Application of the UM-SA12 in southern Africa

1

Operational Aspects of the UM SA12 LAM

The SAWS run a regional version of the UM in-house

Operational on a SX-8 high performance computer

The domain covers the whole of southern Africa as well as surrounding oceans

The UM SA12 has been operational sunce October 2006.

Operational Aspects of the UM SA12 LAM
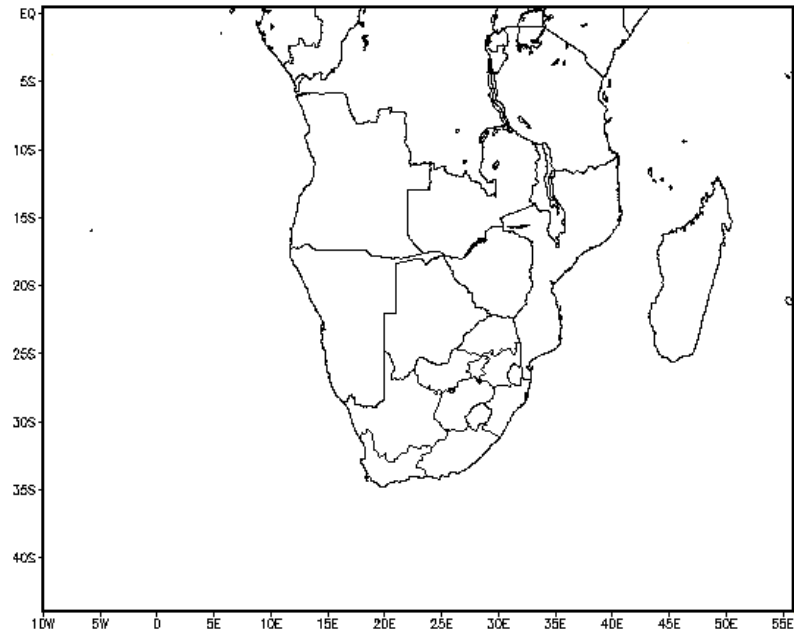
Configuration of UM

12km horizontal resolution

38 vertical levels

Domain:

20W-50E; 45S-0S (SADC)

Provides hourly numerical forecasts for up to two days ahead (48 hours).

3

Operational Aspects of the UM SA12 LAM

- NEC sx8 single node (8 CPUs)
- 648 x 480 grid points
- 38 levels
- 128GB memory, 1.2TB disk-space
- Speed: 42 minutes per 24 hr forecast for SA12: 648x480L38
- 5 Operational runs daily

4

Configurations of the UM SA LAM

Unified Model Forecasts

Unified model **Research runs**

Status of model runs HERE

12km no-DA (Xaana) run

⇨ Updated: Once daily
⇨ Available ~ **13:00 SAST**
⇨ 12km Resolution
⇨ No Data Assimilation
⇨ Last update: **11 Nov 11:39**
⇨ Forecast: **11 Nov 00:00z to 13 Nov 00:00z**
⇨ Temperature Forecast Error : **11 Nov**
⇨ Day 1: Tn Tx
⇨ Day 2: Tn Tx

12km version 7.3 (Xaant)

⇨ Upgrade from vn6.1 to vn7.3
⇨ Available ~ **05:00 SAST**
⇨ 12km Resolution
⇨ No Data Assimilation
⇨ Last update: **12 Nov 04:07**
⇨ Forecast: **12 Nov 00:00z to 14 Nov 00:00z**
⇨ New features

12km DA (Xaang) run

⇨ Updated: Once daily
⇨ Available ~ **09:00 SAST**
⇨ 12km Resolution
⇨ Continuous Data Assimilation
⇨ Last update: **12 Nov 08:50**
⇨ Forecast: **12 Nov 00:00z to 14 Nov 00:00z**
⇨ Temperature Forecast Error : **11 Nov**
⇨ Day 1: Tn Tx
⇨ Day 2: Tn Tx

Xaanj run

⇨ Updated: Once daily
⇨ Available ~ 20:00 SAST
⇨ 12km Resolution
⇨ Intermittend Data Assimilation
⇨ Last update: **27 Nov 20:17**
⇨ Forecast: **27 Nov 12:00z to 29 Nov 12:00z**

15km (Xaaha) run

⇨ Updated: Once daily
⇨ Available ~ 01:30 SAST
⇨ 15km Resolution (only over SA)
⇨ No Data Assimilation
⇨ Last update: **12 Nov 00:48**
⇨ Forecast: **12 Nov 00:00z to 14 Nov 00:00z**
⇨ Temperature Forecast Error : **11 Nov**
⇨ Day 1: Tn Tx

15km version 7.3 (Xaaon)

⇨ Updated: Once daily
⇨ Available ~ 09:00 SAST
⇨ 15km Resolution (only over SA)
⇨ No Data Assimilation
⇨ Last update: **12 Nov 08:35**
⇨ Forecast: **12 Nov 00:00z to 14 Nov 00:00z**

* 4KM MODEL : NOT VERIFIED *

### Saanb run

⇨ Updated: Once daily
⇨ Available ~ 01:30 SAST
⇨ 4km Resolution (only over SA)
⇨ Intermittend Data Assimilation
⇨ Last update: **17 Jan 09:27**
⇨ Forecast: **16 Jan 18:00z to 18 Jan 00:00z**

5

Configurations of the UM SA LAM

- UM SA12: main model run
- Initialised daily at 00UTC
- Initial conditions & lateral boundary conditions from Global UM
- 18 UTC 6hr forecast
- 48 hr forecast
- Updates daily ~ 5:00 SAST (03 UTC)

