4th QUATERLY REPORT OF THE REGIONAL SUBPROJECT PERIOD: (September 2007 to November 2007) RSMC-PRETORIA

1. HIGHLIGHTS OVER THE PERIOD

Whereas in the months of June to August seasonally dry conditions were experienced, the weather picked up again in the period September to November. The next sections give a summary of the major events during the period.

a. September 2007

A surface high pressure system south-east of Madagascar and a near equatorial low north of Madagascar caused strong south-easterly winds north of Madagascar, affecting the northern tip of Madagascar about every day. In the guidance forecasts a forecast for strong wind for the northern tip of Madagascar was included every day of September except the 7th, 8th and 9th and the 17th.

On the 2nd of the month heavy rain was forecast for north-eastern Madagascar for day 5 and on the 4th a forecast for heavy rain for the same region for day 3. On the 6th and 7th heavy rain was given for the coast of Tanzania. On the 13th both ECMWF and GFS put a closed upper low over the northern Mozambique channel and a forecast for heavy rain was included for north-eastern Mozambique for day 4 and on the 14th for the same region for day two and day 5 on the 15th for this area on day 1 to day 5 and on the 16th for the same area for day1. Also on the 14th heavy rain was forecast for north-western Madagascar for day for and on the 15th for this area on day 1 and day 5. No forecasts were given for heavy rain during the remainder of September until the 28th when heavy rain was again forecast for Mozambique over the Beira area and southwards for day 1 to day 5. On the 29th this forecast was carried forward for 2 and day for and on the 30th for southern Mozambique for day four. The forecast for heavy rain on the 28th to the 30th was due to a cut-off low over south-eastern Botswana and a 500/200 trough over the north-eastern interior of South-Africa causing strong upper divergence over southern Mozambique.

b. October 2007

A cut-off low developed over northern South Africa during the last week of September and caused moist air to move southwards from the tropics the central interior of South Africa causing have falls over Botswana during the first week of the month. A low (850/700hPa) developed on the Namibia coast on the 24th and an upper trough on the 25th resulted in forecasts for heavy rain over Botswana (and also over Mozambique and Zimbabwe).

There were also numerous forecasts for heavy rain or strong wind for all countries in this month, particularly in the first week.

c. November 2007

On the 5th and 6th a steep upper trough moved across the interior of South-Africa causing middle layer moisture to flow southward from the tropics to the

central and eastern parts of the country and eventually heavy falls of rain over Zimbabwe and southern Mozambique. The steep trough also resulted in strong north-westerly surface winds over Botswana and Zimbabwe. A ridging surface high along the east coast of South-Africa caused a strong onshore flow over Mozambique and resulted in heavy falls. Chimoio, over the interior north-west of Beira reported 68.0mm on the morning of the 10th and Beira reported 51.0mm.

A cut-off low on the Cape south coast in South Africa on the 22nd and 23rd not only caused extremely heavy falls over the southern Cape but an associated upper trough over the interior further north, and high energy air with a tropical origin caused heavy falls for several days over Zimbabwe and southern Mozambique. A weak low north-east of Madagascar on the 27th and 28th and a ridging surface high along the east coast of South-Africa caused a strong onshore flow over Mozambique that resulted in heavy falls over Mozambique and Madagascar and on the 28th, and also strong surface winds along the south-west coast of Madagascar.

2. OVERVIEW OF PRODUCTS

a. Limited Area Modelling (LAM)

The 12 km resolution Unified Model run by SAWS (UM SA12) has ran successfully over the SADC domain during this period. Output of the model is made available through the RSMC-Pretoria website.

The UM SA12 is found to be quite reliable generally and able to identify conditions favourable for heavy rain and strong winds. A weak point is the lack of instability products that is not normally part of the output of the UM. However, scientists at the South African Weather Service (SAWS) introduced recently a number of instability parameters from the UM SA12, and more will be available soon. These indices are very useful for areas south of 20S. A criticism of the UM SA12 is the the impression that since about mid-November it tends to over forecast heavy rain. However, rainfall area and times of occurrence is still better than any other model used by RSMC-Pretoria for the first two days. UM-Africa Lam is also very useful particularly if, for some reason, the local UM SA12 update too late.

b. Global models

Products from the global models available for the project are very useful. In the case of ECMWF the precipitation fields and tephigrams are most used. It is also found that the ECMWF upper level wind fields handled the development and movement of tropical lows very well, even beyond three days. Similarly the NCEP GFS forecasts were found to be very useful. Particularly convective parameters, such as instability indices, were very useful.

The use of the University of Wisconsin CIMSS Tropical webpage in near-real time proved to be very useful. There is almost daily a discussion of possible (mesoscale) genesis regions that would be favourable for the incubation of tropical cyclones and/or tropical disturbances. CIMSS use Meteosat 7 and perform cloud-drift winds as well as post-processed parameters such as low level vorticity, low level convergence and upper divergence. The results are generally less than 3 hours old and are updated at 3-hourly intervals.

c. Ensemble prediction systems

All ensemble products of the three participating global centres were found to be useful. Particularly the 50 mm per 24 hour and 20 knot charts were useful in preparing the guidance products. Similarly EPSgrams were also used frequently.

The ECMWF extreme forecast index (EFI) fields were very useful drawing attention to potential problem areas. Particularly the precipitation field was useful.

d. NWP or EPS Products that could be useful

It was particularly noticed that forecasting of severe storms in tropical areas is difficult, and models and ensemble products many times fail to give good guidance in this respect. It is well known that stream line analysis combined with areas of moisture convergence is useful in the tropics to identify areas of thunderstorm development. In this regard it was found useful by the forecasters to draw streamlines by hand on 5-day wind products of the ECMWF deterministic model to identify areas of heavy rain and strong winds. It would therefore be useful to have EPS products that could show these areas of convergence in the tropics.

e. RSMC Website

For the duration of the project the RSMC-Pretoria website has been the principle means of communication between RSMC-Pretoria and the five NMHSs involved in the project. All guidance products were distributed on this website.

