Summary Assessment of Seasonal Forecasts for November 2019 to January 2020

Executive Summary

The general indication from forecast models and current climate signals is that a relatively mild and wet November-January is likely.

- **Storms:** Indications are that the frequency of storms moving into the UK from the North Atlantic will most likely be around or above average during the three-month period.

- **Precipitation:** UK precipitation totals will most likely be around or higher than the long-term seasonal average.

- **Temperature:** UK temperatures will most likely be warmer than the long-term seasonal average.

- **Long-range Models:** Numerical Weather Prediction models strongly favour above average temperatures and generally favour above average precipitation totals.

- **Climate Signals:** There are few dominant climate signals at present (e.g. ENSO is neutral) but the North Atlantic is relatively warm in the vicinity of the UK and the QBO and Polar Vortex are both in states consistent with an increased chance of mild, wet and stormy weather.

Further monthly updates will continue to be issued through the season.

Seasonal Forecast Assessment Summary

In order to produce this seasonal forecast assessment, the outputs of various seasonal forecast models have been analysed, along with some key climate indicators. In terms of the seasonal forecast models, EuroTempest has chosen to focus on precipitation and temperature as all agencies used in this report provide forecasts for both of these parameters, enabling a comparison across all agencies. Owing to the relationship between the occurrence of North Atlantic storms and mild and wet conditions, temperature and precipitation have been used as a proxy for storminess, as forecast models do not provide a direct measurement of storm occurrence. Similarly, despite the relationship between most climate signals and UK weather being relatively weak, the status of these signals can often be suggestive of which weather types may be more likely to prevail, and so can be used to indicate trends in temperature, precipitation and storminess.

Climate Models Summary

Eight different seasonal forecasts derived from Numerical Weather Prediction (NWP) models are discussed in section 3.1. The implications of these models for UK weather during NDJ 2019 have been interpreted as follows:

Agency	PRECIPITATION		TEMPERATURE
UKMO	Above average		Above average
CFS	Around or above average		Above average
JAMSTEC	Below average		Below average
CPTEC	Around average		Around or above average
Météo France	Above average		Above average
SAWS	Above average		Above average
KMA	Above average		Above average
APCC	Above average		Above average

Climate Signals Summary

The current and projected states of available climate signals are summarised in section 3.2, for more information on the characteristics of these signals please see the EuroTempest climate signals factsheet. The impacts of these signals on UK weather during NDJ 2019 have been interpreted as follows:

Signal	PRECIPITATION		TEMPERATURE
NAO	No dominant signal		No dominant signal
AO	No dominant signal		No dominant signal
PV	Above average		Above average
QBO	Above average		Above average
ENSO	No dominant signal		No dominant signal
MJO	No dominant signal		No dominant signal
North Atlantic SST	Above average		Above average
Eurasian snow cover	Below average		Below average
Arctic sea ice extent	Below average		Below average

1. How stormy has the season so far been?

The table below shows the number of 'windy days' that occur on average each month through the UK winter windstorm season. It defines a 'windy day' in three different ways based on the percentage of UK weather observation stations that record maximum gusts of 45mph or higher.

% stations >45mph	Number of "Windy Days"									
	Average Season								2019/2020 Season	
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	**TOTAL**	Sep	Oct
>10%	9	16	20	21	21	15	15	117	10	17
>20%	2	5	9	11	10	7	6	50	3	2
>50%	0	0	1	2	2	2	1	8	0	0

October 2019 saw 17 days where more than 10% of stations reported gusts of at least 45mph and no days where more than 50% of stations did so, which is line with the average for October. However, there were just 2 days where more than 20% of stations reported gusts of 45mph or more compared to the long-term average for October of 5 such days.

Looking forward, an average November-January is represented by a total of 62 days on which more than 10% of weather observation stations report maximum wind gusts of at least 45mph, 30 days where more than 20% of stations report such gusts, and 5 days with more than 50% of stations reporting 45mph max gusts.

We will be monitoring storminess through the season and will continue to include the number of windy days observed to date in future monthly reports.

2. Extended Outlook

The following forecast is based on both the output of numerical weather prediction models and climate signals with a shorter-term impact.

2.1 Early-Mid November

Weather models suggest that the next few weeks will likely be characterised by unsettled conditions. However, indications are that the AO is likely to become increasingly negative over the next few weeks while the NAO is most likely to remain in a near neutral phase. This suggests an increasing chance that conditions could become more settled and colder towards the end of the next few weeks.