6
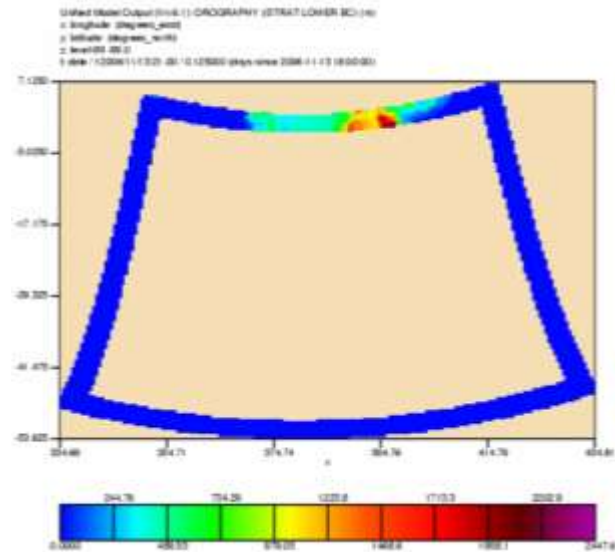
Configurations of the UM SA LAM

- UM SA12 DA: continuous data assimilation
- Same domain and resolution as UM SA12
- 48 hr forecast initialised daily at 00UTC
- Ops and background error files from Global UM
- Updates daily ~ 9:00 SAST (07 UTC)

Configurations of the UM SA LAM

- UM SA15: 3 model runs
- Horizontal resolution of 15 km
- Only covers the South African domain
- 48 hr forecast initialised daily at 00UTC
  1. Old version of UM code (v 6.9)
  2. Old version but with different cumulus scheme
  3. Upgrade version of UM code (v 7.3)
- Updates daily ~ 1:00, 1:30 & 8:30 SAST respectively
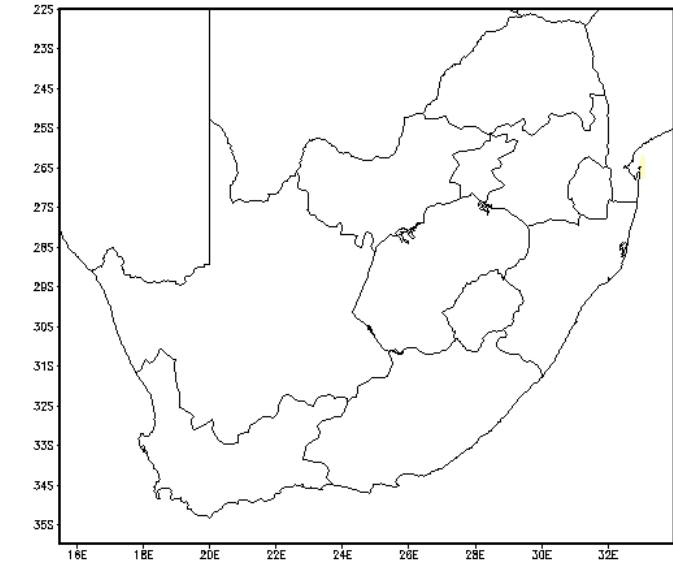
Applications of the UM SA LAM

- Regional responsibilities (RSMC / SWFDP)
- Training (www.eumetrain.org)
- Flash Flood Guidance
- Client specific forecasts (i.e. ESKOM)
- Site specific forecasts (i.e. wind farms)
- Regional multi-model ensemble probability forecasts

UM Upgrade 2015
Changes at PS34

Global

(17km) 70 Levels (ENDGame)
– 48 hour forecast twice/day
– 6 day forecast twice/day

NAE retired in July 2014

(our previous regional model)

