

Review of seasonal forecasting activities at the Met Office

Richard Graham, the Climate Products Group, Seasonal Forecast Team, Alberto Arribas
(seasonal model development)

ECMWF Forecast Users Meeting, 10-12 June 2009



Prediction and research

Tools for prediction:

- monthly: ECMWF system
- seasonal: Met Office GloSea system, ECMWF, Météo-France (EUROSIP), statistical methods
- Decadal: Met Office DePreSys system
- products (global and UK) for monthly and seasonal timescales, consultancy for decadal
www.metoffice.gov.uk/research/seasonal

Research:

- applications/product development
- model calibration and multi-model combining
- ENSO teleconnections (to Europe)
- extremes prediction (seasonal to decadal)



Content

- Met Office seasonal forecasts for UK/Europe
 - summer 2008 and winter 2008/9
- role of stratosphere in winter ENSO teleconnection
- implementation of new seasonal system, GloSea4 – August 2009
 - (seasonal system development team – Alberto Arribas)



Met Office
Hadley Centre

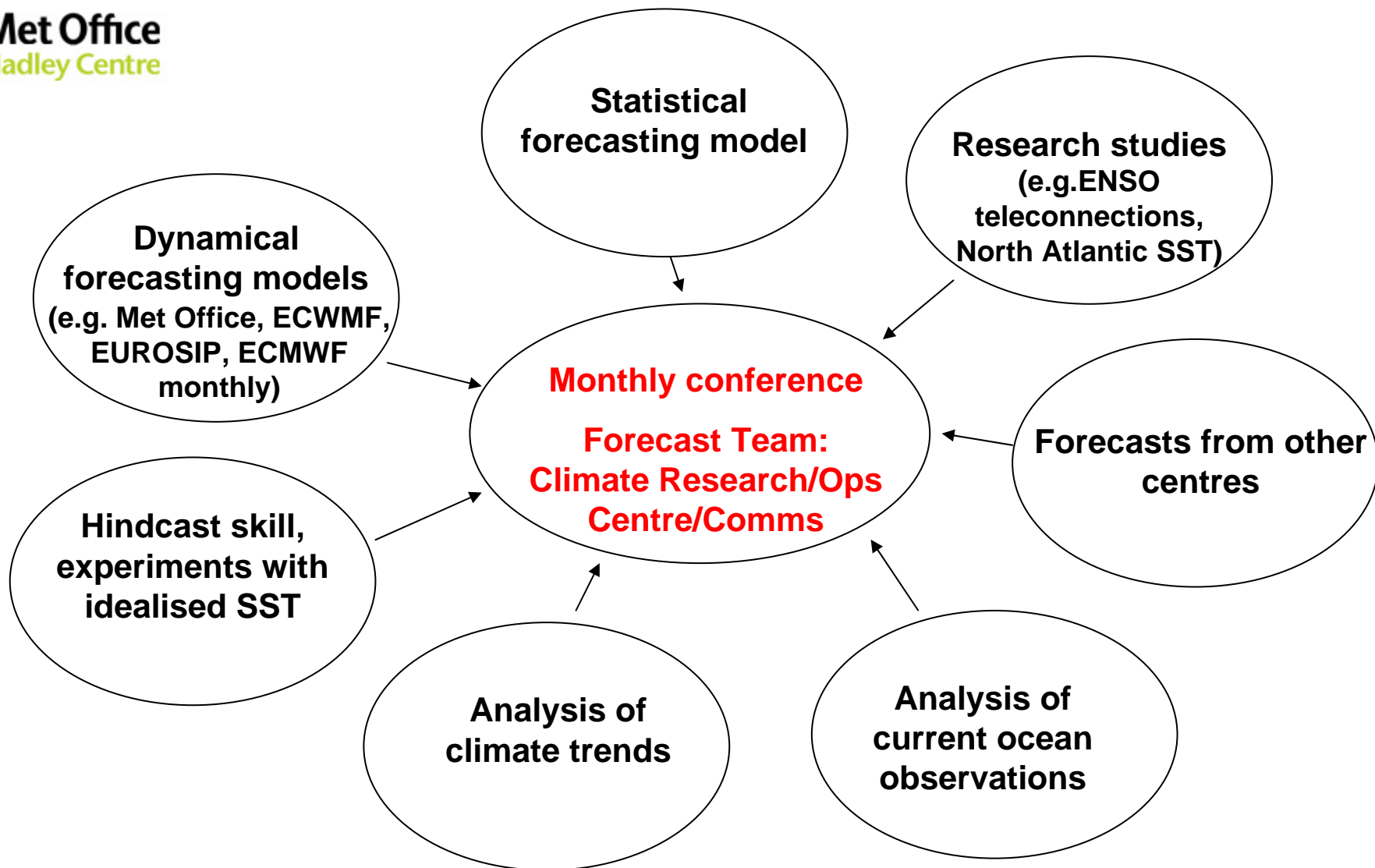


**Summer 2008 (rainfall): outcome
predicted 'most likely' occurred**



Met Office
Hadley Centre

The model output alone is not 'the forecast', expert interpretation needed!