Guidance products are archived under a related webpage www.weathersa.co.za/RSMCarchive . Unfortunately some of the products were not archived from 10 to 26 May for an unknown reason. Similarly some products were again missed for a few days in November 2007. All guidance maps were still available.

a. Preparation of RSMC-Pretoria guidance

RSMC Guidance products for the next five days are prepared daily by the forecasters of the National Forecast Centre and disseminated according to the set deadlines. Products from the global centres (deterministic models and ensemble products) play a critical role in the analysis process.

b. **Usefulness of SWFDP NWP/EPS Products received from each global and regional centre**

Again it was found that the range of products is extremely valuable to aid the forecasters during their analysis of the current and expected weather situation. The variety of model products from different centres aid the forecasters in decision making particularly in situations where they differ from each other on the weather expected. Particularly the ensemble prediction products played an important role in identifying areas of severe weather days

in advance. This helped in issuing advisories days in advance to disaster management structures.

The official forecasts and discussions from Meteo-France La-Reunion were very useful for forecasting of tropical cyclones through the field phase of SWFDP.

The use of QSCAT winds in near-real time by NMCs can be promoted, especially for the Mozambique Channel, the seas off Tanzania, Kenya and Zanzibar as well as seas surrounding the Comoros and Madagascar. QSCAT data were used as input into 'day 1' maps, particularly when winds were over 30kts. The data is usually only 2 to 4 hours old. They were particularly useful help when considering tropical disturbances such as east-wind troughs and 'named' disturbances.

3. PROJECT EVALUATION AGAINST SWFDP GOALS

SWFDP GOAL	**PROGRESS AGAINST GOALS**
To improve the ability of NMCs to forecast severe weather events	NMCs are receiving guidance products daily broadening their decision making tools.
To improve the lead time of alerting these events	Guidance products for five days in advance are disseminated daily, alerting NMCs to potential severe weather as predicted by the models and ensembles.
To improve the interaction of NMCs with Disaster Management and Civil Protection authorities before, during and after severe weather events	No feedback received from NMCs in this regard.
To identify gaps and areas for improvements	Some gaps that have already been identified are: • There is a need for improving nowcasting tools in a similar way as been done for forecasting tools in this project. • There is still room for improving collaboration with emergency management authorities. • Verification of products through the forecast chain (i.e. guidance forecasts, warnings issued and response by emergency authorities) is still a challenge.
To improve the skill of products from Global Centres through feedback from NMCs	Little information was received

4. LESSONS LEARNED

a. Communication and feedback between the RSMC-Pretoria and NMCs

Apart from the quarterly reports no feedback was received from NMCs to RSMC-Pretoria. This remained a problem throughout the project. Some attempts were made by RSMC-Pretoria to contact forecasting offices of NMCs when particular dangerous situations were expected. However, this aspect must be revisited and better arrangements for communication and feedback made. This challenge was also raised during the operational phase preparatory training in RSMC Pretoria early in November 2007, it was encouraging when all the regional countries (those that are part of the project and those who will join when the project becomes operational) committed to address this communication gap.

b. Impact on capacity at the RSMC

Preparation of guidance products for Southern Africa did put additional load on the senior forecasters in Pretoria. In anticipation of operational implementation of the demonstration activities, SAWS has created two additional senior forecaster posts to support this function. A dedicated forecaster shift will contribute to improved products.

c. Future role of SWFDP products in winter forecasts

Winter storms with snow and heavy rain affects mainly the southern parts of the sub-continent. The success in providing advisories and early warnings on potential snowstorms, heavy rain and gales proved that these parameters can be predicted well in advance for countries like South Africa and Lesotho, and warnings of cold outbreaks and even heavy rain associated with winter weather for other countries like Namibia, Botswana, Zimbabwe, Mozambique and Swaziland.

In an operational roll-out of the SWFDP project beyond November 2007 these parameters should be considered for inclusion in the guidance products.

d. Meteorological and regional benefits

Reflecting on the benefit of gaining experience of regional weather systems, the forecasters recognized that this project brought a new opportunity for RSMC Pretoria to monitor regional weather systems on daily basis.

The project has elevated the meteorological awareness and support at parliament level. Two presentations that reflected on the existence and progress of this project were made to parliament members by RSMC-Pretoria during this project period. The South African parliament members expressed strong support for this project and encouraged that it should be enhanced and sustained.

e. Visibility of Meteorological Centres within the southern Africa regional structures.

The constitution of the newly established regional structure called Meteorological Association of Southern Africa (MASA) has been finalised during the project phase. RSMC Pretoria gave a presentation on SWFDP just before the regional officials started with their meeting to establish a constitution for MASA. All the members expressed enthusiasm and their support of this project. The future of this project is currently being discussed at the regional level. This once again demonstrates how this project has elevated meteorological awareness at political level within the region.

f. How the project assisted on regional gap capabilities identification

The participating countries, RSMCs and global centres had the first project progress meeting in Maputo, Mozambique in February to March 2007. It was at this meeting where the following capability gaps were identified, namely;

I. A need to enhance interaction between RSMCs and NMCs.
II. An insufficient interaction between users and providers of meteorological information.
III. Poor nowcasting capabilities of NMCs that led to consideration of enhancing nowcasting through satellite applications in a potential follow-up action.
IV. A need to enhance the links between forecasters and disaster management in the region to establish complete end-to-end warning systems.
V. Communication limitations due to slow internet speed that caused difficulties for some NMCs who had to access guidance products and models from global centres and RSMC-Pretoria through the internet.

