Consortia Presentation

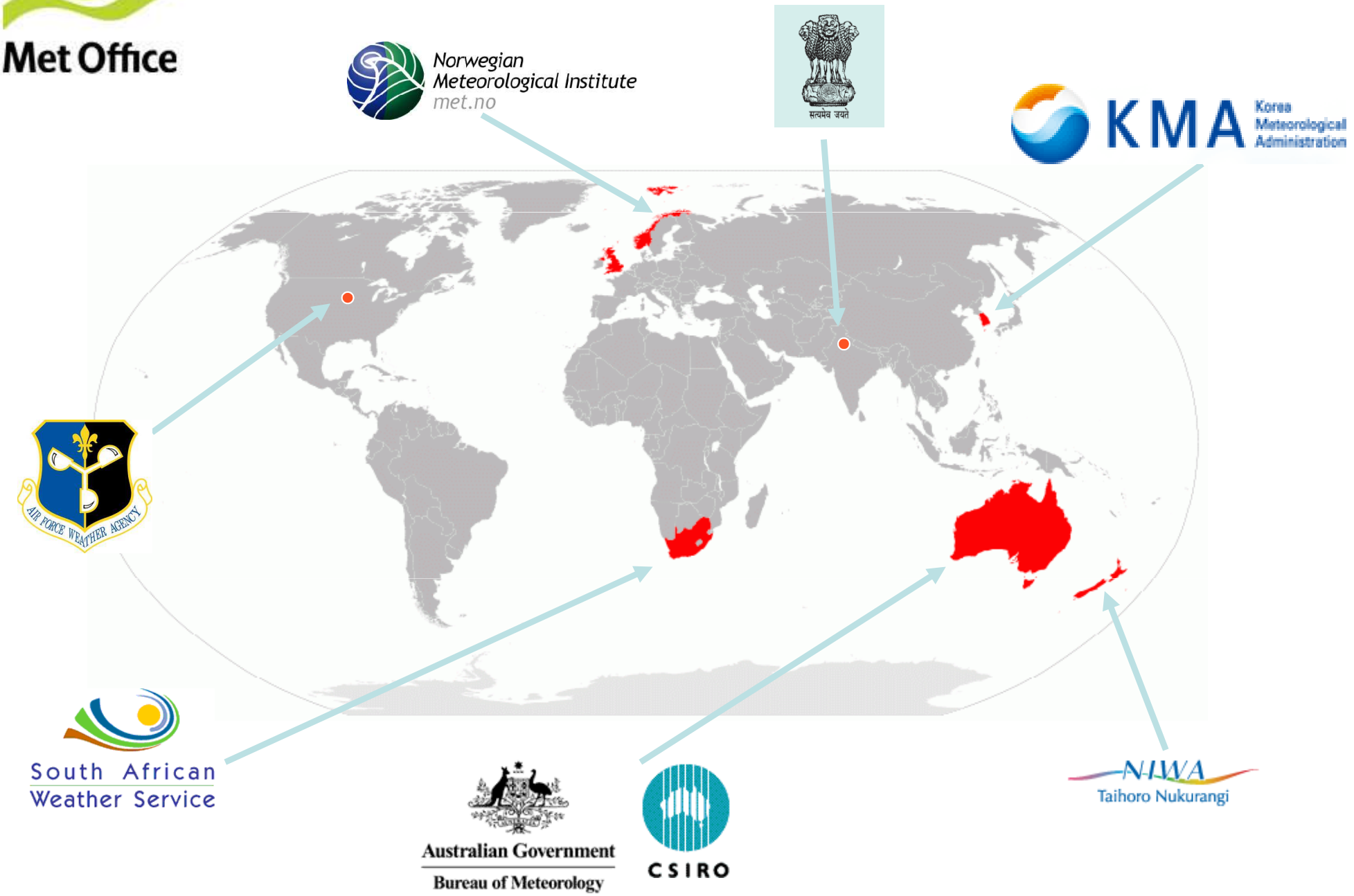
Mike Bush

For 34th EWGLAM and 19th SRNWP Annual Meeting 2012

08th – 11th October 2012 Helsinki, Finland

Collaborations

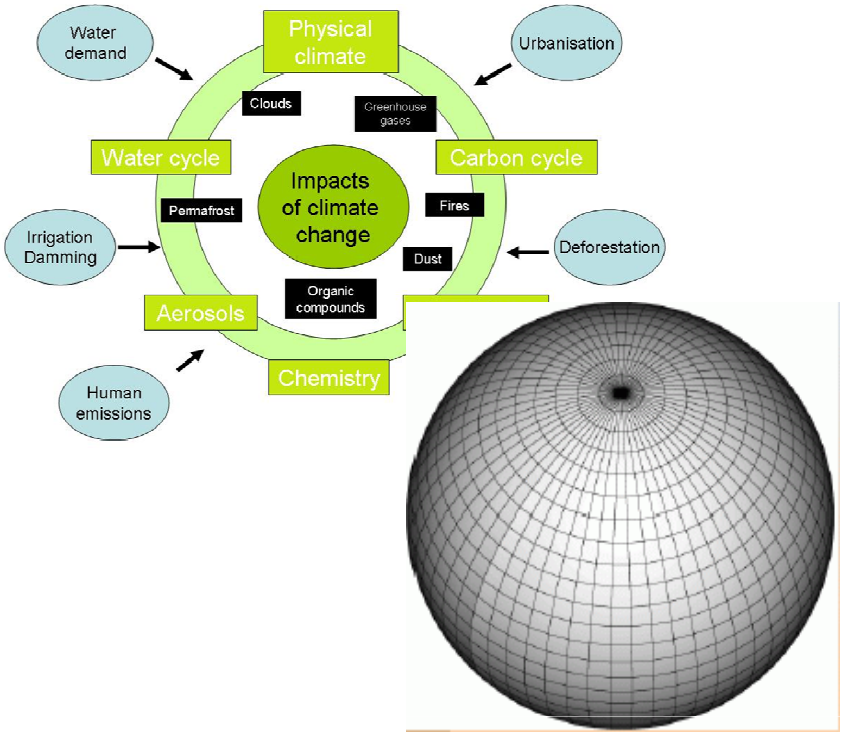
International UM partnership: Operational users 2012



ESSP: Environmental Science to Service Partnership

- ESSP concept: Bring together the data, knowledge, science and expertise of a number of public sector science based organisations to develop services that would prove much harder to develop by one of those organisations alone.
- The partners include representation from:
- Department for Environment, Food and Rural Affairs (Defra)
- Environment Agency (EA)
- Met Office
- Ordnance Survey (OS)
- Natural Environment Research Council (NERC) and its Centres represented by the British Geological Survey (BGS) and the Centre for Ecology & Hydrology (CEH).