Euro4

– 4.4km 70 Levels
– 60 hour forecast twice/day
– 5 day forecast twice/day

UKV

– 1.5km 70 Levels
– 36 hour forecast eight times/day

10
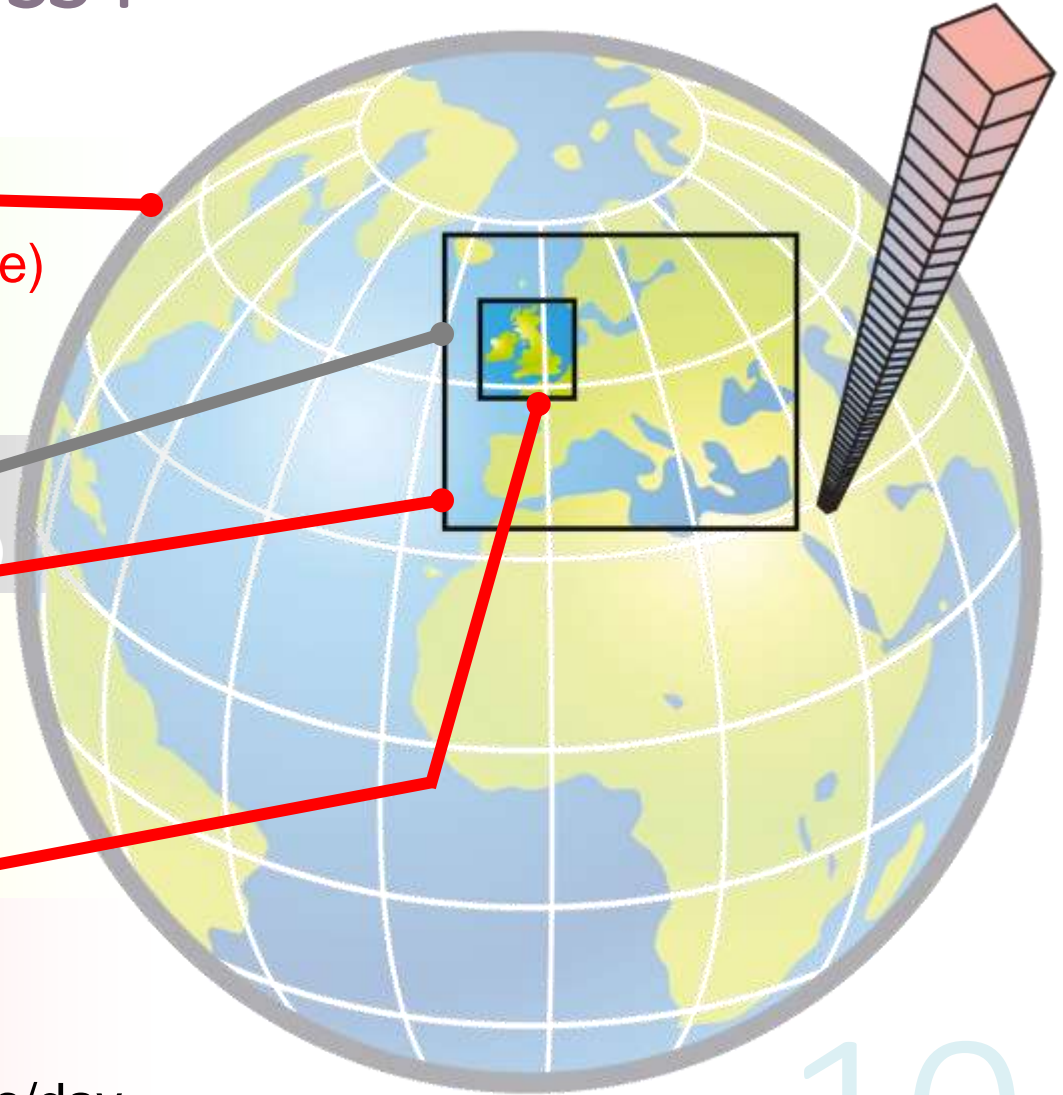
Ensemble NWP model suite
Changes

MOGREPS-15

will be retired
by March 2015

MOGREPS-G

– 33km 70 Levels
7 day forecast 4 times/day
– 12 members
– 24 member lagged products

We no longer run MOGREPS-R

(our regional ensemble model)

MOGREPS-UK

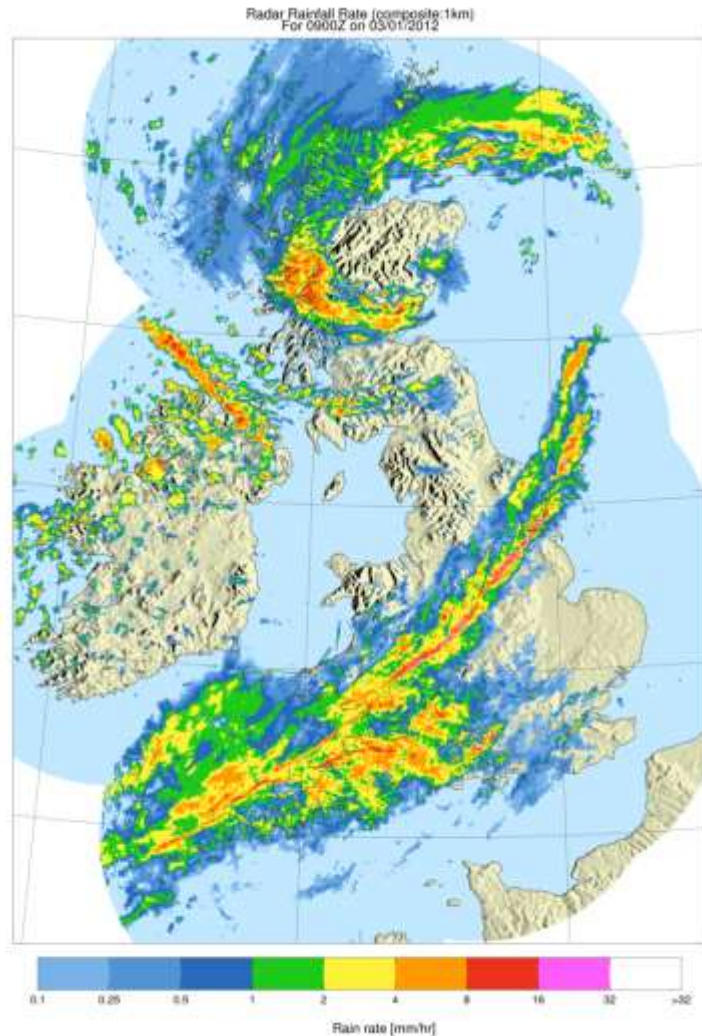– 2.2km 70 Levels
– 36 hour forecast 4 times/day
– 12 members