Annex 1. Examples of guidance products from RSMC-Pretoria

Figure 1: The front page of the RSMC-webpage used for making products available to NMCs.

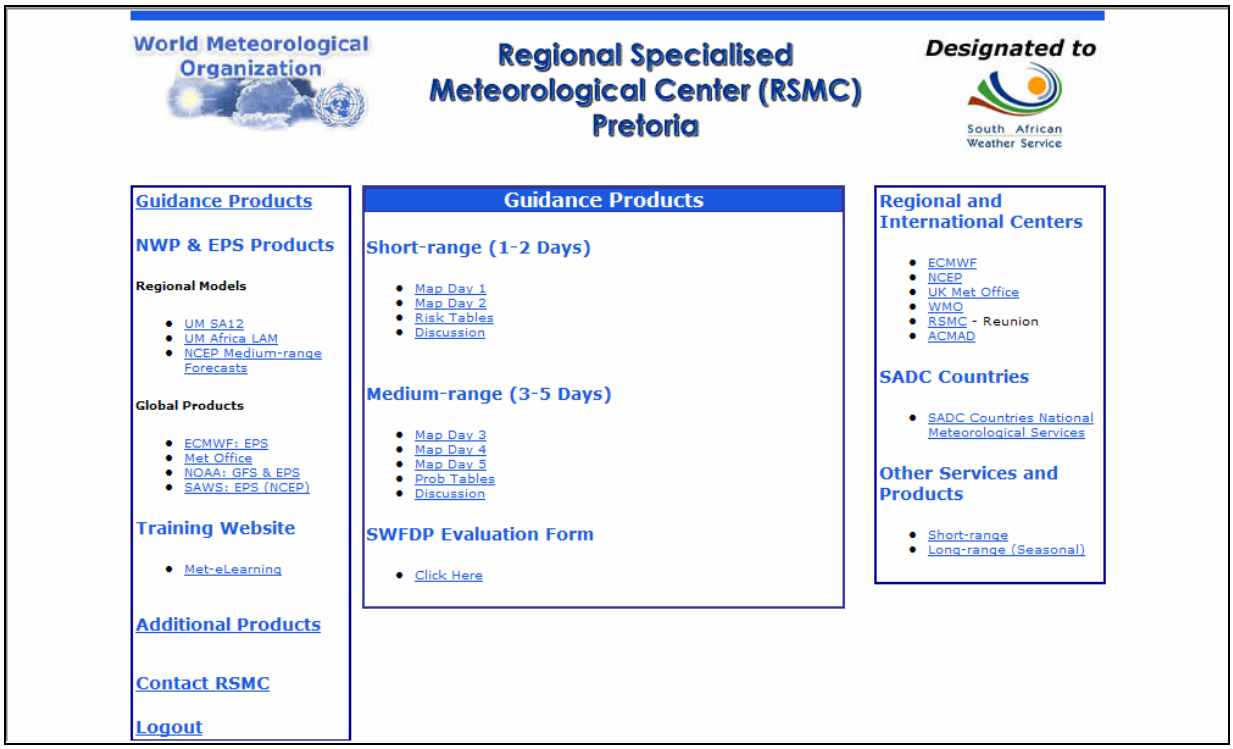
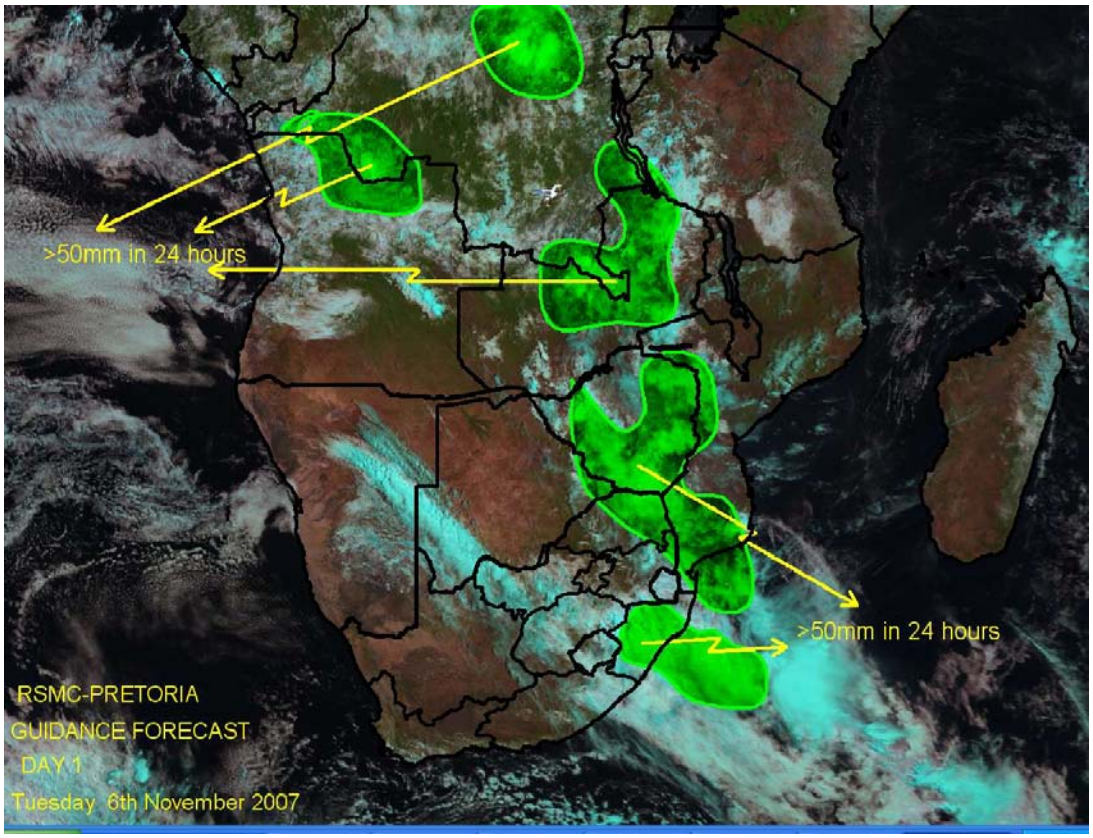
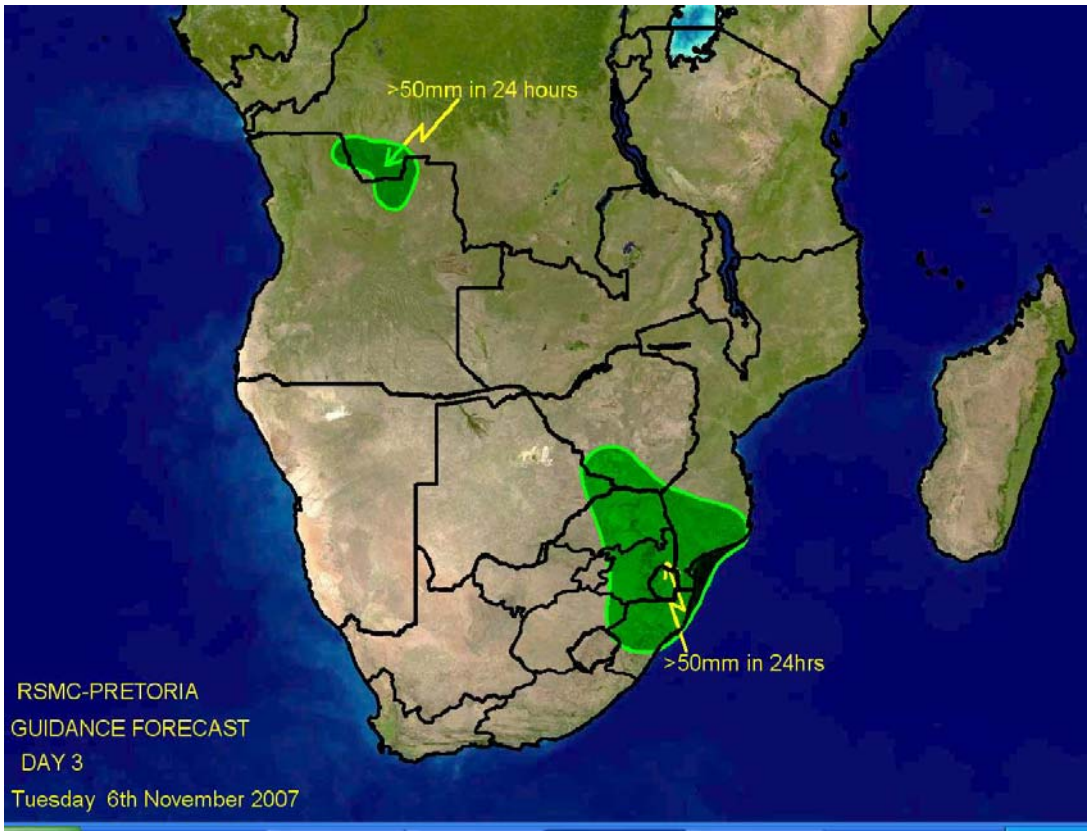


