

Operational use of Ensemble Prediction System (EPS) and Deterministic forecasts for severe weather forecasting:

Case studies

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RSMC PRETORIA

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- Case of 15 September: Heavy rains in the Seychelles
- Case of 11 October 2014: Severe thunderstorms in central RSA and Lesotho
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- Conclusion

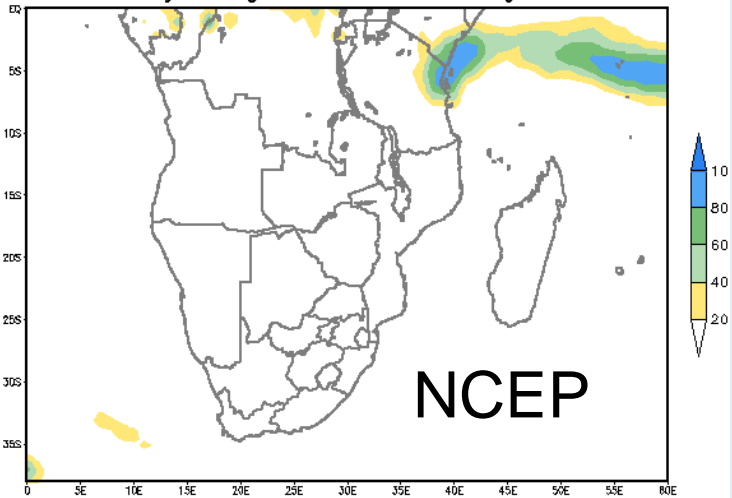
15 September 2014: Heavy rains in the Seychelles

- Main islands (Praslin and La Digue) affected
- Highest rain total= **210mm**
- Heavy rain event lasted for 12 hours
- 14 flooding events reported
- 6 reports of landslides
- 27 collapsed embankments and retaining walls
- Fallen electricity poles and broken water pipes

EPS products

EPS products

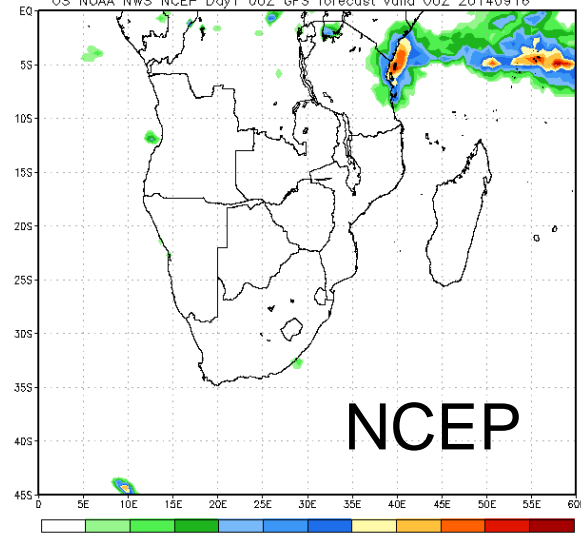
Probability of regional rainfall exceeding 8.5 mm



Forecast for 15 Sep 2014 – Forecast day: 1

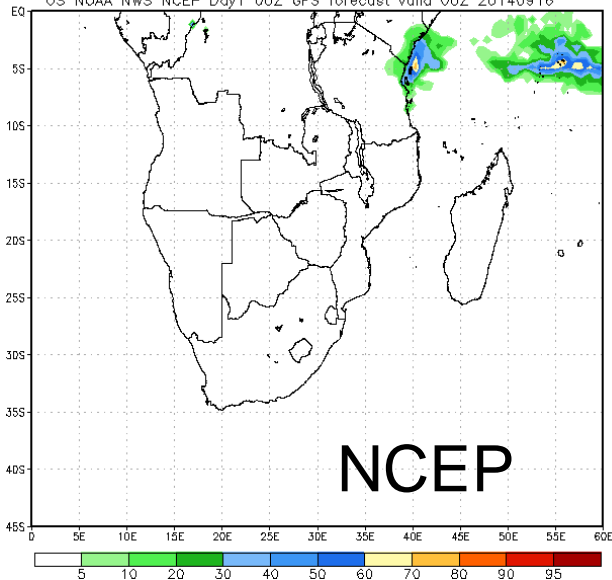
Probability of 24hr total precipitation exceeding 25 mm

US NOAA NWS NCEP Day1 00Z GFS forecast valid 00Z 20140916

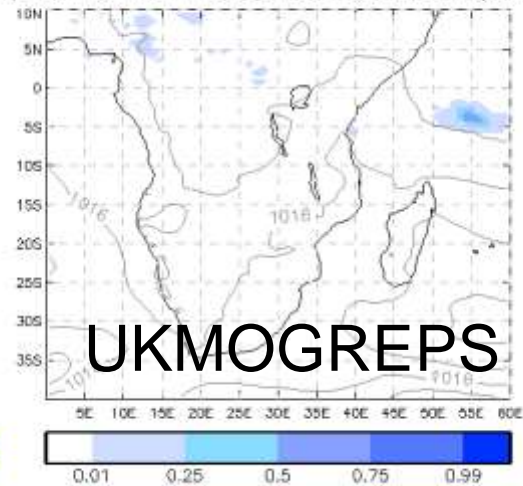


Probability of 24hr total precipitation exceeding 50 mm

US NOAA NWS NCEP Day1 00Z GFS forecast valid 00Z 20140916



MOGREPS-15 Probability map for 24HourPrecip > 50.0mm
DT: 00Z Mon 15/09/2014 VT: 00Z Tue 16/09/2014 lead time 24h
(Ensemble Mean PMSL plotted as faint background)

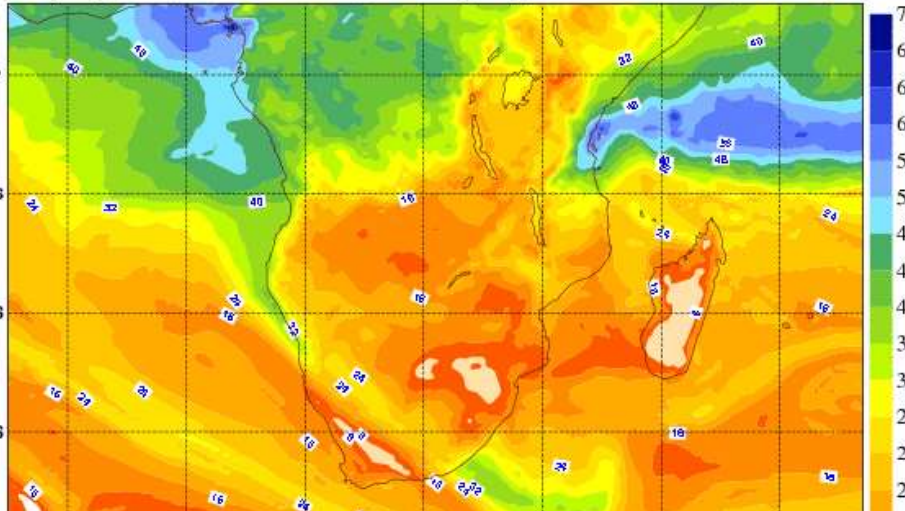


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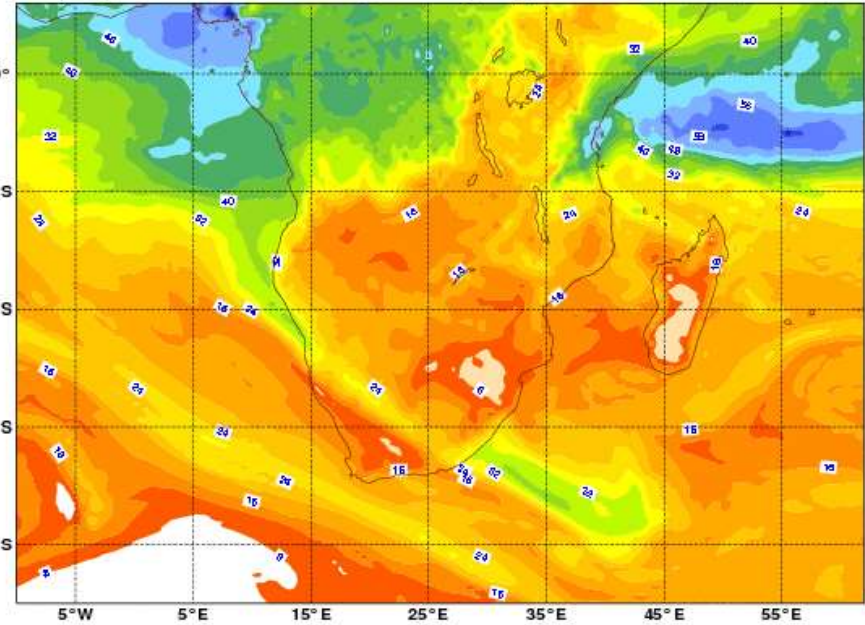
Deterministic products

ECMWF

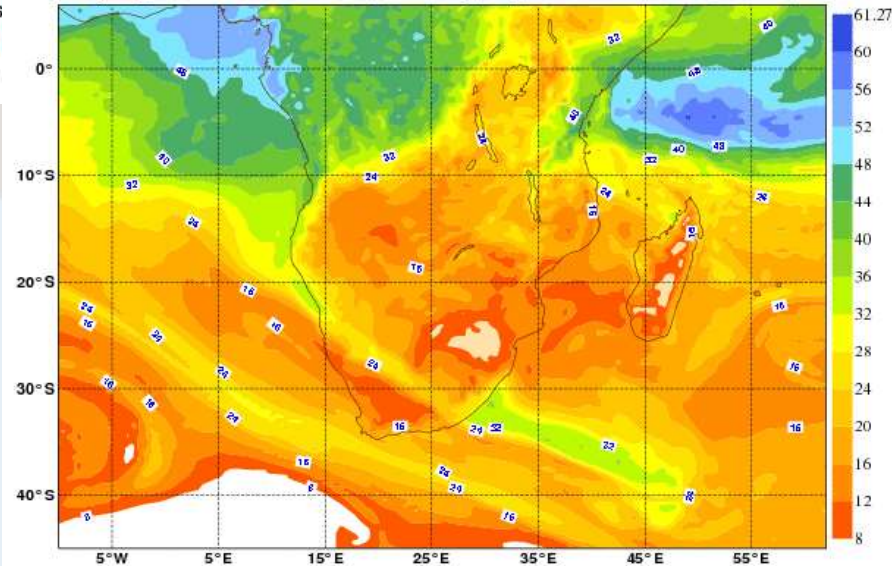
Sunday 14 September 2014 12UTC ECMWF Forecast t+18 VT: Monday 15 September 2014 06UTC Surface: Total column water



Sunday 14 September 2014 12UTC ECMWF Forecast t+24 VT: Monday 15 September 2014 12UTC Surface: Total column water

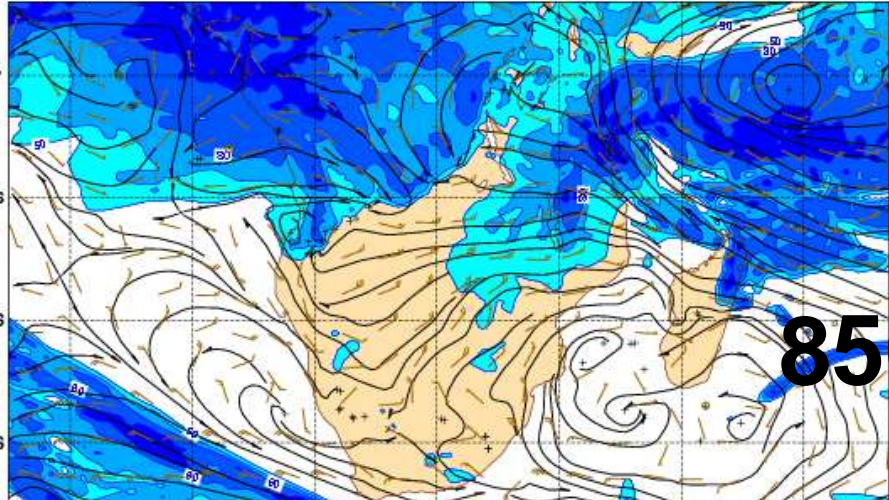


Sunday 14 September 2014 12UTC ECMWF Forecast t+30 VT: Monday 15 September 2014 18UTC Surface: Total column water



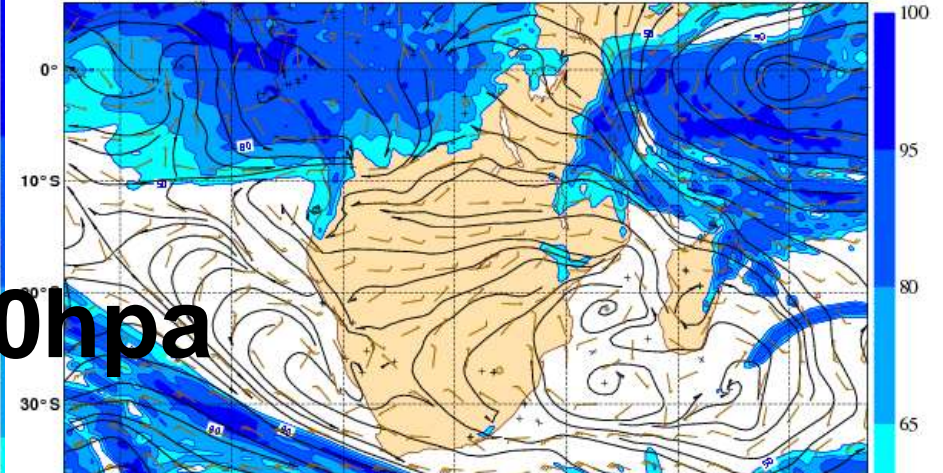
ECMWF

Sunday 14 September 2014 12UTC ECMWF Forecast 4-18 VT: Monday 15 September 2014 06UTC 850hPa Relative humidity/ V velocity/ V velocity