11
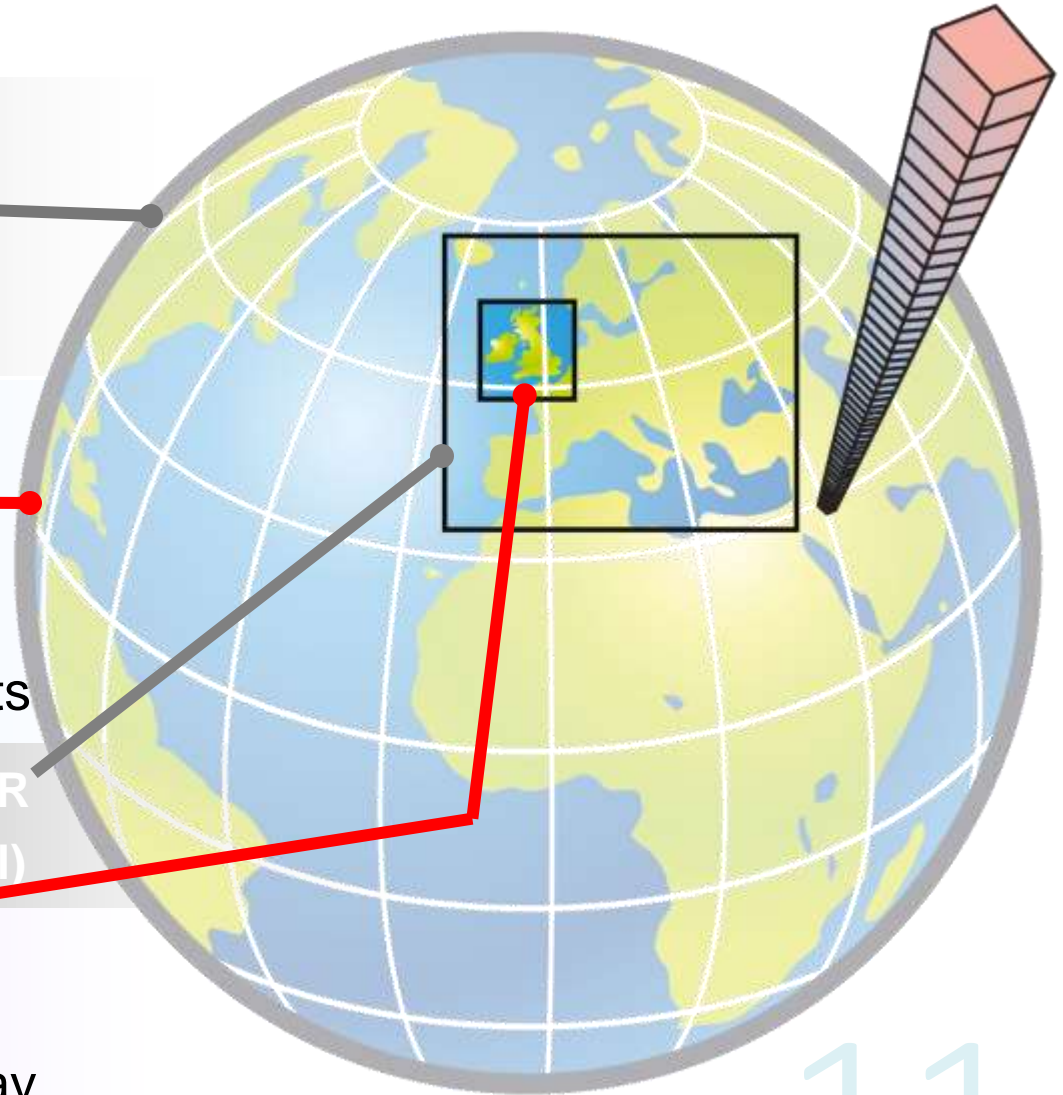
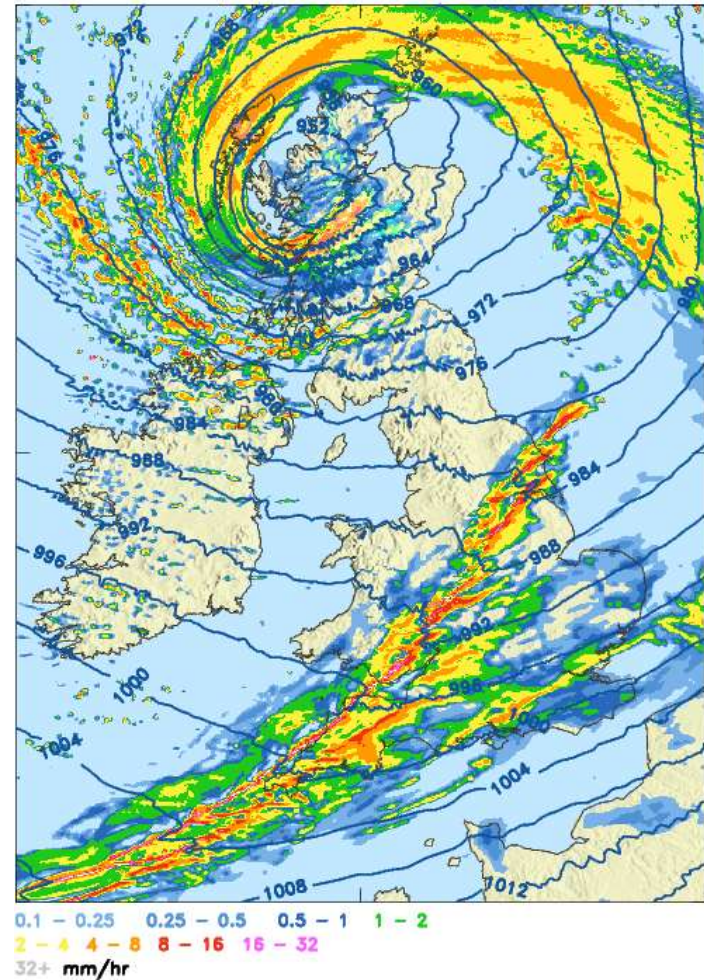# Testing the ENDGame core