2.2 Remainder of November into early December

There is generally no clear signal and confidence in forecasts for this period is low at present. There is no strong indication towards any particular outcome but neither is there any strong indication that conditions during this two-week period will be markedly different from the average conditions expected for the 3-month period as a whole. The climate signals (see section 3.2) are weakly consistent with milder and wetter weather.

3. Seasonal Forecast Assessment

3.1 Models

The general indication from the forecast models is that a relatively mild and wet three-month period is likely.

The majority of models favour above average precipitation and temperature and only one of the forecast models favours a below average season for both parameters. The signal is strongest for temperature, with many models suggesting that the chance of a warmer than average winter is >50% - i.e. it is not only the favoured outcome but also more likely than the two alternative outcomes (of an average or a colder than average winter) combined. The forecast models are generally slightly less definitive about precipitation, with many suggesting the probability of a wet season is only marginally greater than the probability of an average season. However, the majority of forecast models generally suggest that the probability of a relatively dry season is low (<20%).

It should be noted that the forecast models generally define "average" conditions as the mean of the last 30 years or so. The generally increasing trend of warmer conditions, as a result of climate change, makes it more likely that temperatures will exceed these historical averages. Therefore, temperatures this NDJ period that are colder than those that the UK has experienced within the last few years could still be above "average" by this definition.

Models used:
- **UKMO**: UK Met Office
- **CFS:** The US National Centers for Environmental Prediction Climate Forecast System
- **JAMSTEC:** Japan Agency for Marine-Earth Science and Technology
- **CPTEC:** Center for Weather Forecasts and Climate Studies (Brazil)
- **Météo-France:** National Met Agency of France
- **SAWS:** South African Weather Services
- **KMA:** Korea Meteorological Administration
- **APCC:** APEC Climate Center (South Korea)

3.2 Climate Signals (see climate signals factsheet for more information)

The climate signals are currently more ambiguous than the forecast models. Many are in a weak or neutral state. It is also generally the case that most of the climate signals exert most influence on the UK in mid-winter than during autumn and other times of the year. Nevertheless, there is a suggestion among the climate signals that milder, wetter and windier conditions may be more likely than cooler, drier and calmer weather, which is at least consistent with the forecast models. The combination of warm sea surface temperatures close to the UK, a strong polar vortex, and a favourable phase of the QBO contributes to a slightly increased likelihood of a positive NAO during the NDJ period, which in turn indicates a slightly increased likelihood of mild, wet and windy weather. Despite there being above average Eurasian snow cover and below average Arctic sea ice there is no strong signal for a cold and dry season, as no other climate signals are expected to be in a phase which is likely to reinforce the already weak relationship between Eurasian snow cover / Arctic sea ice and UK weather. In particular, the strong polar vortex is expected to reduce the likelihood of very cold snaps during the winter months.

NAO: North Atlantic Oscillation
Current State: Slightly negative
Projected State: Expected to be changeable but generally close to neutral.
Implications for UK weather: Slightly increased chance of wet and windy conditions while in a positive phase.

AO: Arctic Oscillation
Current State: Weakly negative
Projected State: Expected to remain near neutral, with a slight preference for a weakly positive phase through much of the three-month period.
Implications for UK weather: Slightly increased chance of wet and windy conditions while in a positive phase.

PV: Polar Vortex
Current State: Strong
Projected State: Expected to remain strong
Implications for UK weather: Potential for warmer and wetter conditions and reduced likelihood of very cold snaps when the polar vortex is strong.

QBO: Quasi-Biennial Oscillation
Current State: Westerly phase
Projected State: Westerly
Implications for UK weather: Increased chance of mild, wet and stormy weather.

ENSO: El Nino Southern Oscillation
Current State: Neutral
Projected State: ENSO is expected to remain in a neutral or near-neutral state through the NDJ period. A distinct El Niño or La Niña event is unlikely.
Implications for UK weather: ENSO is not currently expected to have much effect on the UK weather over the coming three months.

MJO: Madden Julian Oscillation
Current State: The MJO is currently weak and not well defined.
Projected State: No consistent timescale for the progression through the phases.
Implications for UK weather: The MJO is not currently providing any indication of trends in UK weather over the coming 3 months.