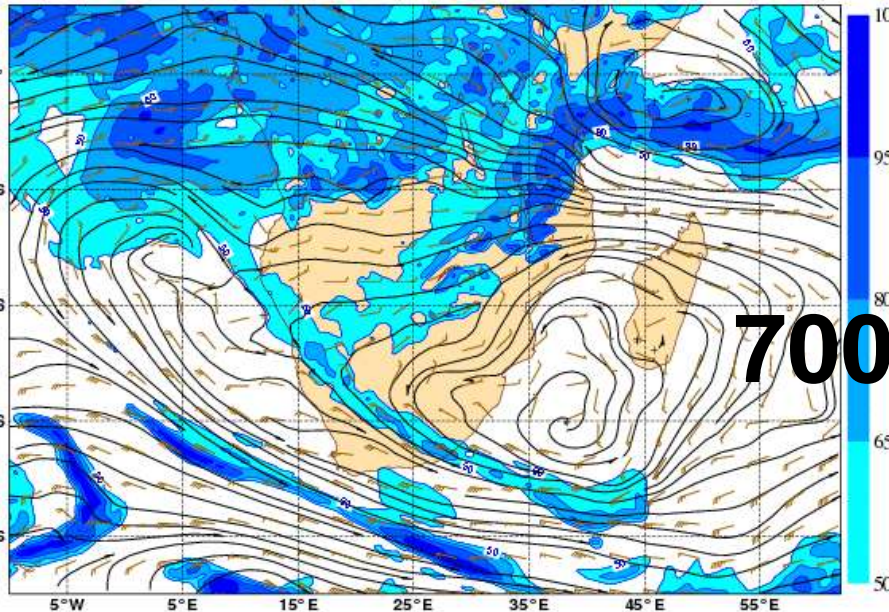


850hpa

Sunday 14 September 2014 12UTC ECMWF Forecast 1-24 VT: Monday 15 September 2014 12UTC 850hPa Relative humidity/ V velocity/ V velocity

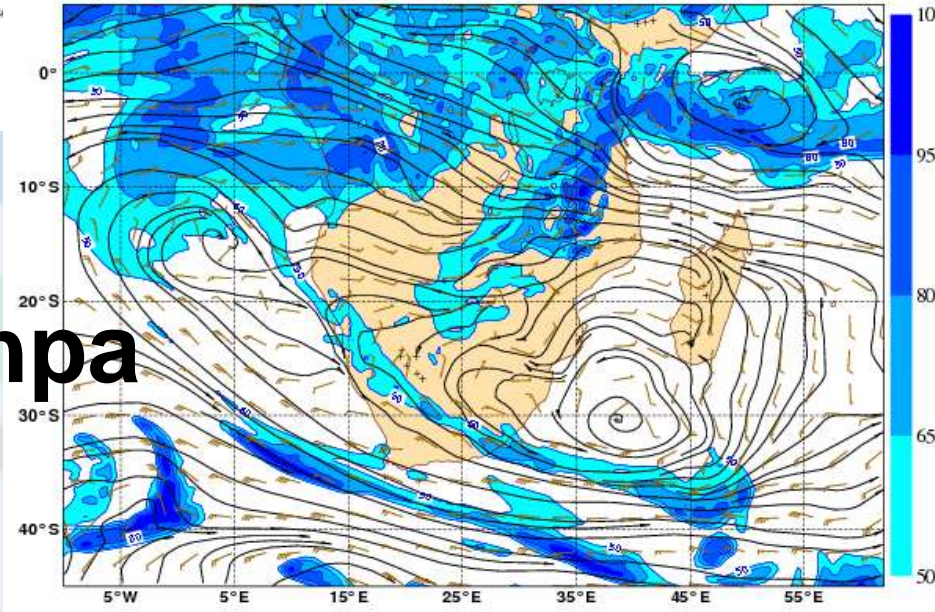


Sunday 14 September 2014 12UTC ECMWF Forecast 1-24 VT: Monday 15 September 2014 12UTC 700hPa Relative humidity/ V velocity/ V velocity



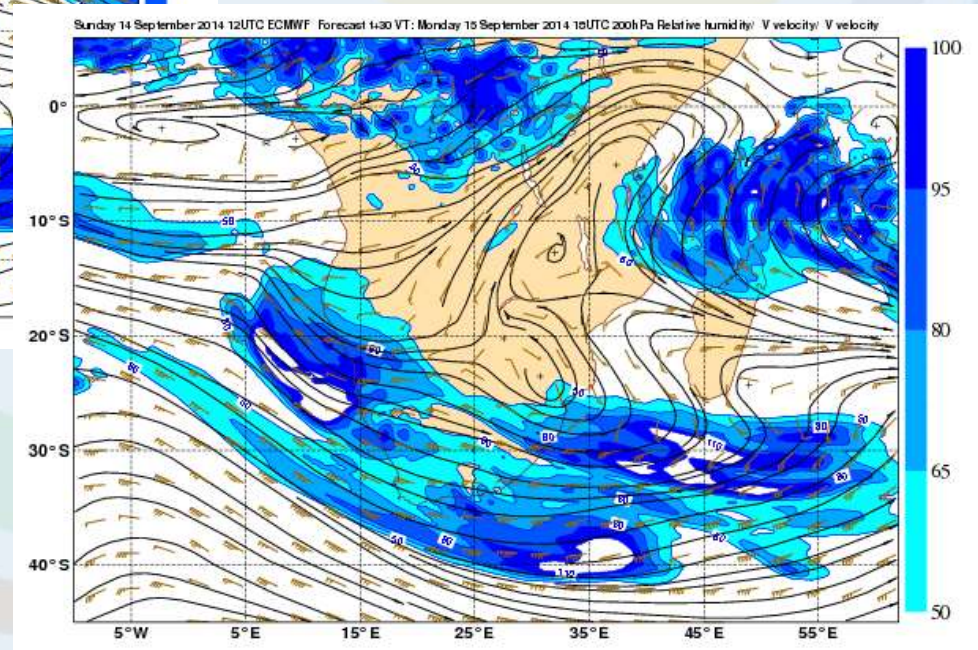
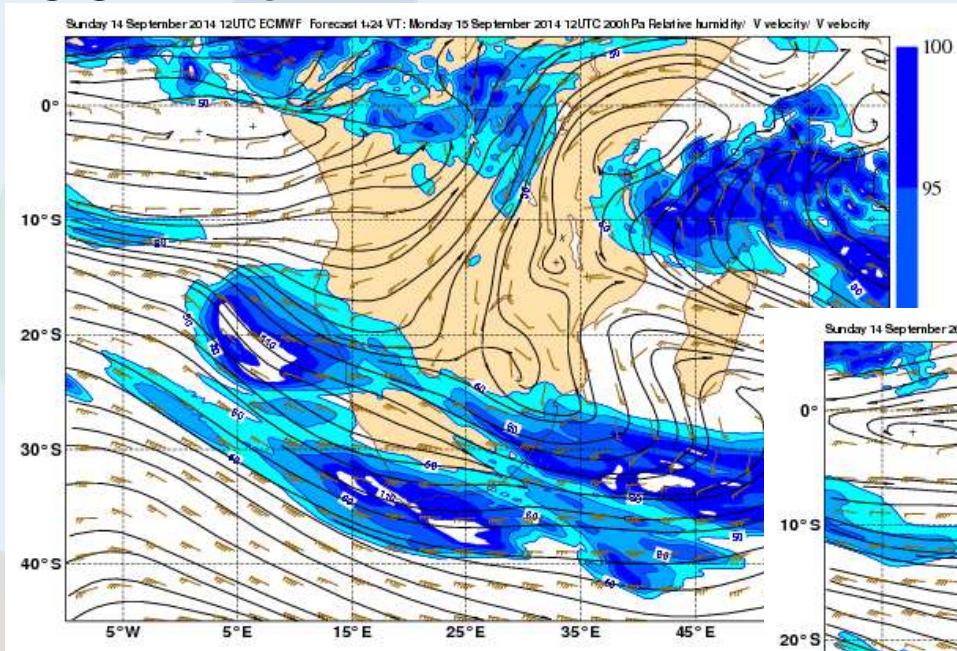
700hpa

Sunday 14 September 2014 12UTC ECMWF Forecast 1-30 VT: Monday 15 September 2014 18UTC 700hPa Relative humidity/ V velocity/ V velocity

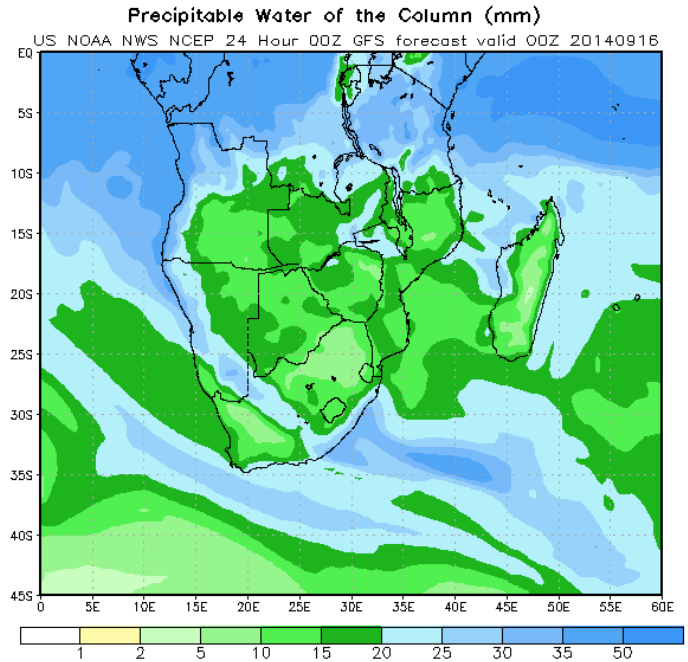
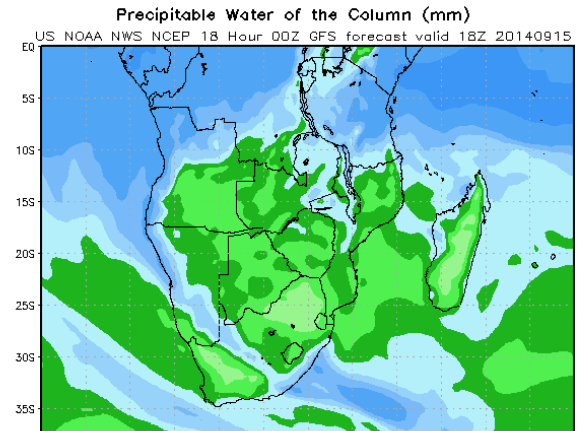
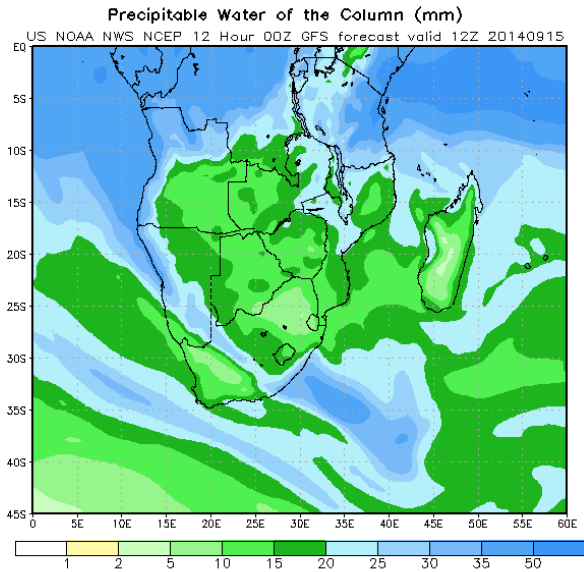