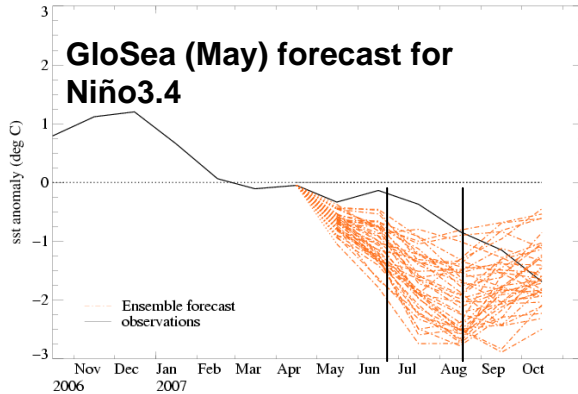




Met Office

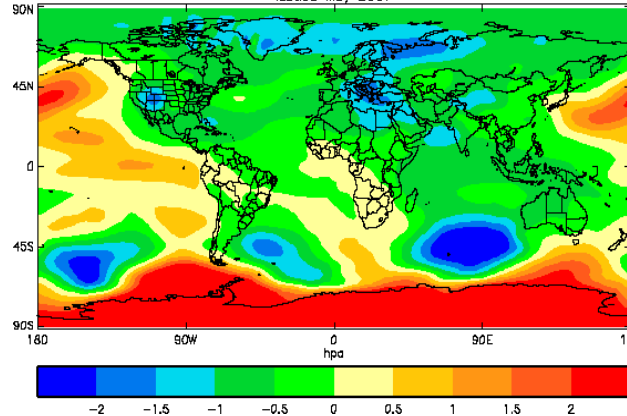
Summer 2008: first recall summer 2007

Ensemble Forecast of SST anomaly for region Niño3.4 from 01/05/2007

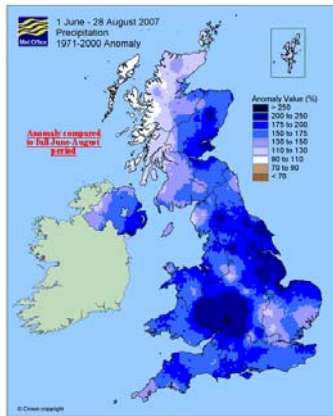
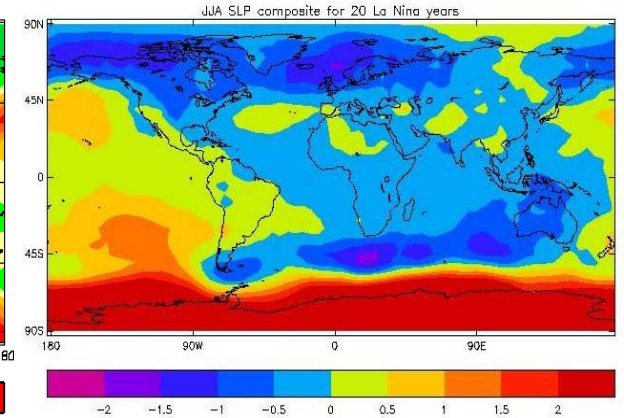


Ensemble mean pmsl anomaly, JJA

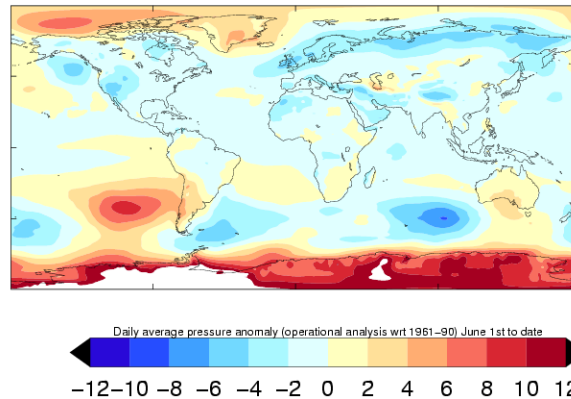
Met Office : Ensemble mean anomaly : mean sea level pressure : Jun/Jul/Aug
Issued May 2007



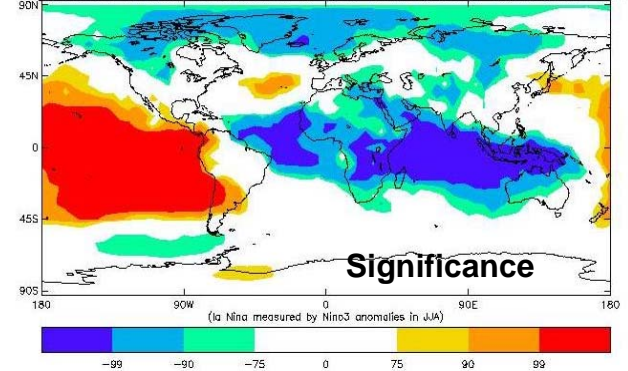
JJA pmsl anomaly composite for top 20 La Niña years



Observed JJA pmsl anomalies



Significance of the difference between SLP in top 20 La Niña years and all years, 1871-1999



2007: wettest UK summer since 1914 in some regions

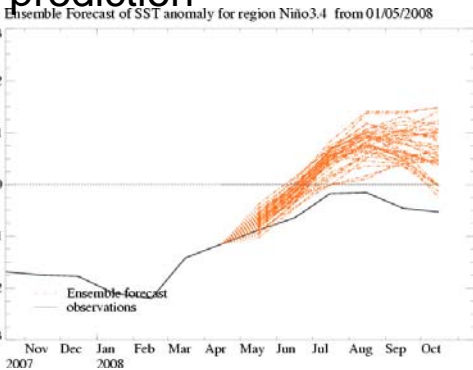
Summer 2008: GloSea forecasts from May

2008

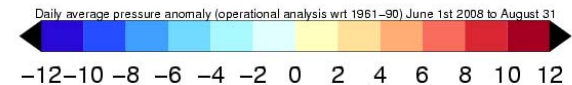
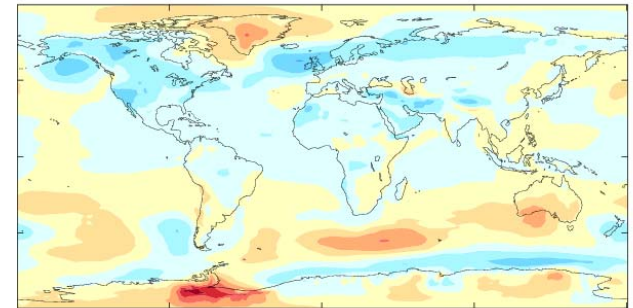
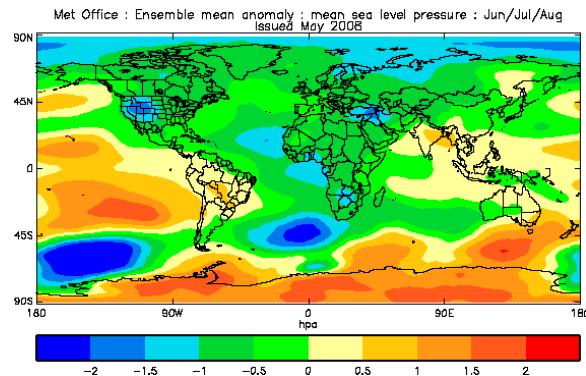
GloSea (May) ensemble mean
pmsl anomalies