North Atlantic SST
Current State: Warmer than average across mid-latitudes and below average across high-latitudes.
Projected State: This pattern is expected to persist
Implications for UK weather: Increased likelihood of positive NAO, suggesting an increased chance of milder, wetter and stormier periods.

Eurasian Snow Cover and Arctic Sea Ice Extent
Current State: Eurasian snow cover is above average, Arctic sea ice extent is below normal.
Projected State: Arctic sea ice is expected to remain below normal.
Implications for UK weather: Slightly increased likelihood of colder and drier periods.

Appendices

Seasonal Forecast Assessment - Method

In order to have any confidence in whether a season will likely turn out as forecast (by any agency) it is necessary to consider:

a. whether there is a strong indication in any given forecast towards conditions for the coming season which are different from what might be expected from an average season based on the long term historical record
b. consistency across a range of available forecasts

In assessing the outlook for the UK, EuroTempest has taken account of forecasts produced by WMO designated global producing centres for long-range forecasts, these are either National Meteorological Agencies or other meteorological centres. These centres are listed in the "Seasonal Forecast Assessment – Sources" section below.

EuroTempest has chosen to focus on precipitation and temperature as all agencies used in this report provide forecasts for both of these parameters, enabling a comparison across all agencies. Owing to the relationship between the occurrence of North Atlantic storms and mild and wet conditions, temperature and precipitation have been used as a proxy for storminess, as forecast models do not provide a direct measurement of storm occurrence.

No two agencies present their forecasts in exactly the same way. Some present forecasts in terms of probabilities – e.g. the probabilities of the upcoming period being in the top third (above average), middle third (average) or bottom third (below average) of historical periods in terms of observed mean precipitation or temperature.

Other agencies present forecasts in terms of anomalies - i.e. the expected difference in the mean precipitation or temperature over the coming season from what would be expected from an average period based on the historical record. Forecasts using this method are generally either stated as being above or below the average.

For example the probability of above average precipitation should be considered against the "climatological" chance of an above average period. This is 1 in 3, or around 33%, because any period will fall in either the top third (above average), middle third (average), or bottom third (below average).

It should be noted that these agencies generally define "average" conditions as the mean of the last 30 years or so. The generally increasing trend of warmer conditions as a result of climate change makes it more likely that temperatures will exceed these historical averages. Therefore, temperatures this season that are colder than those that the UK has experienced within the last few years could still be above "average" by this definition.

Also, the resolution of the forecasts (both spatial and in terms of the forecast parameter) differs between agencies. As such, absolute direct comparisons are not possible. EuroTempest has assessed each of the forecasts and summarised its conclusions in the summary tables. The entries in the table represent EuroTempest's standardised interpretation (applied to the UK) of the forecasts provided by each agency and do not necessarily represent a specific forecast for the UK by each agency.

It is also important to note that all agencies advise treating seasonal forecasts with caution – e.g. the UKMO seasonal forecast website states "Raw data are displayed for use by international meteorological centres. This does not constitute a seasonal forecast for a given location."

In assessing the outlook for the UK winter season EuroTempest has taken account of forecasts produced by eight agencies. These are either National Meteorological Agencies or other meteorological organisations. All eight of these agencies/organisations are World Meteorological Organization (WMO) designated global producing centres for long-range forecasts.
(http://www.wmo.int/pages/prog/wcp/wcasp/gpc/gpc.php)

UK Met Office (UKMO)
http://www.metoffice.gov.uk/research/climate/seasonal-to-decadal/gpc-outlooks/glob-seas-prob

The US National Centers for Environmental Prediction Climate Forecast System (CFS)
http://www.cpc.ncep.noaa.gov/products/people/wwang/cfsv2fcst/

Japan Agency for Marine-Earth Science and Technology (JAMSTEC)
http://www.jamstec.go.jp/frcgc/research/d1/iod/e/seasonal/outlook.html

Center for Weather Forecasts and Climate Studies (CPTEC) - Brazil
http://clima1.cptec.inpe.br/gpc/pt

Météo-France
http://www.meteofrance.com/accueil/previsions-saisonnieres

South African Weather Services (SAWS)
http://www.weathersa.co.za/component/content/article/2-uncategorised/179-long-range-forecast?Itemid=168

Korea Meteorological Administration (KMA)
http://www.wmolc.org/~GPC_Seoul/

APEC Climate Center (APCC) – South Korea
http://www.apcc21.net/ser/outlook.do?lang=en