ECMWF

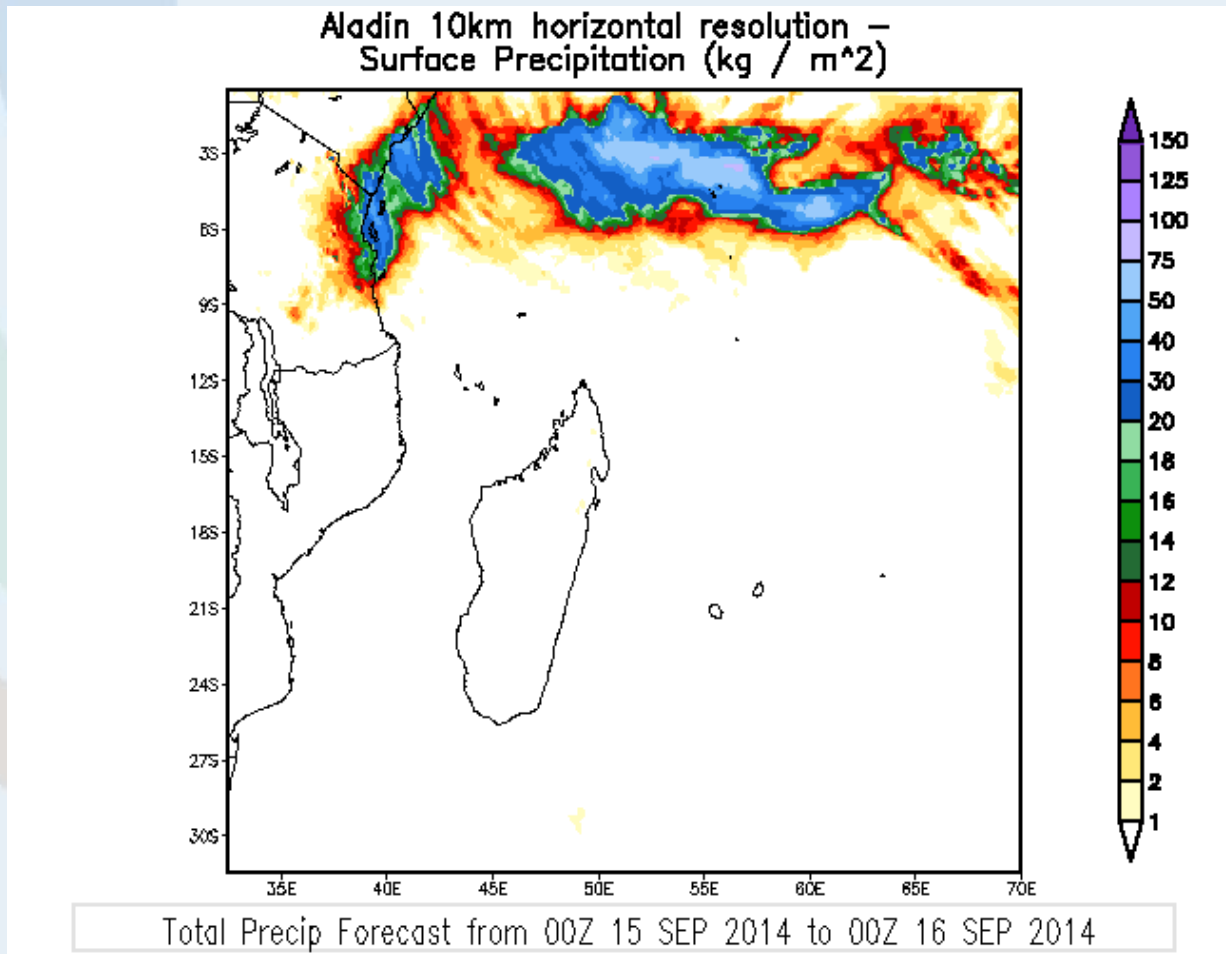
200 hPa



NCEP

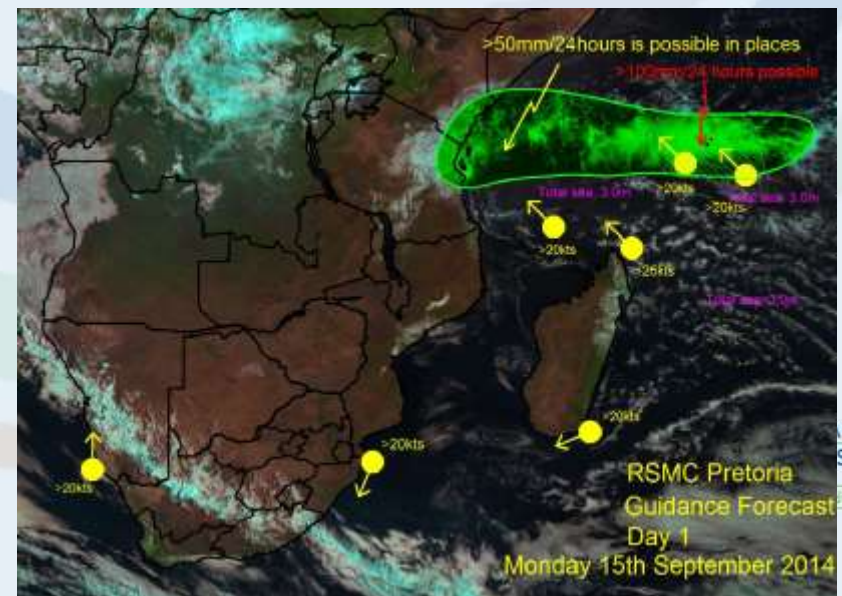
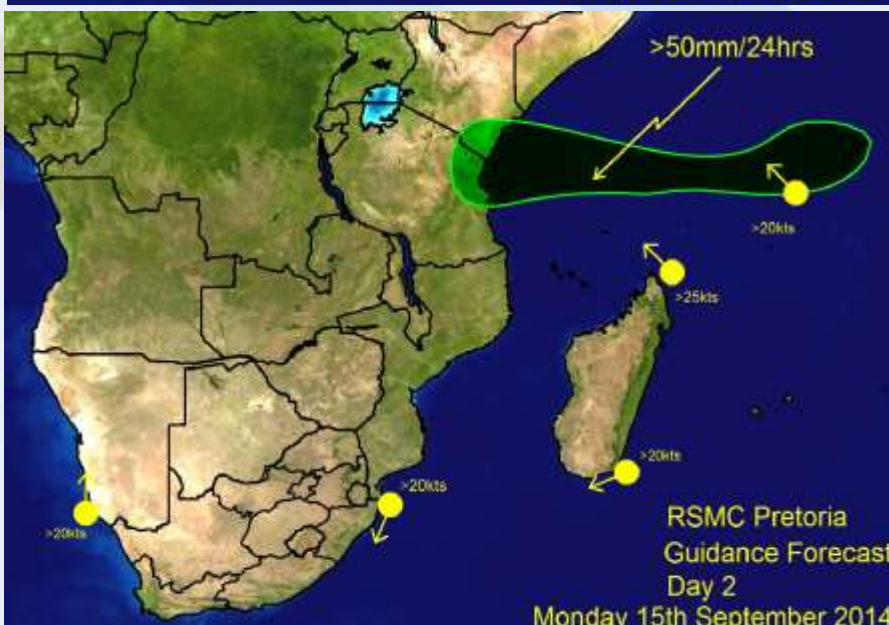
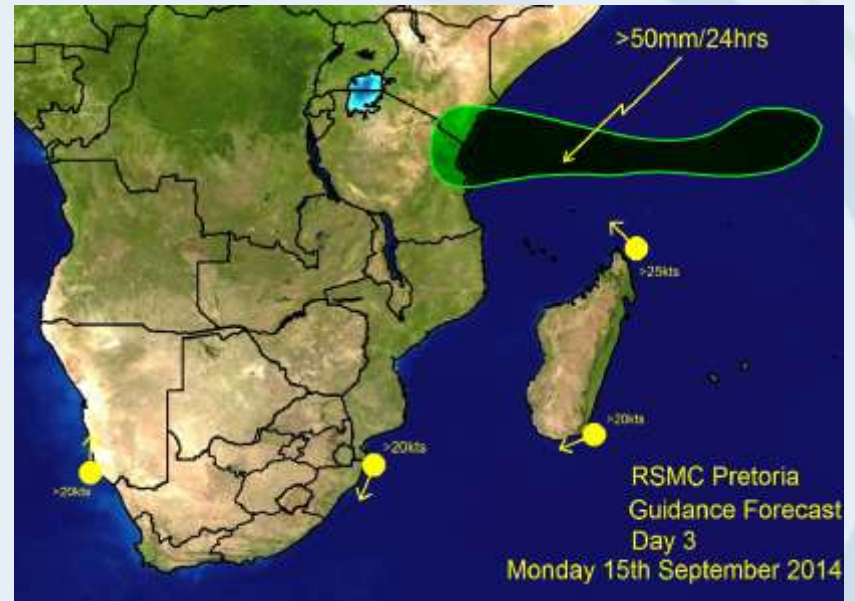
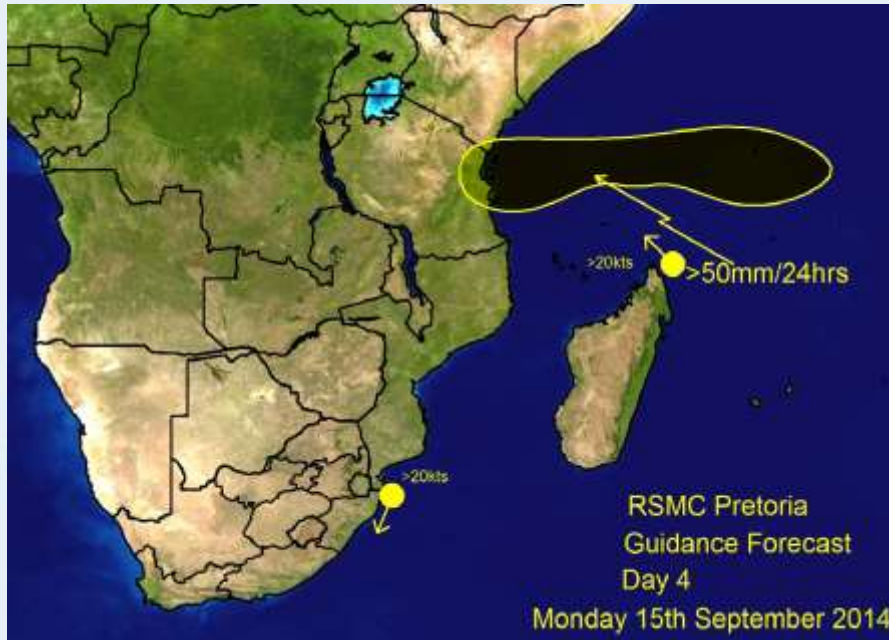


Aladin



24hour forecast accumulated precipitation

Guidance from RSMC



Products Assessment by Seychelles forecasters

Mark for usefulness of products (put 1 in the chosen cell)

		Guidance	
		RSMC Pretoria	1
KEY		NWP	EPS
A = Very useful (basis of the warning)	ECMWF	B	X
B = Useful (aided warning confidence)	NCEP	A	X
C = Neutral (not useful)	Met Office	X	B
D = Negative (misleading)			
X = Not used			

11 October 2014: Severe storms over central RSA and Lesotho

- Severe thunderstorms were experienced on the 11th and 12th October over central RSA and parts of Lesotho
- Large amounts of hail fell in certain areas resulting in disruption to traffic and cars getting stuck on the roads. In some places, there were very large hail.
- In Lesotho, several school roofs were blown away due to the strong winds



© J. Van Heerden



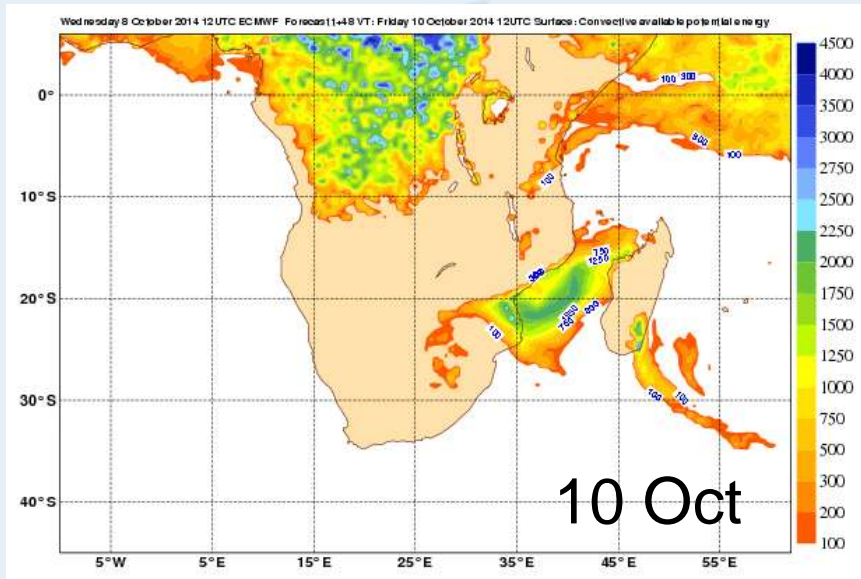
Winterton, RSA.