Figure 2: Forecasts for Day 1 (top image) and Day 3 (bottom image for 6 Nov 2007.





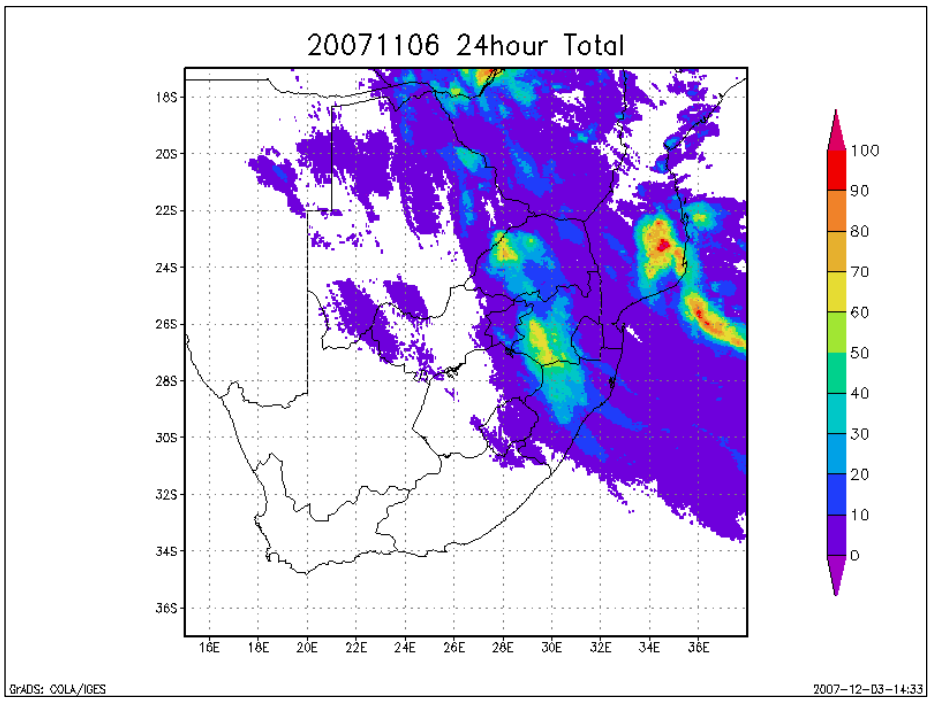


Figure 3: An “eye-ball” verifying image from the satellite rainfall for 6 November 2007 produced by the Hydro-estimator running on the SAWS computers.