observed JJA anomalies

GloSea (May) Nino3.4
prediction

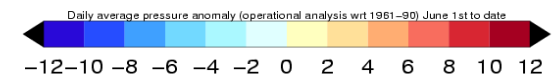
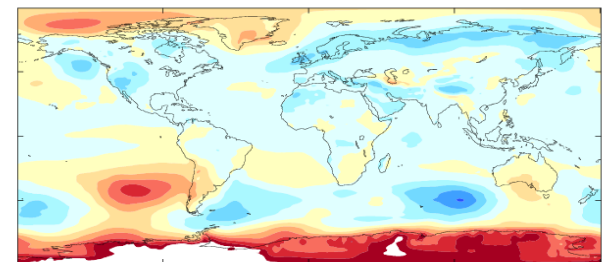
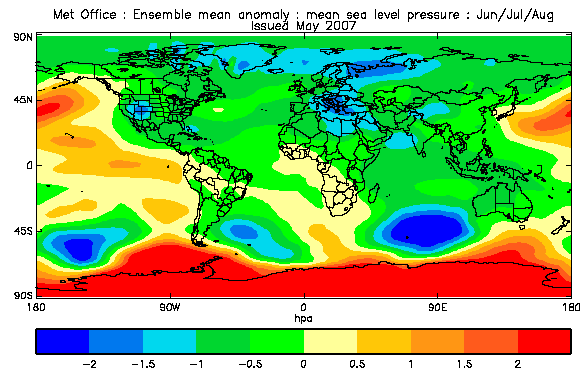


JJA08



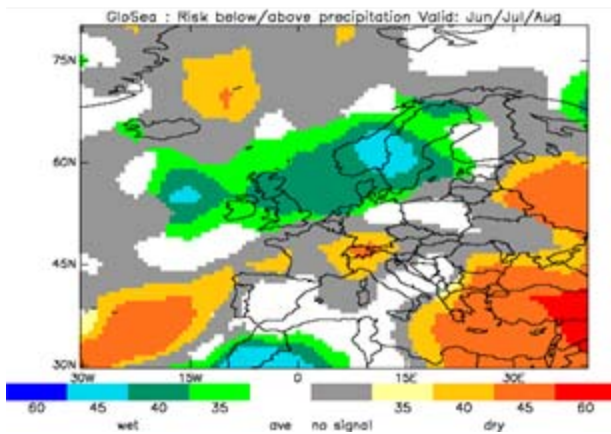
2007

JJA07

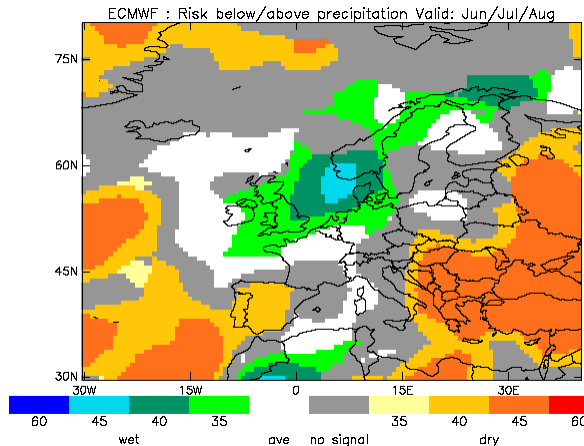


Summer (JJA) 2008 precipitation predictions from May

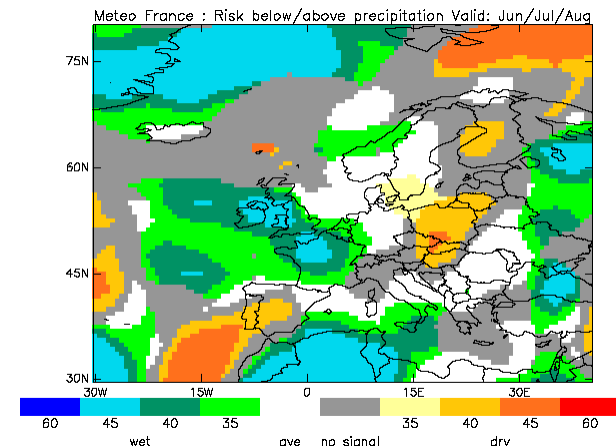
GloSea



ECMWF

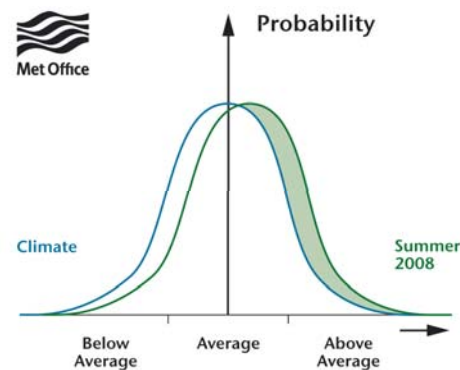
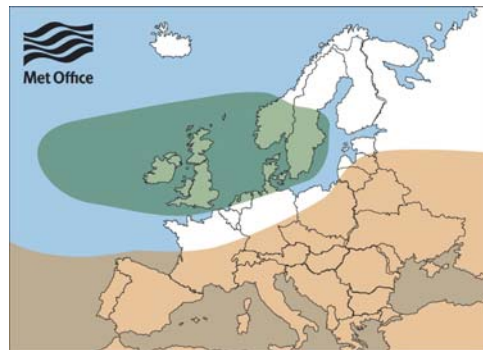