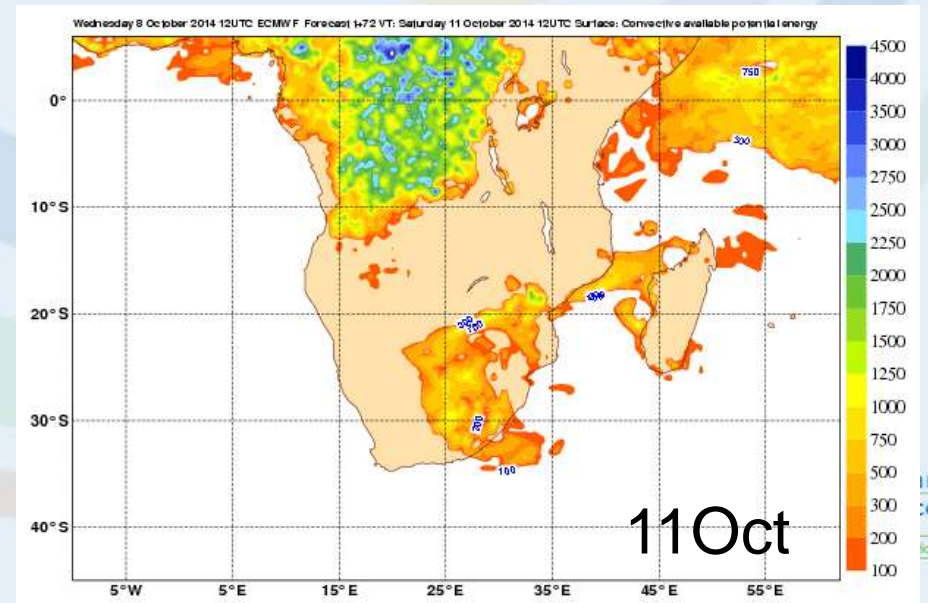
© J. Van Heerden

Global NWP

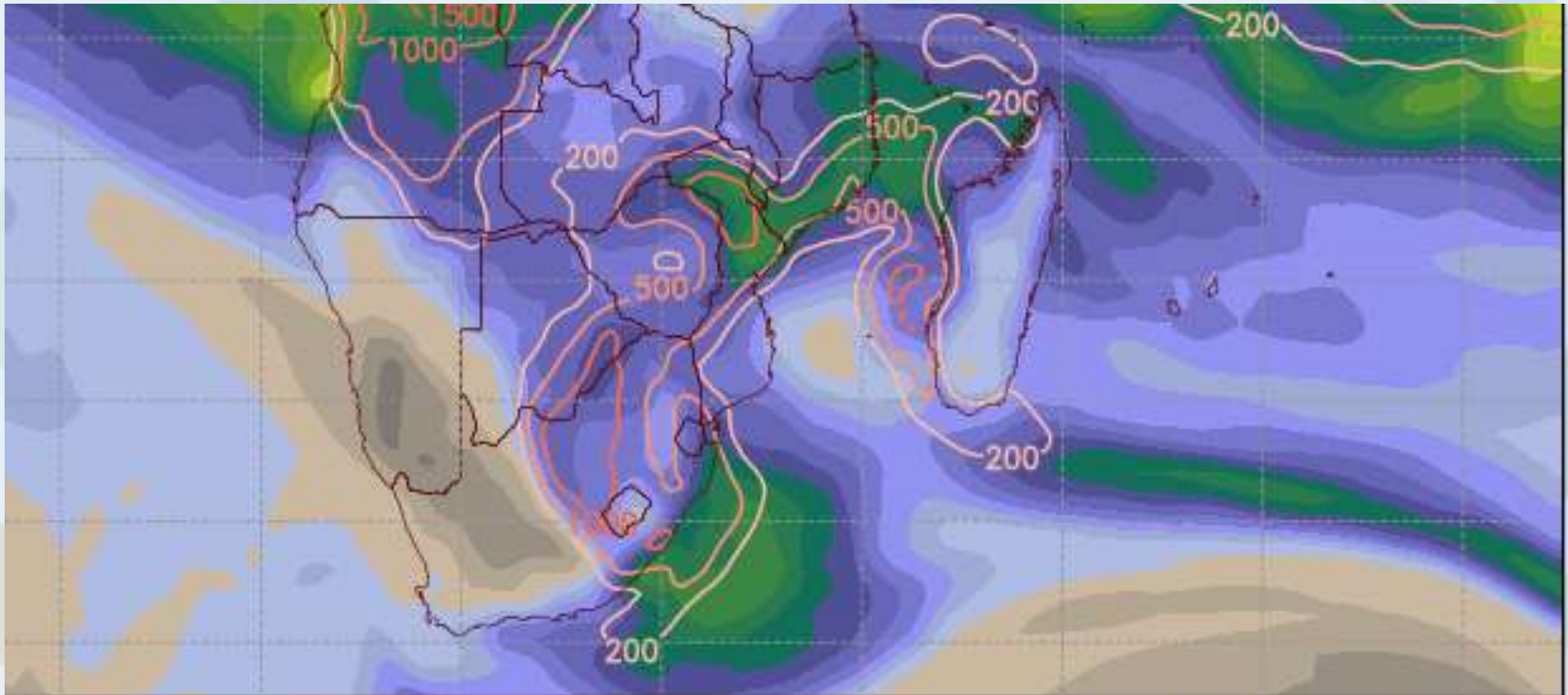
ECMWF Wed 08Oct 12:00Z run



Significant increase in CAPE
From Friday into Saturday



GFS Mon 06Oct 12:00Z run

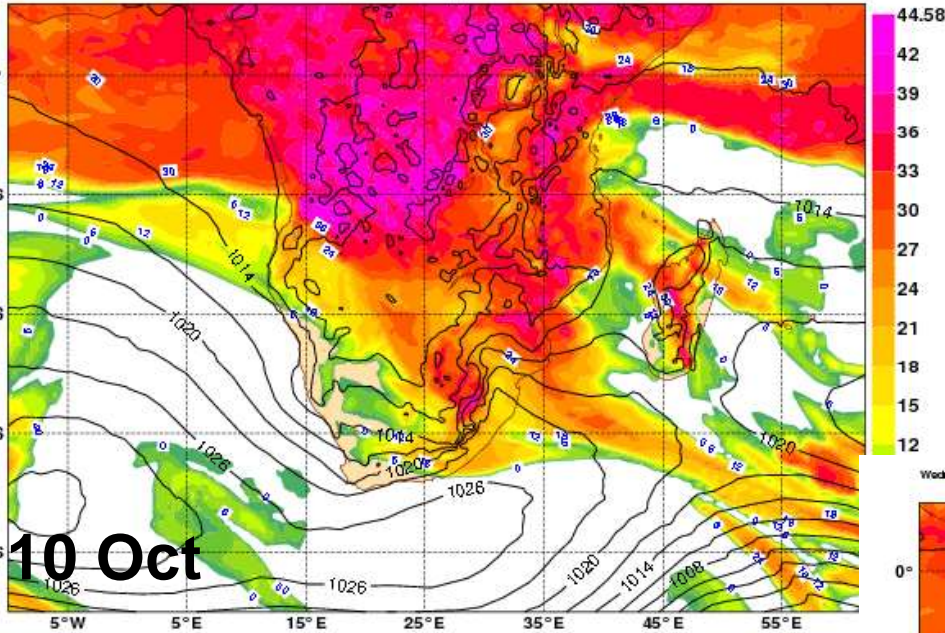


T2014 Valid: 12Z Sat 11 OCT 2014

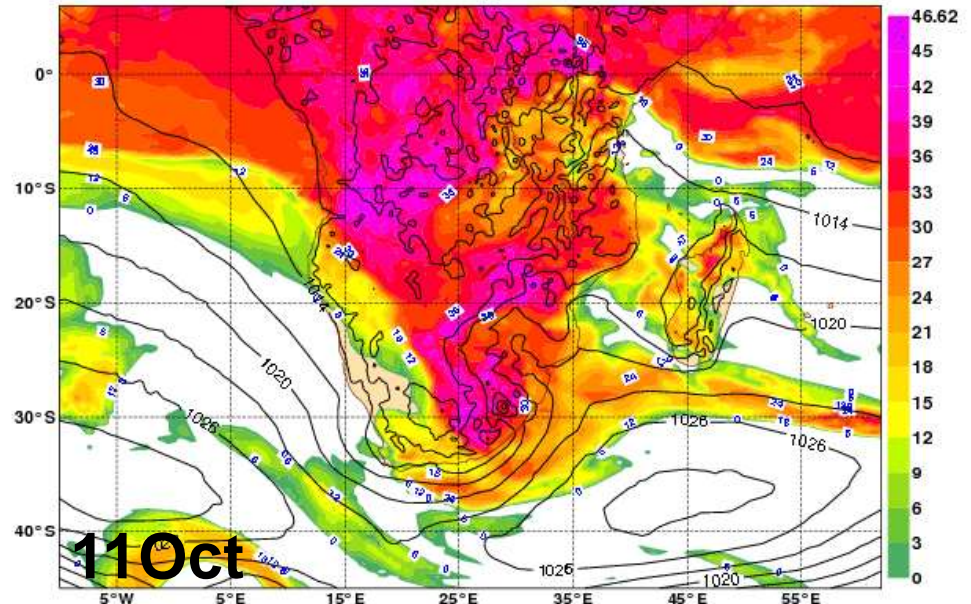
Precipitable Water (mm) and CAPE (J/kg)

ECMWF Wed 08Oct 12:00Z run

Wednesday 8 October 2014 12UTC ECMWF Forecast 1148 VT: Friday 10 October 2014 12UTC 850hPa Temperature/ Mean sea level pressure
K Index (C)



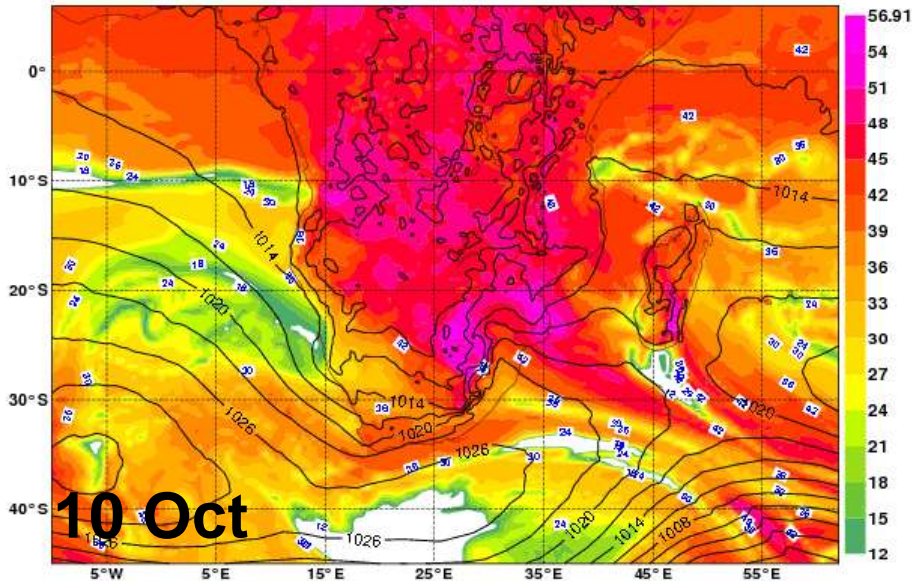
Wednesday 8 October 2014 12UTC ECMWF Forecast 1472 VT: Saturday 11 October 2014 12UTC 850hPa Temperature/ Mean sea level pressure
K Index (C)



Significant increase in K index
From Friday into Saturday

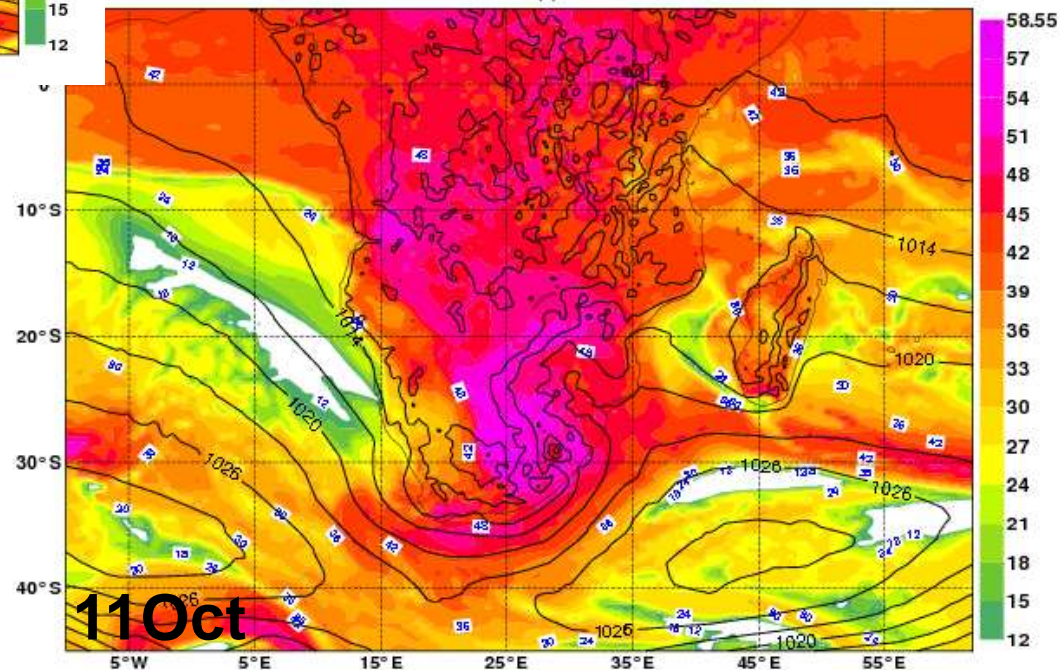
ECMWF Wed 08Oct 12:00Z run

Wednesday 8 October 2014 12:00 UTC ECMWF Forecast 1448 VT: Friday 10 October 2014 12:00 UTC 850h Pa Temperature / Mean sea level pressure
TT Index (C)



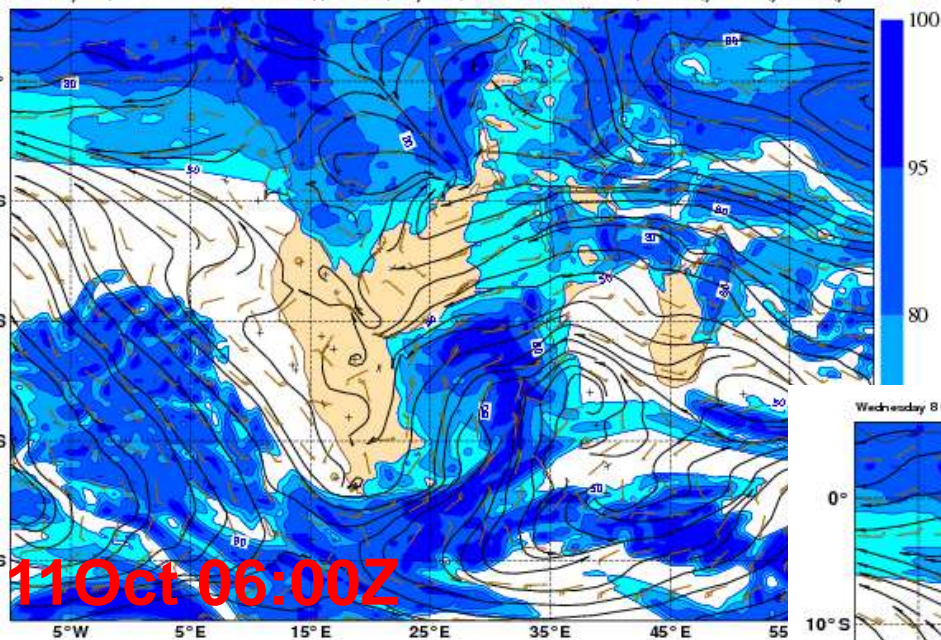
Significant increase and westward spread in Totals Total from Friday into Saturday

Friday 8 October 2014 12:00 UTC ECMWF Forecast 1472 VT: Saturday 11 October 2014 12:00 UTC 850h Pa Temperature / Mean sea level pressure
TT Index (C)