Figure 4: An example of the short-range discussion

RSMC-PRETORIA
SWFDP GUIDANCE PRODUCTS

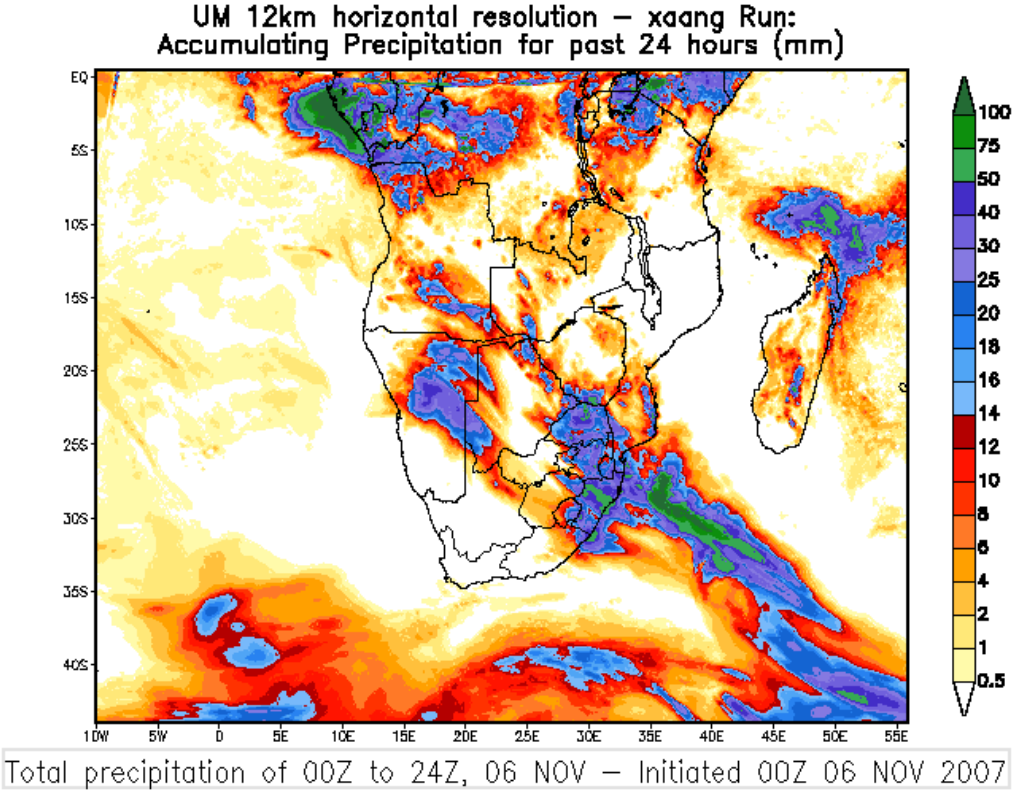
SHORT-RANGE (DAY 1 AND DAY 2)

Issue Date: Tuesday 6th November 2007
Valid for: 6th and 7th November 2007.

1. SYNOPSIS OF EXPECTED WEATHER PATTERNS

Day 1: 6th November 2007.
A steep upper trough over south-western Botswana and the central interior of South-Africa and a 700hPa low over northern Angola. Moist, tropical air is flowing from the tropics southwards to the eastern interior
Of South-Africa and Mozambique. Heavy falls are also expected over northern Angola, DRC and Zambia as well as the north-eastern tip of Madagascar.

