



Winter outlook consultation

Dr Matt Huddleston

2nd June 2006

The presentation covers the following sections

- Forecasting for the energy industry & markets
- The 2005/2006 winter forecast
- Communicating seasonal & climate risks
- Schedule for the 2006/07 winter forecast

- Weather is a major driver of demand, both Electricity and Gas
- Temperature
- Wind (When its cold!)
- Cloud cover / solar radiation (illumination?)
- Precipitation

- Historical weather and climate data
- Real time observations
- 0–5 day regional and site specific weather forecasts
- 5-10 day regional and site specific probability forecasts
- Monthly and Seasonal Outlooks
- Hadley Centre Climate Prediction and Impact Assessment
- Local, National, European and Global capability



The Dec `05 – Feb `06 winter forecast

Europe braces for its winter of discontent

And now for January weather forecast...

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DAILY EXPRESS

The World's Greatest Newspaper

維新日報 西曆一千九百零九年

THURSDAY NOVEMBER 24, 2005 40

WE'VE GIVEN THREE AWAY HERE'S ANOTHER ONE

WIN THIS £34,000 CAMPER VAN



● We have dearest gas in the world ● No flu jabs

❄️ Cold will kill 89,000 ❄️ ⚡ Power cuts on the way

WINTER OF DISCONTENT

By **John Ingham** and **Graham Hiecott**

BRITAIN is facing a long hard winter as the big freeze threatens thousands of extra deaths and power cuts. Major snowfalls are expected to hit the North this morning, spreading steadily south, fanned by strong Arctic winds.

The Mos Office reinforced its warnings of one of the worst winters in a decade, dominated by cold blasts from Siberia. Citizens caring for the elderly women that as refugees 86,000 pensioners will die in "the end."

Concerns have been heightened by the Government's "diversion" campaign. They leader Michael Howard censured the Government of "inefficiency and incompetence" over the diversion.

He said the bill will guarantee enough jobs and energy

Mr. Howard's warning came as analysts revealed that, the UK's gas is now the most expensive in the world, trading at twice the price for crude oil. This will lead to bigger bills for households.

Even Tony Blair refused to rule out cuts to domestic gas supplies as he came under fire over escalating prices and fears of fuel shortages this winter.

And the Government's problems piled up last night as honoring organizations questioned whether ministers had done enough to make sure Britain's roads remained open.

During a harsh winter,
 Sick young birds die.



**THIEVES
TARGET
£200M
DIAMOND
AGAIN**

A SECOND bid to steal a \$200million diamond—the world's biggest—has been launched from a flat in London, says a

THIEVES TARGET £200M DIAMOND AGAIN

A SECOND bid to snag a \$900million diamond, the world's biggest, has been awarded by a firm in London - \$75



Huylian pull banners in the Scottish Highlands yesterday

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12/23/2005

Secret briefings as Met Office issues weather warnings

By David Reed

THE Fire Office conducted an unprecedented emergency meeting to its industry counterparts yesterday in advance of what they are faced in the culture