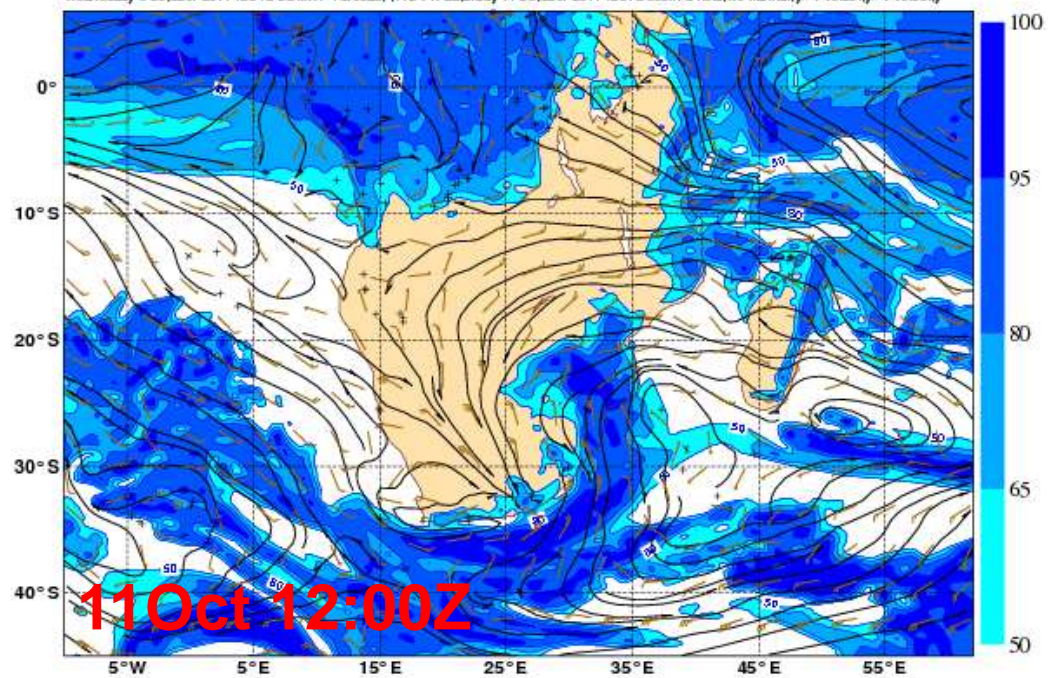


ECMWF Wed 08Oct 12:00Z run

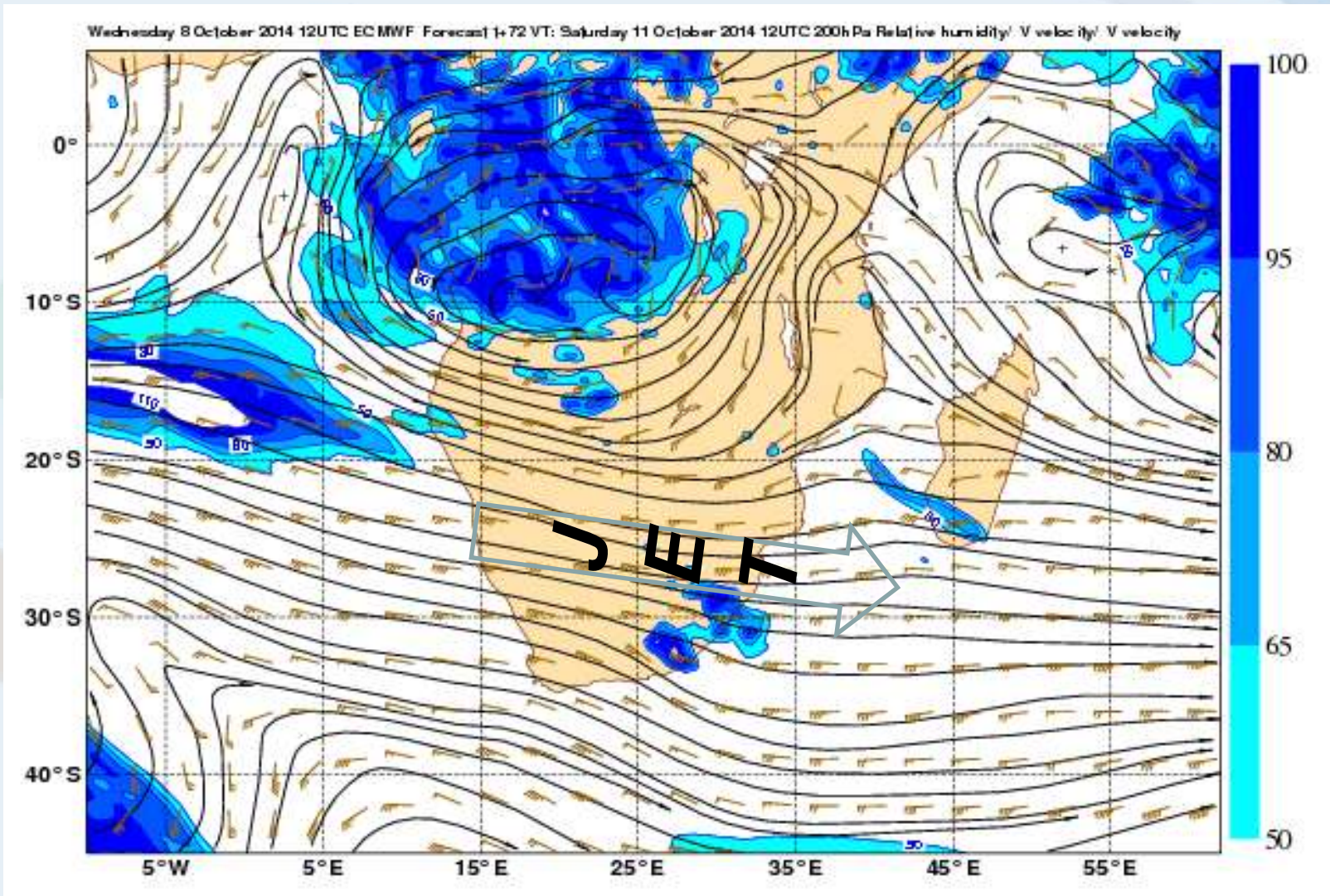
Wednesday 8 October 2014 12UTC ECMWF Forecast 1+88 VT: Saturday 11 October 2014 08UTC 850h Pa Relative humidity/ V velocity/ V velocity



Wednesday 8 October 2014 12UTC ECMWF Forecast 1+72 VT: Saturday 11 October 2014 12UTC 850h Pa Relative humidity/ V velocity/ V velocity

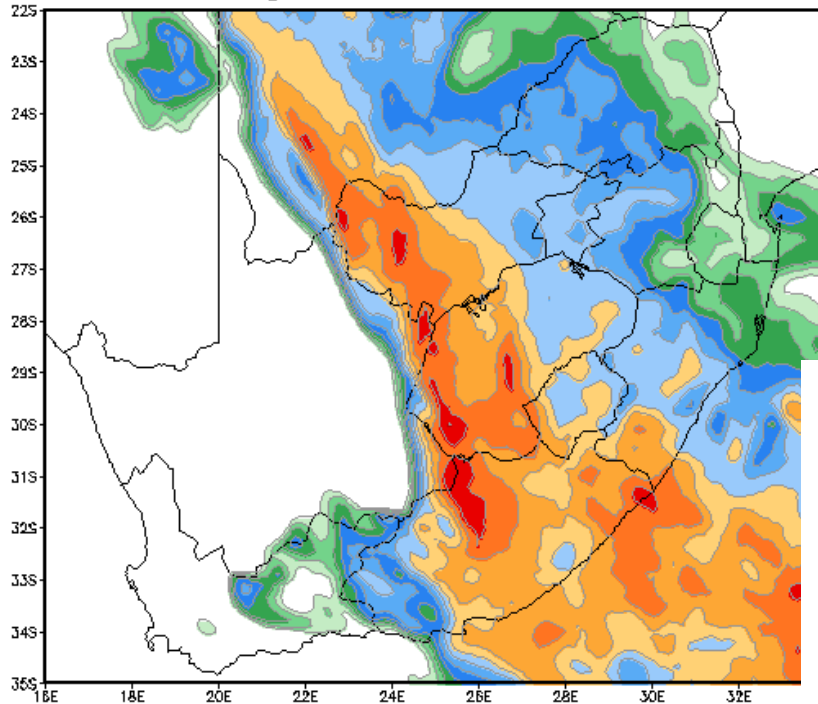


ECMWF Wed 08Oct 12:00Z run



Regional NWP

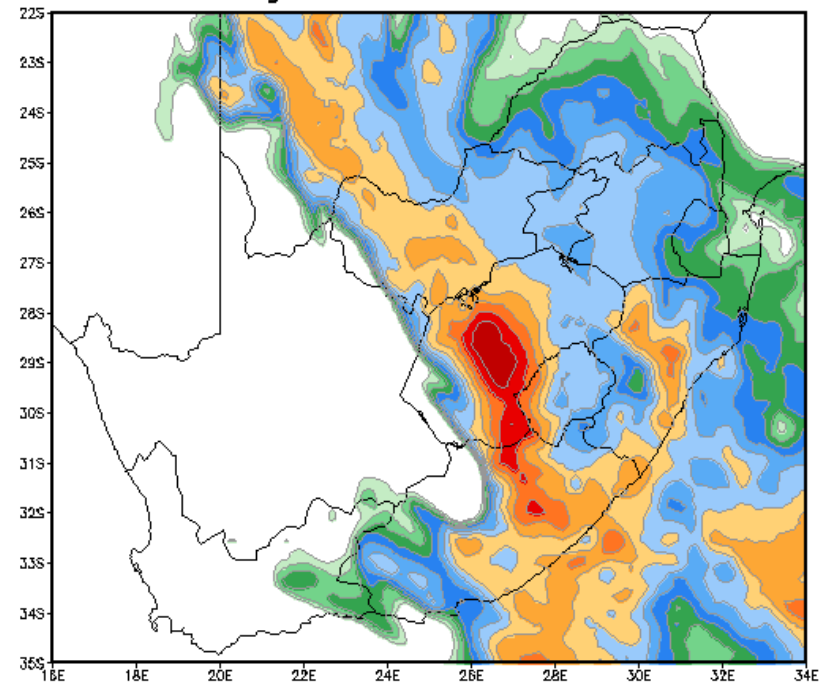
UM 12km horizontal resolution – xaant Run:
High Level Total Totals Index



39hr Forecast from 00Z 10 OCT 2014 – for 15Z 11 OCT 2014

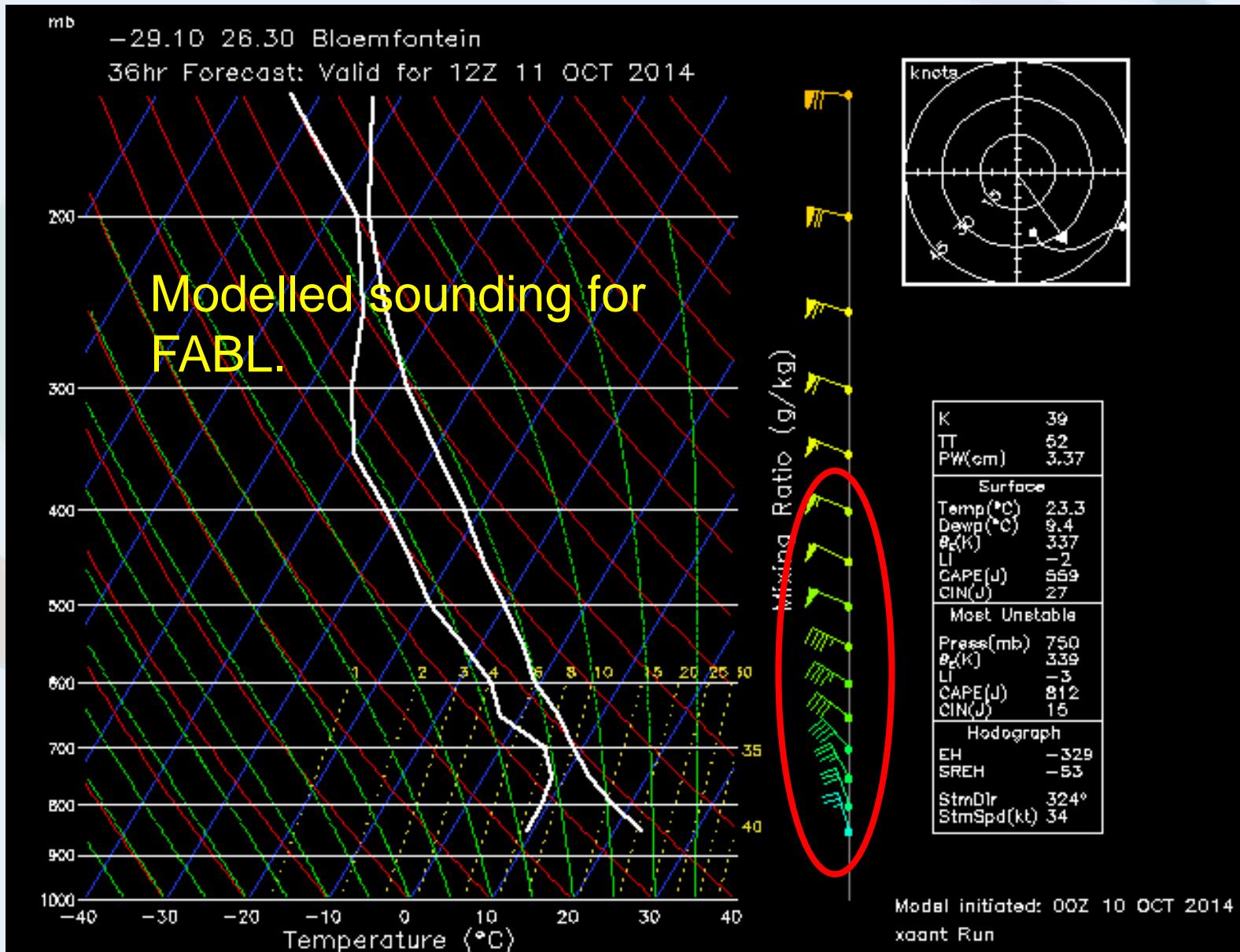


UM 12km horizontal resolution – xaant Run:
High Level Total Totals Index



42hr Forecast from 00Z 10 OCT 2014 – for 18Z 11 OCT 2014

Regional NWP



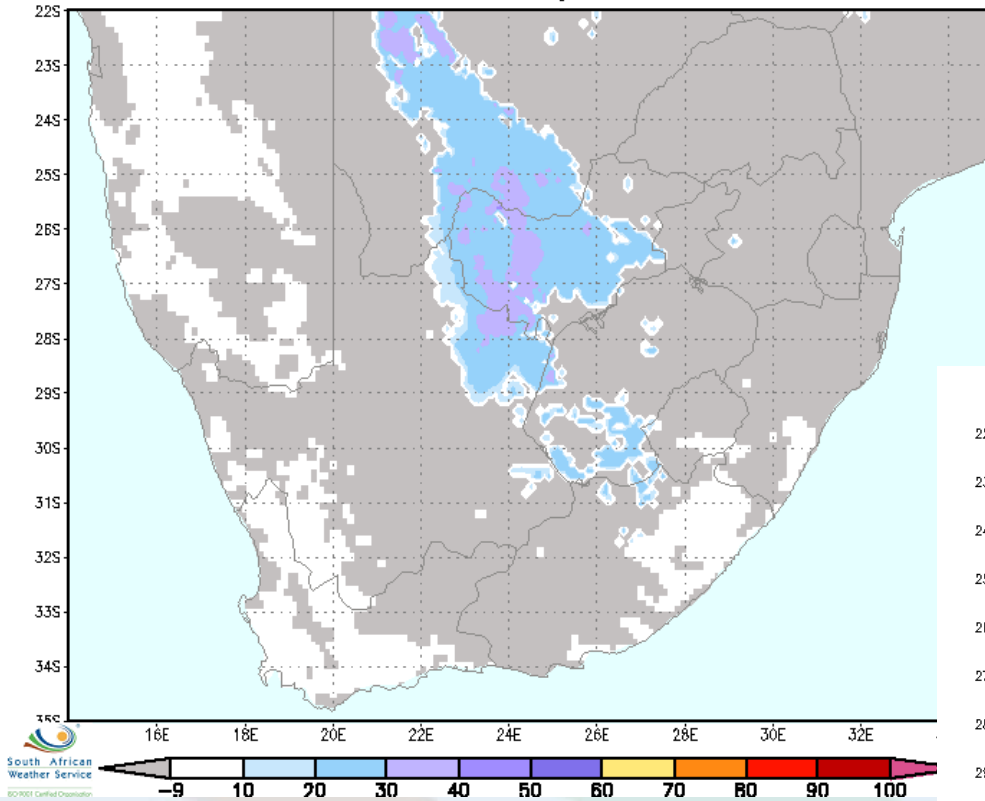
Now-casting

Combined Instability Index

- Will be dealt with in detail tomorrow
- Is a combination of satellite data, UM as well as topography
- It creates a probability map in the morning for convection later in the day.
- It uses K index, Liftex Index, Total Totals, Precipitable waters and topography

