are likely to be over 0.8°C warmer than the recent past
- In 2021, the Arctic (north of 60°N) is likely to have warmed by more than twice as much as the global mean compared to the recent past
- In 2021, southwestern North America is likely to be drier whereas the Sahel region and Australia are likely to be wetter than the recent past.
Climate predictions updated each year

⇒ Increasing chance of temporary 1.5 deg
⇒ Increased chance of wetter Sahel
⇒ Increased chance of Atlantic storms
Series of short talks:

**Finance:**
- Insurance - Atlantic storms with Willis (Doug Smith, Geoffrey Saville)
- Infrastructure/water management (Holger Pohlman, DWD)
- ENSO and Commodities (Vassili Kitsios, CSIRO)
- Hazards to real estate, banking and investment (Richenda Connell, David Carlin)

**Energy:**
- C3S and wind energy (Carlo Buontempo)
- Energy – ENEL, Italy and Spain (Panos Athanasiados)
- Power industry investment and planning (Francisco Laverón)

**Food Security:**
- Agriculture and wheat (Paco Doblas-Reyes)
- Viticulture, (Antonio Graca)
- Tokyo Marine and tropical cyclones (Masa Kimoto)
- Tuna and fishing industry (Alistair Hobday)
- Ecosystem Predictions (Daniela Matei, Mark Payne)

Followed by review paper: O’Kane et al., in preparation
Outstanding research issue: weak signal to noise ratio

Ensemble mean is highly correlated with obs ($r \sim 0.8$)
Should explain 60% of observed variability
Magnitude of ensemble mean variability is inconsistent with correlation

$=>$ Need for large ensembles until resolved

Smith et al. Nature, 2020
Summary

GC on Near Term Climate Prediction has met its main objectives:

- **White paper**: Kushnir et al., *Nature Climate Change*, 2019
- **Operational decadal predictions**: WMO operations, designated producing centres, regular activity
- **Global Annual to Decadal Climate Update**: issuing each year with WMO expert teams on climate services and operational predictions

Presented results at UNFCCC meeting this month on behalf of WMO

Current activity on applications
Outstanding research question on signal to noise ratio
Future use of predictions - RIFS

Continue to collect and provide real time predictions: