Met Office
Hadley Centre

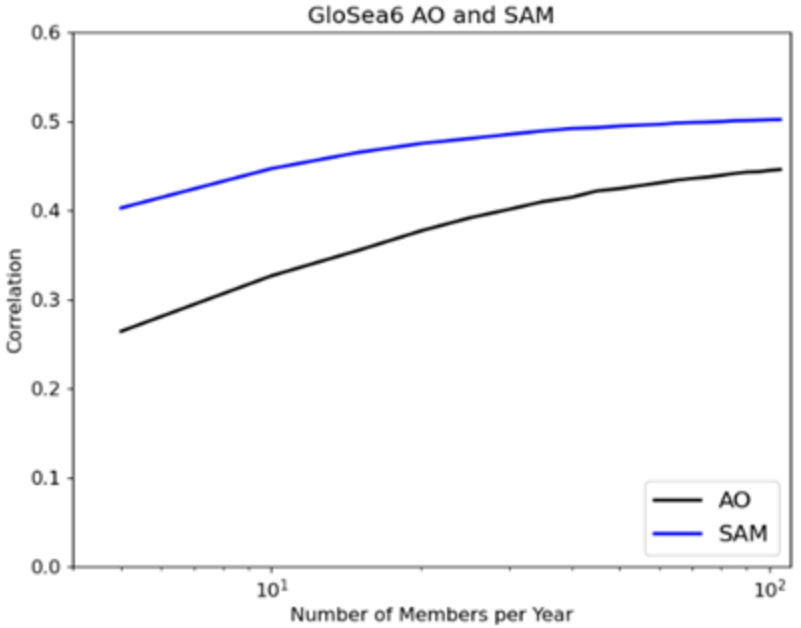
Exeter-GPC

Seasonal Predictions & Annual-to-Decadal Predictions at the Met Office in the UK

www.metoffice.gov.uk

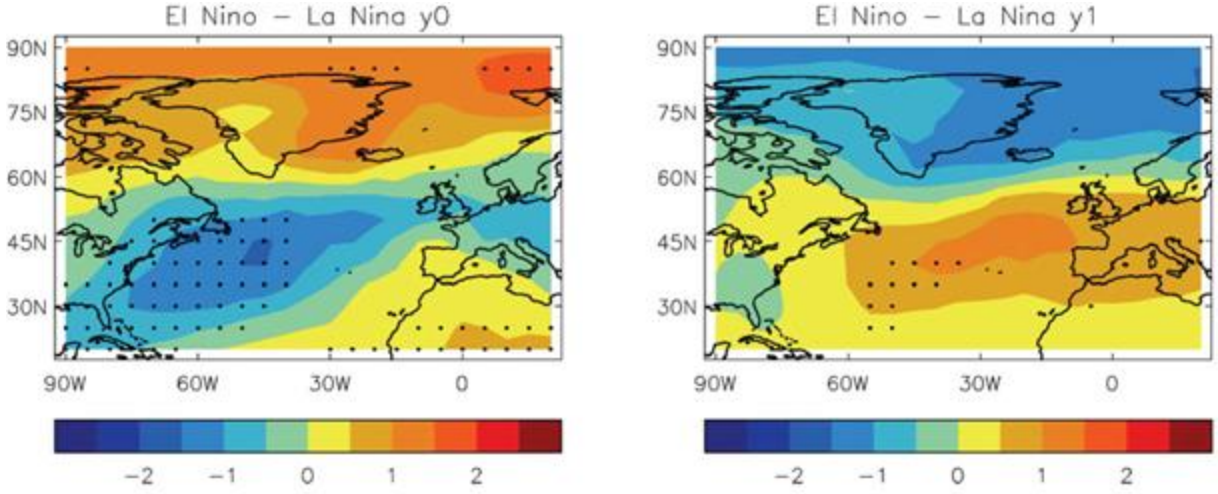
GloSea6: Large Ensembles for seasonal forecasting

