



# A Review of Weather Conditions Affecting the UK (and other areas) during Winter 2015/16

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ECMWF User Workshop, Thursday 9<sup>th</sup> June 2016

With thanks to Jonathan Smith, Jason Kelly, Paul Hutcheon, Neil Armstrong, Chris Tubbs and Matthew Lewis

# Contents and Overview

Use a review of Winter 2015/16 to demonstrate what ECMWF products are popular with Met Office operational meteorologists.

Some background into how Met Office operational meteorology and severe weather warnings work.

Expand upon this in a global context discussing some of what the Global Guidance Unit do.

Worth stating that ECWMF output is used in conjunction with the UM for week one and on the seasonal time scale, but we are heavily reliant on ECWMF output for weeks two to four.

# Met Office Forecasting Structure

Five tiers of forecaster, or operational meteorologist, headed by The Guidance Unit.

Made up of three positions – the Chief Operational Meteorologist and two Deputies.

Chief leads the shift and has overall accountability for the global meteorological story.

Chief focuses on short-range, one Deputy focuses on medium-range, the other on global guidance.

Outside normal working hours are the senior point of contact.

Core products are NSWWS and internal cross-organization guidance.

# Met Office Forecasting Structure

The Guidance Unit are the heaviest users of ECMWF forecast products in Met Office forecasting.

Chief uses output in the shorter range.

Medium-range Deputy focuses on longer range, often out to weeks 3 and 4, and relies heavily on ECMWF output.

Global Guidance Unit Deputy focuses on global matters on a number of different time scales.

Deputies are also involved in seasonal forecasting – internally a monthly meeting is held feature scientists and forecasters to discuss and produce some seasonal forecasts.

# NSWWS

The National Severe Weather Warnings Service.

Introduced by the Met Office in the aftermath of the 15/16 October 1987 Storm.

Gives a few days notice of severe weather.

Has evolved into an impacts-based traffic light warning service which incorporates a probabilistic element.

A matrix is used to communicate probability and magnitude of impacts on two key market sectors – the general public and civil contingency organizations.

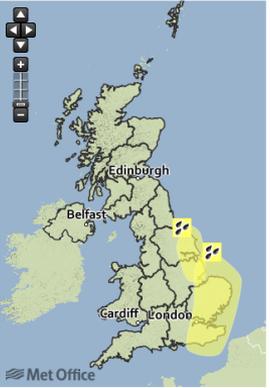
Warnings are for reasonable worst case scenarios.

## National Severe Weather Warnings - United Kingdom

Overview
Detail

**Met Office Weather Warning Overview: United Kingdom**  
Issued on Tue 31 May

**Tue 31 May**



**Tue 31 May**



**Wed 1 Jun**



**Thu 2 Jun**



**Fri 3 Jun**



**Sat 4 Jun**



Use the small maps above to select the weather warnings over the next five days. Click on your chosen region below for more details of current warnings in force.

<b>United Kingdom</b>	
Orkney & Shetland	
Highlands & Eilean Siar	
Grampian	
Strathclyde	
Central, Tayside & Fife	
Dumfries, Galloway, Lothian & Borders	
Northern Ireland	
Wales	
North West England	
North East England	
Yorkshire & Humber	
West Midlands	
East Midlands	
East of England	
South West England	
London & South East England	

Warnings:  Beware  Be prepared  Take action  Rain  Wind  Snow  Ice  Fog

The Met Office has responsibility for providing weather warnings for the UK. Coloured regions on the map show where severe weather warnings have been issued. When issued, the public are advised to take extra care. Further information and advice can be found on the [Severe weather impact links](#) page.

