SUMMARY ASSESSMENT OF SEASONAL FORECASTS FOR EUROPE

DECEMBER 2023 AND JANUARY, FEBRUARY 2024

Executive Summary

There are indications, particularly from seasonal forecast models, of an enhanced likelihood of wetter than average conditions across Europe for December, January, and February as a whole. In addition, both climate models and climate signals suggest there is an increased potential for this season to be colder than recent years. However, climate signals in particular suggest the likelihood of variability and change through the season: periods of both wet and windy weather and cold, dry and calm weather are likely at different times throughout the three-month period.

Storm Events

Current climate signals and historical analogues do not provide any particularly strong or unambiguous indications regarding the likelihood of significant windstorm activity. There is little evidence to suggest that a particularly active season is any more likely than normal.

Precipitation

Seasonal forecast models are generally consistent in suggesting an increased likelihood of above average precipitation across Europe for the three-month period as a whole, although there is less consistency for southern Europe. Climate signals suggest an increasing potential for drier conditions across northern Europe and Scandinavia from early next year.

Temperature

Temperatures are still likely to be warmer than the long-term climatological average across Europe; however, there are indications from seasonal forecast models that temperatures could be cooler than they have been in recent winters. This is reasonably consistent with the indication from some climate signals and historical analogues that colder conditions (than in recent winters) could become more likely from the end of the year.