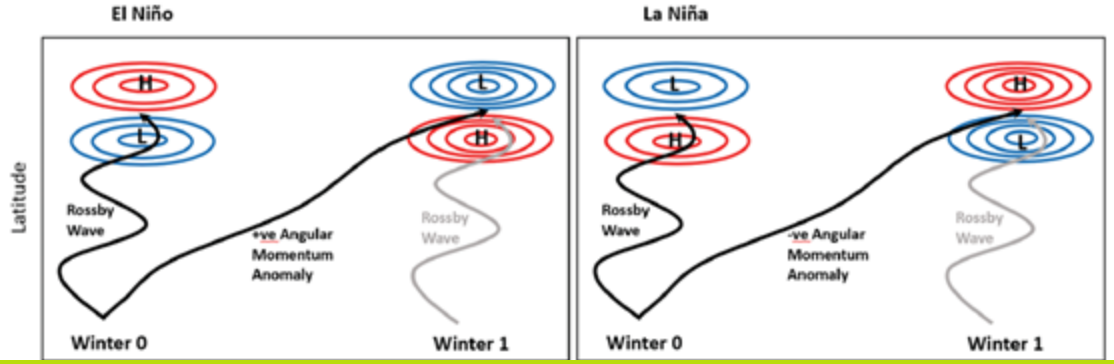
- MO plans to implement a 100 member seasonal forecast ensemble in 2025
  - Increases skill
  - Reduces uncertainty in bias correction
  - Supports ‘UNprecedented Simulated Extremes using Ensembles’ (UNSEEN)



Winter skill from the tropical Pacific

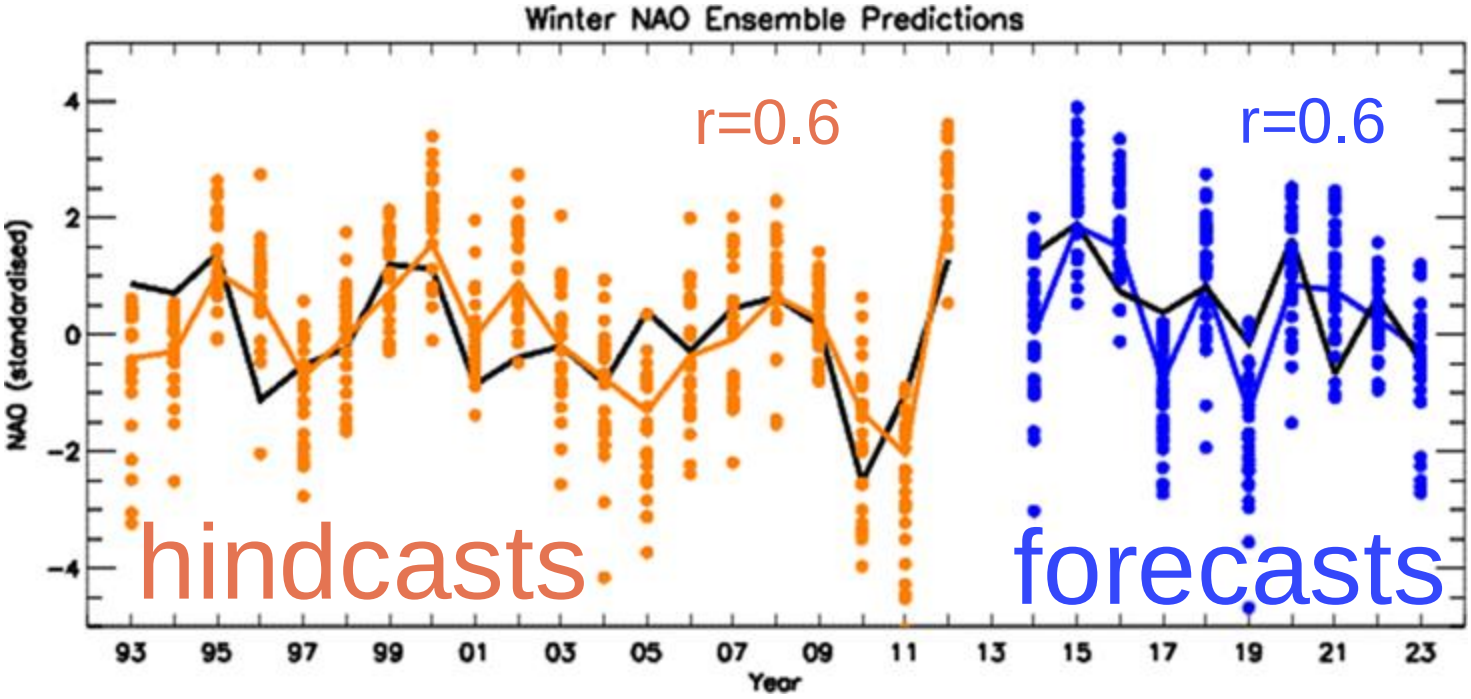
- There is a known connection in the same winter
- There appears to be a response in the following winter as well
- Has opposite sign
- Possible explanation is poleward-migrating atmospheric angular-momentum anomalies
- Will help winter prediction