Météo-France



Tercile category probabilities

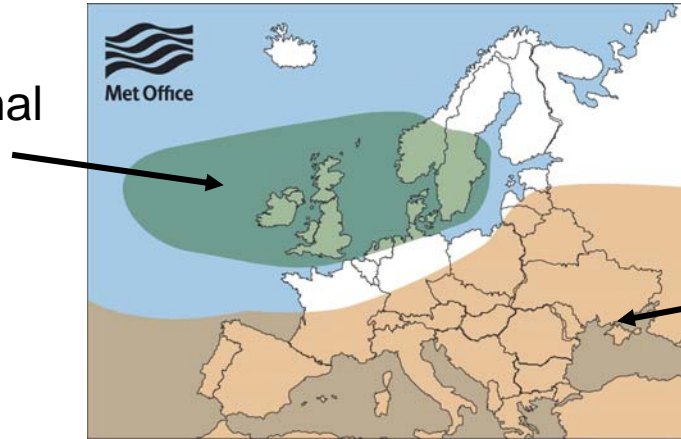
‘Toolkit’
used in
media
briefing





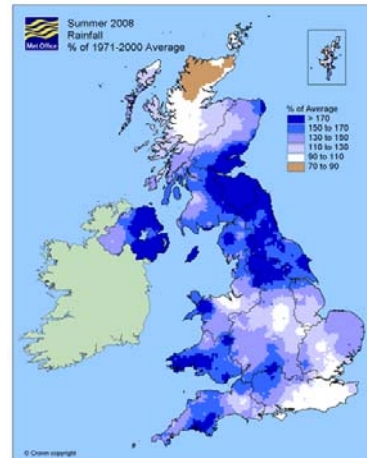
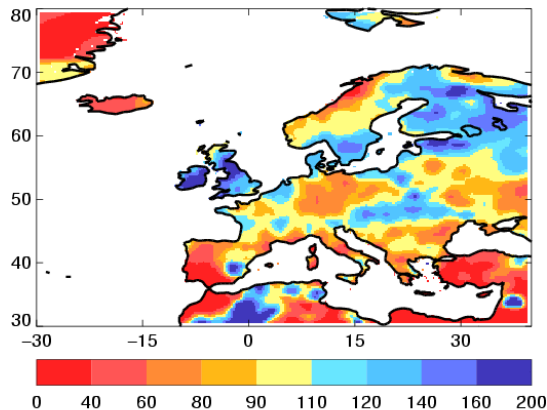
Summer 2008, UK forecast: ‘...likely to be more than usual cloudy cool spells...average or above average rainfall...’

more likely above normal



more likely below normal

SUMMER 2008 PRECIPITATION
PERCENTAGE OF LONG TERM AVERAGE (1971–2000)



Observed precip anomalies

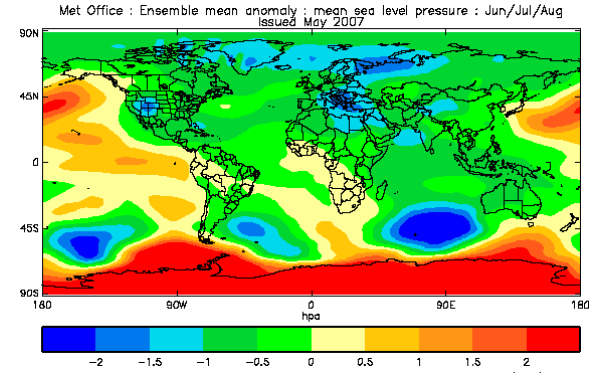
Summer 2009?

GloSea JJA ensemble mean pmsl, 2007/8/9

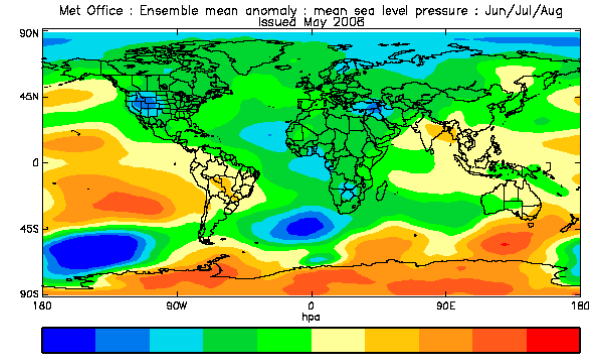
2009
Temperature:
 much of Europe likely above average

Precip:
 western Europe: likely average or below average
 eastern Europe: likely below average

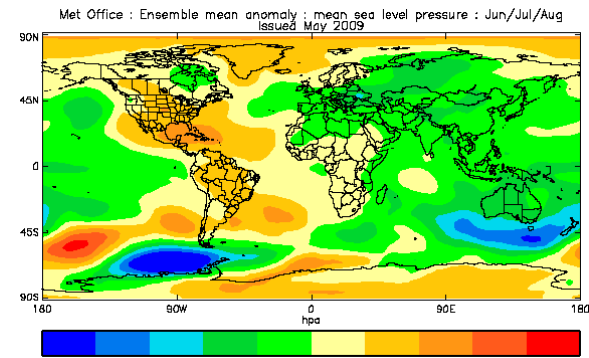
2007



2008

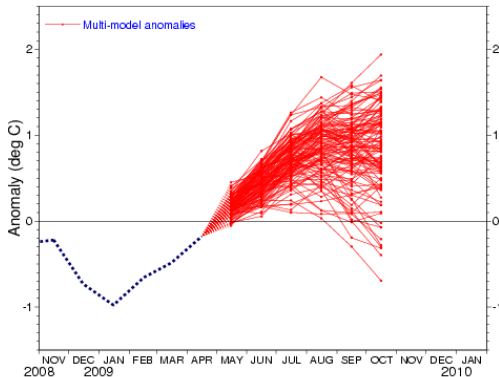


2009



EUROSIP Nino3.4

NINO3.4 SST anomaly plume
 EUROSIP multi-model forecast from 1 May 2009
 ECMWF, Met Office, Météo-France
 Monthly mean anomalies relative to NCEP adjusted Oiv2 1971-2000 climatology