Western part of Scotland and Northern Ireland were heavily bombed and Northern Ireland was the most severely affected. In 1964, quite a few smaller bombings in many areas. For example, in 1965, there were 100 bombings in Northern Ireland. The total number of bombings in the United Kingdom was 1,000 in 1965, 1,000 in 1966, 1,000 in 1967, 1,000 in 1968, 1,000 in 1969, 1,000 in 1970, 1,000 in 1971, 1,000 in 1972, 1,000 in 1973, 1,000 in 1974, 1,000 in 1975, 1,000 in 1976, 1,000 in 1977, 1,000 in 1978, 1,000 in 1979, 1,000 in 1980, 1,000 in 1981, 1,000 in 1982, 1,000 in 1983, 1,000 in 1984, 1,000 in 1985, 1,000 in 1986, 1,000 in 1987, 1,000 in 1988, 1,000 in 1989, 1,000 in 1990, 1,000 in 1991, 1,000 in 1992, 1,000 in 1993, 1,000 in 1994, 1,000 in 1995, 1,000 in 1996, 1,000 in 1997, 1,000 in 1998, 1,000 in 1999, 1,000 in 2000, 1,000 in 2001, 1,000 in 2002, 1,000 in 2003, 1,000 in 2004, 1,000 in 2005, 1,000 in 2006, 1,000 in 2007, 1,000 in 2008, 1,000 in 2009, 1,000 in 2010, 1,000 in 2011, 1,000 in 2012, 1,000 in 2013, 1,000 in 2014, 1,000 in 2015, 1,000 in 2016, 1,000 in 2017, 1,000 in 2018, 1,000 in 2019, 1,000 in 2020, 1,000 in 2021, 1,000 in 2022, 1,000 in 2023, 1,000 in 2024, 1,000 in 2025, 1,000 in 2026, 1,000 in 2027, 1,000 in 2028, 1,000 in 2029, 1,000 in 2030, 1,000 in 2031, 1,000 in 2032, 1,000 in 2033, 1,000 in 2034, 1,000 in 2035, 1,000 in 2036, 1,000 in 2037, 1,000 in 2038, 1,000 in 2039, 1,000 in 2040, 1,000 in 2041, 1,000 in 2042, 1,000 in 2043, 1,000 in 2044, 1,000 in 2045, 1,000 in 2046, 1,000 in 2047, 1,000 in 2048, 1,000 in 2049, 1,000 in 2050, 1,000 in 2051, 1,000 in 2052, 1,000 in 2053, 1,000 in 2054, 1,000 in 2055, 1,000 in 2056, 1,000 in 2057, 1,000 in 2058, 1,000 in 2059, 1,000 in 2060, 1,000 in 2061, 1,000 in 2062, 1,000 in 2063, 1,000 in 2064, 1,000 in 2065, 1,000 in 2066, 1,000 in 2067, 1,000 in 2068, 1,000 in 2069, 1,000 in 2070, 1,000 in 2071, 1,000 in 2072, 1,000 in 2073, 1,000 in 2074, 1,000 in 2075, 1,000 in 2076, 1,000 in 2077, 1,000 in 2078, 1,000 in 2079, 1,000 in 2080, 1,000 in 2081, 1,000 in 2082, 1,000 in 2083, 1,000 in 2084, 1,000 in 2085, 1,000 in 2086, 1,000 in 2087, 1,000 in 2088, 1,000 in 2089, 1,000 in 2090, 1,000 in 2091, 1,000 in 2092, 1,000 in 2093, 1,000 in 2094, 1,000 in 2095, 1,000 in 2096, 1,000 in 2097, 1,000 in 2098, 1,000 in 2099, 1,000 in 2100, 1,000 in 2101, 1,000 in 2102, 1,000 in 2103, 1,000 in 2104, 1,000 in 2105, 1,000 in 2106, 1,000 in 2107, 1,000 in 2108, 1,000 in 2109, 1,000 in 2110, 1,000 in 2111, 1,000 in 2112, 1,000 in 2113, 1,000 in 2114, 1,000 in 2115, 1,000 in 2116, 1,000 in 2117, 1,000 in 2118, 1,000 in 2119, 1,000 in 2120, 1,000 in 2121, 1,000 in 2122, 1,000 in 2123, 1,000 in 2124, 1,000 in 2125, 1,000 in 2126, 1,000 in 2127, 1,000 in 2128, 1,000 in 2129, 1,000 in 2130, 1,000 in 2131, 1,000 in 2132, 1,000 in 2133, 1,000 in 2134, 1,000 in 2135, 1,000 in 2136, 1,000 in 2137, 1,000 in 2138, 1,000 in 2139, 1,000 in 2140, 1,000 in 2141, 1,000 in 2142, 1,000 in 2143, 1,000 in 2144, 1,000 in 2145, 1,000 in 2146, 1,000 in 2147, 1,000 in 2148, 1,000 in 2149, 1,000 in 2150, 1,000 in 2151, 1,000 in 2152, 1,000 in 2153, 1,000 in 2154, 1,000 in 2155, 1,000 in 2156, 1,000 in 2157, 1,000 in 2158, 1,000 in 2159, 1,000 in 2160, 1,000 in 2161, 1,000 in 2162, 1,000 in 2163, 1,000 in 2164, 1,000 in 2165, 1,000 in 2166, 1,000 in 2167, 1,000 in 2168, 1,000 in 2169, 1,000 in 2170, 1,000 in 2171, 1,000 in 2172, 1,000 in 2173, 1,000 in 2174, 1,000 in 2175, 1,000 in 2176, 1,000 in 2177, 1,000 in 2178, 1,000 in 2179, 1,000 in 2180, 1,000 in 2181, 1,000 in 2182, 1,000 in 2183, 1,000 in 2184, 1,000 in 2185, 1,000 in 2186, 1,000 in 2187, 1,000 in 2188, 1,000 in 2189, 1,000 in 2190, 1,000 in 2191, 1,000 in 2192, 1,000 in 2193, 1,000 in 2194, 1,000 in 2195, 1,000 in 2196, 1,000 in 2197, 1,000 in 2198, 1,000 in 2199, 1,000 in 2200, 1,000 in 2201, 1,000 in 2202, 1,000 in 2203, 1,000 in 2204, 1,000 in 2205, 1,000 in 2206, 1,000 in 2207, 1,000 in 2208, 1,000 in 2209, 1,000 in 2210, 1,000 in 2211, 1,000 in 2212, 1,000 in 2213, 1,000 in 2214, 1,000 in 2215, 1,000 in 2216, 1,000 in 2217, 1,000 in 2218, 1,000 in 2219, 1,000 in 2220, 1,000 in 2221, 1,000 in 2222, 1,000 in 2223, 1,000 in 2224, 1,000 in 2225, 1,000 in 2226, 1,000 in 2227, 1,000 in 2228, 1,000 in 2229, 1,000 in 2230, 1,000 in 2231, 1,000 in 2232, 1,000 in 2233, 1,000 in 2234, 1,000 in 2235, 1,000 in 2236, 1,000 in 2237, 1,000 in 2238, 1,000 in 2239, 1,000 in 2240, 1,000 in 2241, 1,000 in 2242, 1,000 in 2243, 1,000 in 2244, 1,000 in 2245, 1,000 in 2246, 1,000 in 2247, 1,000 in 2248, 1,000 in 2249, 1,000 in 2250, 1,000 in 2251, 1,000 in 2252, 1,000 in 2253, 1,000 in 2254, 1,000 in 2255, 1,000 in 2256, 1,000 in 2257, 1,000 in 2258, 1,000 in 2259, 1,000 in 2260, 1,000 in 2261, 1,000 in 2262, 1,000 in 2263, 1,000 in 2264, 1,000 in 2265, 1,000 in 2266, 1,000 in 2267, 1,000 in 2268, 1,000 in 2269, 1,000 in 2270, 1,000 in 2271, 1,000 in 2272, 1,000 in 2273, 1,000 in 227