Lee waves over the UK. 12 June 2013
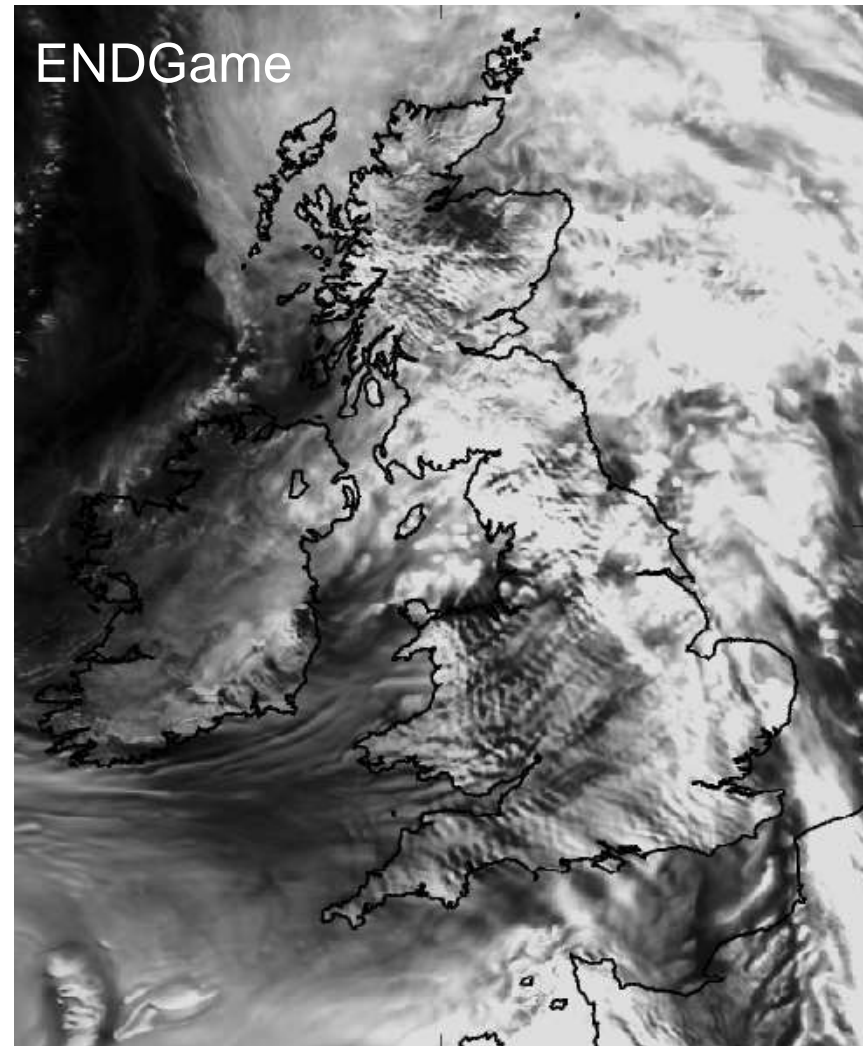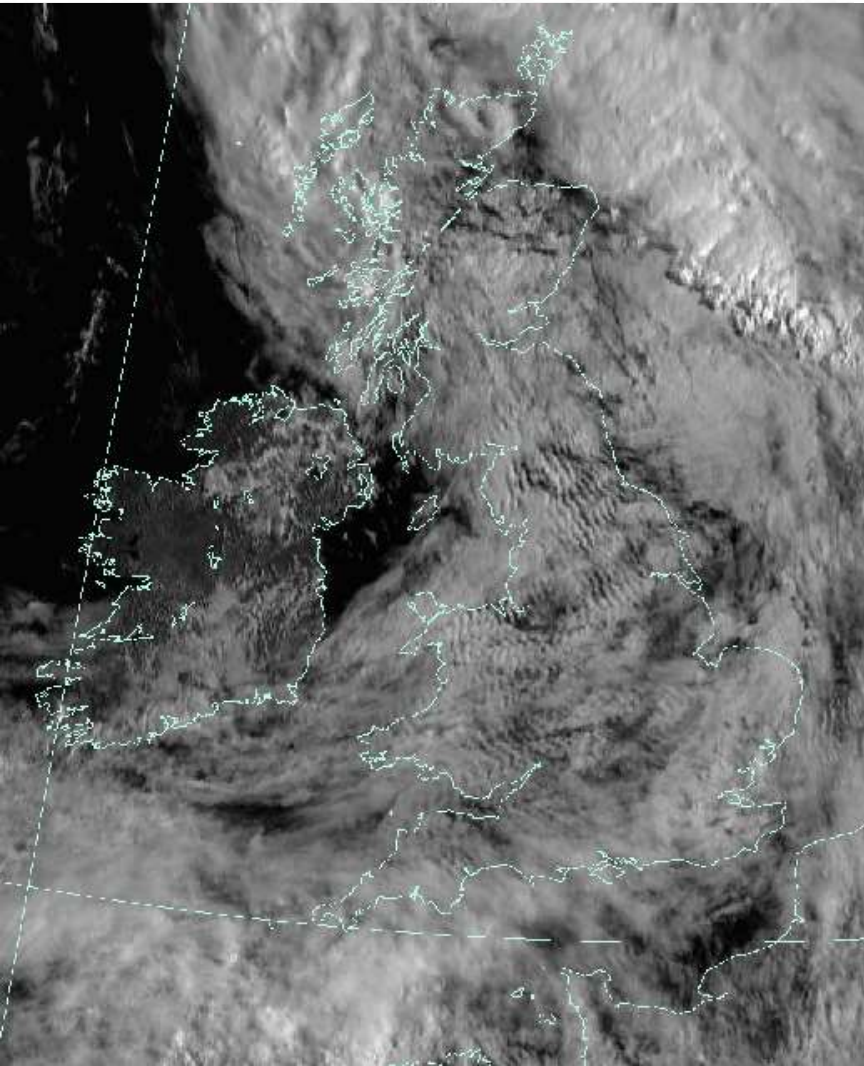
Case Studies (Winter Storm)

Radar Rainfall Rate (composite 1km)
For 0900Z on 03/01/2012

Rain rate [mm/hr]