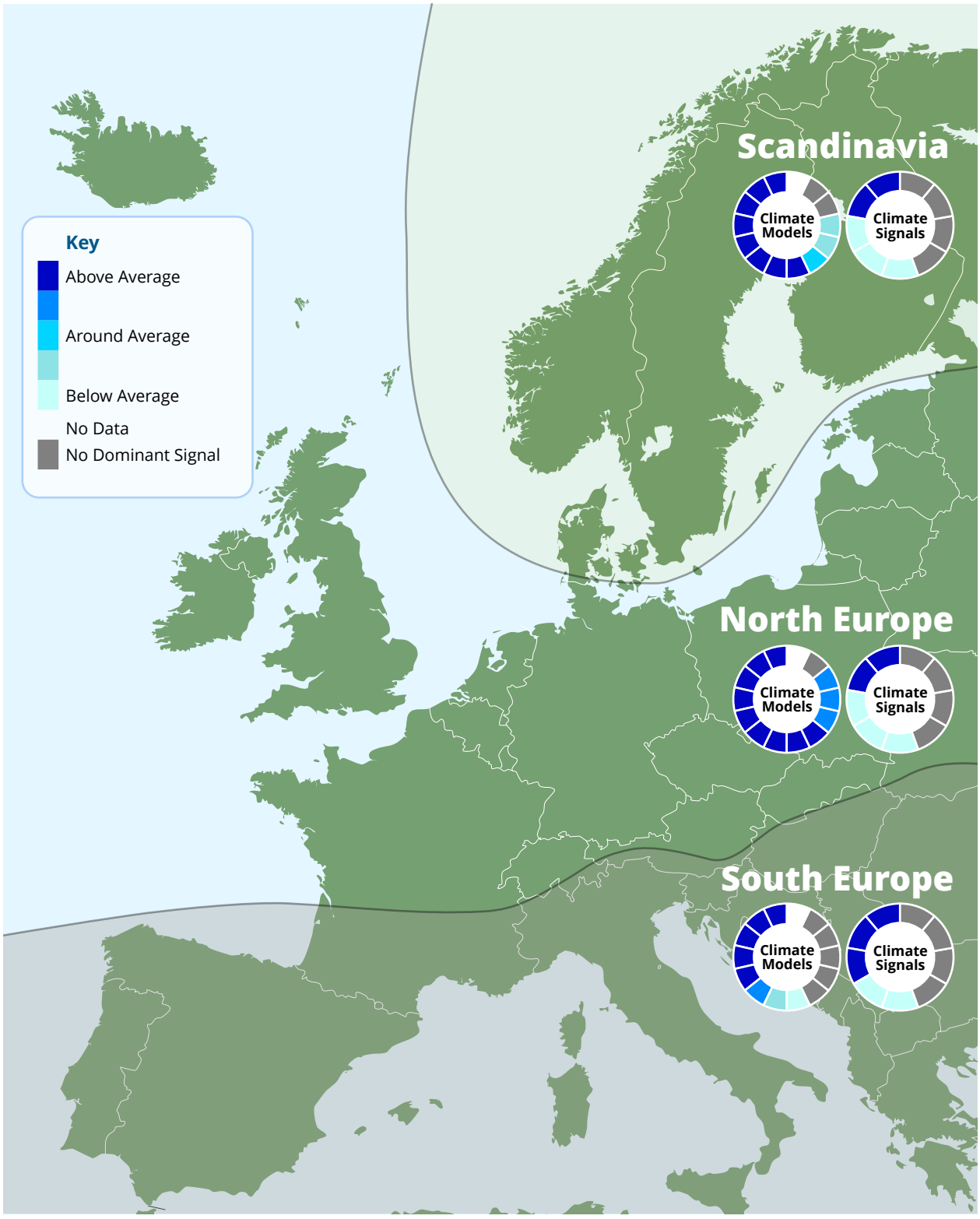
Westerly Winds

There is no clear consensus between seasonal forecast models on the likely strength of the westerly winds across Europe, although more of them tend to suggest an increased likelihood of stronger winds than do the opposite. Climate signals suggest that some reduction in the strength of westerly winds across northern Europe and Scandinavia is possible from early next year.

This report is an early indication of weather conditions across Europe during Dec 2023 - Feb 2024. The final EuroTempest Seasonal Forecast Assessment for the 2023-24 winter season will be issued in January 2024.