"I agree with a Viet Cong spokesman and spokesman who said the killing by Z-Nation was related to the previous day's proclamation. He also stated that the last time we had a cold winter of magnitude, so this is as well to get the human body to exert and the Government

While the slanders of Deeds and "Buck" Brins were being spread among farmers, a crowd of about 100 Whites, headed by a mounted English officer marching with them to the eastern Bell of the county over the wasteness of the Office mill, The North of S. land, Newburn Ireland, the way Water and southwest hand could see far. (Because they were pale-faced, they carried some small reds. It was a most beautiful sight.)

Temperatures in Abasco and some of the worst air quality recorded during a 100-mile-a-day factor per day and the average for the day in London dropped by Mr. Elliott said. "This is the first time this far we have experienced weather like this. Very strong winds and clouds from the North and it is to drive down the country tonight. It will feel like it is very raw as the winds will. Amherst is 44° and snow."

The forecast predicts a lot of snow in the South overnight. The South and east side of the country will be affected through the week. The Highway Agency

ics in the UK too. The Bedford
ard Research Centre at University
lege London agrees that the NAO
be predicted, though it uses a
unique based on snow cover and
temperature gradients rather than
temperatures. Its forecast is for
NAO to be only slightly below
normal this winter - not enough to
tify the Met Office's warning.

rk Saunders, head of long-range forecasting. "There is a divergence of opinion between forecasters and I think the Met Office should have been a little more cautious."

Prof Saunders points out that cold weather in late November, such as in the British Isles will experience over the next few days, does not portend an Arctic winter. In fact, the Met Office's four-week forecast suggests that it will become mild during ear

Four rescues were also observed in the operation on Nov. 14.

quest after they became stranded in blizzards on the frozen coast of Britain's second highest mountain. An RAF helicopter and

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The winter headline forecast for Dec-Feb 2005/06



The forecast for Dec-Feb 2005/6 – was first issued in September 2005 and updated monthly

The Met Office continues to predict a two in three chance of a colder-than-average winter for much of Europe, and that if Europe were to experience below-average temperatures, parts of the UK - especially southern regions - would also be affected. There is also an indication for a drier-than-average winter over much of the UK.