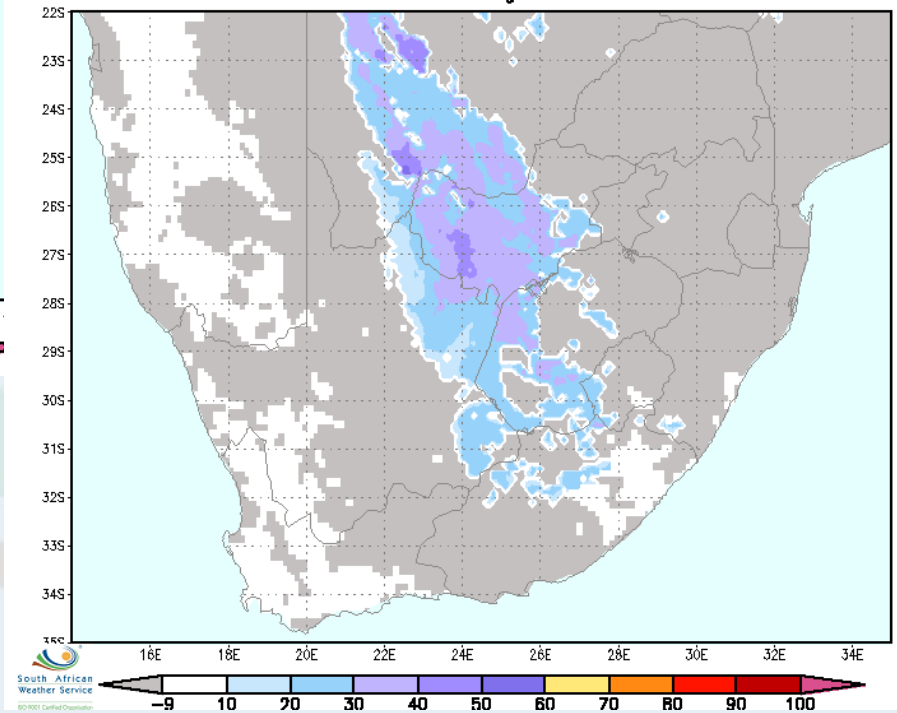
CII

Probability for convective thunderstorms in percentages on
11OCT2014 Time average 0300-0600 UTC



Doesn't calculate for
Clouded areas

Probability for convective thunderstorms in percentages on
11OCT2014 Time average 0400-0700 UTC



Satellite images

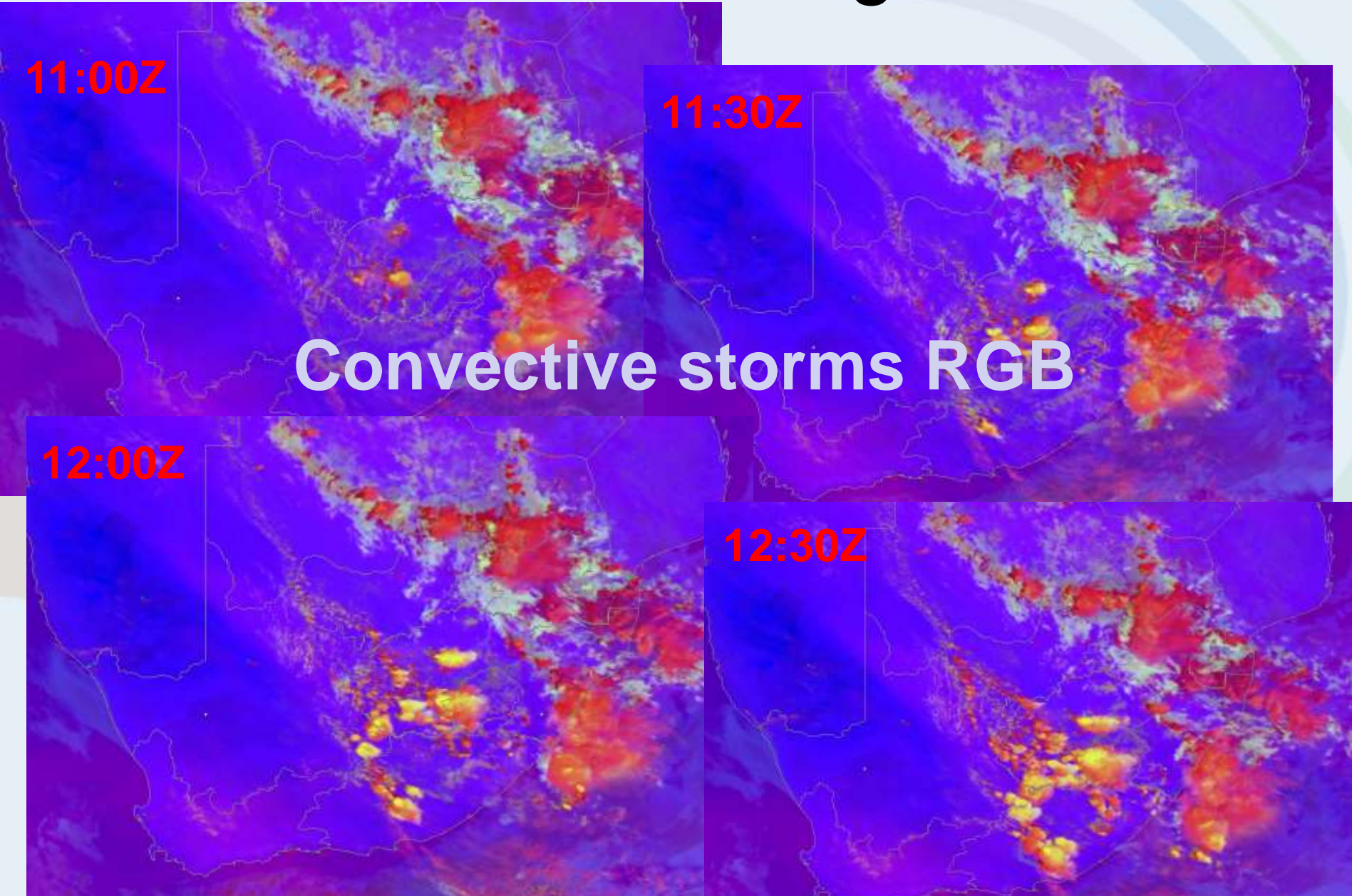
11:00Z

11:30Z

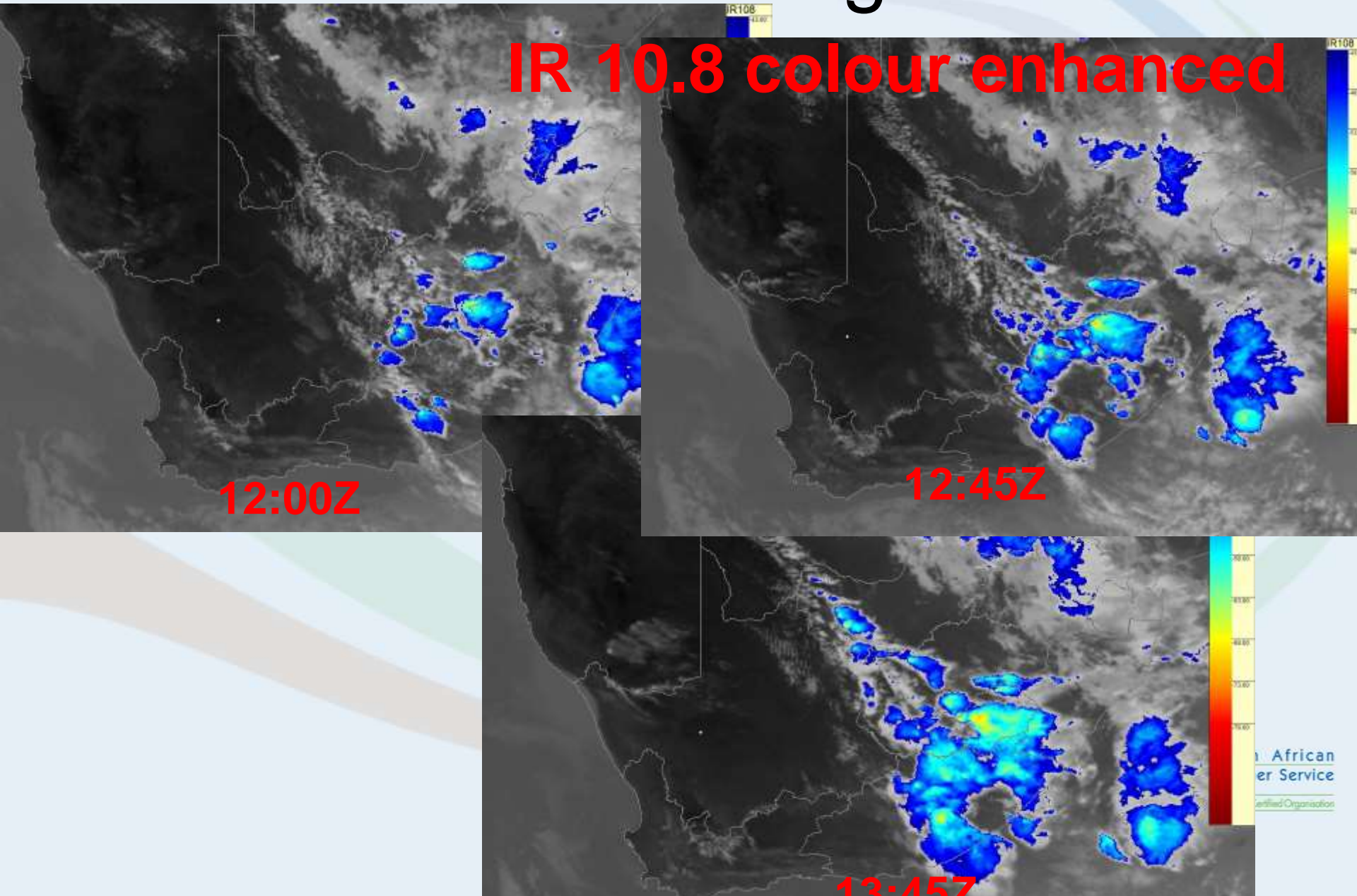
Convective storms RGB

12:00Z

12:30Z



Satellite images



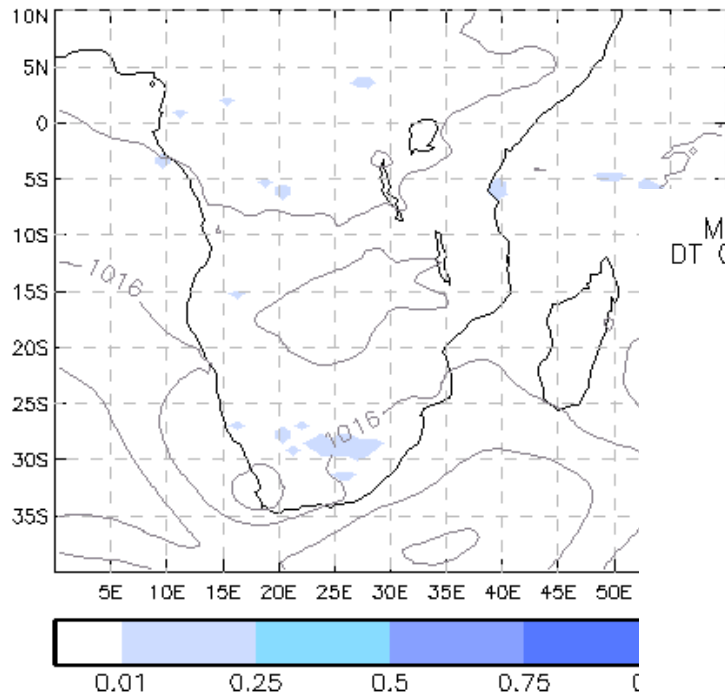
1-4 November 2014: Heavy rains over parts of RSA and Lesotho

- A cut-off low pressure affected RSA and parts of Lesotho from 1 to 4 November
- Several stations reported between 40 and 60mm
- Due to numerous continuous days of rain, risk of flash flooding in some places.