Joint Weather and Climate Research Programme (JWCRP)



Shared science

- UK Earth System Modelling Strategy
- Next-generation dynamical cores

JWCRP Weather Research Strategy

- The JWCRP strategy for weather research is developed with the aim to reduce the consequences of high impact weather and other hazards in the UK and globally through provision of more accurate, more detailed, and longer lead time forecasts, on time scales from 1 hr to 1 month, for the public and government agencies

Shared research facilities

- MONSooN
- FAAM

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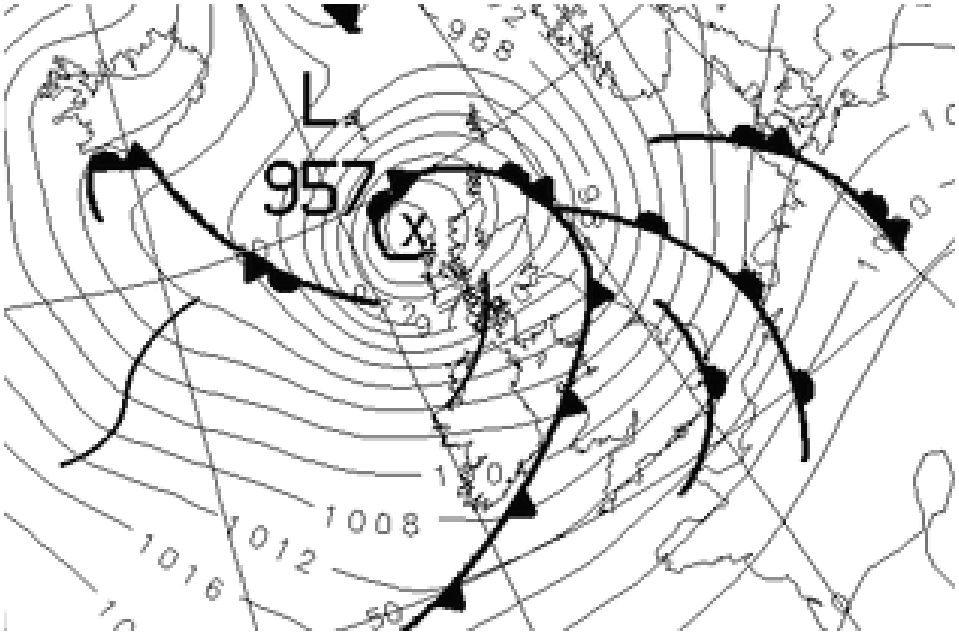
DIAMET

Wind farm in North Ayrshire (not in operation due to the severe weather warning, but something went wrong…)

- DIAbatic influences on Mesoscale structures in Extratropical sTorms
- Collaborative project between the Met Office and NERC/NCAS
- Investigation of many facets of mesoscale structure in cyclones
- IOP-8 Cyclone Friedhelm – 8th Dec 2011
- Rapid development (deepening 40hPa in 24 hours)
- Severe surface winds
  - 165mph (gust) on Cairngorm
  - Considerable damage & disruption



DIAMET: FAAM aircraft in the Scottish Sun!!!

THE SCOTTISH Sun

SAYS

What a stormer

IT came, it blew, but it didn't conquer.

Yes the 165mph hurricane that battered Scotland left a trail of destruction in its wake.

Yes, it led to travel problems, left thousands without power and damaged buildings.

But at the end of the day the country was still standing.

And the Government, the emergency services, the local authorities and the poor suffering public themselves all played their part.

There are times when there's nothing we can do to withstand the worst that Mother Nature chucks at us.

But at least we were better prepared than we were this time last year when no one in power seemed to be aware that we actually had a season called winter.

This time early decisions were made on school closures, the transport network was kept moving – albeit with disruptions – and emergencies were tackled swiftly.

Hurricane Bawbag – as the gales were dubbed on Twitter – might have been ferocious.

But Scotland played a stormer.

Battle lines

HOW will history remember David Cameron?

Like Neville Chamberlain, the lame-duck Premier who returned from Europe in 1938 waving a bit of paper claiming he had tamed Hitler?

Or like Winston Churchill, the British lion who roared defiance and never surrendered?

We're about to find out. Mr Cameron is in Brussels today for the most important meeting of his career.

It is do or die for the eurozone countries. Much as it pains them to admit it, they need Mr Cameron's backing if a quick deal is to be done and catastrophe averted.

The PM has some strong cards to play. In exchange for helping save the euro, Mr Cameron should tell Brussels to get its nose out of the City of London.

He should also start the ball rolling on a bonfire of EU employment and immigration regulations, farming and fisheries laws, and health and safety rules. All damage the UK economy.

If the PM comes back like Chamberlain touting empty promises, he will be on the way to fulfilling Churchill's accurate prophecy that ducking confrontation today guarantees a nightmare tomorrow.

That nightmare – Brussels seizing more control over Britain and the Tory Party in open mutiny – awaits Mr Cameron if he shows anything less than Churchillian steel and resolve in Brussels.

In 1940 the battleground was the beaches. Today it is the conference table.

Fight for Britain, Prime Minister. The country is on your side.

STORM-HIT SCOTLAND: EXPERTS' THRILLING FLIG

twitter

@goodnighthorse: Did I hear that right? Blowing at 165mph? Wow. I have a new, if grudging, respect for the conservatory-muncher.

Pressure drop spark for 'bomb'

WEATHER "bombs" are the most severe of all winter storms.

They were identified in 1980 by scientists Fred Sanders and John Gyakum and apply to a low where the sea level atmospheric pressure drops at least one millibar an hour for 24 hours.

Hurricane expert Kyle Griffin of the University at Albany, US, said "bombs" were caused by differences between deep low pressure and strong high pressure.

He said: "As the storm bombs out, the distance between the high and low pressure systems remains roughly the same while the pressure difference increases.

"Because of this the winds respond by becoming gusty."

And he revealed the fierce weather has roots in southern Europe.

He said: "This storm and high pressure near Spain are closer than the atmosphere usually allows – so winds near the centre of the low are much stronger."

twitter

Im_Jonny: Charging all my gadgets in case the power goes out.

Gale blast from past

SCOTLAND is no stranger to terrifying storms – including the 172mph tempest in 1986.

Gales swept the country on March 20 with the most ferocious gusts – which set a UK record – recorded on Cairngorm summit.

One of the most violent storms ever was the hurricane of 1968, which left 20 dead, including nine in Glasgow.

Journey to the centre of the storm

DRAMATIC CYCLONE-CHASE MISSION

ONE flight wasn't cancelled yesterday — and it flew on a white-knuckle journey straight into the eye of the storm.

By MATT BENDORIS

While planes across the country were being grounded, Flight B658 took off from Exeter, Devon, on schedule at 10.30am.