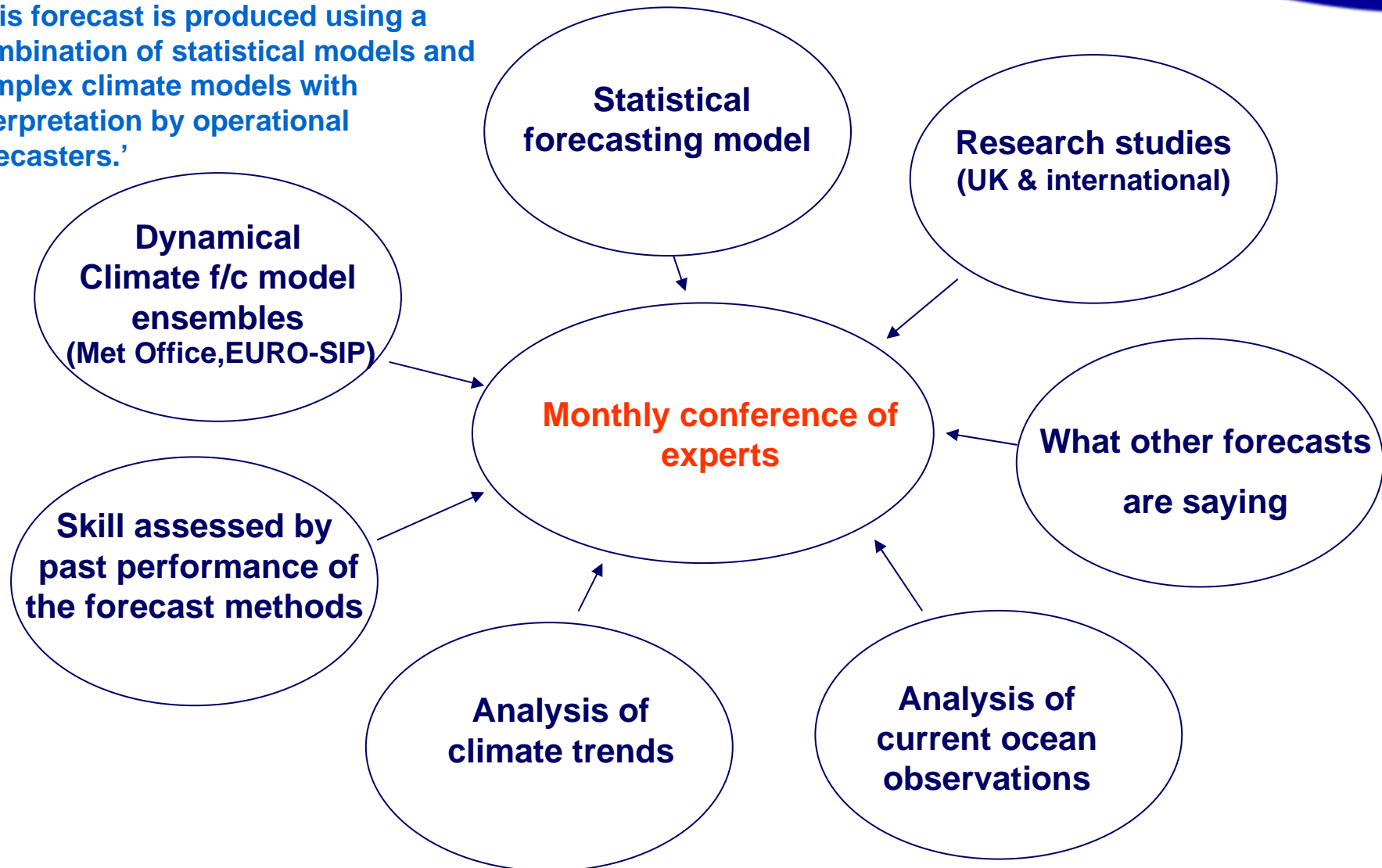
The last eight winters have been relatively mild and perhaps have given the impression that these are 'normal'. The balance of probability is for a winter colder than those experienced since 1995/6.

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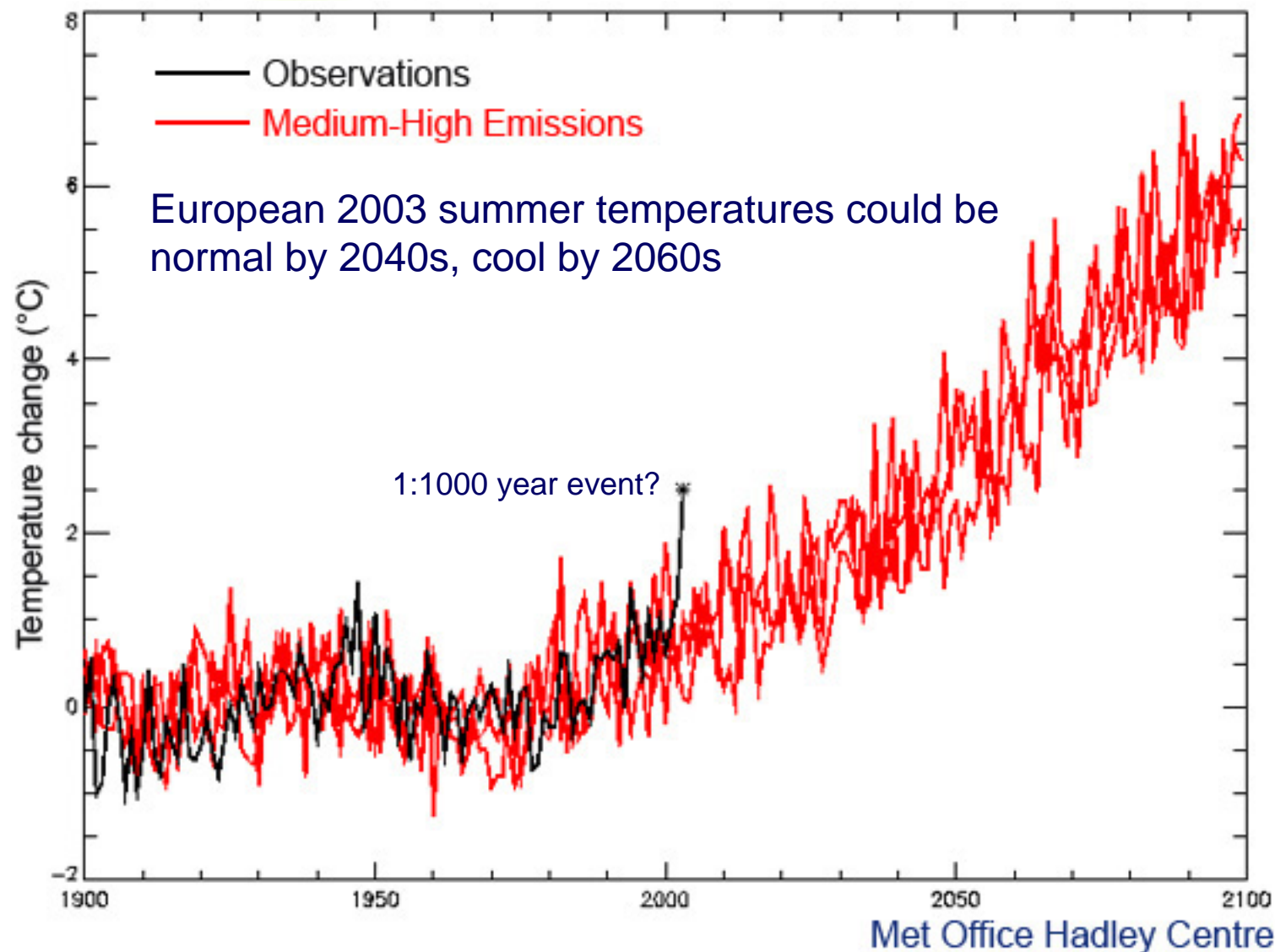
How the seasonal winter forecast is produced