## National Severe Weather Warnings - United Kingdom

Overview
Detail

**Warnings in place for the region: United Kingdom**  
Issued on Tue 31 May

**Tue 31 May**



**Wed 1 Jun**



**Thu 2 Jun**



**Fri 3 Jun**



**Sat 4 Jun**



[« Back to Warnings Overview map](#)

United Kingdom

[Collapse all warnings](#)

-  **Yellow warning of rain**

Dates	Warning	Chief Forecaster's assessment	Weather Impact Matrix
<p>Issued at: 1021 on Mon 30 May 2016</p> <p>Valid from: 0015 on Tue 31 May 2016</p> <p>Valid to: 1200 on Tue 31 May 2016</p>	<p><b>A band of rain, heavy and thundery in places, will spread westwards from the early hours of Tuesday morning. There is the risk that rain will turn torrential in places, with frequent lightning. Winds will also increase, with northerly gales on coasts. Whilst most places will miss the worst of the weather, please be aware of the risk of flash flooding.</b></p>	<p><b>A thundery low over the continent will pass close to the southeast of England, bringing a band of rain with it. This is likely to contain thundery elements and locally very intense rain, bringing the risk of 20 mm in the hour and more than 60 mm in a few hours. As it comes west it should weaken, so the greatest risk of disruption is in eastern parts during the early hours.</b></p>	 <p>What does this mean?</p>

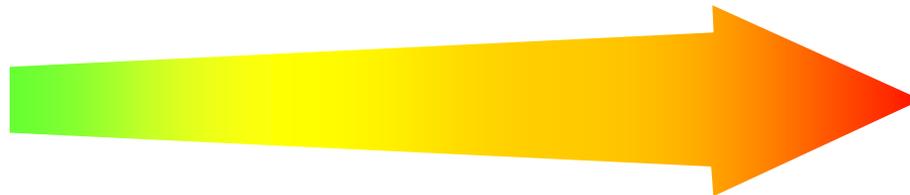
# NSWWS



<b>LIKELIHOOD</b>	<b>HIGH</b>				
	<b>MED</b>				
	<b>LOW</b>				
	<b>VERY LOW</b>				
		<b>VERY LOW</b>	<b>LOW</b>	<b>MEDIUM</b>	<b>HIGH</b>
		<b>IMPACT</b>			

Three red warnings last winter!

Just one per winter previous winters.



# NSWWS

Warnings process:

1. Forecast the weather.
2. Assess of the likelihood of severe weather.
3. Assess potential impact of any severe weather (eg geographical factors, climatological context, antecedent conditions etc).
4. Requires input from a number parties, eg Flood Forecasting Centre, Hazards Centre, Civil Contingencies Advisors.
5. Chief Op Met's assessment explaining why the warning has been assigned that colour and discussing uncertainties.