It was packed with 20 scientists on a mission to meet head-on the worst Scots winter storm in years.

And at precisely noon the storm chasers got their wish when the modified BAe 146-301 large Atmospheric Research Aircraft, above right, entered Cyclone Friedhelm.

On board was intrepid weather expert John Mathves, right. And the 43-year-old gave a blow by blow account exclusively to The Scottish Sun about what it's like to be at the eye of a storm.

He said: "We went looking for a very explosive cyclone – and we found one." John and the team wanted to investigate why storms are at their worst over Scotland during the winter. They believe melting ice 'speeds up' the cyclones.

And they got the opportunity to test their theory as temperatures rose across Scotland this week before we were battered by yesterday's 'perfect storm', shown in satellite image above.

John, of Reading University, explained: "We took off from Exeter airport, and flew straight up the Irish Sea in a direct line to the Isle of Lewis, where we knew the storm would be at its worst."

But their flightpath took them on a white-knuckle ride when they met waves of over 70ft high in the spar around the islands of Coll and Islay in the Southern Hebrides.

He said: "We were flying at just 1,000ft at that point, which is always very worrying when you are at low levels because it was very, very turbulent. The waves were around 60 to 70ft high. I was sitting right behind the pilot in a seat in the cockpit, so I had a fantastic view. In truth although it was very worrying, it was also very exciting." But worse was yet to come – when they caught up with Cyclone Friedhelm.

John explained: "We met the storm at exactly midday right over the centre of Lewis. That's where we recorded winds of about 150 knots (173.1mph). I understand they were around the same at the top of the Cairngorms where they reached 165mph.

"The main difference is, that was just a gust of wind on top of the Cairngorms – we had that wind speed constantly."

Parachutes

The flight was piloted by Captain Alan Forbes and co-pilot Ian Ramsay-Rhea.

Its distinguished passengers also included cloud experts and Met Office boffins.

The team were hunting for a little-known weather system called 'sting jets' which are thought to be at the root cause of our violent winter storms.

John added: "The theory is they are made even stronger by evaporating ice, which is what we were investigating.

"When we found them, we dropped 17 sondes (sensors), which fall down to the sea on little parachutes and measure temperature and wind speeds as they drop." But when they reached the eye of the storm, the hardy passengers were able to enjoy a rare moment of calm.

John said: *"When you fly to the very middle, it's much calmer. The winds were only about 20mph at the centre which gave us a few moments of relief."*

But the research plane flew into difficulties when they were unable to land after their ten-hour storm-chasing flight.

The pilots dashed to Teesside in the north of England to refuel.

John said: "We were supposed to land at Prestwick airport but it was just too windy.

"In fact we were unable to land anywhere in Scotland. So instead we were diverted to Teesside to refuel instead."

The flight was part of project FAAM – which stands for Facility for Airborne Atmospheric Measurements.

It's the result of a collaboration between the Met Office and the Natural Environment Research Council for atmospheric scientists.

John joked: "It was certainly a flight with a difference. Put it this way, the pilot had the fasten seatbelt sign on at all times."

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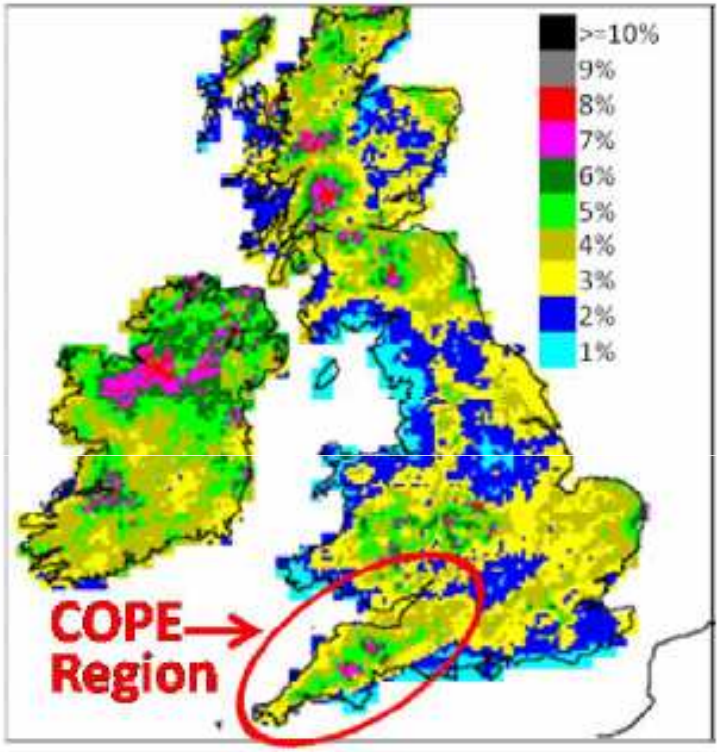
Dramatic . . . view of storm from plane

DYMECS

- DYMECS (DYnamical and Microphysical Evolution of Convective Storms)
- This project will develop statistics on the properties of thunderstorm cells and showers by tracking them using the Chilbolton radar.
- The statistics on storm cell properties will be used to validate the microphysics parametrization and explicit convection from high-resolution runs of the Met Office Unified Model.
- http://www.met.reading.ac.uk/~dymecs/home/