'This forecast is produced using a combination of statistical models and complex climate models with interpretation by operational forecasters.'



Changing return periods due to climate change



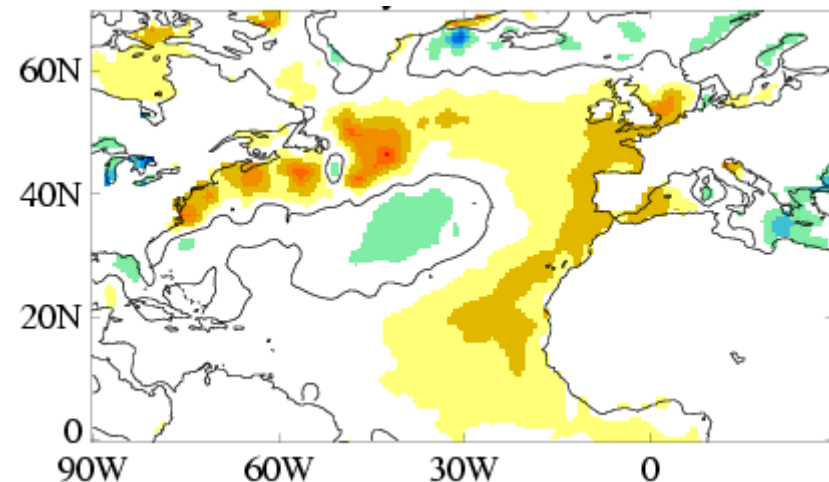
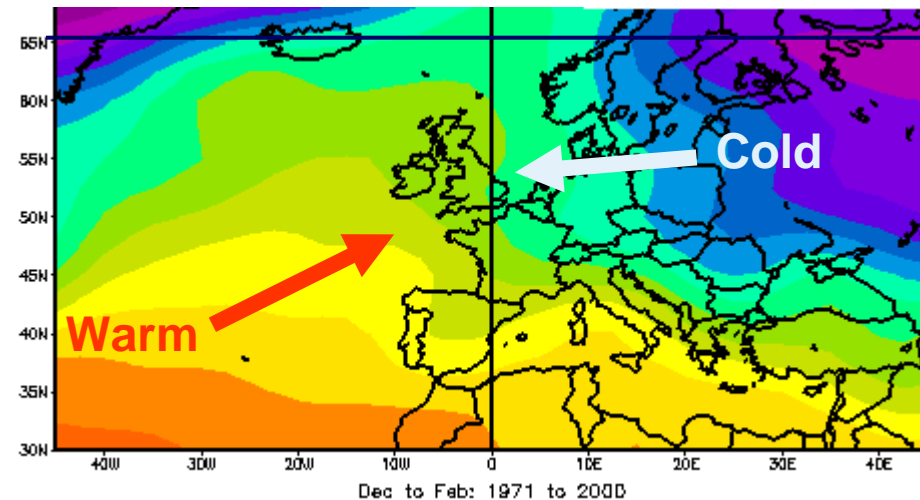
Warm oceans and cold winters?