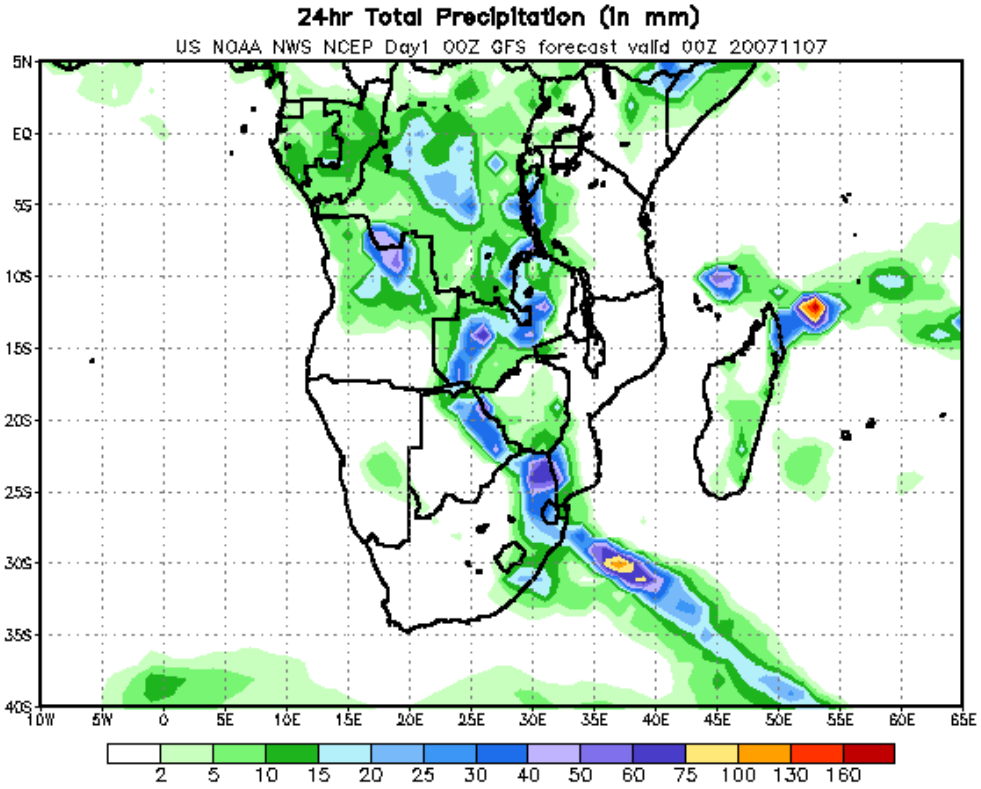
Degree of confidence: high



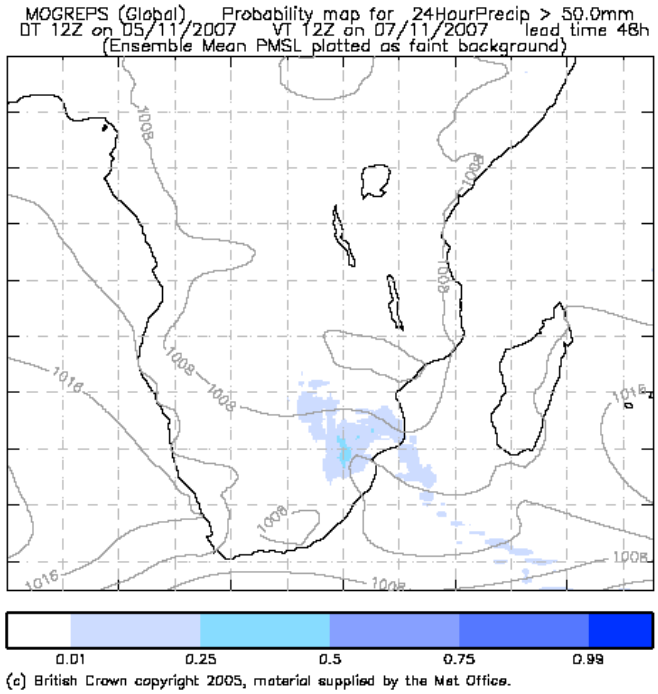
Day 2: 7th November 2007.
Steep upper trough from Angola to the central interior of South-Africa with moist air still flowing from the tropics to the eastern interior of South-Africa and Mozambique., where heavy falls are likely. Further heavy falls east of the upper trough over DRC, Zambia, Zimbabwe and northern Botswana.

Confidence level: High

24 hour Rainfall for day one, 6th November 2007.



Probability map for 24 hour precip >50mm for 12hour period till 1200Z on the 7th



November

DISCUSSION OF GUIDANCE PRODUCTS FROM GLOBAL AND REGIONAL CENTRES:

There is excellent conformity between deterministic NWP (GFS, ECMWF and UM) regarding the development and positioning of the upper air low for today and tomorrow.

Forecaster: Evert Scholtz

Figure 5: Example of short-range risk tables

RSMC-PRETORIA
SWFDP GUIDANCE PRODUCTS
RISK TABLES

SHORT-RANGE (DAY 1 AND DAY 2)

Issue Date: 6th November 2007

In order to provide more information about the geographical location of the severe event the following convention is adopted when filling in the cells: X for the whole country, N for the northern part, S for the southern part, W for the western part and E for the eastern part.

DAY 1: th November 2007

	HEAVY PRECIPITATION				STRONG WINDS			
RISK	No risk	Low risk	Medium risk	High risk	No risk	Low risk	Medium risk	High risk
Botswana	X				X			
Madagascar		NE			X			
Mozambique			South		X			
Tanzania	X				X			
Zimbabwe	X				X			

DAY 2: 7th November 2007

	HEAVY PRECIPITATION				STRONG WINDS			
RISK	No risk	Low risk	Medium risk	High risk	No risk	Low risk	Medium risk	High risk
Botswana		Extreme north-west			X			
Madagascar	X				X			
Mozambique			South		X			
Tanzania	X				X			
Zimbabwe			Central		X			

Figure 6 : An example of medium range discussion

RSMC-PRETORIA
SWFDP GUIDANCE PRODUCTS

MEDIUM-RANGE (DAY 3, DAY 4 AND DAY 5)