COPE / MICROSCOPE

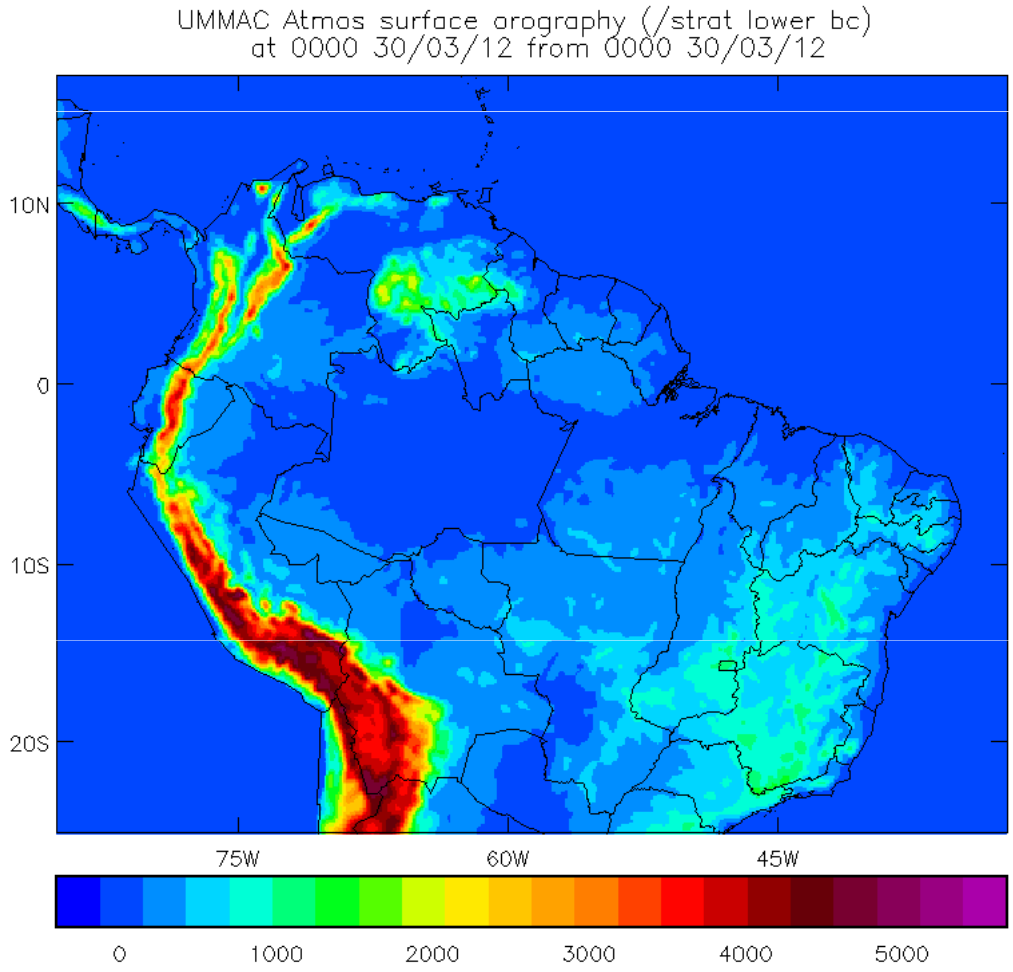


- COnvective Precipitation Experiment
- UK-led project proposed for southwest England in June, July and August 2013.
- This experiment is motivated by the continued low skill in quantitative precipitation forecasts (QPF) of NWP models.
- Follow on to CSIP concentrating on SW England and emphasizing development rather than initiation

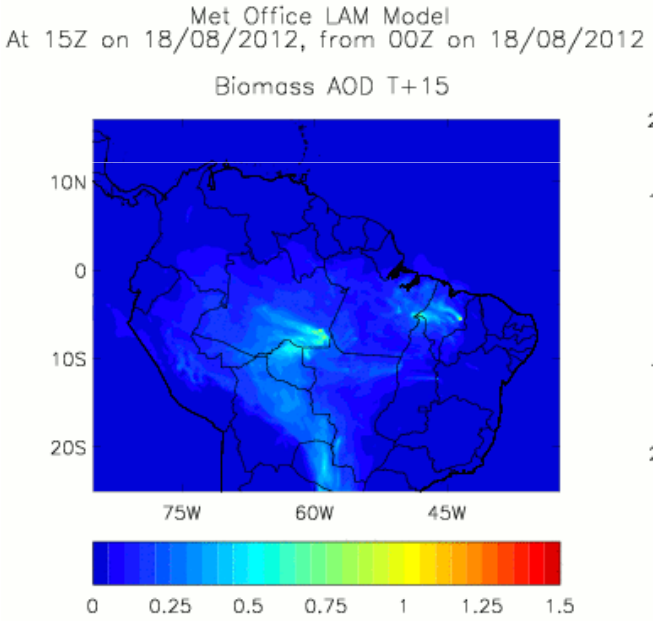
The South American Biomass Burning Analysis (SAMBBA)

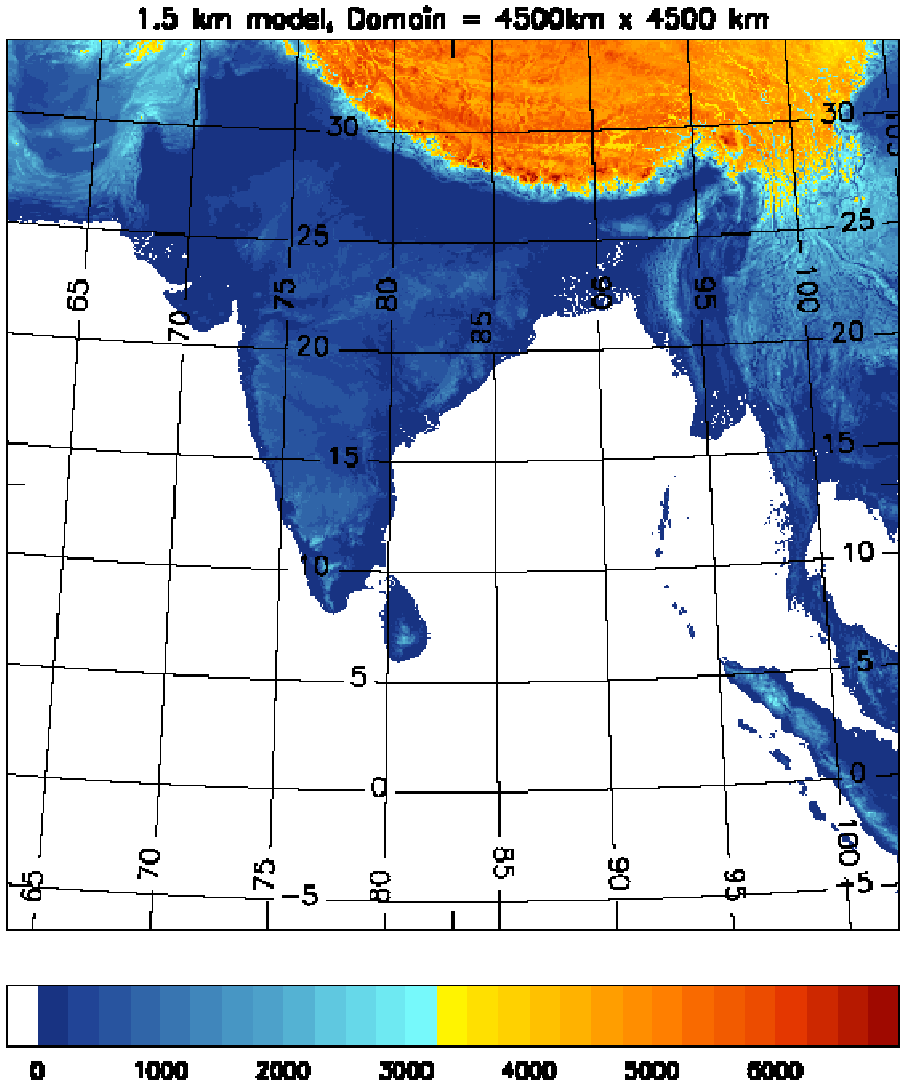
- The SAMBBA project is using the FAAM research aircraft to make an intensive set of flight measurements over Amazonia in September 2012.
- This campaign involves the Met Office, the UK university communities and Brazilian partners (INPE and University of Sao Paolo).
- The aims are to measure and model a number of biomass burning aerosol quantities (e.g. emissions, microphysical and radiative properties etc.)