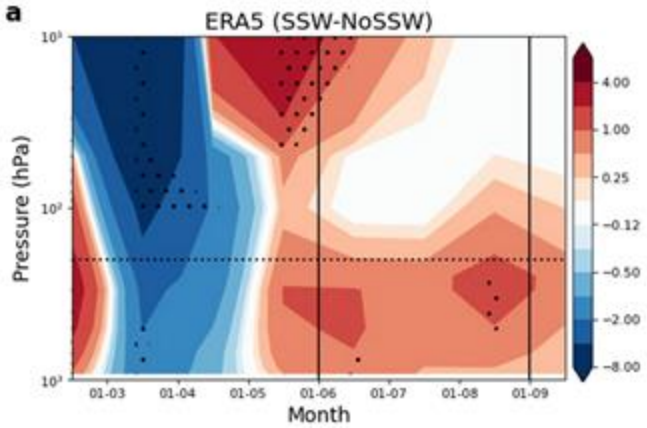
Scaife et al (2024)

10 years of skillful NAO forecasts

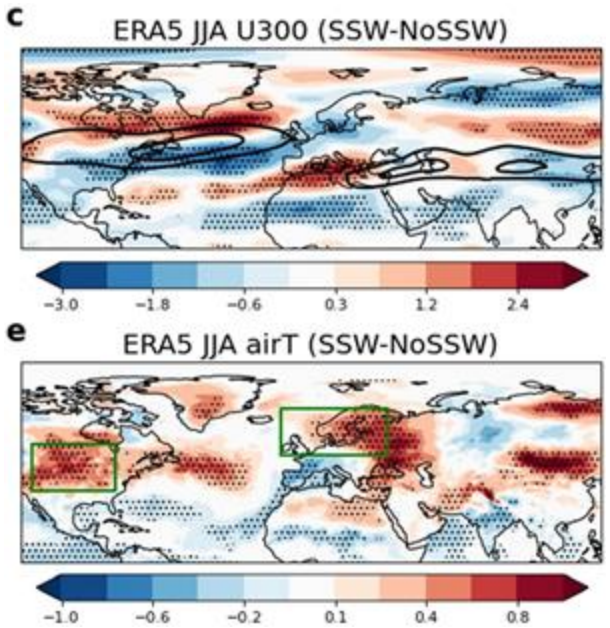


Stringer et al (2024)

Window of opportunity for summer forecasts



- Winters that end with a strong Sudden Stratospheric Warming (SSW)
- Unusually strong westerlies follow and propagate down to surface
- Persistence through summer



- In June-August (JJA) jet shifts North
- Consistent with Summer NAO
- Warm summer over North America and Northern Europe
- Polar vortex in May predicts summer conditions
- Predicting May vortex index better than predicting temperature directly
- Large ensembles needed