# Winter 2015-2016

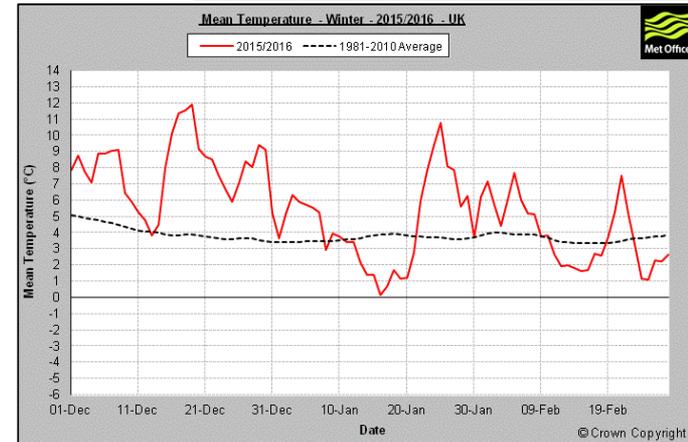
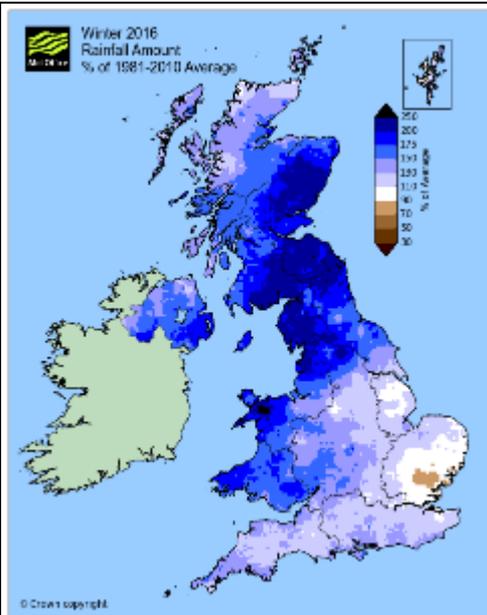
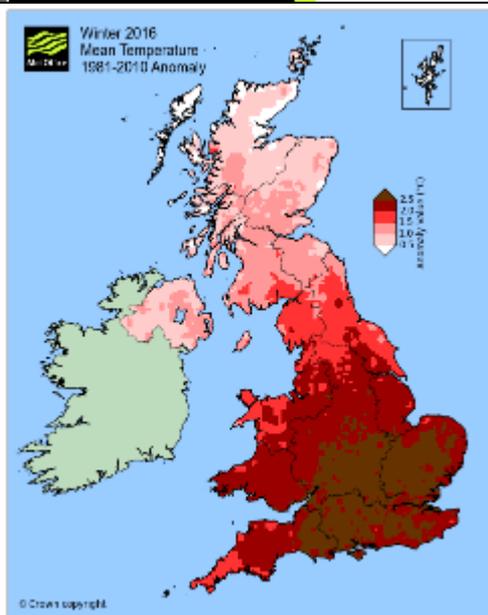
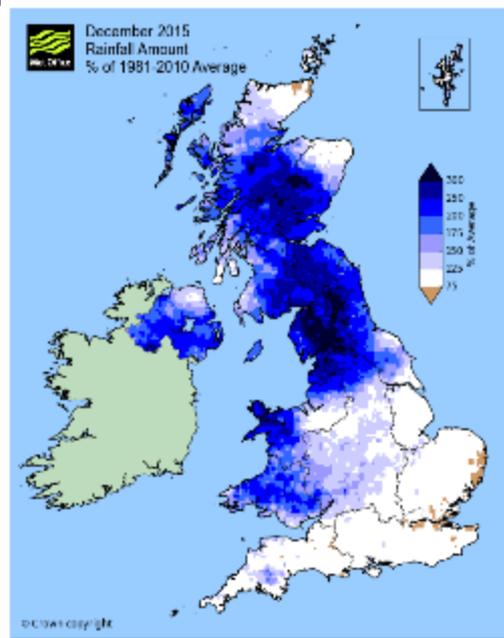
A memorable winter, especially Dec – Jan and Feb quieter!

Some remarkable weather, particularly Dec which had record rainfall and record warmth in persistent Tm airflow. 'Highlights' included:

- New UK-24 and 48-hour rainfall record (341.4 mm at Honister Pass and 405 mm at Thirlmere).
- Dec 2015 warmest Dec in UK Series and the CET and very wet in N and W regions - some parts four times average Dec rainfall.
- Unsurprisingly Dec 2015 was the wettest Dec and wettest calendar month in the UK Series.
- Second wettest and third warmest winter in UK Series for UK as a whole.
- Wales, Scotland and N Ireland all recorded their wettest winter in this series, England and Wales their warmest winter.

# Winter 2015-16

December had the most remarkable weather – January and February remained unsettled but less so than December.



# Setting Historical Context

Data used by the Met Office to compare months and seasons include:

- Central England Temperature (1659).
- England and Wales Precipitation (1766).
- The UK Series (1910).

The UK Series was developed by the Met Office to provide a gridded, homogenized climate dataset for the whole of the UK.

It is based on the archive of UK weather observations with regression and interpolation techniques applied to generate a regular grid.

# Storm Naming

- Joint Met Office and Met Eireann pilot project to name windstorms expected to affect the UK and Ireland.
- Motivation is to raise awareness of severe weather and ensure greater public safety.
- Benefits of storm naming were highlighted by events such as the St Jude's Day Storm.
- Met Office name storms when they have the potential to cause 'medium' or 'high' wind impacts on our NSWWS impacts matrix.
- Challenges included timely identification of when storms would reach an appropriate level of impact and likelihood to warrant naming and managing media messaging.