The South American Biomass Burning Analysis (SAMBBA)



- A 12km LAM has been set-up and will run for the duration of the campaign
- It will assist flight planning and be a testbed for implementing a new biomass burning scheme in the UM.





- As part of the EMBRACE project (EU FP7) a series of high resolution simulations of the 2011 Indian Monsoon are currently being run on the Power 7 supercomputers.
- The driving model for these simulations is the current global operational forecast model and nested directly inside it on a 4500 km x 4500 km grid are simulations at 1.5 km, 4 km, 24 km and 120 km.

Met Office news

Head of the Met Office Hadley Centre

- Professor Stephen Belcher became the new Head of the Met Office Hadley Centre from January 2012.
- Previously he was the Joint Met Office Chair at the University of Reading (which is part of the Met Office Academic Partnership launched in 2010)
- He has held key research posts at Reading and Cambridge in the UK and Stanford University in the USA.
- His work at Reading into the effects of climate change on cities and the role of the oceans in climate continues on a part-time basis.

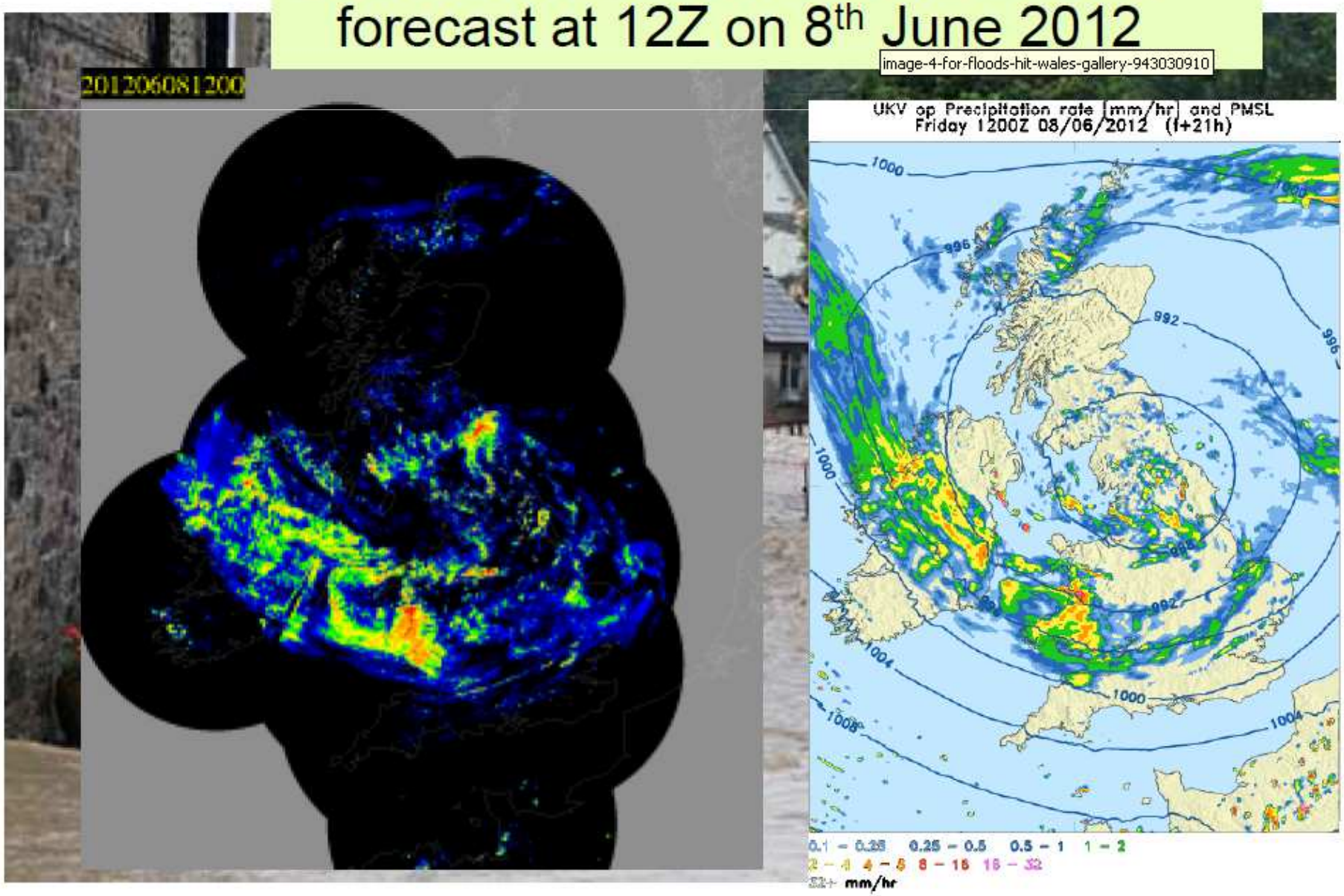
Head of Weather Science

- Dr Gilbert Brunet will take over from Dr Brian Golding as Head of Weather Science from Autumn 2012.
- He will be on secondment from his current post as Director of Research at Environment Canada
- He is Chair of the Joint Scientific Committee of the World Weather Research Programme, World Meteorological Organization (WMO).
- Expert in dynamical meteorology