- Oceans act as the climate memory and influence the atmosphere
- Air is modified by track over the ocean
- The influence of the warm Atlantic ocean temperatures depends on the wind direction

Sea temp November 1995 (opposite) – one month later December 1995 was the coldest December for more than 20 years

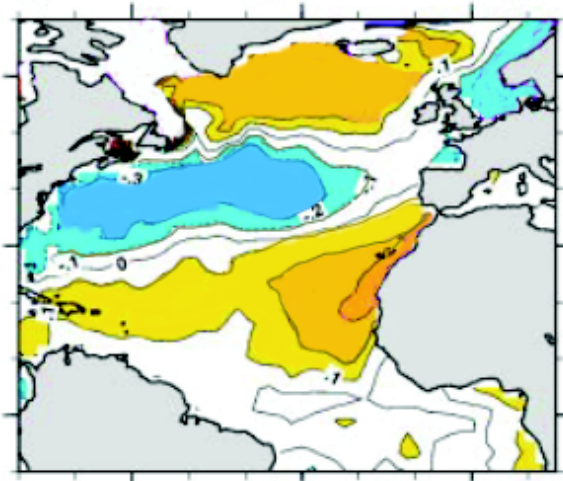
Winter Average Temperature



The North Atlantic Oscillation



Sea-surface temperature (SST) anomalies

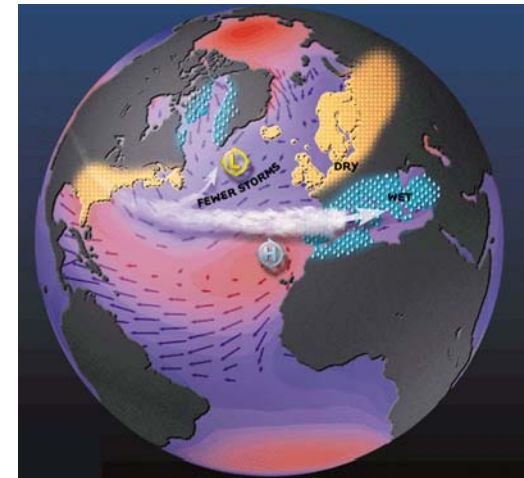


Negative NAO



WINTER
(Schematic)

North Atlantic Oscillation



- In mid-latitudes internal seasonal variability is large. The scientific evidence suggests a weak forcing of the ocean on the atmosphere in winter (and the models underestimate the effect).
- Negative North Atlantic Oscillation (NAO) implies greater frequency of easterly flow.
- The empirical-statistical NAO forecast uses the May sea surface temperatures to predict winter NAO (*Rodwell & Folland, 2002*) and is correct ~ 2:3 times for the sign of the anomaly or change in sign.