ENDGame

UKV EGD Precipitation rate [mm/hr] and PMSL
Tuesday 0900Z 03/01/2012 (t+24h)

0.1 − 0.25   0.25 − 0.5   0.5 − 1   1 − 2
2 − 4   4 − 8   8 − 16   16 − 32
32+   mm/hr

13

Maintaining our global standing

CBS ranking relative to Met Office, 00Z-12Z
Combined Areas
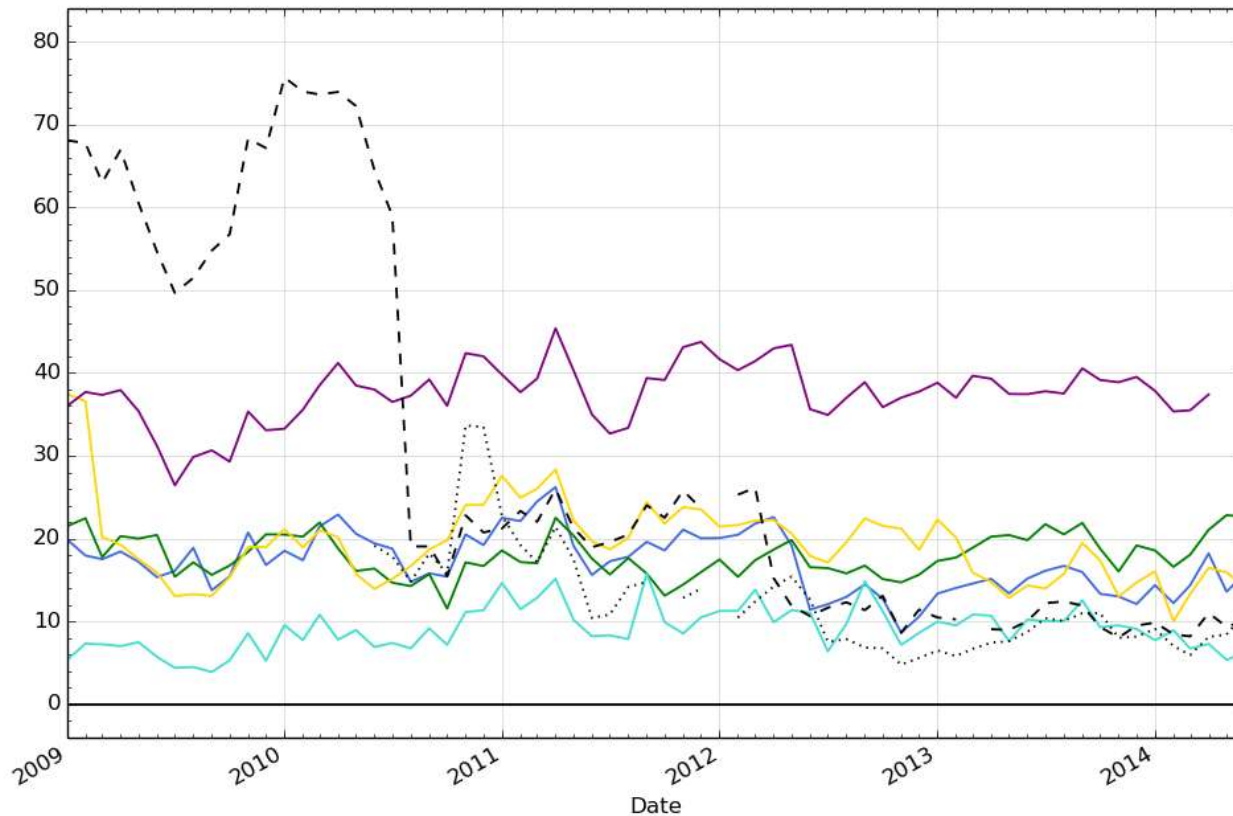
© Crown Copyright 2014. Source: Met Office

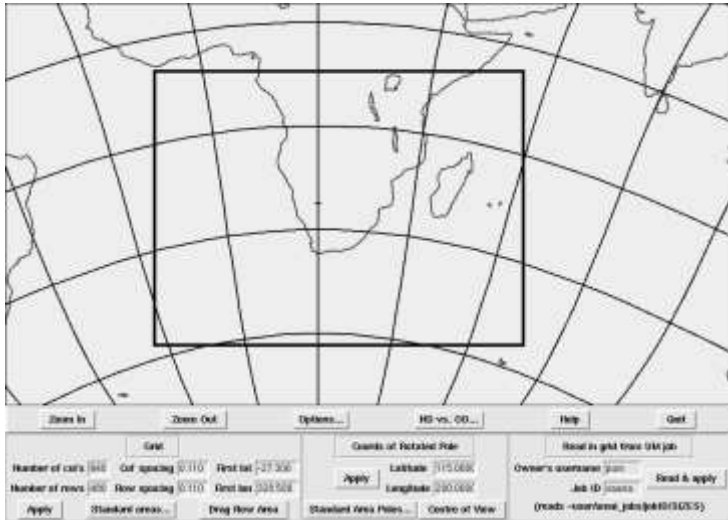# Benefit of UKV over Global

Relative benefit (%)