Met Office
Hadley Centre

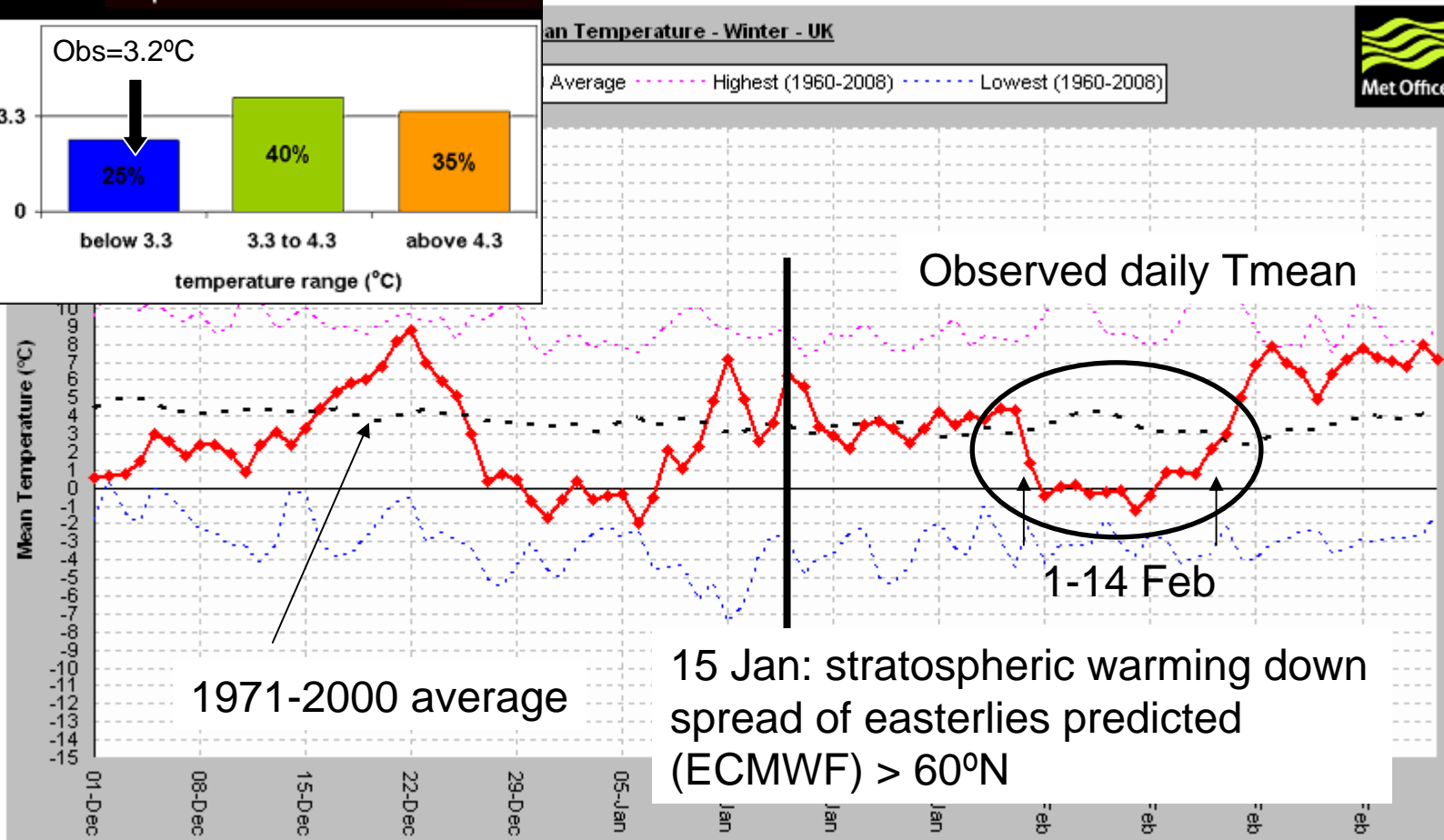
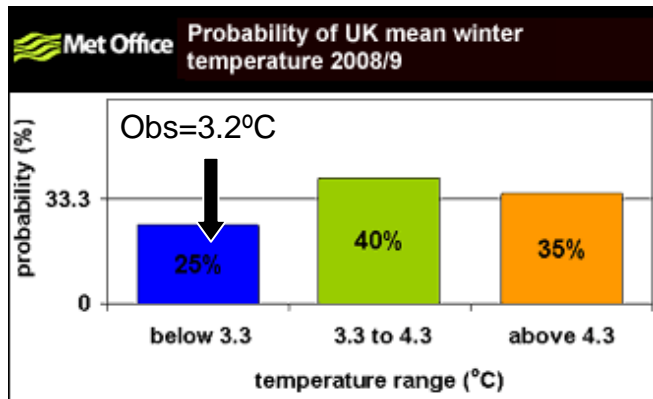
Winter 2008/9 (temperature):
outcome predicted 'most likely' did
not occur