EPS products

EPS products

MOGREPS-15 Probability map for 24HourPrecip > 50.0mm
 DT: 00Z Sat 01/11/2014 VT: 00Z Mon 03/11/2014 lead time 48h
 (Ensemble Mean PMSL plotted as faint background)

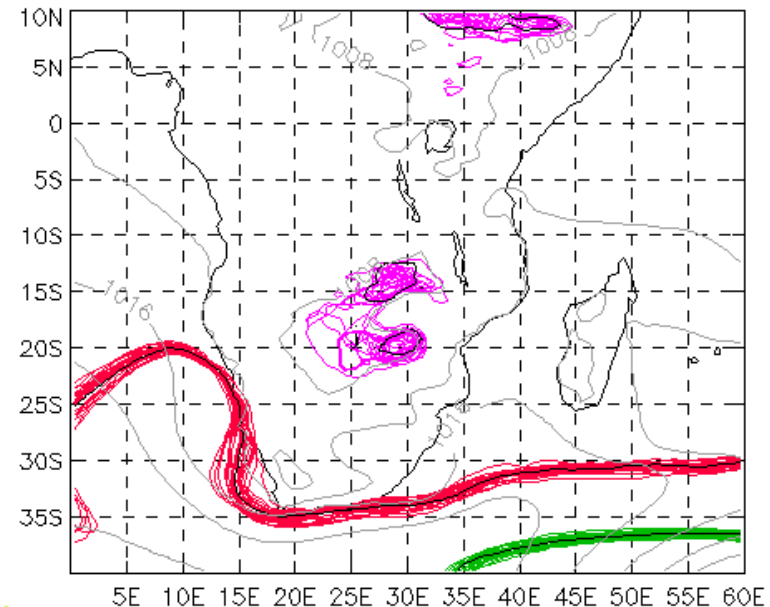


(c) British Crown copyright. Material



02 November

MOGREPS-15 Spaghetti chart for 500hPa geopotential height
 DT 00Z on 01/11/2014 VT 12Z on 02/11/2014 lead time 36h
 (Ensemble Mean PMSL plotted as faint background)



Green = 546 dam, Red = 564 dam, Pink = 582 dam
 Black lines represent Control member



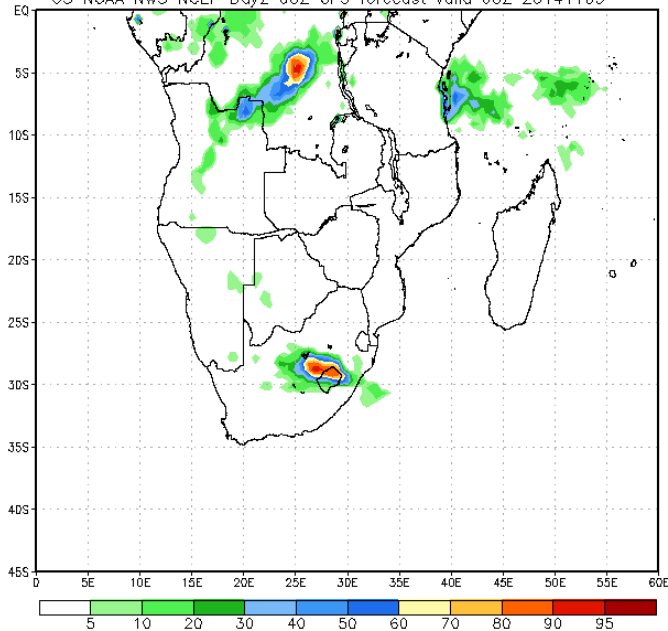
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NCEP

02 November

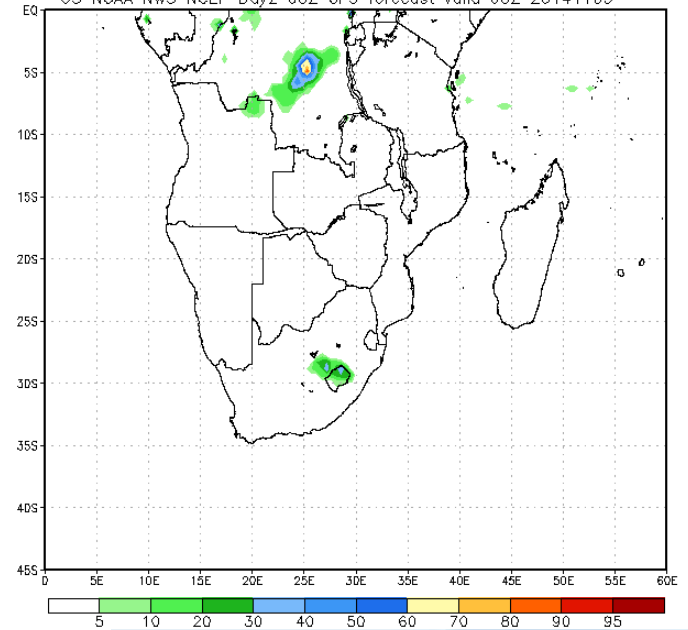
Probability of 24hr total precipitation exceeding 25 mm

US NOAA NWS NCEP Day2 00Z GFS forecast valid 00Z 20141103



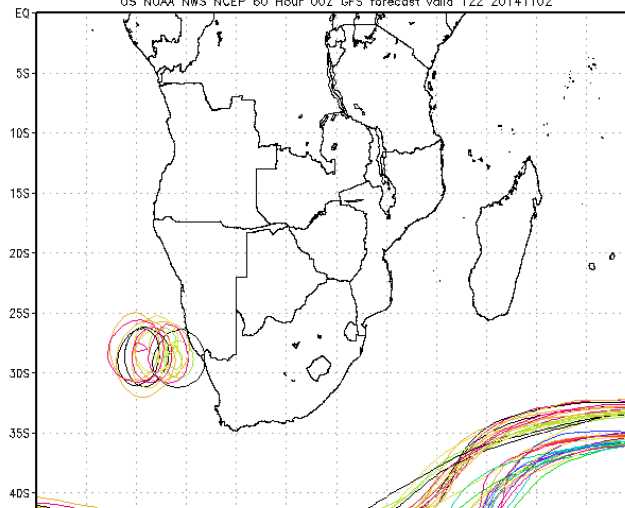
Probability of 24hr total precipitation exceeding 50 mm

US NOAA NWS NCEP Day2 00Z GFS forecast valid 00Z 20141103



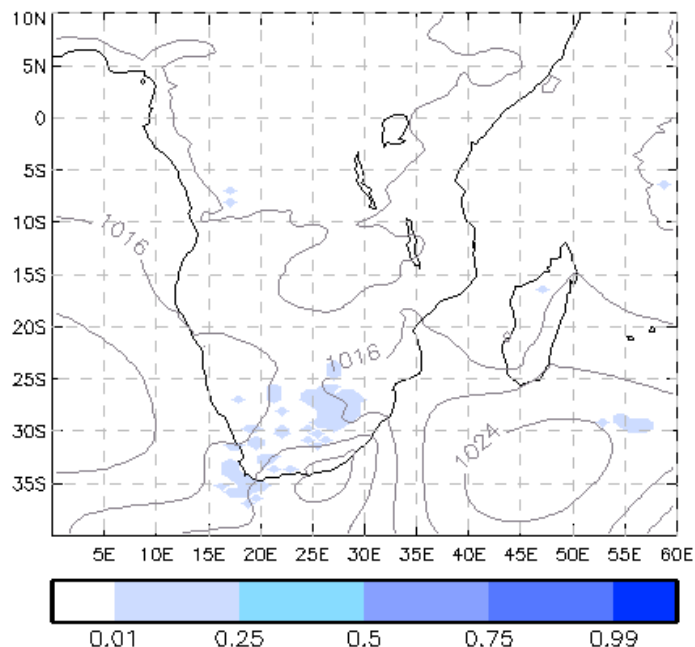
Spaghetti plot of 500mb Hgts 5550m 5650m is

US NOAA NWS NCEP 80 Hour 00Z GFS forecast valid 12Z 20141102



EPS products

MOGREPS-15 Probability map for 24HourPrecip > 50.0mm
 DT: 00Z Sat 01/11/2014 VT: 00Z Tue 04/11/2014 lead time 72h
 (Ensemble Mean PMSL plotted as faint background)

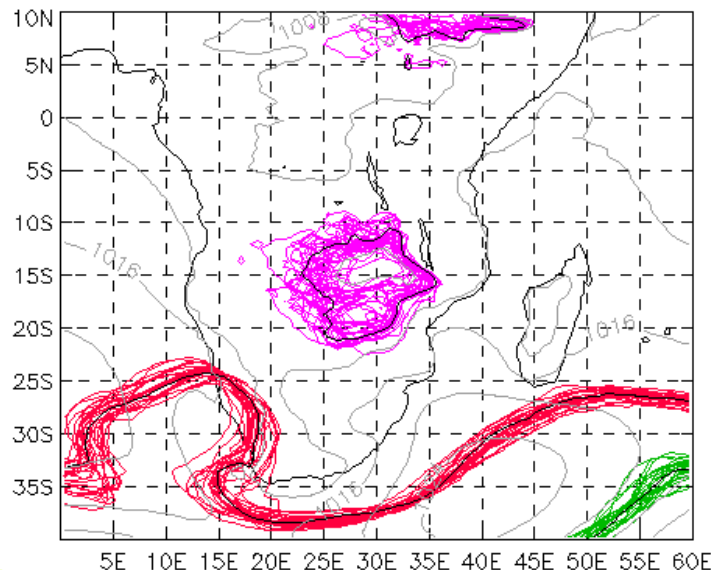


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03 November

EPS-15 Spaghetti chart for 500hPa geopotential height
 on 01/11/2014 VT 12Z on 03/11/2014 lead time 60h
 (Ensemble Mean PMSL plotted as faint background)



Green = 546 dam, Red = 564 dam, Pink = 582 dam
 Black lines represent Control member

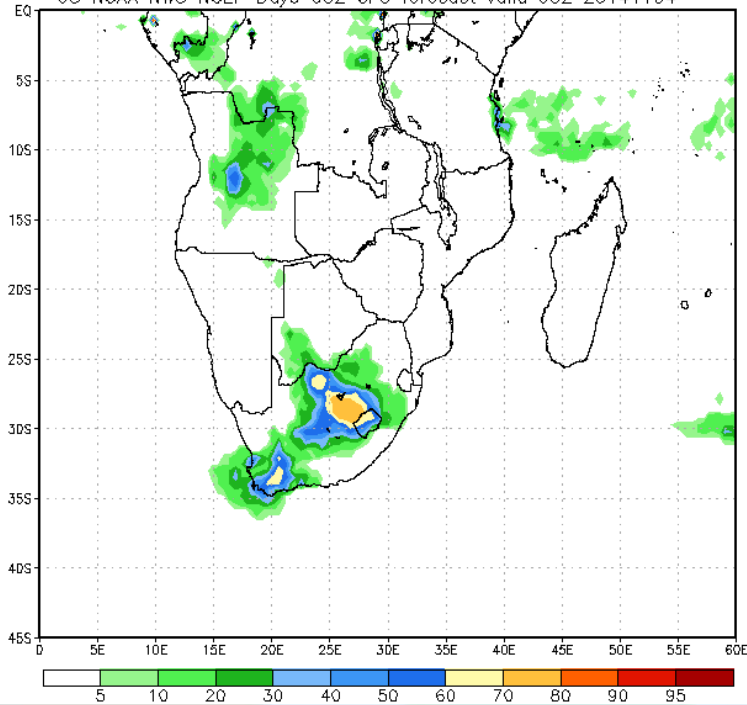


(c) British Crown copyright. Material supplied by the Met Office.

NCEP

Probability of 24hr total precipitation exceeding 25 mm

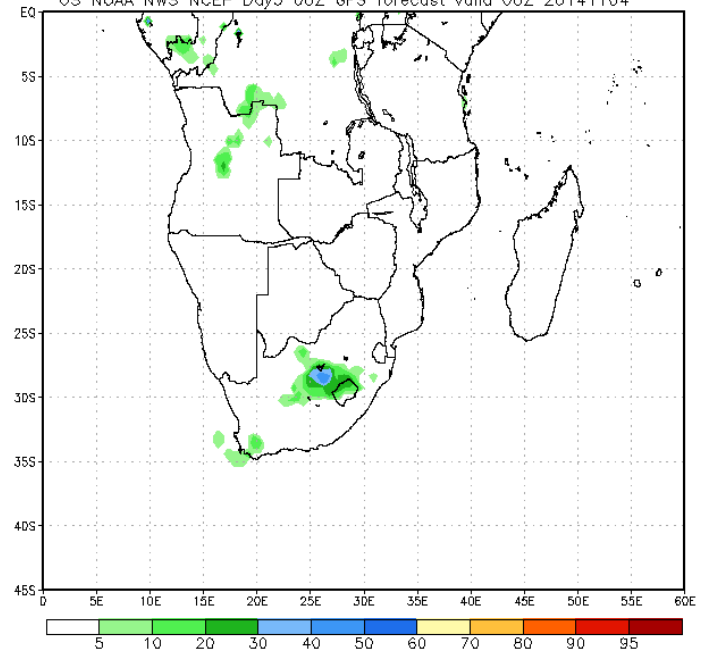
US NOAA NWS NCEP Day3 00Z GFS forecast valid 00Z 20141104