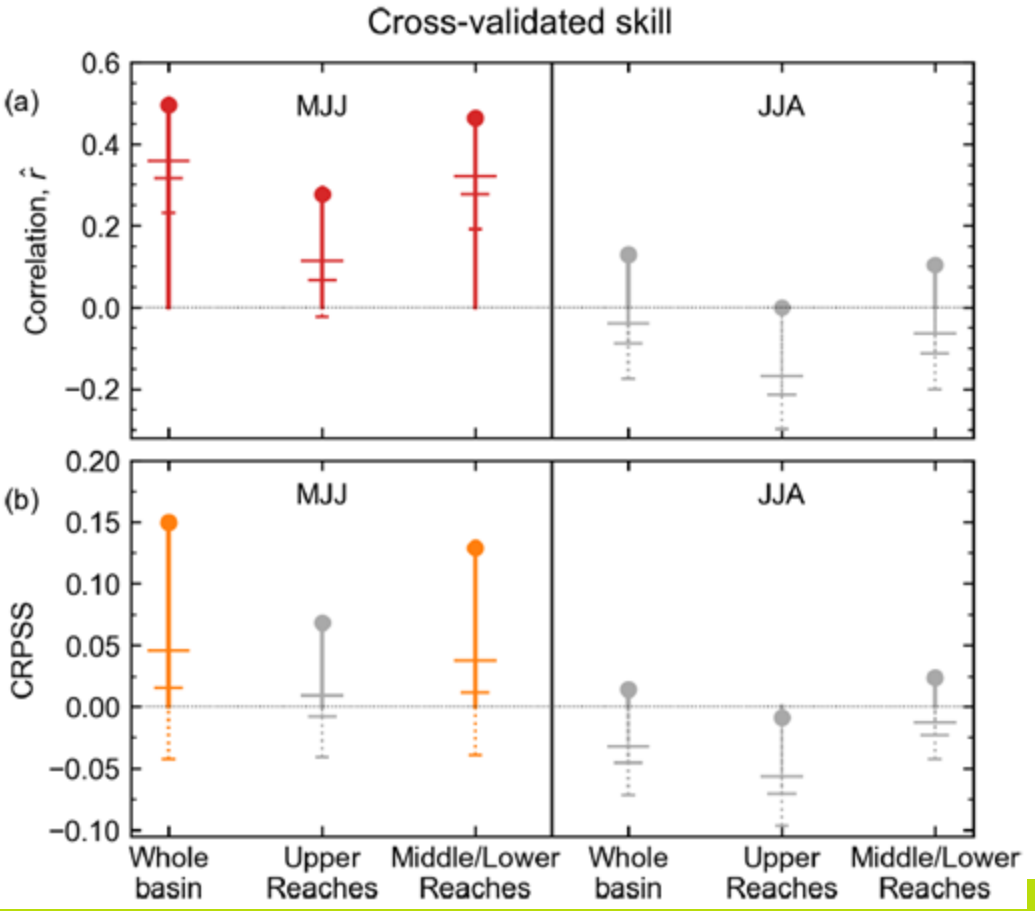
Dunstone et al (2023b)

Decadal Prediction System version 4

- Hermanson et al (2023): ocean re-analysis used to initialise hindcasts & forecasts
  - shows large uncertainties in North Atlantic circulation
- Quadrupling of ensemble size to 40 members
  - allows the prediction signals to be more clearly distinguishable from noise
- New decadal prediction system based on Global Configuration 5 of HadGEM3-MM
  - Incorporate the latest model improvements, including new sea ice model
- Interannual forecasts: Making use of 2-year ENSO predictability
  - 1980-2022; initialized May & Nov; 28 months; 40 members

Forecasts of Summer Rainfall in the Yangtze River Basin from Novemb

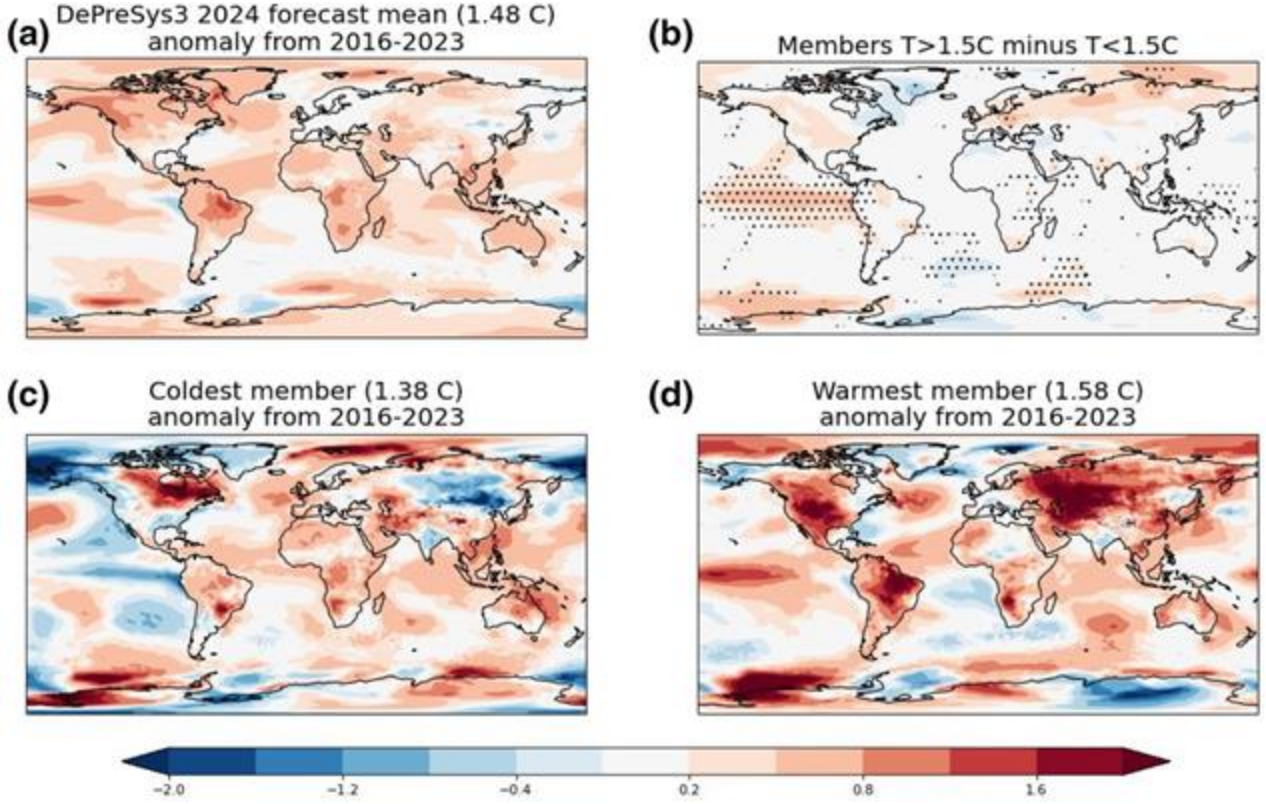
- Predictions from November for the following summer (7 months lead time)
- Allows Three Gorges Dam to manage resources
- Early summer only
- As existing seasonal forecasts, uses 850 hPa zonal wind index, not precipitation.