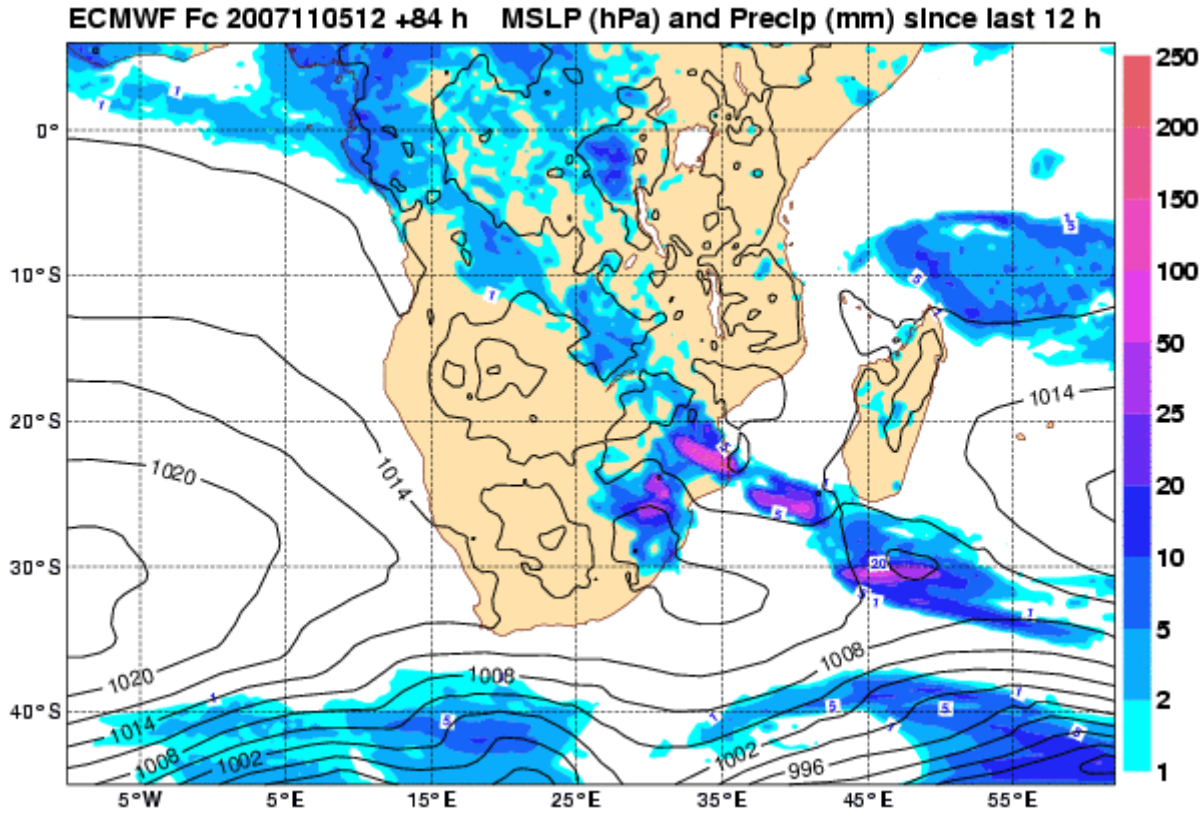
Issue Date: 6th November 2007
Valid for: 8th , 9th & 10th November 2007

1. SYNOPSIS OF EXPECTED WEATHER PATTERNS

DAY 3: Thursday 8th November 2007.

Upper trough Angola to the eastern interior pf South-Africa and further heavy rain expected east of the trough over Zimbabwe, Mozambique and the north-eastern part of South-Africa.

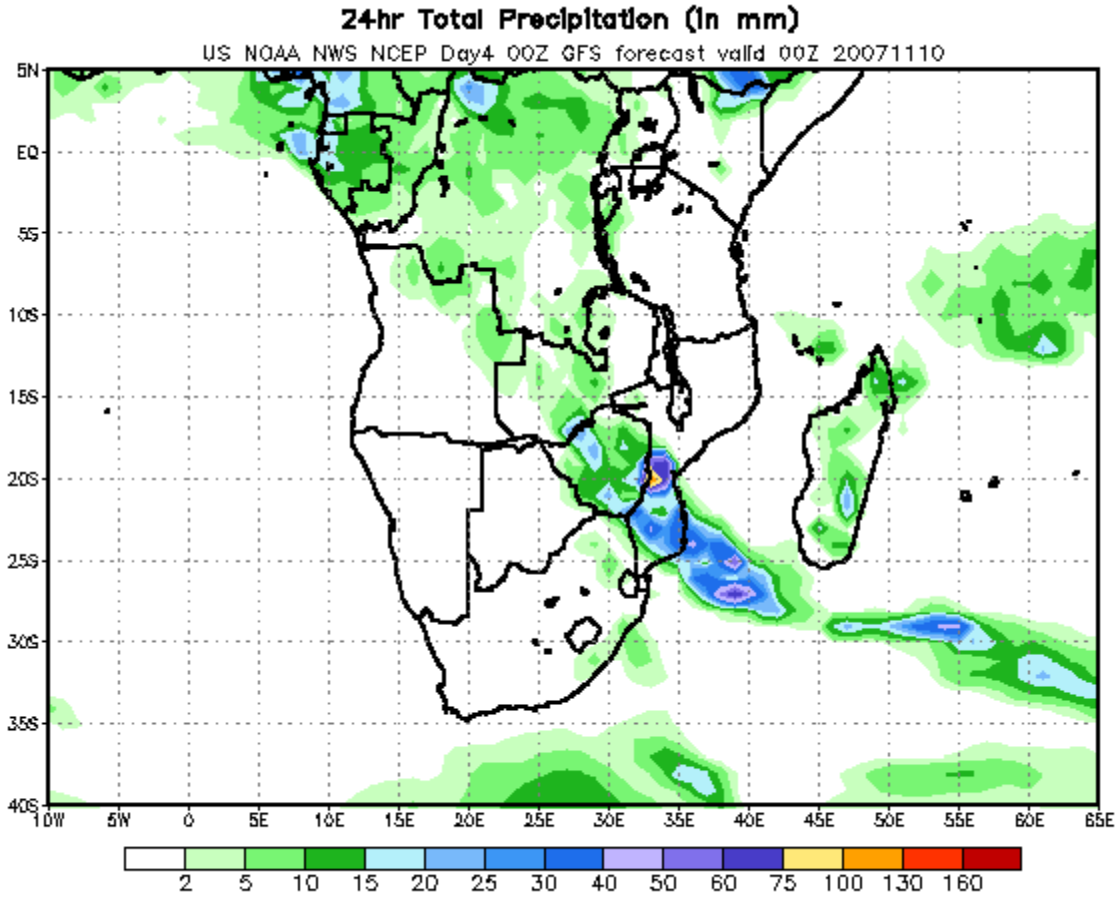
Degree of confidence: Moderate



DAY 4: Friday 9th November 2007.

The upper trough now over western Zimbabwe to southern Mozambique with further heavy rain over Mozambique and Madagascar.