03 November

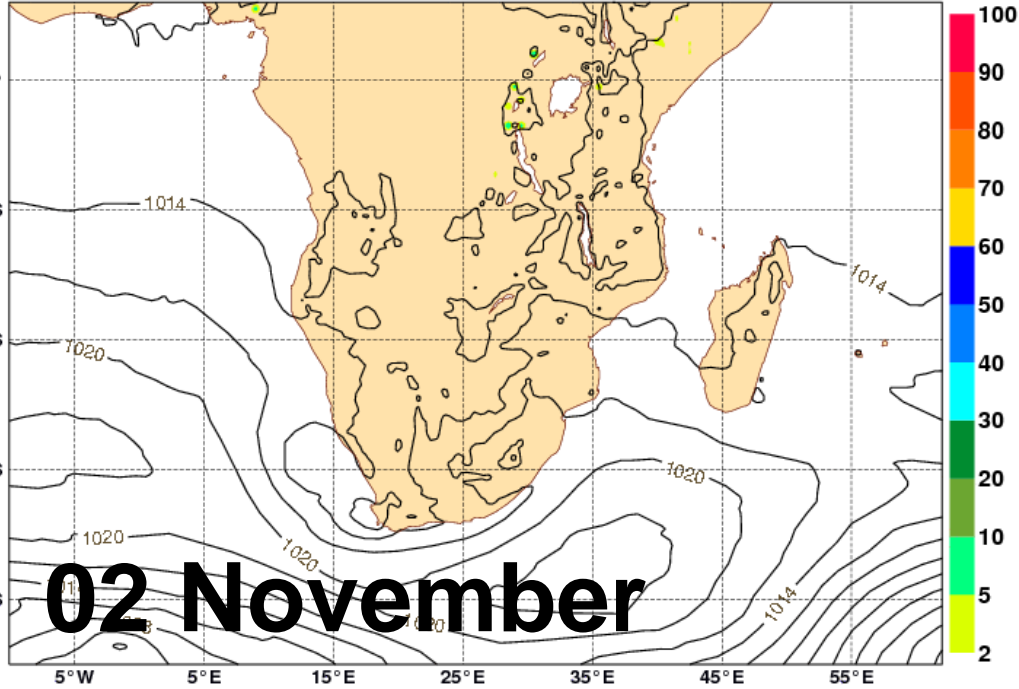
Probability of 24hr total precipitation exceeding 50 mm

US NOAA NWS NCEP Day3 00Z GFS forecast valid 00Z 20141104

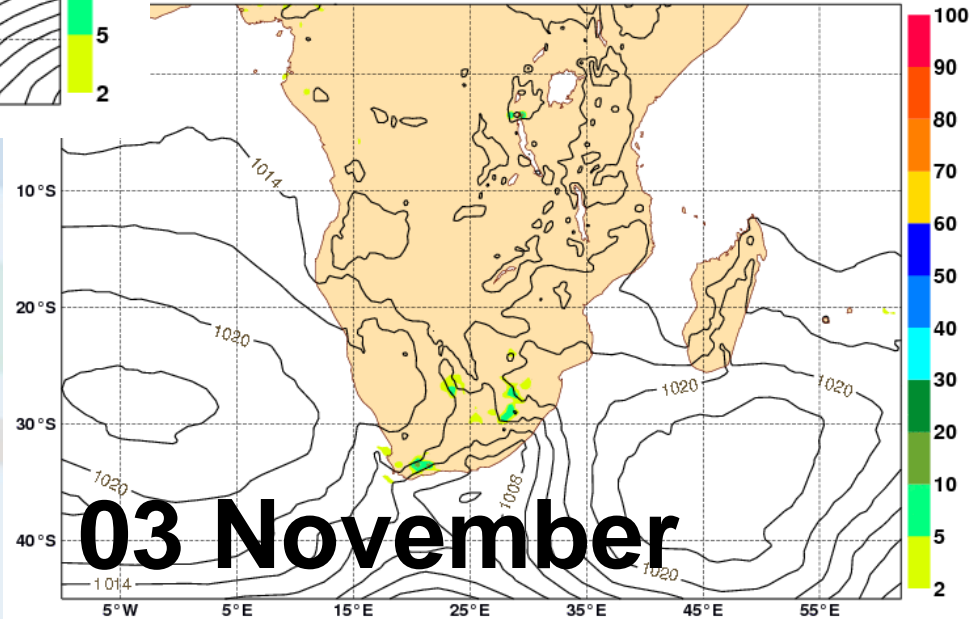


ECMWF

ECMWF Fc 2014110100 +48 h MSLP (hPa) and Probability of Precip exceeding 50mm/24h since last 24 h (%)

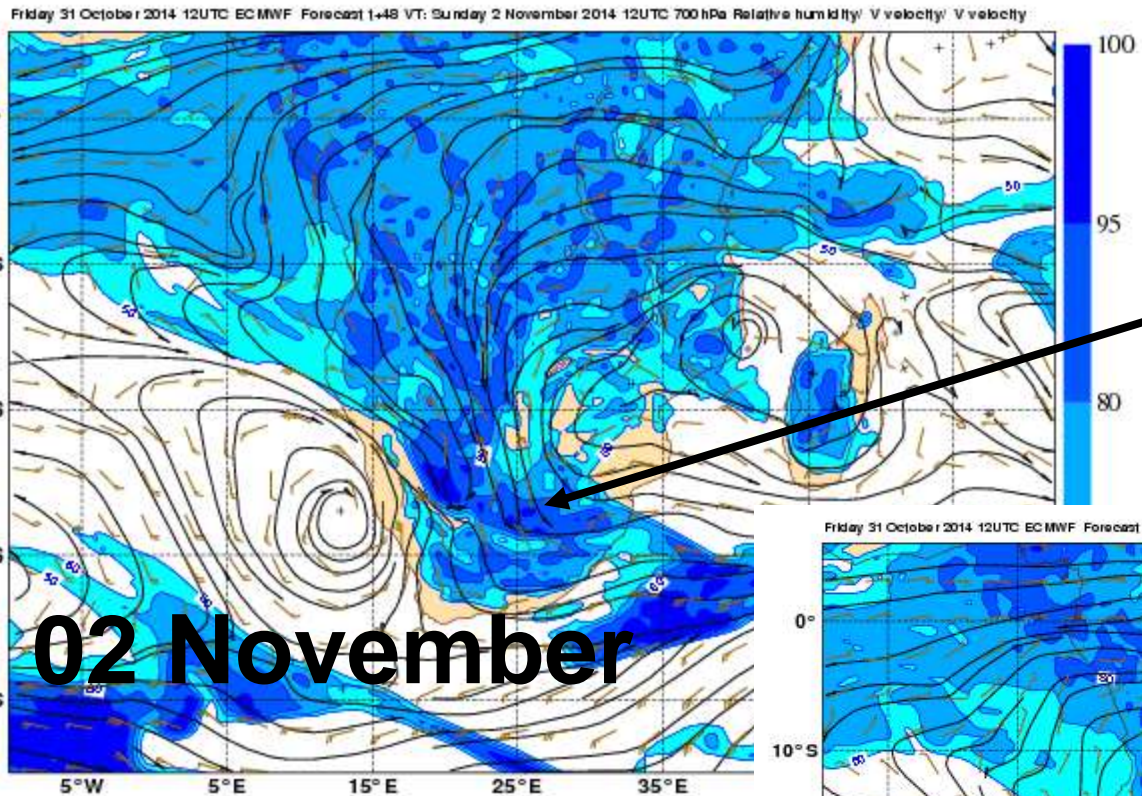


2014110100 +72 h MSLP (hPa) and Probability of Precip exceeding 50mm/24h since last 24 h (%)

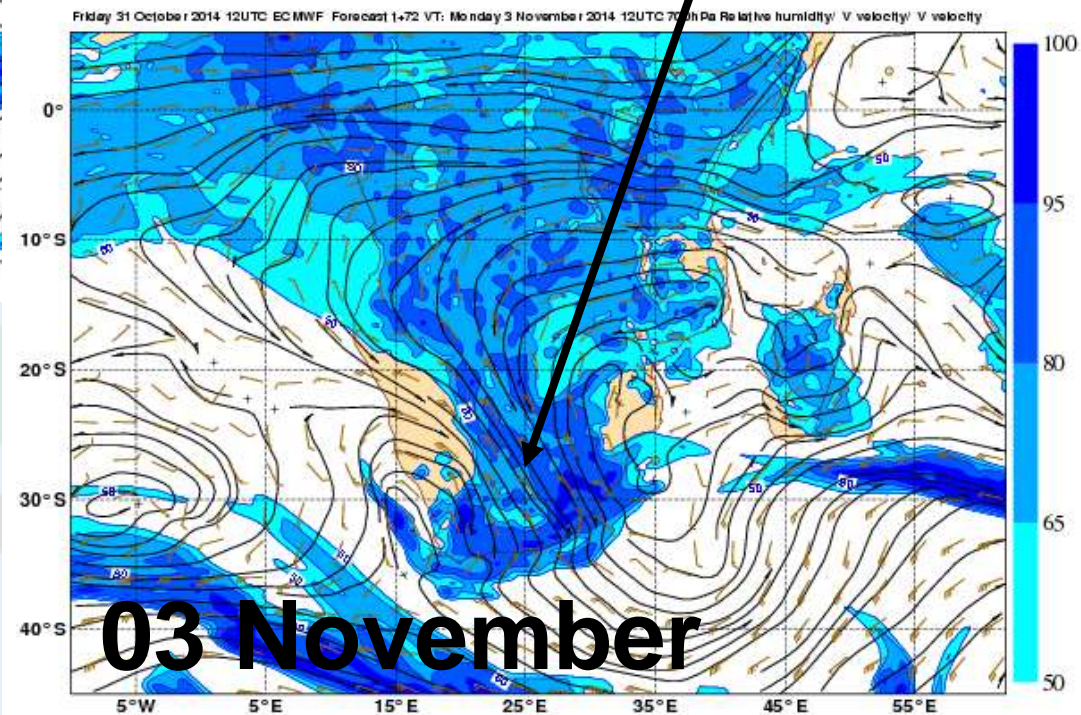


Deterministic Products

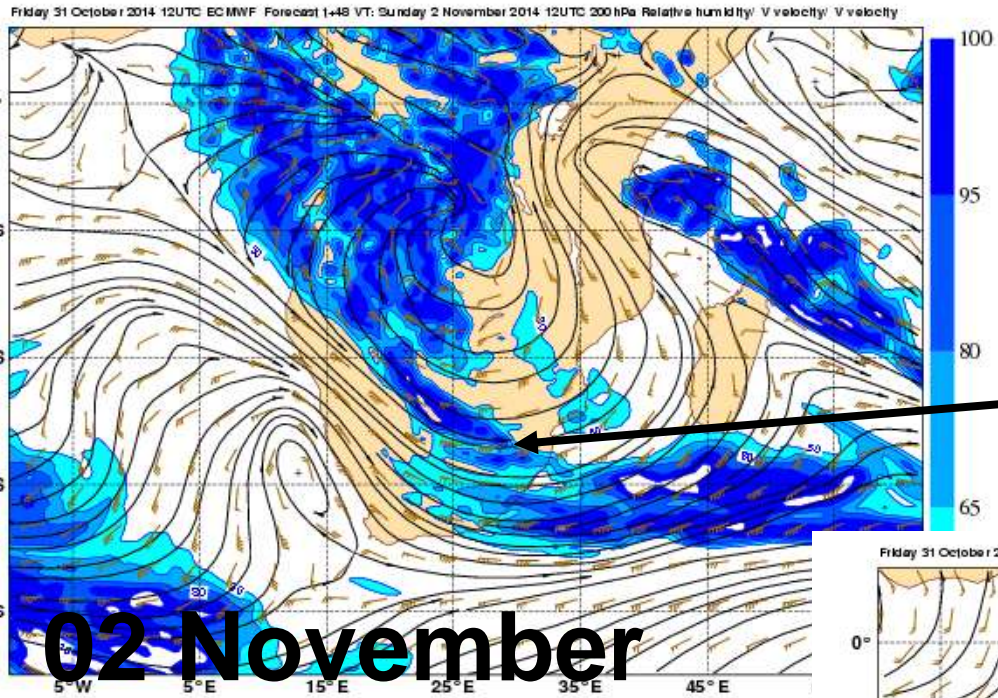
Deterministic Products



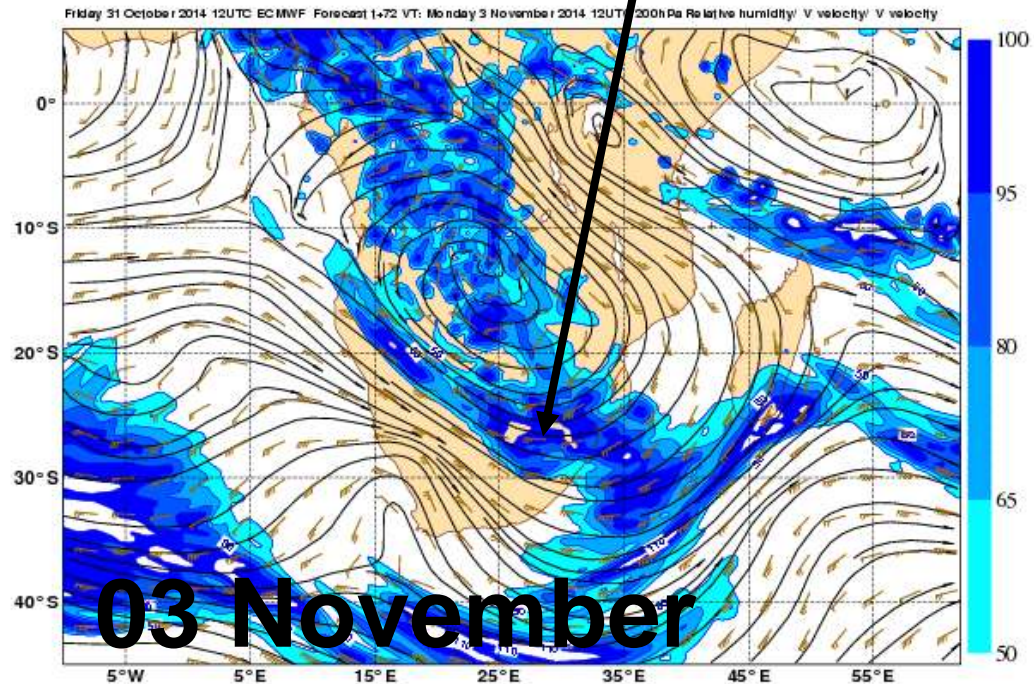
Convergence at 700hPa
Over central RSA



Deterministic Products



Diffluent flow at 200hPa
Over central RSA



Conclusion

- Effective and correct usage of the EPS/NWP products made available for SWFDP on the RSMC website can help in forecasting severe weather events and is encouraged.
- With a relatively good lead time
- include the now-casting products as well
- Further input from observations like upper air ascents
- Feedback to RSMC and Global centres is encouraged

END