UK Index – focus on surface weather

UK4 to April 2010, then UKV

UKV at least 10% better
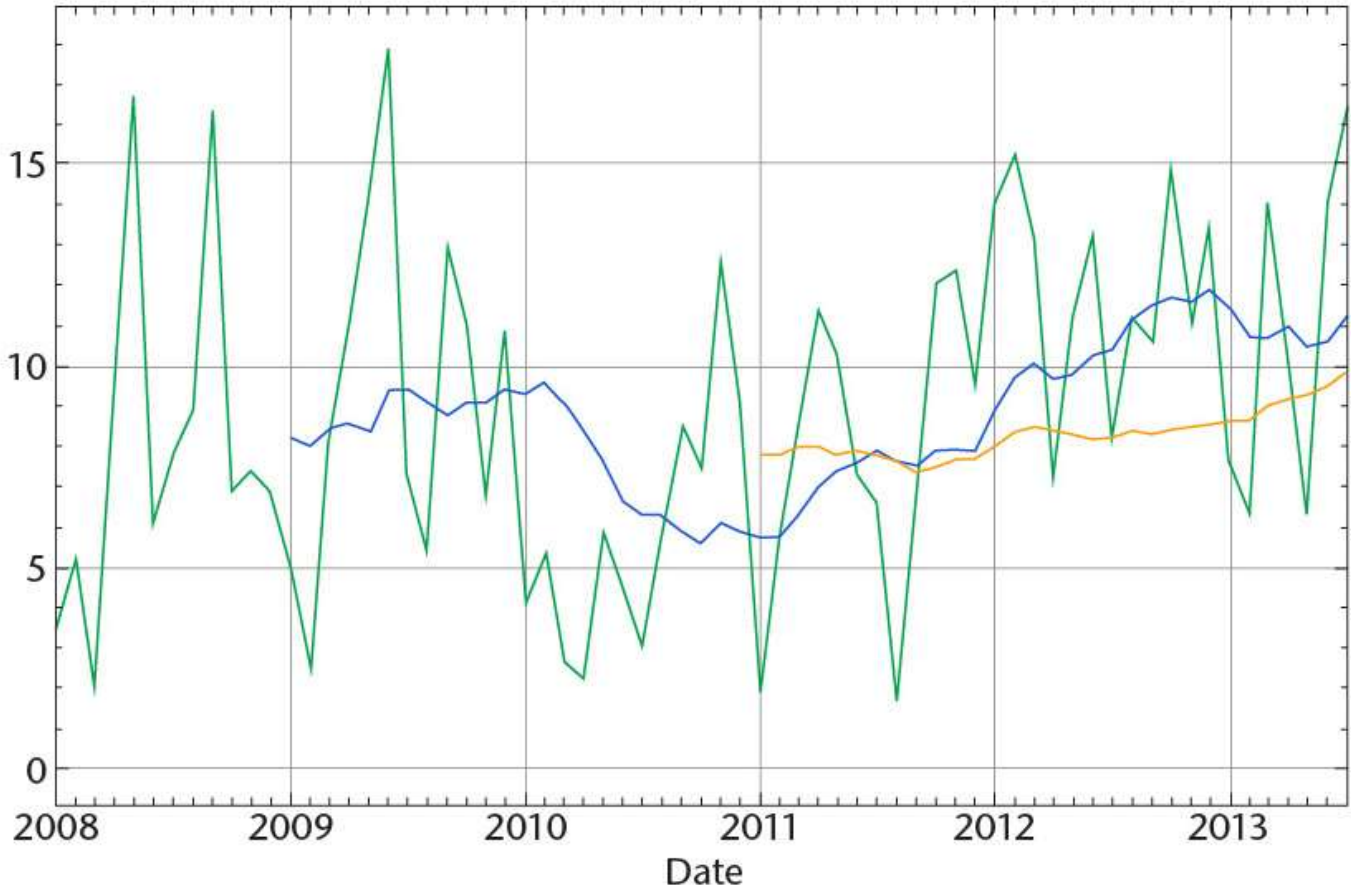
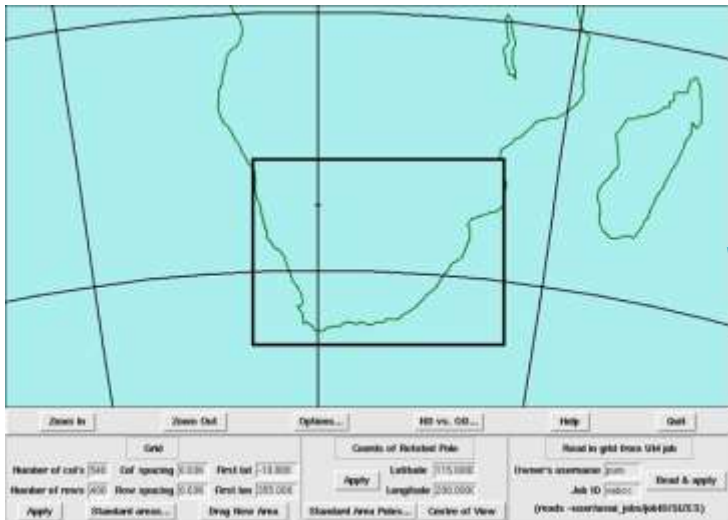Main domain at 12 km (to decrease to 4 km mid 2014)
38 – vertical levels
Model output on 19 pressure levels:
1000 950 900 850 800 750 700 650 600 550 500 450 400 350
300 250 200 150 100 hPa
Hourly output (1 – 48)
Initialised 00Z