Bett et al (2023)

2024 the first year that global temperature exceeds 1.5°C?

- Predictions of surface temperature from end of 2023
- 2024 will likely (76% chance) be a new record year with a 1-in-3 chance of exceeding 1.5°C
- Most likely: 1.48°C
- Interval: 1.39 to 1.56°C
- Warmer members have warmer tropical Pacific and Eurasian continent



Dunstone et al (2023a)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WMO Lead Centre for Annual-to-Decadal Climate Prediction

www.wmolc-adcp.org

- Hosted at the Met Office
- Started as an informal exchange of annual-to-decadal predictions among modelling centres around the world in 2010 (Smith et al. 2013)
- Today: four Global Producing Centres (BSC, CCCMA, DWD, Met Office) supported by ~10 Contributing Centres
- The Lead Centre:
  - Prepares forecast fields annually from the data collected
  - Prepares verification statistics of the multi-model and individual models
  - Makes available up-to-date information on the decadal prediction systems
  - Creates Global Annual to Decadal Climate Update (consensus forecast)

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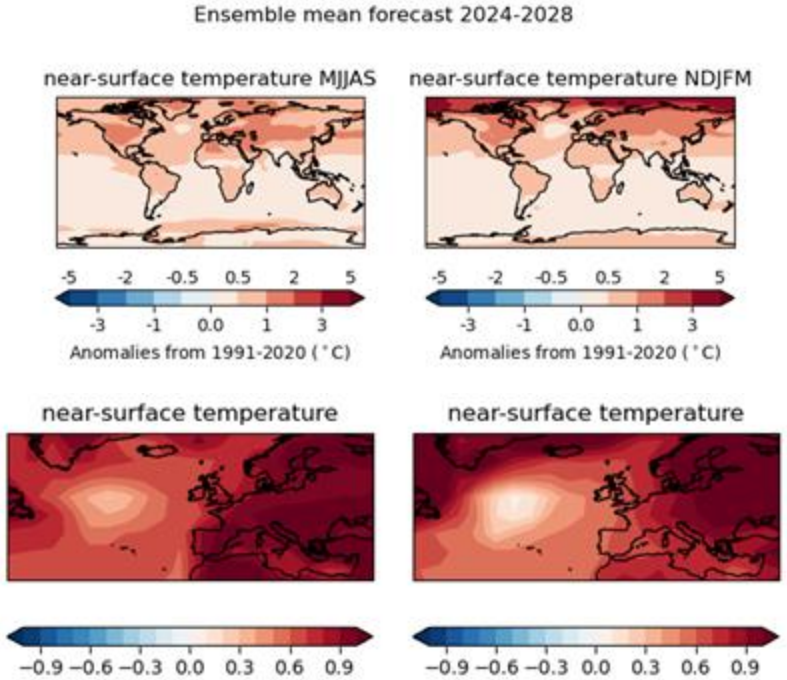
WMO Global Annual to Decadal Climate Update

- Issued annually by WMO Lead Centre for Annual to Decadal Climate Prediction, hosted by the Met Office
- Contributions from centres around the world: Spain, Canada, Germany, UK, Italy, Norway, USA, China, Japan
- Complements WMO Global State of the Climate
- Press release from WMO with pickup by nearly all major news outlets with millions of subscribers in multiple languages
- Mentioned by UN Secretary-General in climate speech
- More about this climate service: Hermanson et al, 2022, BAMS

The Lead Centre for Annual-to-Decadal Climate Prediction collects and provides hindcasts, forecasts and verification data from a number of contributing centres worldwide.

