

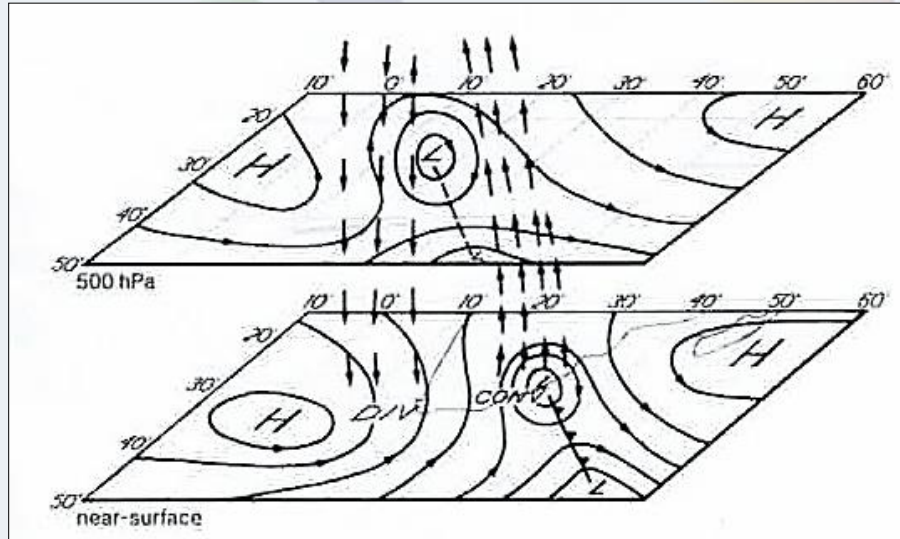
Cut-off low weather system

Objective of Presentation

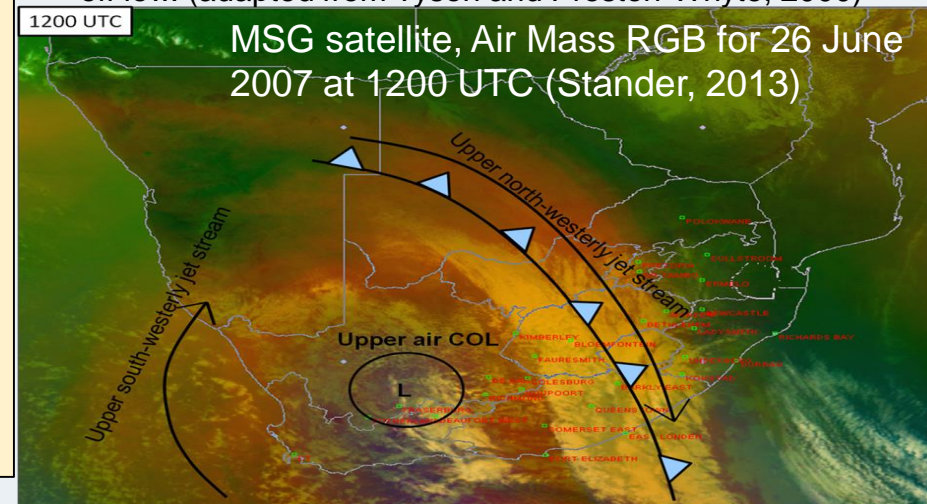
- What is a cut-off low (COL) weather system
- Characteristics and seasonal occurrence
- How do they form?
- Case study - time sequence of COL movement from 16 to 18 June 2020
- Social media and SAWS verification

What is a Cut-off low pressure system (COL)?

- A Cut-Off Low (COL) is an upper air low pressure system (around 300 hPa/30000Ft) that develops south of South Africa, stemming from the main westerly trough systems of cold air.
- It is a cold cored weather system
- As it develops it deepens into a closed low that extends to the surface and which becomes displaced equator-ward of the main westerly flow.
- COL's are unstable, baroclinic systems that slope westwards with height
- Associated with strong convergence and upward motion, particularly while they are deepening.
- Divergence in the upper air acts together with the surface convergence to produce vertical motion through the 500hPa level.