Ceredigion flooding

UKV forecasts for flooding in June 2012

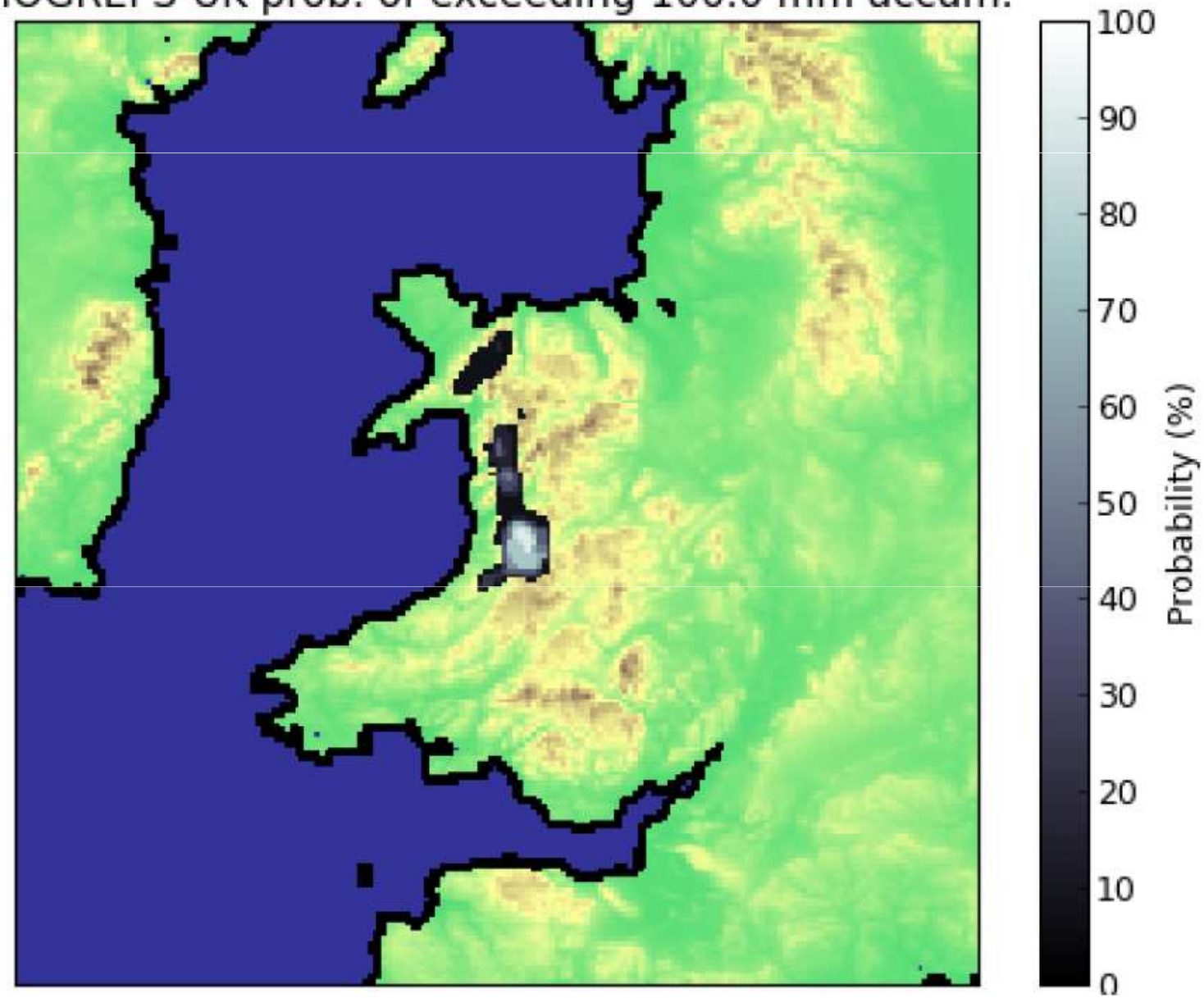
Instantaneous radar and T+21 UKV forecast at 12Z on 8th June 2012



Preliminary results from 2.2km MOGREPS-UK ensemble

Met Office

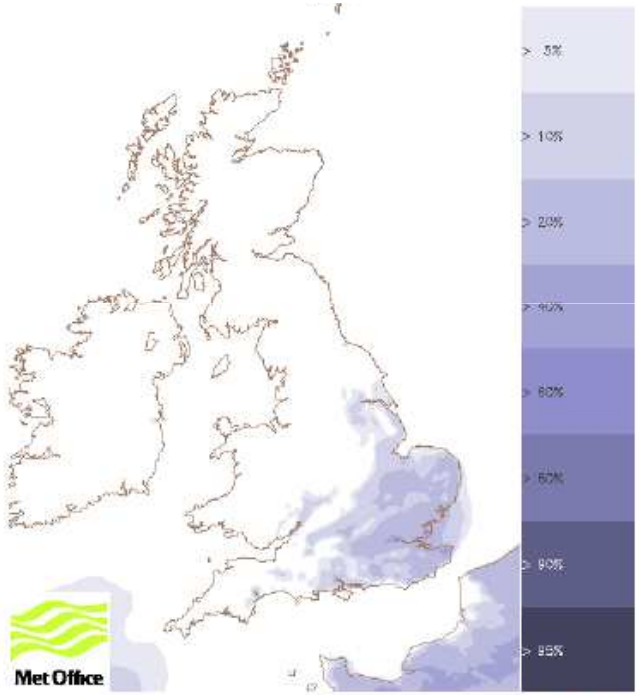
0800 UTC
9th June



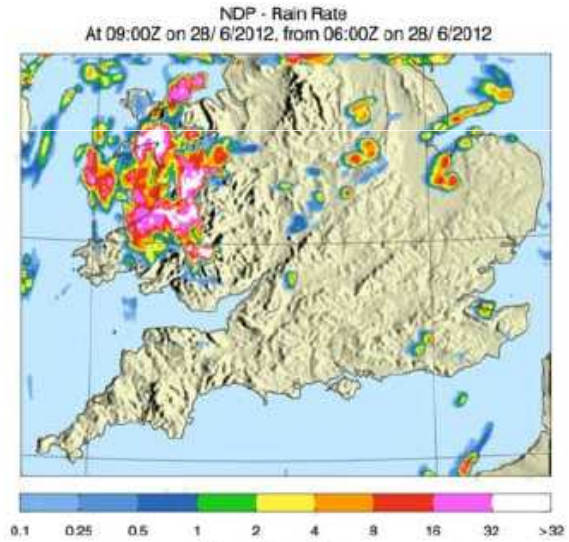
Olympics 2012: a science showcase

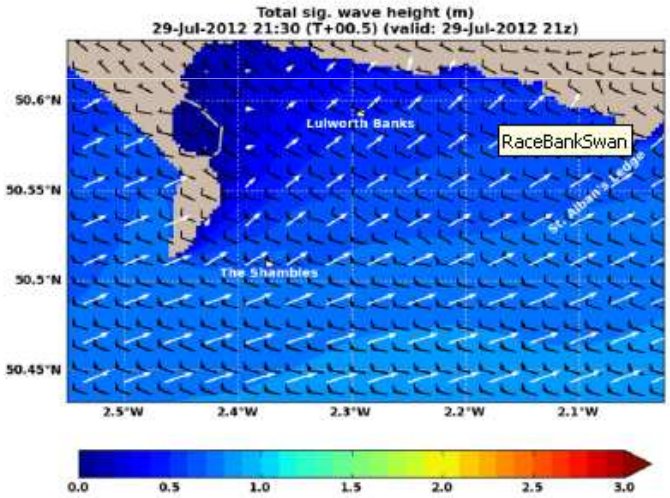
- Significant progress in science and technology