# Storm Naming



Met Office MET Working in partnership with Met Éireann

## A-Z of UK storm names

<b>A</b> Abigail	<b>H</b> Henry	<b>O</b> Orla	<b>V</b> Vernon
<b>B</b> Barney	<b>I</b> Imogen	<b>P</b> Phil	<b>W</b> Wendy
<b>C</b> Clodagh (Clo-da)	<b>J</b> Jake	<b>Q</b> *	<b>X</b> *
<b>D</b> Desmond	<b>K</b> Katie	<b>R</b> Rhonda	<b>Y</b> *
<b>E</b> Eva	<b>L</b> Lawrence	<b>S</b> Steve	<b>Z</b> *
<b>F</b> Frank	<b>M</b> Mary	<b>T</b> Tegan	
<b>G</b> Gertrude	<b>N</b> Nigel	<b>U</b> *	

\*These letters are not included. This is done in line with the US National Hurricane Centre naming convention and will maintain consistency for official storm naming in the North Atlantic.

Name	Date of Impact on UK/Ireland
Abigail	12-13 Nov 2015
Barney	17-18 Nov 2015
Clodagh	29 Nov 2015
Desmond	5-6 Dec 2015
Eva	24 Dec 2015
Frank	29-30 Dec 2015
Gertrude	29 Jan 2016
Henry	1-2 Feb 2016
Imogen	8 Feb 2016
Jake	2 March 2016
Katie	27-28 March 2016

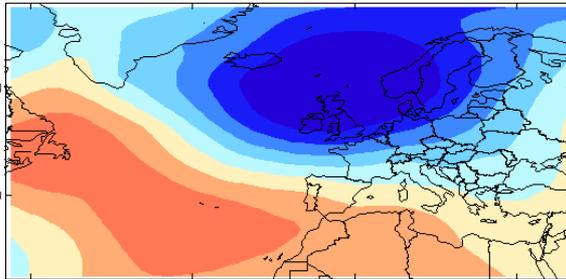
# Winter 2015/16

Forecaster involvement starts with our seasonal forecasting process.

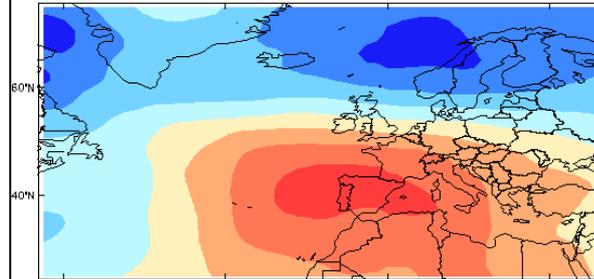
ECMWF seasonal and monthly output features heavily, alongside Met Office seasonal model, GloSea5, a time-lagged ensemble.

Discussion also includes consideration of broader scale drivers with known teleconnections, eg ENSO, QBO, SSW.

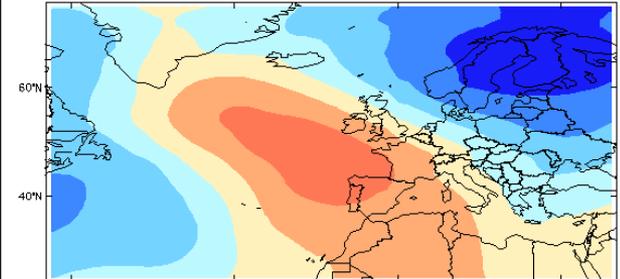
ECMWF : Ensemble mean anomaly : mean sea level pressure : Dec