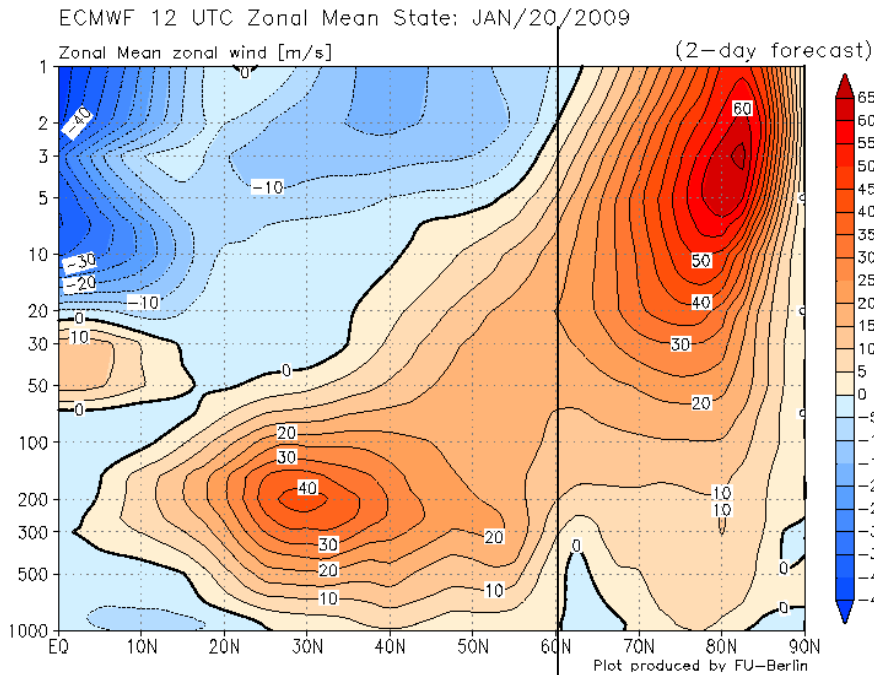
Met Office
Hadley Centre

Winter 2008/9: UK

Forecast (relative to 1971-2000)

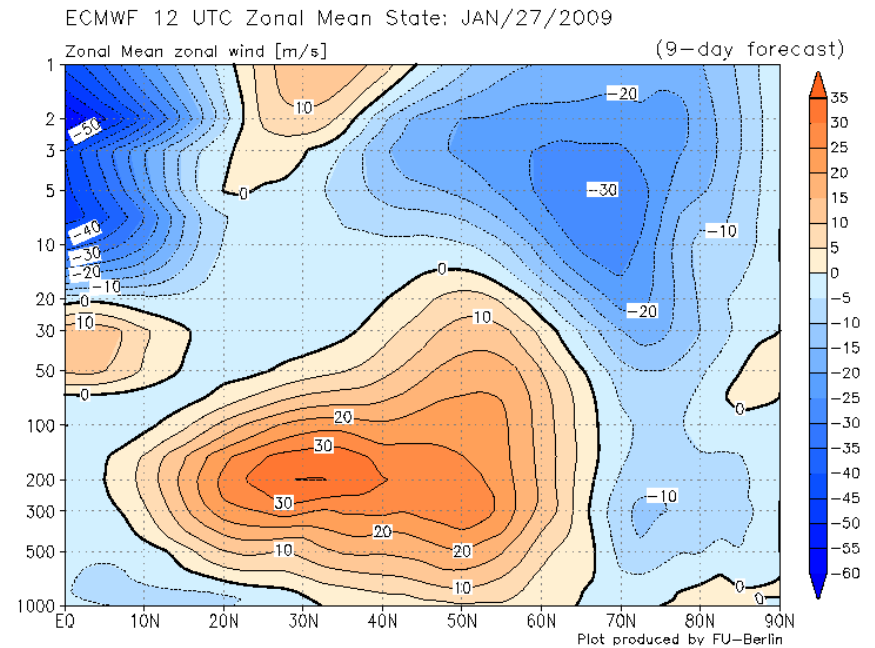


Predicted stratospheric warming: ECMWF: zonal wind (init. 18 Jan)



Day 2: Jan 20

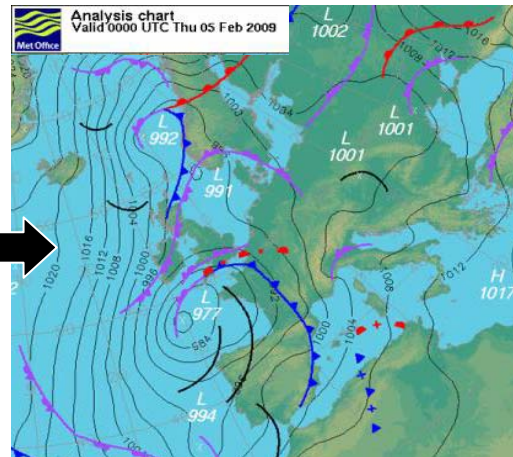
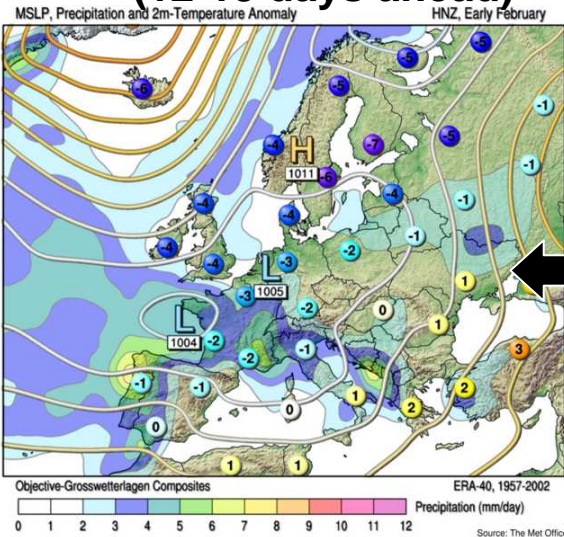
60°N