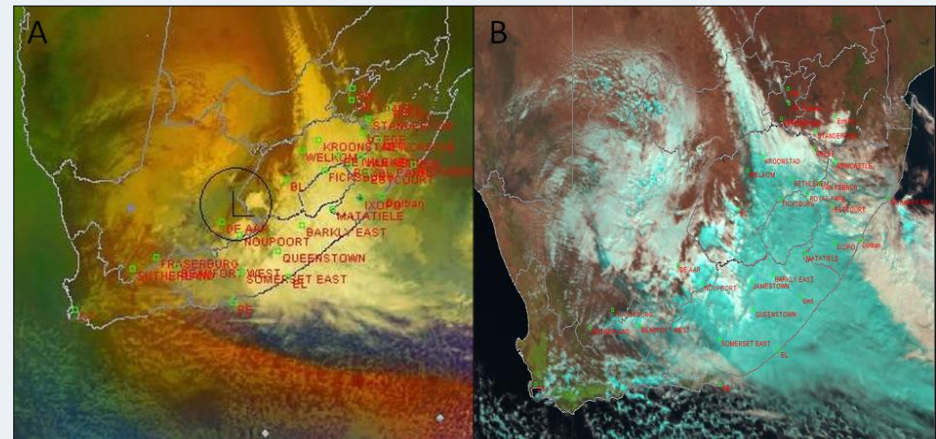
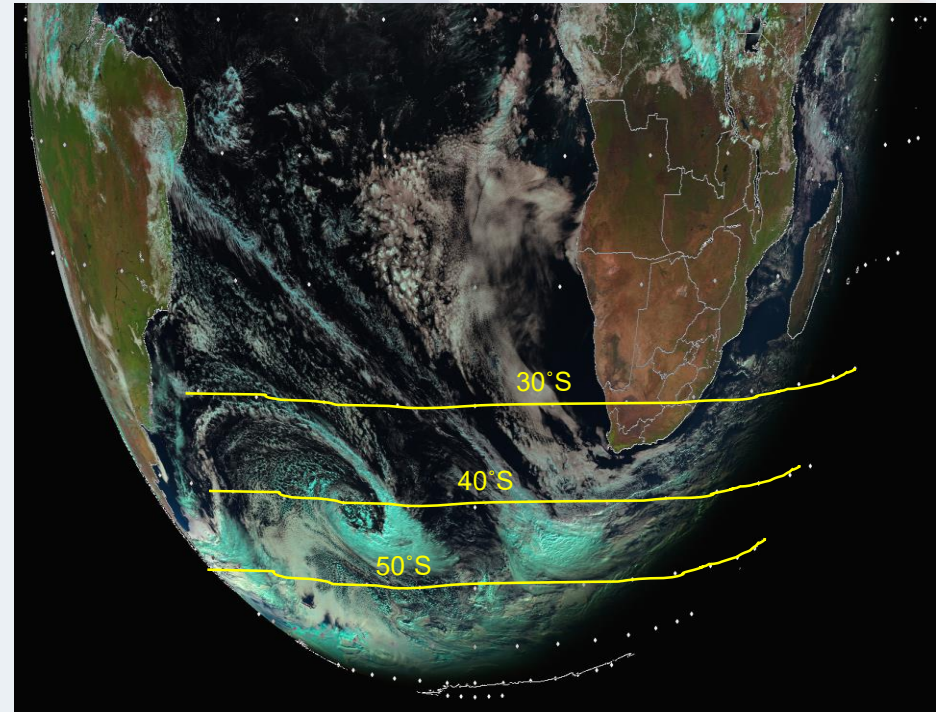


Near surface and 500 hPa circulations associated with a cut off low. (adapted from Tyson and Preston-Whyte, 2000)