ECMWF : Ensemble mean anomaly : mean sea level pressure : Jan



ECMWF : Ensemble mean anomaly : mean sea level pressure : Feb





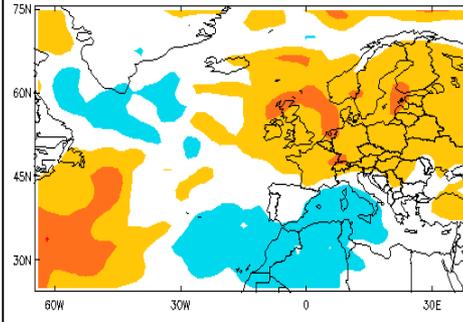
Met Office

# Winter 2015/16

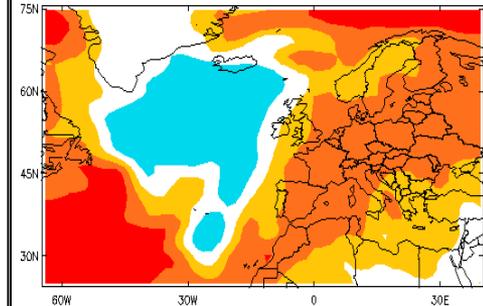
Tercile categories and PMSL anomalies among the main products used.

Strong signal for mild and wet.

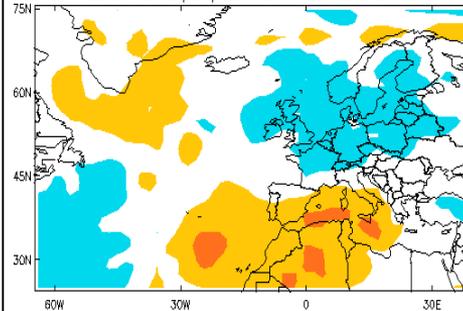
ECMWF : Probability of tercile categories Dec/Jan/Feb  
Issued Nov 2015  
above-normal precipitation 2015 1981–2010 climate



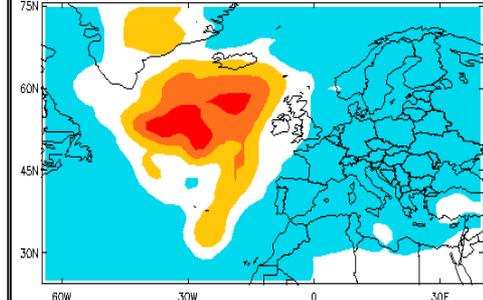
ECMWF : Probability of tercile categories Dec/Jan/Feb  
Issued Nov 2015  
above-normal 2m temperature 2015 1981–2010 climate



below-normal precipitation 2015 1981–2010 climate



below-normal 2m temperature 2015 1981–2010 climate



# Winter 2015/16

In the 6-15 day range focus is on regime changes, potential for high-impact weather and confidence in trends.

Approach is to apply a synoptic typing scheme to ECMWF EPS output.

Much of this work has been carried out by Rob Neal – see Neal et al 2016 Met Apps – and draws on earlier work by Paul James.

Makes use of a new synoptic typing scheme developed by David Fereday rather than existing scheme, eg GWL or LWT.

This scheme gives ‘more flavours’ of weather types affecting UK.

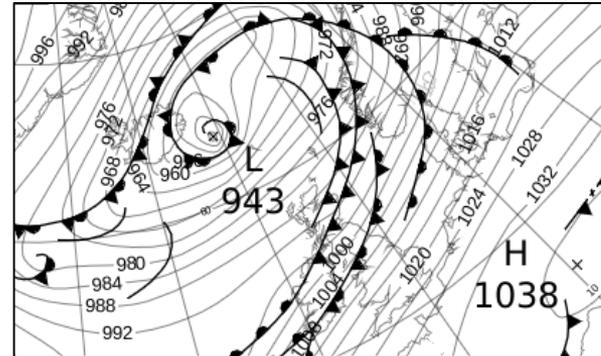
# Winter 2015/16

Storm Desmond...

...record 24 and 48 hour UK rainfall with 341.4 mm in 24 hours and 405 mm in 38 hours.