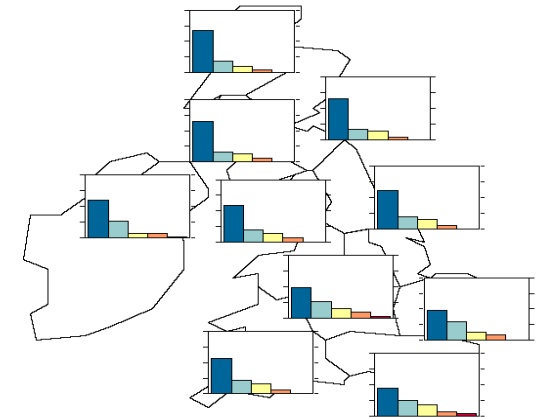
Day 9: Jan 27

Products from ECMWF monthly system 22nd Jan

2-8 February 2009:
(12-18 days ahead)



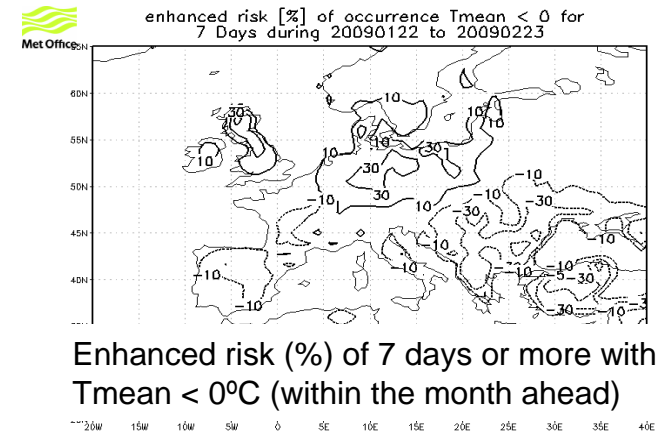
Monthly Outlook



Temperature: quintile
category probabilities

**‘DECIDER’ Grosswetterlagen –
regime with sig. enhanced
probability**

26 Jan: ‘...there is reasonable confidence for temperatures to be well below 1971-2000 averages for prolonged periods during at least the first two weeks of February...’





Met Office
Hadley Centre



Stratospheric resolution and ENSO teleconnections

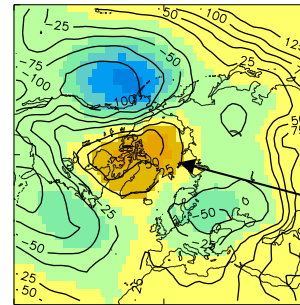
Late winter (JFM) impacts of El Niño: observed and modelled

60 level HadGAM model forced with observed SST (AMIP) – current operational system has 19 levels

Composite of 6 (x8 ensemble) simulated El Niño events in period 1961-2002 (AMIP)

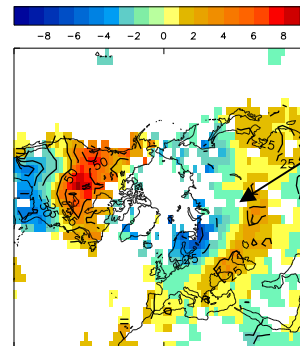
See: *Ineson and Scaife, Nat. Geoscience, 2009*

Observations (20 El Ninos, 1873-2006)

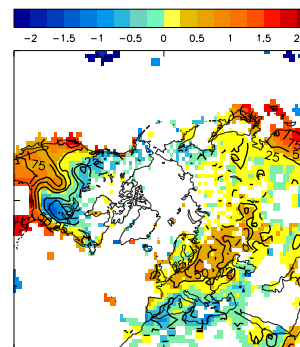


PMSL

Negative AO response:
cold northern Eurasia,
warm central Eurasia



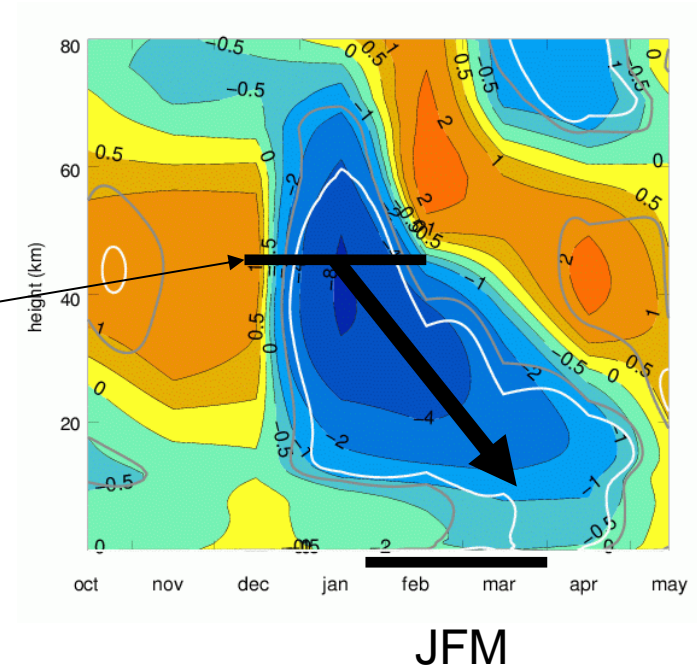
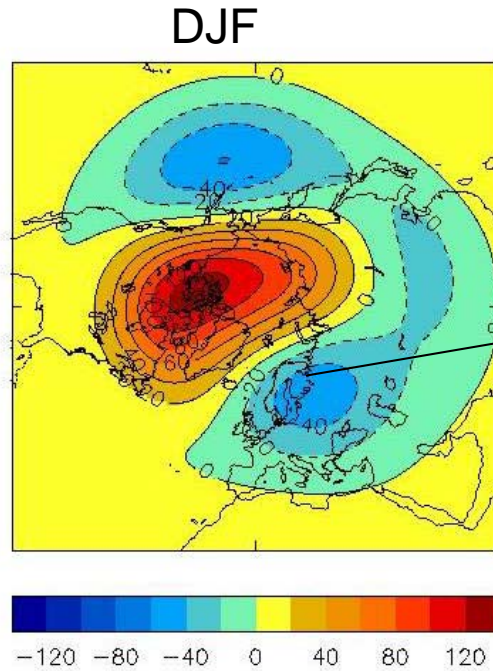
Temperature