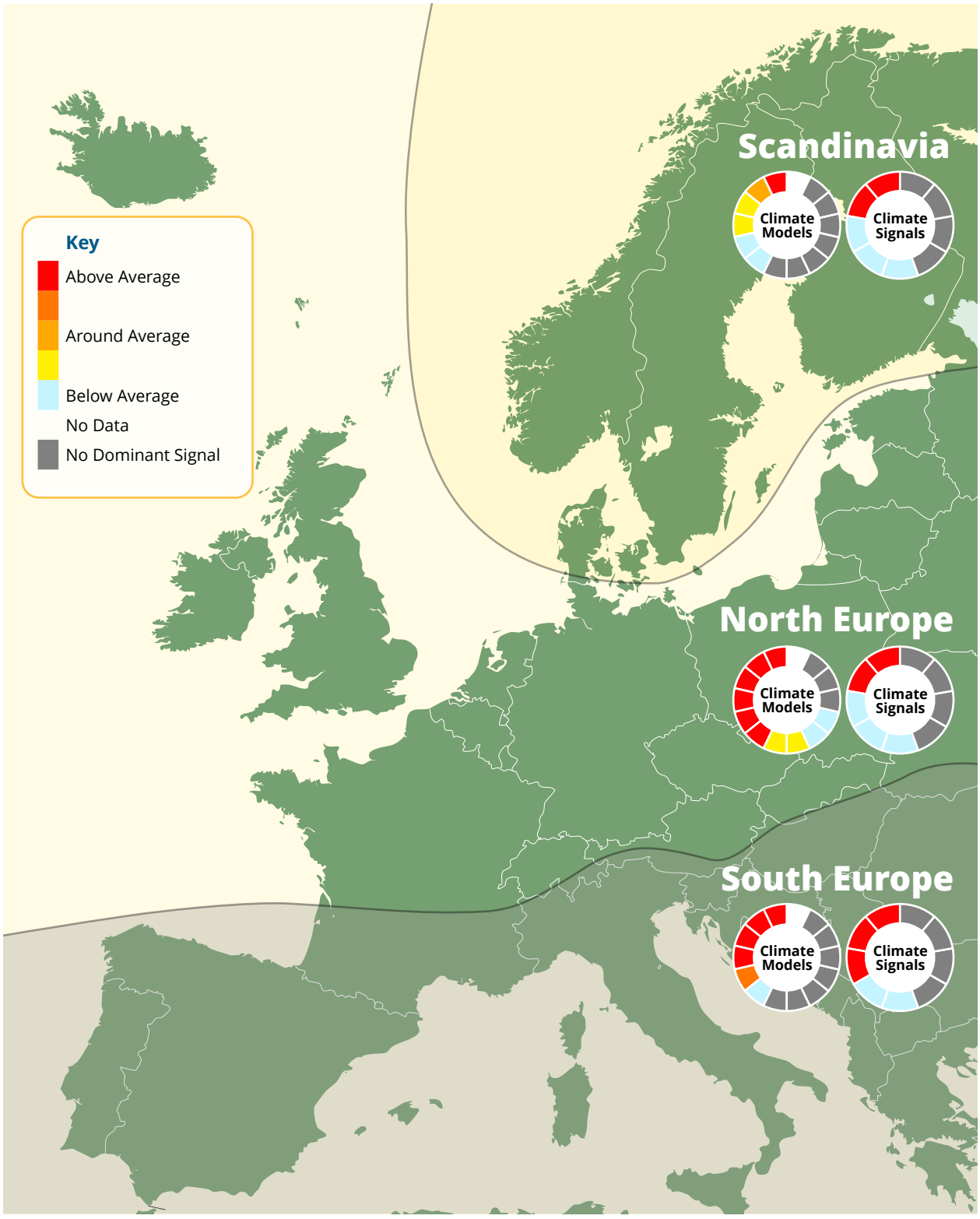
Euro Tempest

Assessment Summary – Precipitation
December 2023 and January, February 2024



Euro Tempest

Assessment Summary – Westerly Winds
December 2023 and January, February 2024



Extended Outlook

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

Next few weeks

Settled conditions are likely through the latter half of this week across much of Europe, except across parts of southern Europe where some wet weather is possible across the weekend. Some further wet and windy weather is possible from next week across northern Europe and then spreading into parts of central Europe.

Next Month

There is an increasing likelihood of spells of colder, calmer and drier weather across northern Europe and Scandinavia into the New Year, although spells of wetter, milder and windier weather may well continue for a time in early January and cannot be ruled out further into the year. The opposite is true of southern Europe, where there is a greater potential for warmer, wetter and potentially stormier conditions than is typical.

Seasonal Forecast Assessment

Climate Models Summary

While there is some variability between the climate models they are generally consistent in suggesting an enhanced likelihood of wetter than average conditions across northern Europe and Scandinavia for December 2023 to February 2024 (DJF). The signal is weaker for southern Europe, but conditions are still more likely to be wetter than average than they are to be drier.

Weaker winds across Scandinavia and stronger winds across southern Europe are present in more models than the reverse; nevertheless, the majority of models have no dominant signal for the strength of the westerly winds across Europe during the DJF period. While El Niño increases the likelihood of stronger than normal westerlies in the autumn and early winter it tends to make weaker than normal westerly winds more likely in late winter. The lack of an overall signal from the climate models is consistent with this as the presence of El Niño would tend to suggest a switch in the relative strength of westerly winds between December and February. ENSO and its influence are discussed in more detail in the next section of this report.

The seasonal forecast models still suggest that above average temperatures are likely across DJF; however, this likelihood is reduced in the models compared to recent years, especially across northern Europe and Scandinavia. This suggests that there is an enhanced likelihood during this DJF period of Europe experiencing temperatures lower than have been experienced in recent years. It should be noted that “average” conditions are generally defined as the mean of the last 30 years or so. The generally increasing trend of warmer conditions associated with climate change makes it more likely that temperatures now will exceed these historical averages. Colder winters, relative to recent years, could still be above average relative to the longer term historical 30-year average.

Climate Signals

In terms of their influence on European weather in December the main global climate signals of ENSO and the QBO are currently in “competing” phases. The ENSO El Niño phase currently prevailing tends to enhance the likelihood of wet, warm and windy weather in northern Europe and Scandinavia through most of December. Conversely, the current easterly phase of the QBO tends to reduce the likelihood of wet and stormy weather here. Above average sea surface temperatures (SSTs) in the influential region of the north Atlantic suggest an enhanced likelihood of wetter and warmer than average conditions.

Looking at indications for the shorter term in particular, there is an increased likelihood of wetter, windier and warmer weather across northern Europe and Scandinavia through the rest of December as both the NAO and the AO are currently forecast to be in a positive phase through the next couple of weeks.

In the longer term (that is, early next year), there is evidence that the influence of El Niño flips at around the turn of the year from increasing the likelihood of warmer, wetter and stormier conditions in the final three months of the year to reducing the likelihood of such weather in the first three months of the year. In the absence of any large shift in ENSO or the QBO (which is not currently anticipated) any influence these factors have on European weather will no longer be competing but will become aligned (towards an enhanced chance of calmer but colder conditions) at around this time. When exactly this shift occurs is likely to influence how wet, mild and stormy the DJF season is as a whole.

Historical Analogues

Possible characteristics of upcoming months can be investigated by looking at previous years in which there was a similar climatic set up.