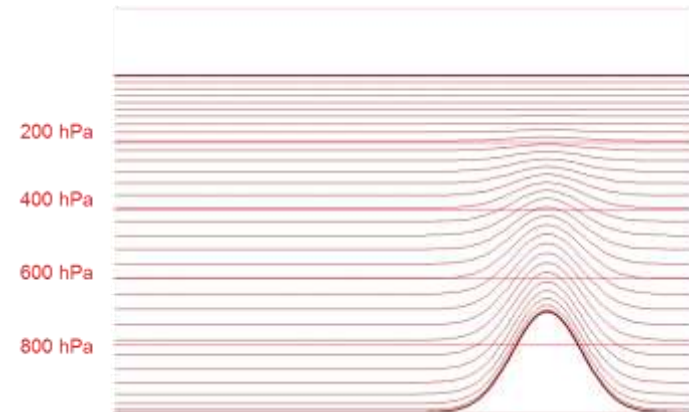Based on main model forecast, but output domain decreased
23 – vertical levels
Output on 23 vertical model levels (sigma coordinate/terrain
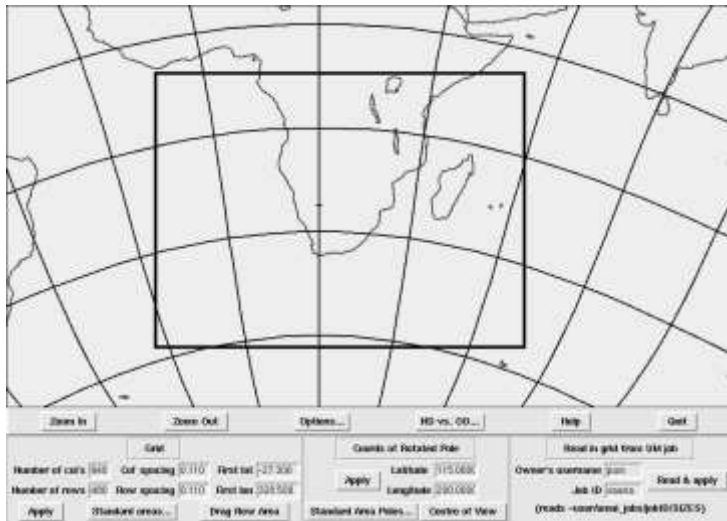following)
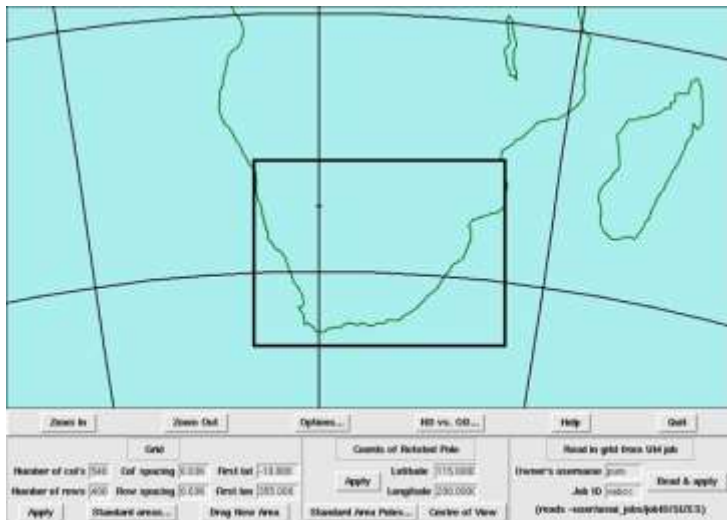Hourly output (1 – 48)
Initialised 00Z
Limited variables

200 hPa

400 hPa

600 hPa

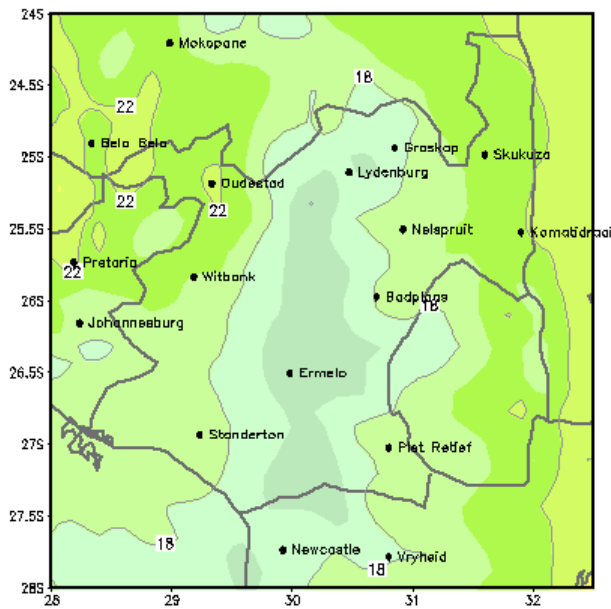800 hPa

HPC upgrade – mid-2014

Main domain at 4 km
70 – vertical levels (80 km up in the atmosphere)
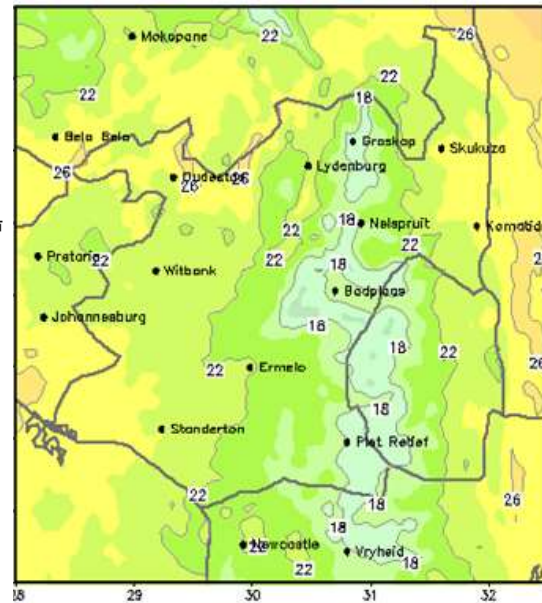Number of variables output will increase

South African domain to decrease to 1.5 km
70 – vertical levels
Number of variables output will increase

Effect of resolution increase

12 km   4 km   1.5 km