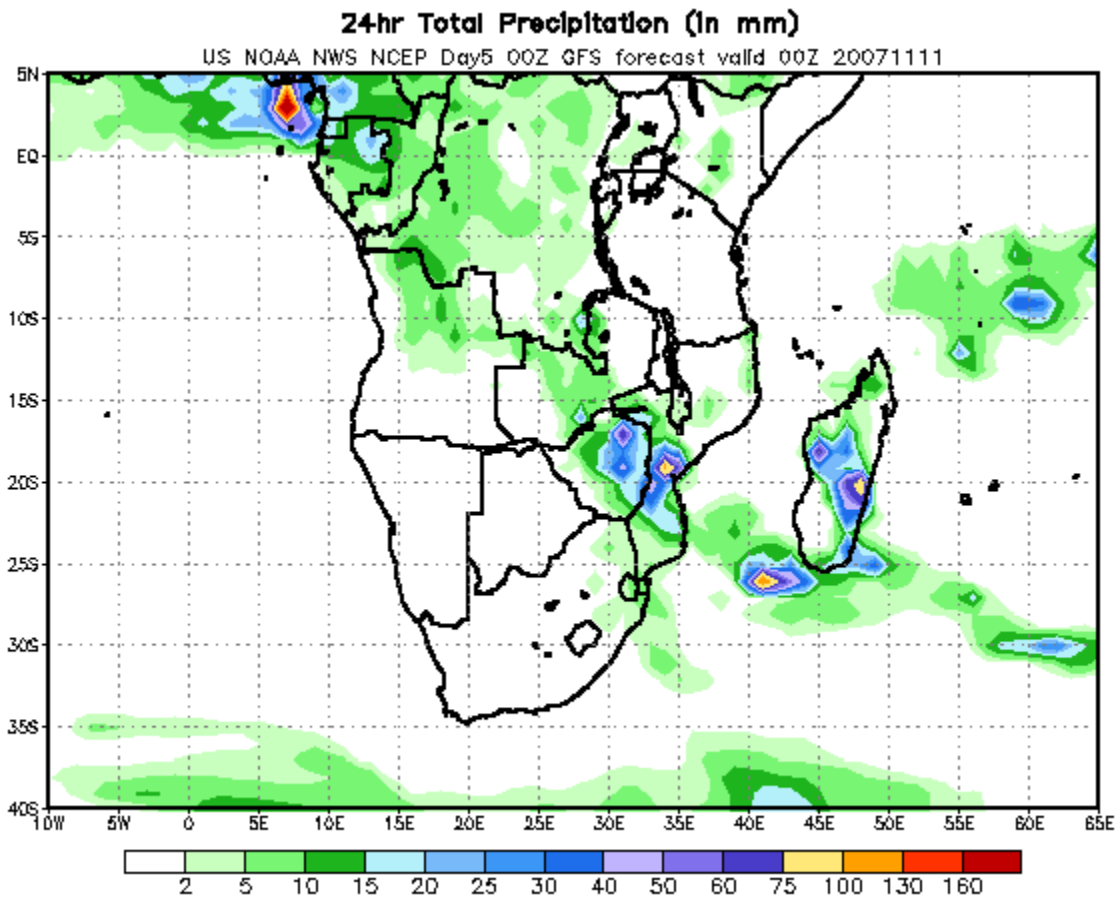
Degree of confidence: Moderate



DAY 5: Saturday 10th November 2007.

Upper trough over Mozambique and over the ocean east of the continent. On the surface a high is ridging along the east coast of South-Africa, enhancing the onshore flow on the Mozambique coast, maintaining heavy rain over Mozambique with heavy falls also over central Madagascar.

Degree of confidence: Moderate



2. DISCUSSION OF GUIDANCE PRODUCTS FROM GLOBAL AND REGIONAL CENTRES

ECMWF and NCEP models still more or lesss in line on the regions of heavy falls.

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Forecaster: Evert Scholtz.

Figure 7: An example of medium term probability tables

RSMC-PRETORIA
SWFDP GUIDANCE PRODUCTS
PROBABILITY TABLES

MEDIUM-RANGE (DAY 3, DAY 4 AND DAY 5)

Issue Date: 6th November 2007

In order to provide more information about the geographical location of the severe event the following convention is adopted when filling in the cells: X for the whole country, N for the northern part, S for the southern part, W for the western part and E for the eastern part.

DAY 3: 8th November 2007

	HEAVY PRECIPITATION (exceeding threshold 50 mm/24hrs)				STRONG WINDS (exceeding threshold 20 kts)			
Probability	**<10%**	**30%**	**60%**	**>80%**	**<10%**	**30%**	**60%**	**>80%**
Botswana	X				X			
Madagascar	X				X			
Mozambique			South		X			
Tanzania	X				X			
Zimbabwe	X				X			

DAY 4: 9th November 2007

	HEAVY PRECIPITATION (exceeding threshold 50mm/24hrs)				STRONG WINDS (exceeding threshold 20 kts)			
Probability	**<10%**	**30%**	**60%**	**>80%**	**<10%**	**30%**	**60%**	**>80%**
Botswana	X				X			
Madagascar		Central			X			
Mozambique			South & central		X			
Tanzania	X				X			
Zimbabwe			SE		X			

DAY 5: 10th November 2007

	HEAVY PRECIPITATION (exceeding threshold 50mm/24hrs)				STRONG WINDS (exceeding threshold 20 kts)			
Probability	**<10%**	**30%**	**60%**	**>80%**	**<10%**	**30%**	**60%**	**>80%**
Botswana	X				X			
Madagascar			Central and eastern		X			
Mozambique			South & central		X			
Tanzania	X				X			

Zimbabwe		**Extreme SE?**			X			