Summary of evidence in 2005/06



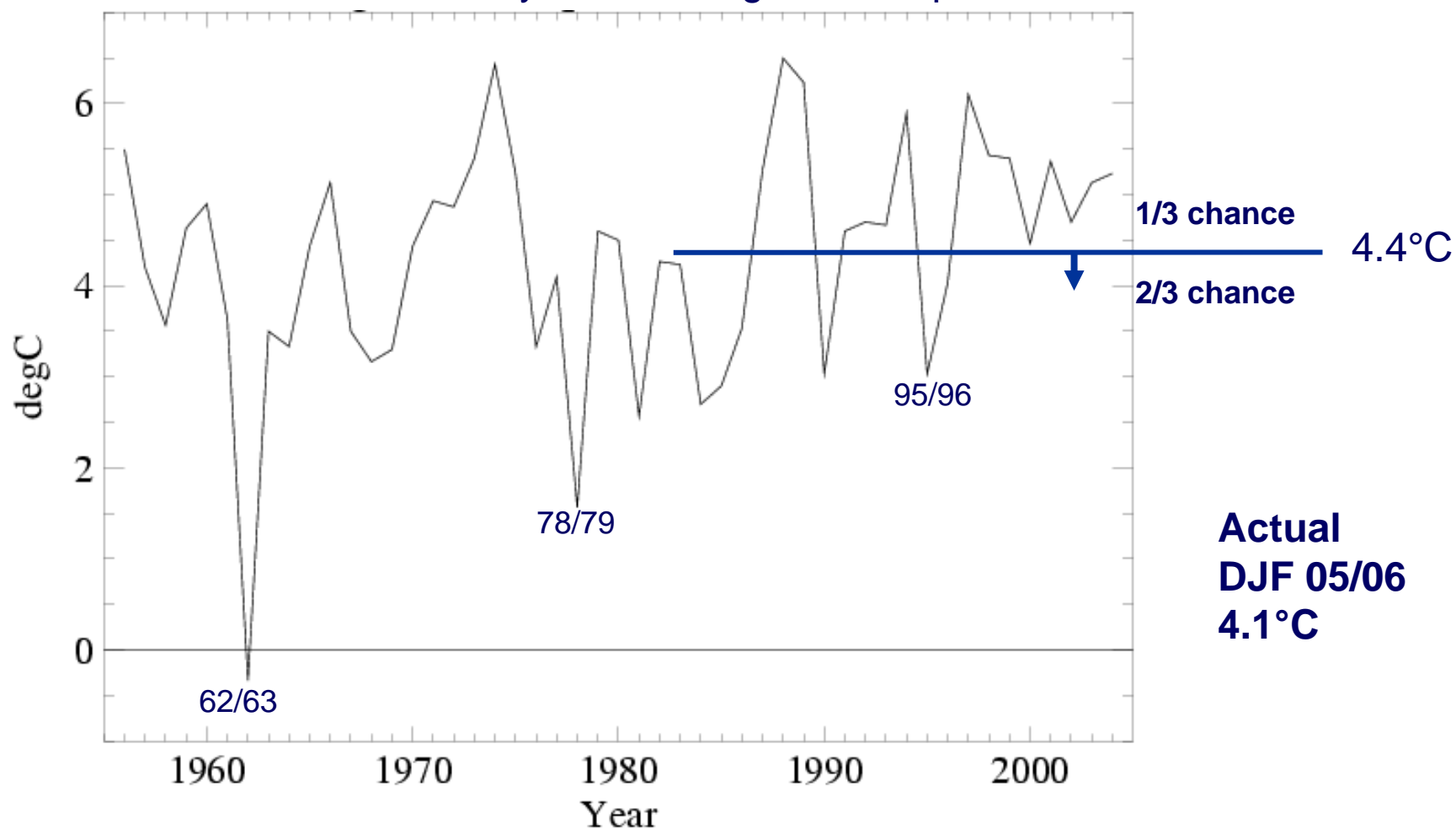
- The statistical **NAO** forecast suggested colder than average winter particularly for Europe (it was supported by the experimental decadal forecast system).
- **Seasonal ensemble model** forecasts for September and October suggested cold conditions over Europe. November suggested warm.
- The seasonal system forecast the **sea surface temperature tripole** consistently with a negative NAO situation – but the signal is weak ~ 40% of observed amplitude (as expected).
- Real time analysis of **sub-surface** ocean temperatures supported the re-emergence of tripole SST anomalies in winter. This was closely (weekly) monitored to see if the forecast was 'on track'.
- **Expert interpretation** (by research, forecast & communications staff) was used to draw all this together into the headline forecast and to subsequently decide if the forecast should be revised.

Central England Temperature – How Cold?

Presented to ~90 users/customers at the Winter Briefing last November

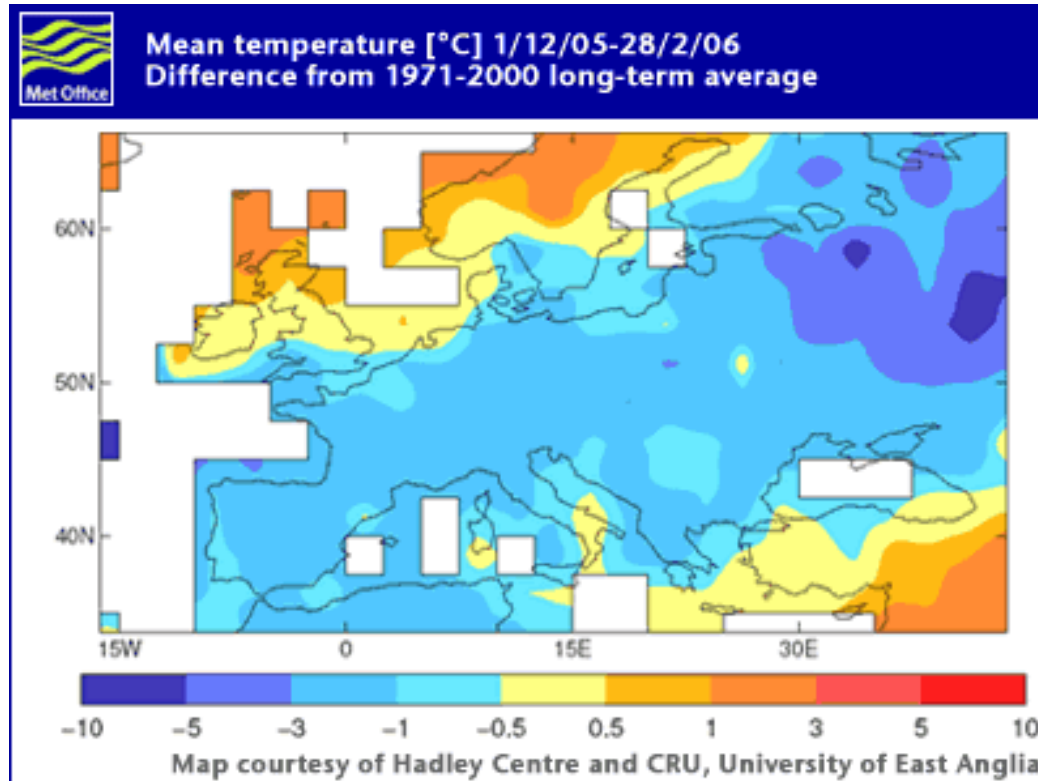


December to February Central England Temperatures



Note: 4.4=median for 1948-1998. 4.48=mean for 1971-2000 as used on web site.