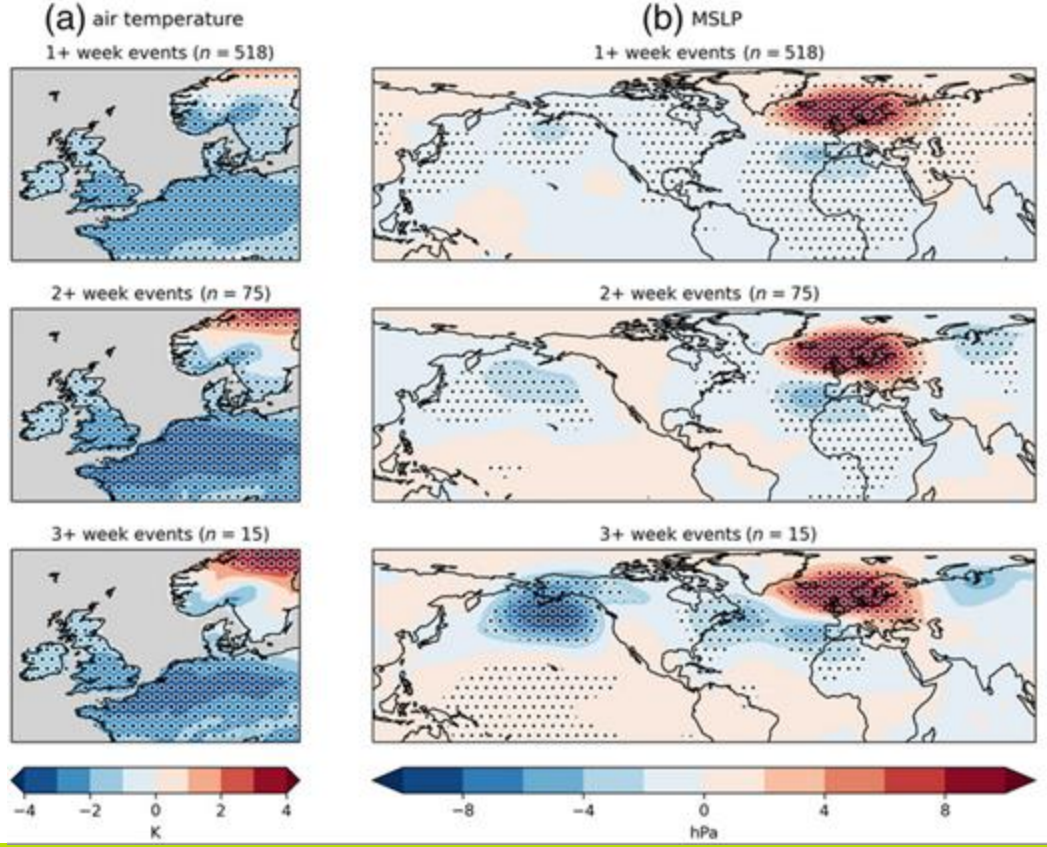
Thank you!

Questions?



Potential for winter wind droughts

- UNSEEN methodology using decadal hindcasts: Kay et al (2023, ASL)
- Potential for more and longer UK wind droughts than seen in observations (for last 60 winters)
- Associated with high pressure and cold weather – problem for renewables
- Long wind droughts may be linked to tropical Pacific (ENSO)



Seasonal Predictability of the East Atlantic Pattern in Late Autumn and Early Winter

- Sea-level pressure skill evolves through seasons
- Seasonal forecasts from IRI data base (8 systems)
- NDJ high EAP & low NAO skill
- DJF low EAP & high NAO skill
- Reflects evolution of ENSO teleconnections thru winter
- Model tropical–extratropical teleconnections are weak compared to observations
- Thornton et al (2022, GRL)