There is only one year in the last 40 (2009) in which the broader climate at the end of November matches the conditions at the end of this last November, that is, that had an ongoing El Niño, an easterly QBO and warmer than normal north Atlantic SSTs. There are a number of years which match two of these signals: those that match the QBO and SSTs (2003, 2005, 2012, 2017, and 2021) and those that match ENSO and SSTs (2004, 2006 and 2015).

European weather through December 2009 to February 2010 overall was largely characterized by a north to south gradient with cooler than average temperatures, lighter westerly winds and lower than average precipitation over the far north of Europe / Scandinavia, gradually becoming warmer, wetter and windier than average across much of Mediterranean Europe. From mid-December much of Europe began to experience significant freeze conditions, and towards the end of the season there was a notable European weather event[1] in the form of windstorm Xynthia. At the very least 2009 serves as a useful demonstration that both significant winter freeze events and notable windstorms can occur in the same season and that the occurrence or likelihood of one does not preclude the possibility of the other.

Given that there is only one relatively closely matching analogue year caveats must especially be applied this year to any attempts to draw conclusions about what may transpire, especially from the more loosely matching candidate years. Nevertheless, it is interesting to note that 2009, which was the historical closest match to the major climate signals through September to November this year, saw a broadly similar pattern of precipitation and temperature through those months as this year did.

On average, around one notable European weather event might be expected in any given DJF period. Over the nine identified analogue years there are slightly fewer notable DJF European weather events than this average; however, there are some years in which there were no notable weather events at all and others in which above average activity was observed. At least one notable European weather event occurring is more likely than none, but neither possibility can be ruled out.

Looking at the outcomes in terms of broad European weather patterns across our candidate analogue years (as opposed to specific weather events): there is no particular consistency in outcomes for DJF in years where either the QBO and SSTs (only) match with this year or where ENSO and SST (only) conditions match.

In summary, there is little suggestion of any particular weather pattern dominating over the next three months. Instead, it is more likely that periods of both warmer, wetter, and windier weather and colder, drier, and calmer weather may occur at different times throughout the three-month period, as occurred in 2009. Likewise, there is little to suggest a particularly extreme season (in terms of impactful storm events) either, although it cannot be ruled out: the number of notable European weather events across the nine identified analogue years is

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[1] a “notable” European weather event is defined as one that appears in the XWS European Windstorm Catalogue (XWS Datasets: (c) Copyright Met Office, University of Reading and University of Exeter) and/or is identified by PERILS AG as a qualifying event

slightly fewer than average but some years did have above average activity. This is perhaps unsurprising given the shifting and currently competing influences of ENSO and the QBO as outlined above. There is also arguably some agreement between climate signals and the seasonal forecast models: the lack of any clear signals with regards to the strength of the westerly winds would be consistent with a change of regime in this respect sometime in the New Year, as is a reduced likelihood of above average temperatures.

For more details on this method see the report entitled "Using Climate Signals to Forecast the UK Winter Storm Season" published here.

Longer range climate signals influential up to 3 months ahead

Signal	Current State	Projected State	Implications for European Weather
ENSO: El Nino Southern Oscillation	El Niño	El Niño throughout DJF	Increased potential for warmer, wetter and stormier periods across northern Europe and Scandinavia through December. Then from January an increased potential for colder, drier and calmer periods across northern Europe and Scandinavia.
QBO: Quasi-Biennial Oscillation	Easterly Phase	Easterly	Increased potential for colder, drier and calmer periods across northern Europe and Scandinavia.
North Atlantic SST	Above average	This pattern is expected to persist	Increased potential for warmer, wetter and stormier periods across northern Europe and Scandinavia.
Eurasian Snow Cover	Around Average	This pattern is expected to persist	No increased potential for any particular type of weather.
Arctic Sea Ice Extent	Below Average	This pattern is expected to persist	No increased potential for any particular type of weather.
PV: Polar Vortex	N/A	The polar vortex has begun to develop but is still very weak.	No increased potential for any particular type of weather.

Shorter range climate signals influential up to 1 month ahead

Signal	Current State	Projected State	Implications for European Weather
MJO: Madden Julian Oscillation	Phase 5	Neutral	No increased potential for any particular type of weather.
NAO: North Atlantic Oscillation	Neutral	Positive	Increased potential for warmer, wetter and stormier periods across northern Europe and Scandinavia.
AO: Arctic Oscillation	Neutral	Positive	Increased potential for warmer, wetter and stormier periods across northern Europe and Scandinavia.

For more information on the characteristics of the signals please see the EuroTempest climate signals factsheet.