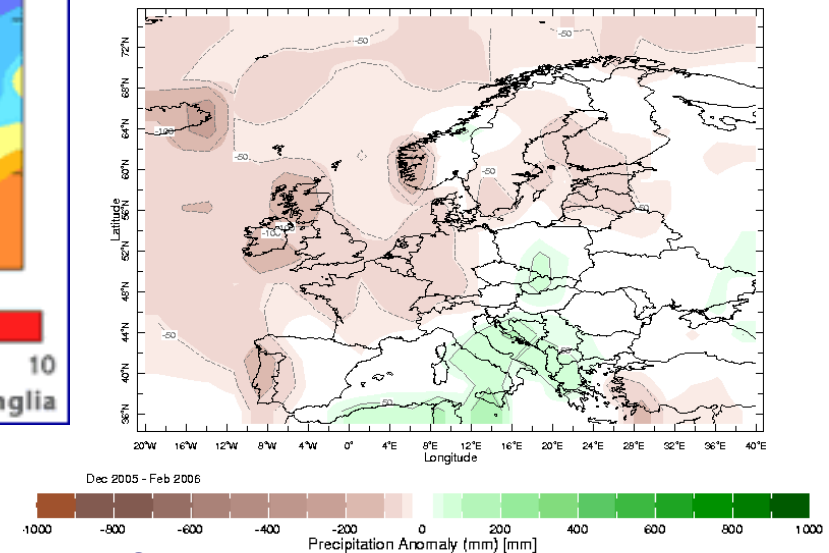
What happened in 2005/06?



It was cold over Europe

Over UK the temperature signal varied with location. It was cold in Southern regions.

It was dry over Europe



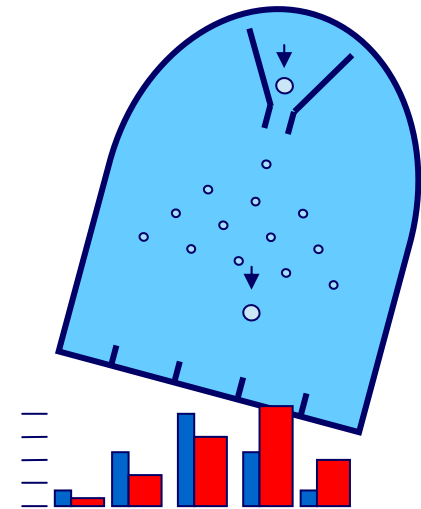
Source:IRI

Note that an individual probability forecast cannot be said to be right or wrong. All we can say is that the most likely forecast category occurred.



Communicating seasonal and climate risks
to the energy industry & markets

- Categorical forecasts
 - **2:** Above / Below; **3:** Above / Normal / Below
 - Need defining in terms of a climatology – but which?
 - Few categories due to short observation record and chaotic nature of climate
 - Not always the most useful way to communicate to experts
- Probability distributions
 - More detail is wanted by users
 - Can provide what is scientifically credible



In mid-latitudes internal seasonal variability is much larger than external signals. Even with improved models, seasonal forecasts for these regions will be probabilistic and have lower skill than shorter-range forecasts.

Science/communication in 2006

- How cold is cold? This needs to be quantified for likelihood forecasts
- Putting the component forecasts on the web wasn't helpful
- We had greater confidence in the forecast for Europe than for UK – need to work with the media & industry to communicate this also.

Developing forecast utility

- Communicate forecast in terms that each market sector can use
 - More detail e.g. changes in likelihood of a 1:50 cold winter, a 1:20 peak day, or of cold weeks/months, or forecast in terms of Composite Weather Variable
 - Find & prove levels of skill that are both scientifically valid & useful to customers
- **Workshop to discuss forecast presentation and interpretation**

Please contact us if you would like to be involved.

- Scoping study for the impacts of climate change on the UK energy industry launch **5th June 2006**
 - Contact *fiona.hewer@metoffice.gov.uk*
- First winter seasonal forecast available (at earliest) :
www.metoffice.gov.uk 1st July 2006
- Winter seasonal forecast updates
 - **1st September 2006**
 - **2nd October 2006**
 - **1st November 2006**
 - **1st December 2006**

- *We want to engage with you*
- *To improve utility of longer range forecasts and other services*
- *Recognise the European perspective / influence*
- *The Climate is changing, it is already affecting your industry – what is a 1 in 20 or 1 in 50 winter now, next year and in 10 years time?*