Precipitation



Signal descends from stratosphere – lagged spread to surface



- signals descend to surface
- transition between early winter (ND) and late winter (JFM) matches observations
- good potential for improved prediction with new GloSea4 system (Aug 2009)



Met Office
Hadley Centre

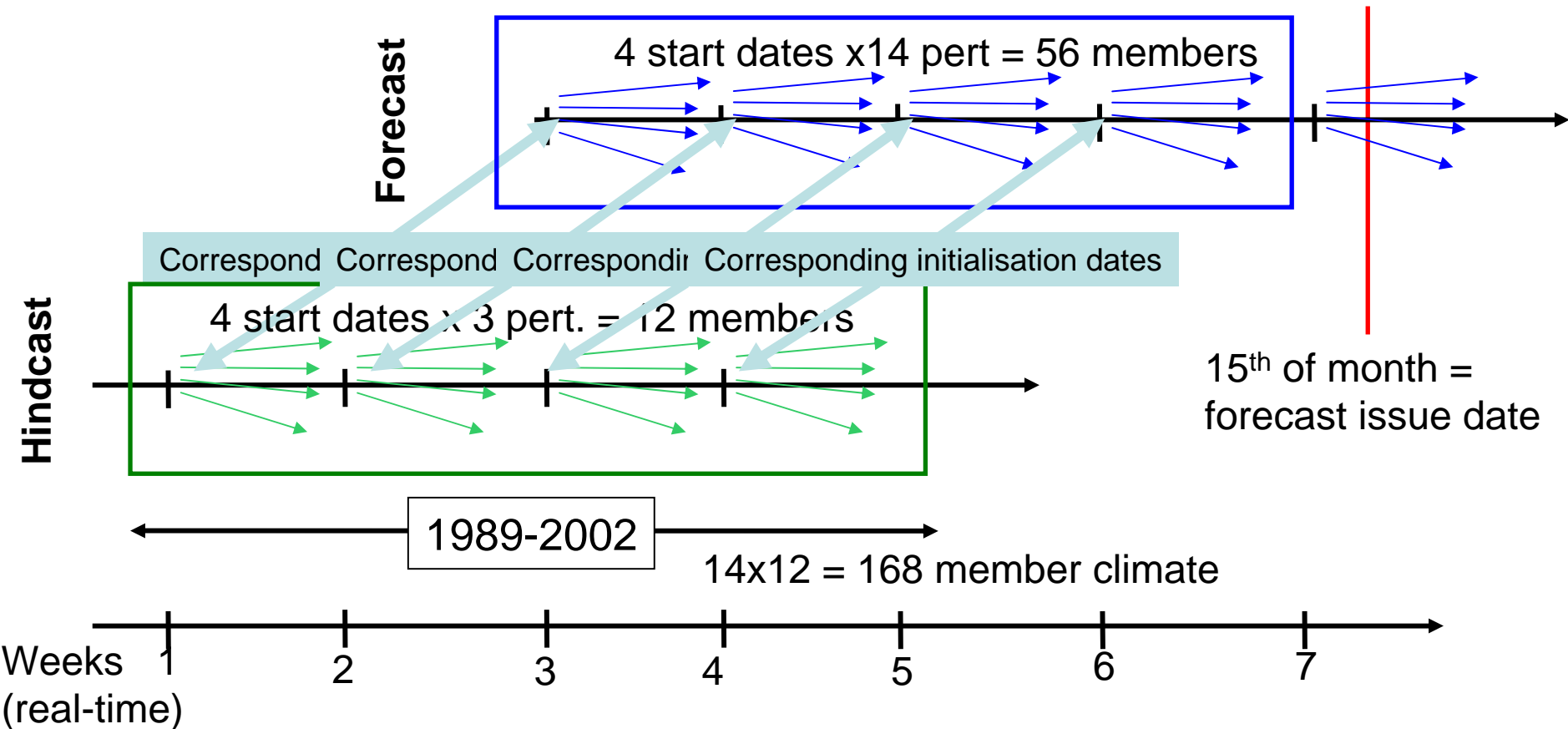


GloSea4: New Met Office seasonal system, operational August 2009

Current (GloSea3) and next (GloSea4) models – everything is changing!

	GloSea3 (present model)	GloSea4 (as of July 2009)
Atmosphere	HadCM3	HadGEM3-A
Resolution	N48 (~240km), 19 lev.	Aug 09: N96 (~120 km), 38 lev. End 09: N96 (~120 km), 85 lev.
Ocean	[Redacted]	
Resolution		
initial condition (IC) perturbations		
Model Perturbations		
Hindcasts	[Redacted]	

Hindcasts will be run ahead of each forecast, continuously in real-time



Real-time hindcast scheme allows more flexible model development programme

Summary

- Seasonal forecasts: mix of dynamical and statistical predictions and forecaster judgement
- ECMWF monthly system – good guidance for winter 2008/9 (helped ‘manage’ seasonal forecast)
- Good prospects for improved (winter) prediction (HadGEM3 + stratosphere)
- GloSea4 – August 2009

Next:

- continued operations (with Operations Centre) – climate services theme
- results on extremes prediction (90th percentile)
- wider range of monthly, seasonal, decadal products



Met Office
Hadley Centre



Thank you! Any questions?