



# **WORLD CLIMATE RESEARCH PROGRAMME**

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

**WCRP Grand Challenge: Near Time Climate Prediction**

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# WCRP Grand Challenge: NTCP

## 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



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# 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.



### Global Producing Centres



### Contributing Centres

BCCR	GFDL	MPI	NRL
CERFACS	IPSL	MRI	Reading
CSIRO	LASG	NCAR	SMHI
DMI	MIROC		

[www.wmolc-adcp.org](http://www.wmolc-adcp.org)

International effort

State of the science climate models

Climate predictions for next 5 years

WORLD METEOROLOGICAL ORGANIZATION

## 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 2021-2025 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.



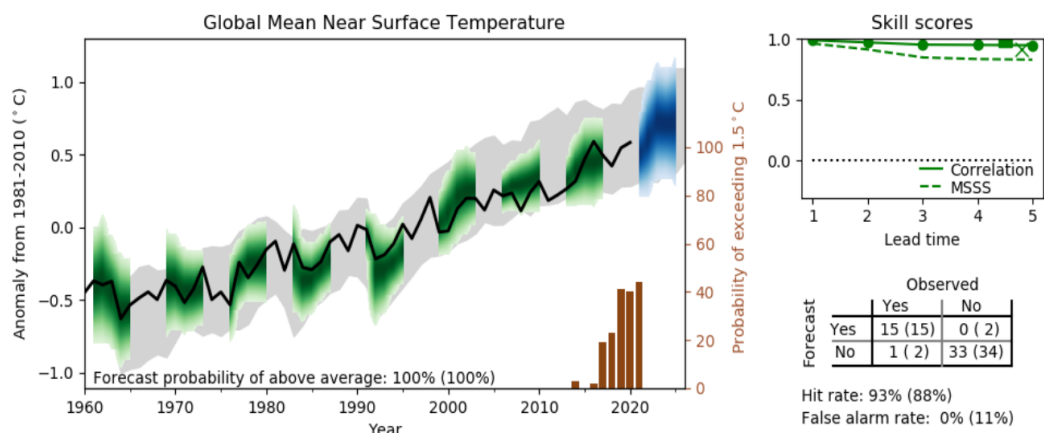
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# Global Annual to Decadal Climate Update

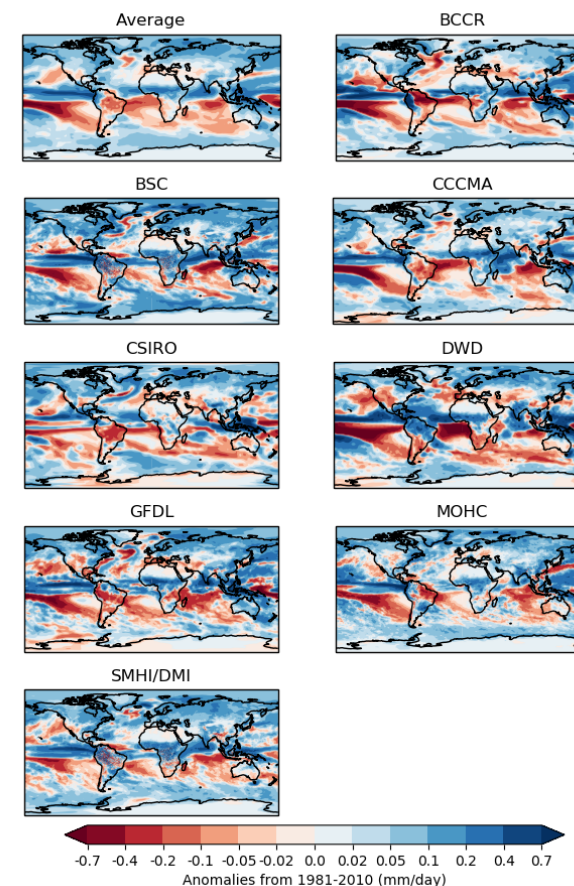
## Probability of temporary exceedance of 1.5°C



## Climate predictions updated each year

- ⇒ Increasing chance of *temporary* 1.5 deg
- ⇒ Increased chance of wetter Sahel
- ⇒ Increased chance of Atlantic storms

## 5 year rainfall predictions



# Documenting applications of decadal prediction

## 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**

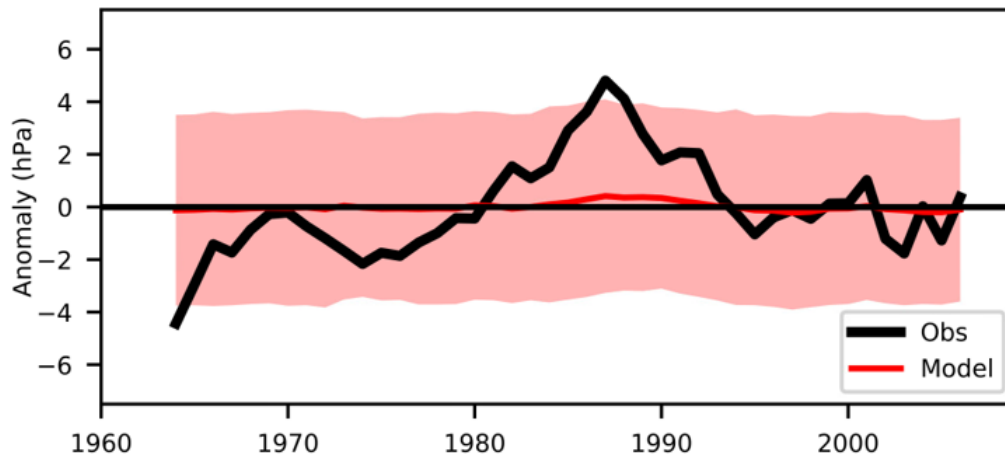


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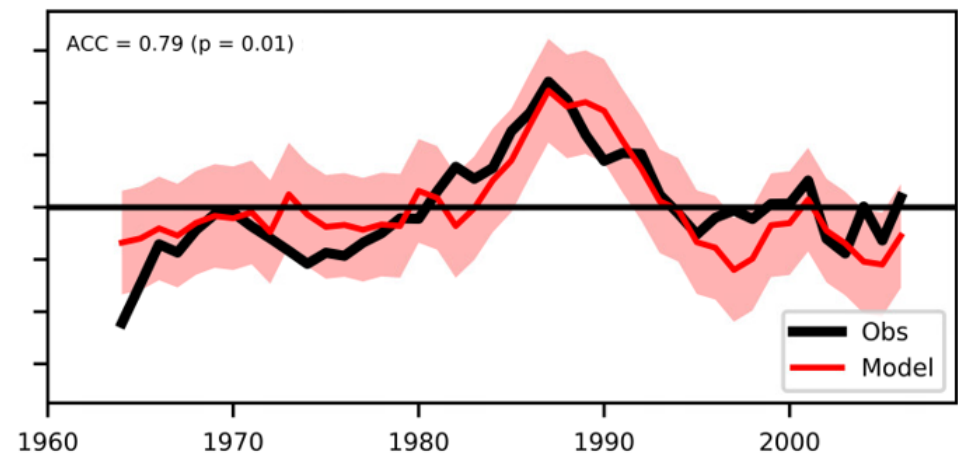


# Outstanding research issue: weak signal to noise ratio

NAO : Forecast years 2 to 9



Variance adjusted



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



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# 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:**

**WMO Lead Centre <http://www.wmolc-adcp.org/>**



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