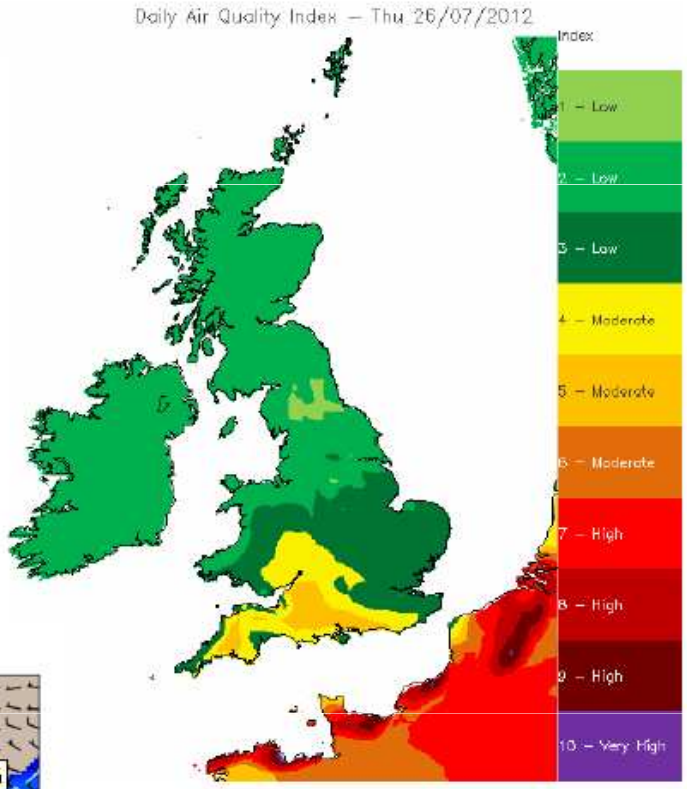
See Clive's talk



UK Convective scale ensemble







- Demonstrates potential for future operational implementation and contributions to *growth*

IBM Power 7

IBM Power 7: Facts & Figures

	IBM Power 6 1E+1F+1C	IBM Power7 2E+2F+2C	Factor
Peak Performance per node (GFLOPS)	600	960	1.6
Number of Nodes	247	1216	4.9
Number of Cores	7904	38912	4.9
Total Peak Performance (TFLOPS)	150	1166	7.8
Total Disk (TBytes)	750	1500	2
Disk Performance (GB/s)	24	48	2
Power (Mwatts)	1.2	2.5	2.1
MFLOPS/Watt	96	370	3.9

Parallel suite highlights

Parallel Suite 29 Highlights (1)

- **Parallel Suite 29 28/03/12:**
- Increased frequency of ensemble models
- MOGREPS-G (global) and MOGREPS-R (regional) ensemble models increased from 2 runs per day to 4 (00,06,12,18z)
- Each run now contains 12 ensemble members rather than 24 so there is only a small increase in cost due to two extra runs per day of the Ensemble Transform Kalman Filter (ETKF)
- However the ensemble products are still be based on 24 members, by combining the latest 12 members into a ‘lagged’ 24-member ensemble using the 12 members from the previous run.
- Lagging aims to reduce the variability between successive model runs to give a more consistent forecast.
- This change was originally withdrawn from PS28 because of concerns about the implications for Global model (hybrid) data assimilation. Further trials have now provided evidence of the positive impact of this change.

Parallel Suite 29 Highlights (2)

- **Demonstration of high-resolution modelling capability for the Olympics:**
- The 2.2km resolution UK ensemble model (MOGREPS-UK) was introduced with four runs per day at 03, 09, 15 and 21Z out to T+6.
- The 333m resolution Weymouth Bay model was introduced with one run per day.

Parallel Suite 30 Highlights

- **Parallel Suite 30 Part 1: 26/06/12**
- “Lift and Shift”of Operational suite onto the new Power 7 supercomputer
- Operational products still produced from the Operational suite on the Power 6 machine as the Power 7 had yet to be accepted.
- MOGREPS-UK: extend to T+36
- UKV: 8 runs a day out to T+36
- Weymouth model: 8 runs a day
- **Power 7 supercomputer accepted: 28/08/12**
- **Parallel Suite 30 Part 2: 17/09/12**
- Operational products now coming from the Power 7 machine
- Power 6 machine switched off shortly afterwards
- Weymouth model ends with the close of the Paralympics