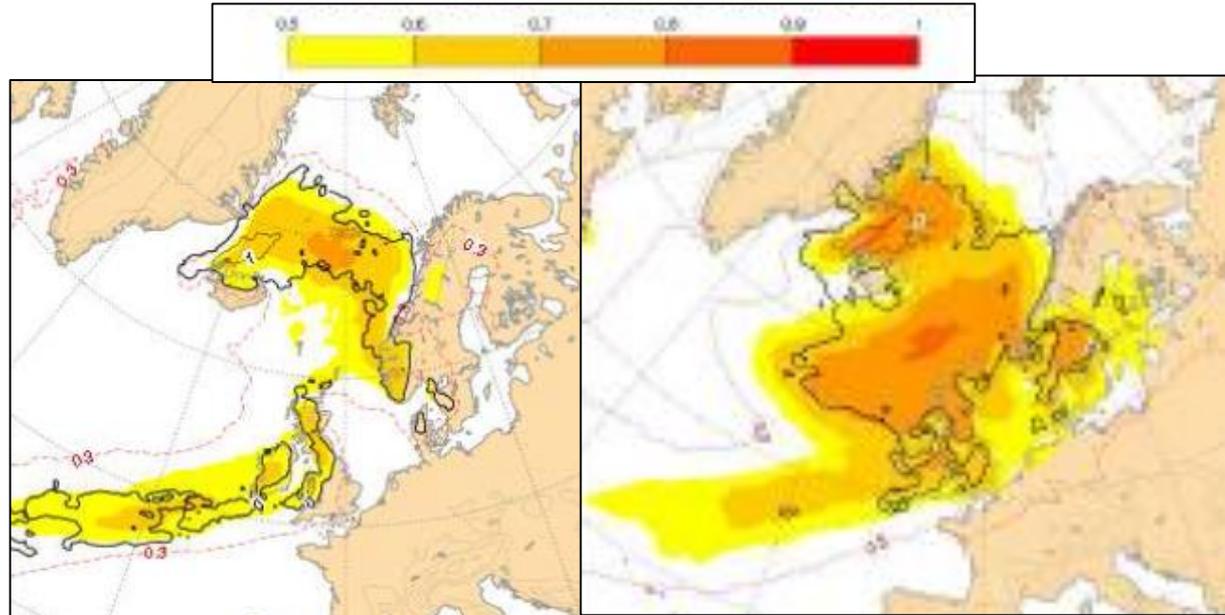


Impacts included flooding and evacuations in Cumbria and southern Scotland, power outages in parts of England, Wales and Ireland and landslides in parts of Scotland.



# Winter 2015/16

EFI output almost a week beforehand highlighted threat of extreme conditions.