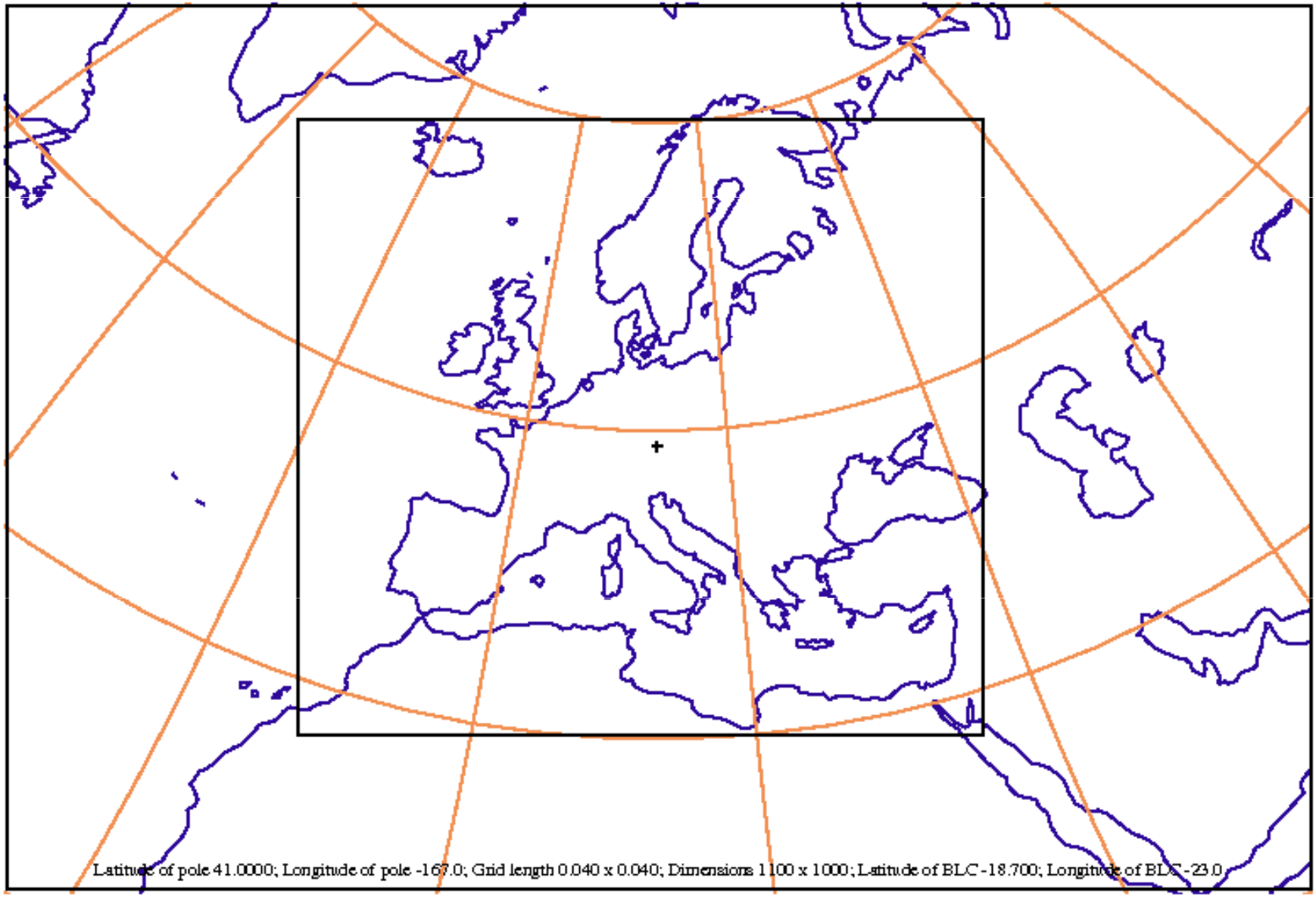
Future Plans

Parallel Suite 31: November 2012

- MOGREPS-G
  - Resolution increase (N400; ~33km)
  - More members to T+9
  - Driving MOGREPS-UK

- Also resolution upgrades to FOAM Deep Ocean Model, the WW3 (Wave) models and Glosea5
- UKV science upgrade (see talk on UKV physics tomorrow)
- New European downscaler 4km model (i.e. no data assimilation)

Domain for Euro 4km model

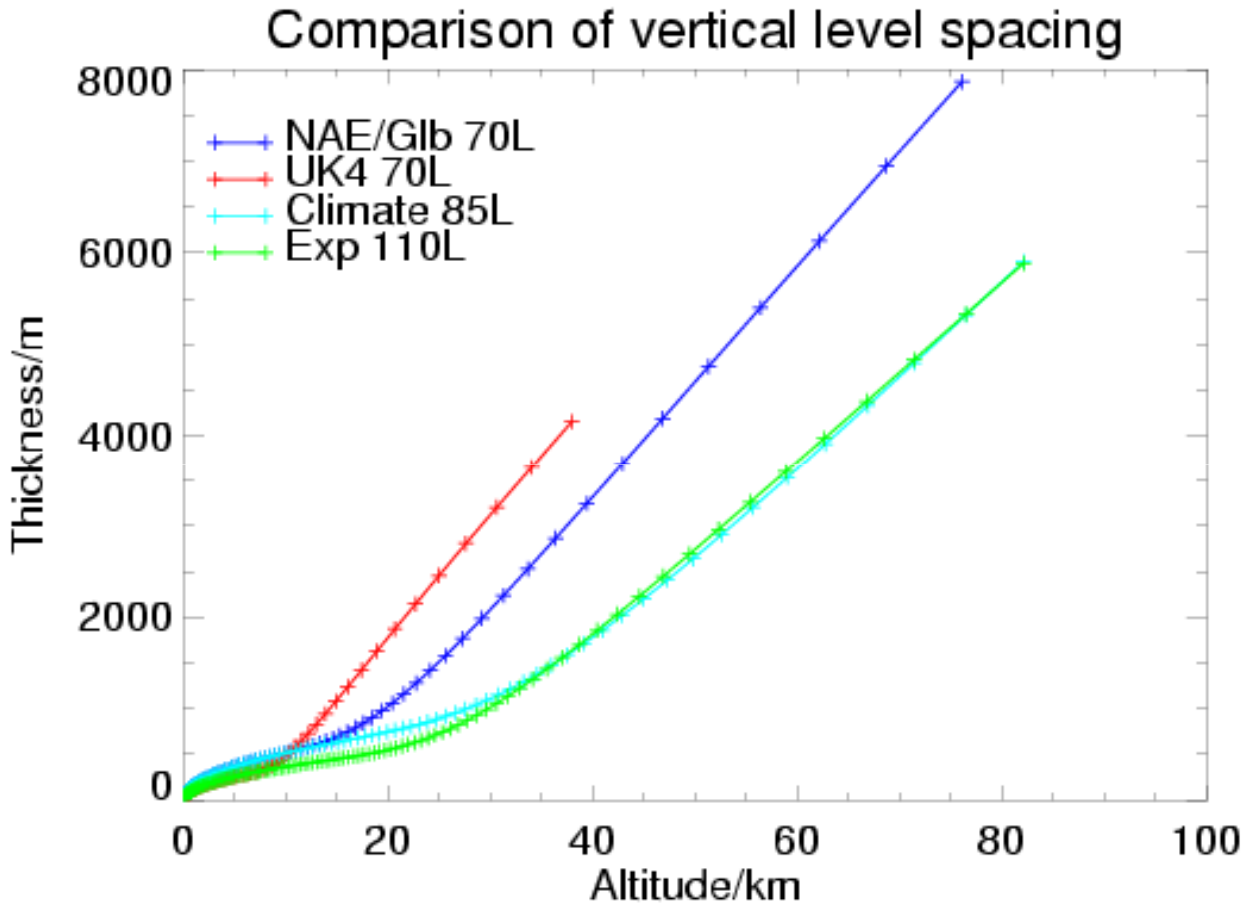


Upgrade plans for 2013/2014

- Retire MOGREPS-R, UK4 and NAE models
- Timescale determined by product migration
- Limited Area models to move to ENDGAME
- Possible Increase in vertical resolution (~110 levels) for limited area models with relatively more levels in the boundary layer
- Rose

Global model plans

- Global model horizontal resolution upgrade to N768 (17km) with GA5 Science (including ENDGAME dynamical core)
- Change in Global vertical levels to L110? in 2014/2015



Rose

- Our current software infrastructure for running scientific suites and applications is complex, fragmented and difficult to use.
  - It requires lots of efforts to maintain.
  - It could be more user friendly.
  - It hinders external collaboration.
- ‘Rose’ is a set of tools to replace technical infrastructure such the Suite Control System (SCS) and GHUI-based user interfaces for the OPS, VAR and UM
- Rose will provide a common solution for managing, configuring and running suites of scientific applications.

Gung-Ho 2014-2020?

- ***G****lobal* ***U****nified* ***N****ovel* ***G****rid* ***H****ighly* ***O****ptimised*
- Next generation dynamical core
- Grid to be decided
- Change of file format from fieldsfile to NetCDF (and GRIB2?)

Questions?