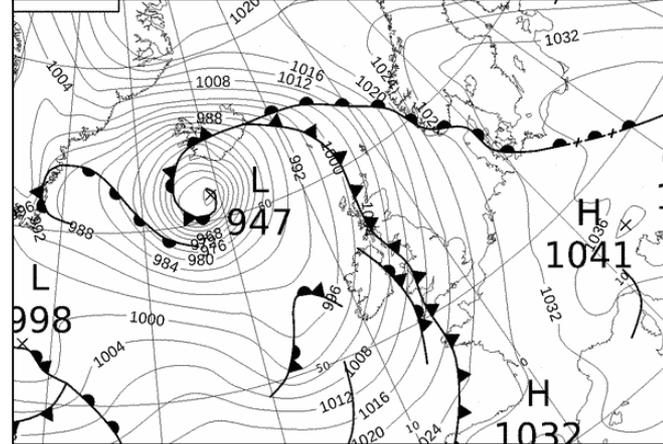
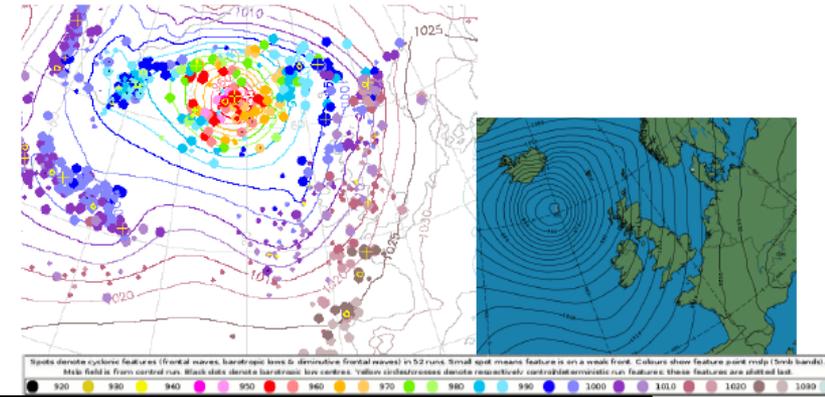
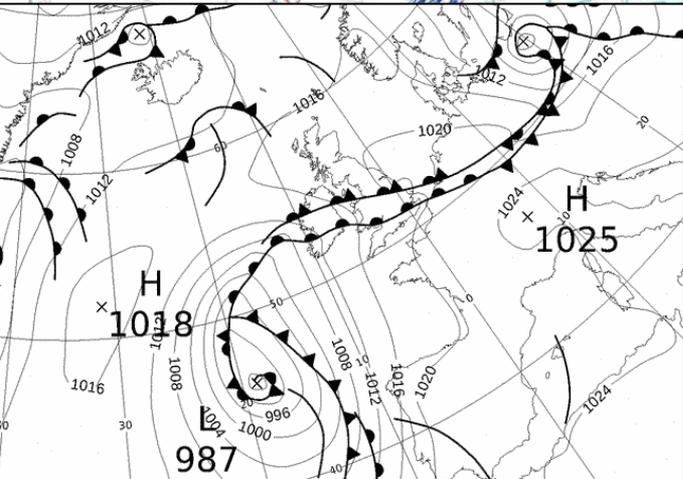
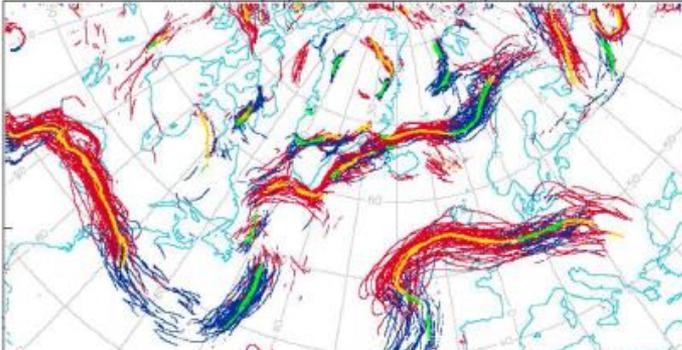




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# Winter 2015/16

DT: 12Z Thu 10/12/2015 VT: 12Z Sun 13/12/2015 lead time 72h



Other ways in which we use ECMWF output is in products blended with other models and our own in-house adaptations.

# The Global Guidance Unit

Remit is to provide guidance on meteorological matters globally on a number of different timescales.

- Production of a Daily World Weather Assessment aimed at flagging up major worldwide weather events across our organization.
- Weekly teleconnections monitoring and guidance.
- Guidance to Met Office forecasters working abroad.
- Support UK government agencies, eg during hurricane season.
- Support for WMO Voluntary Co-operation Program and capacity building, eg Lake Victoria, Nepal.

# The Global Guidance Unit

Nature of the Global Guidance Unit's work draws heavily on a number of ECMWF's outputs:

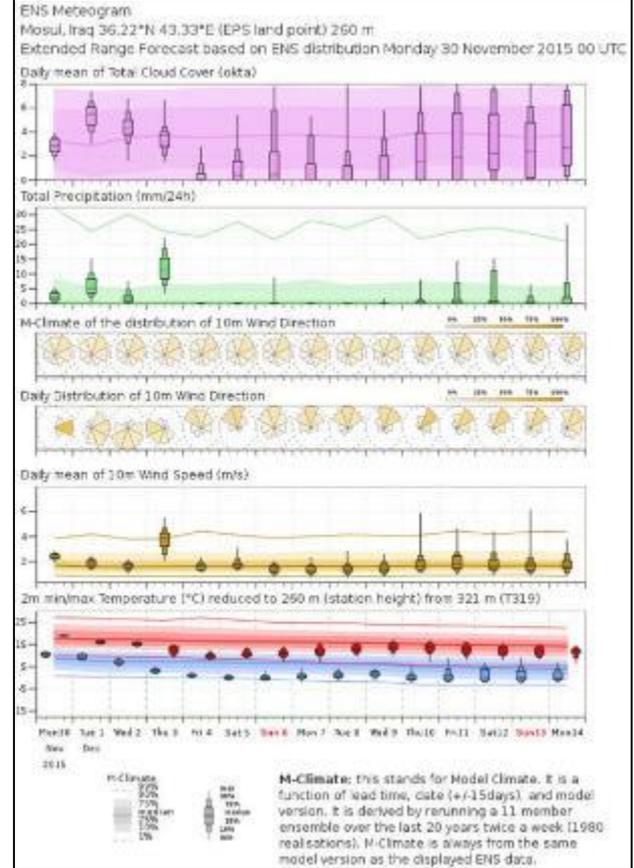
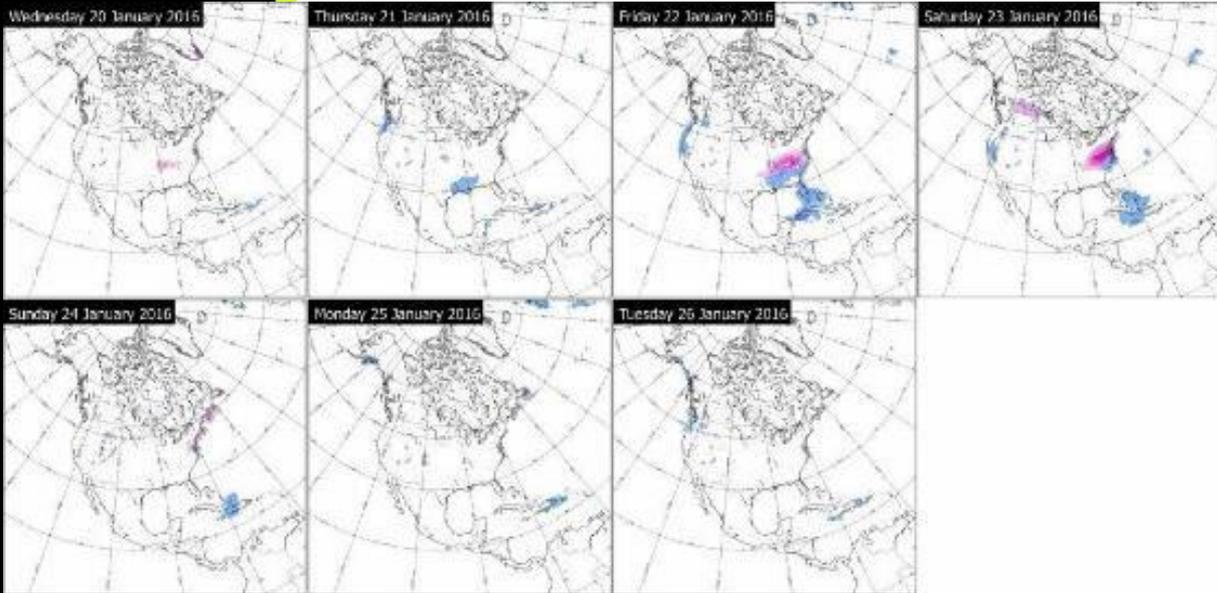
- EFI and the M-Climate.
- Monthly and seasonal forecast output.
- Tropical cyclone diagnostics.
- Extended and long range output.
- MJO diagnostics.

Emphasis on early identification of potentially severe weather and climatological context.



Met Office

# The Global Guidance Unit



# Key Messages

- Presentation hopefully gives an insight into Met Office forecasting.
- Highlighted some of the products which we find most useful.
- Usefulness obviously underpinned by quality of models which lie behind these products!
- Our particular focus lies in weeks one and two and concerns early-as-possible indication of high impact weather and regime change.
- In order for Met Office operational meteorologists to use ECMWF output better, we seek continued improvements to how output is visualized.



Met Office

Any questions?

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