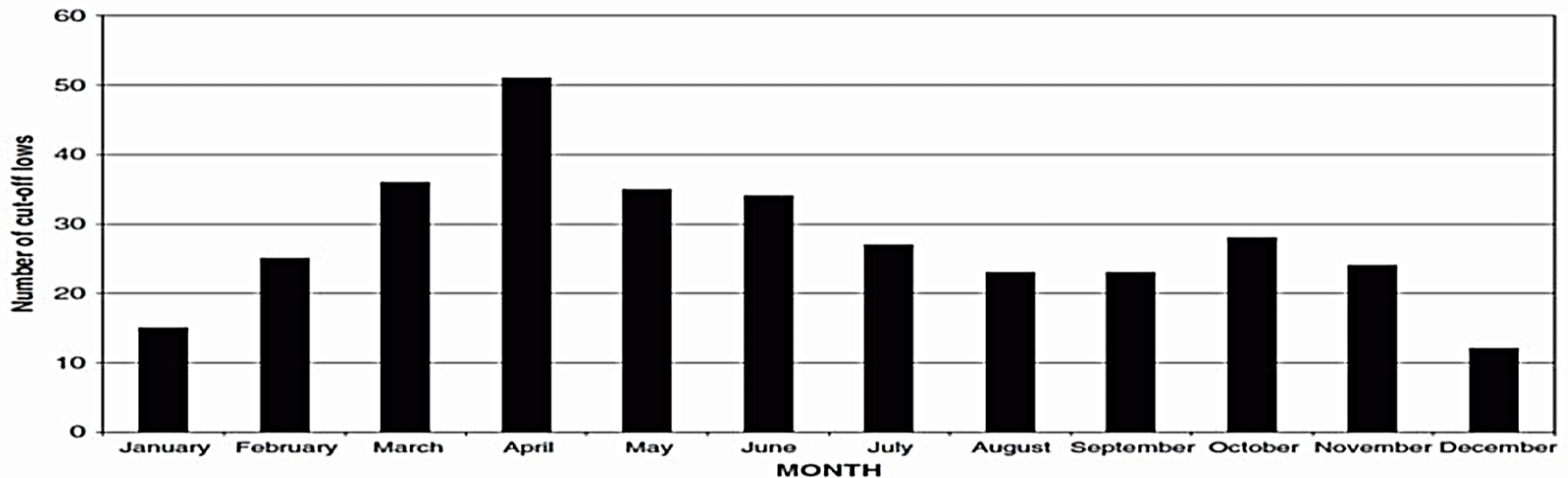
Characteristic Traits of COLs

- Most common Autumn and Spring
- A COL system usually prevails over an area for more than a day, and can last up to 6 days.
- COLs that move slowly over a confined region lead to heavy rainfall.
- Latitude of occurrence around the globe – 20 to 45 deg south.
- Associated low level weather systems - surface low/cold front followed by ridging high
- Number per annum – 40
- Movement from west to east



Seasonal occurrence

- COLs are most frequent during the autumn season in South Africa (March, April & May)
- Highest frequency occurs during April.
- Approximately, one out of ten COLs produce severe conditions and lead to flash flooding.
- They are associated with very cold conditions at the surface which is exacerbated in winter



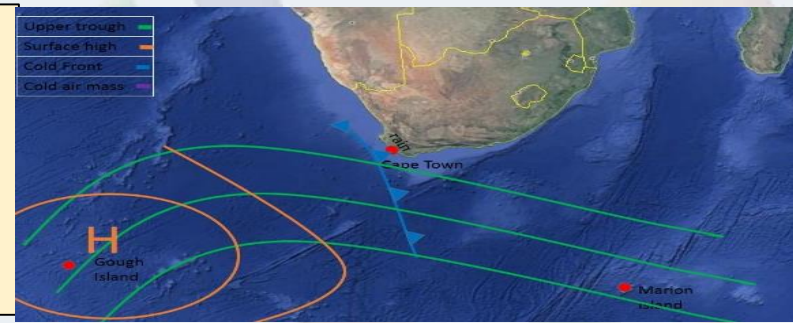
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Typical Synoptic sequence and weather associated with COLs around South Africa

Stage 1:

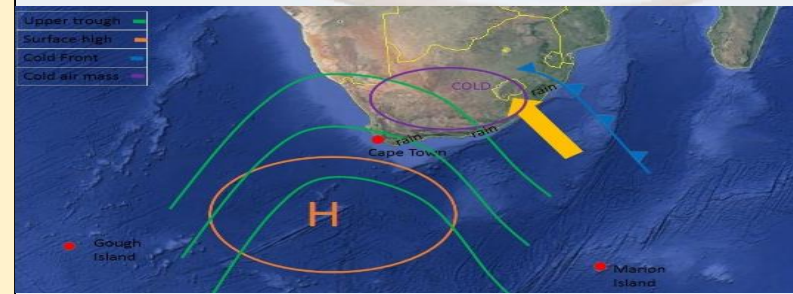
Upper trough located between Gough, Cape town and Marion Island.

Strong surface high around Gough with cold front close to Cape town.



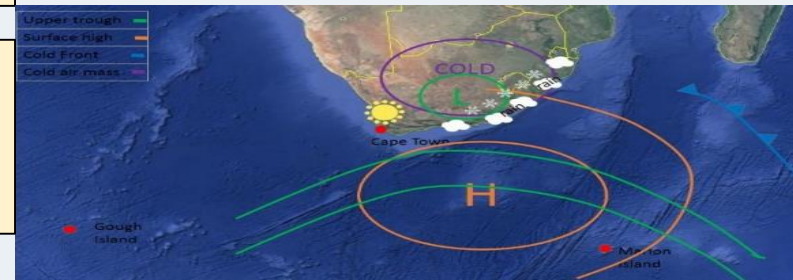
Stage 2:

Upper trough intensifies, high moves eastward with onshore flow over east and south coasts. At the surface, the cold front will be positioned over the eastern parts of South Africa



Stage 3:

COL over country, surface high continued to move eastwards with onshore flow along east coast.



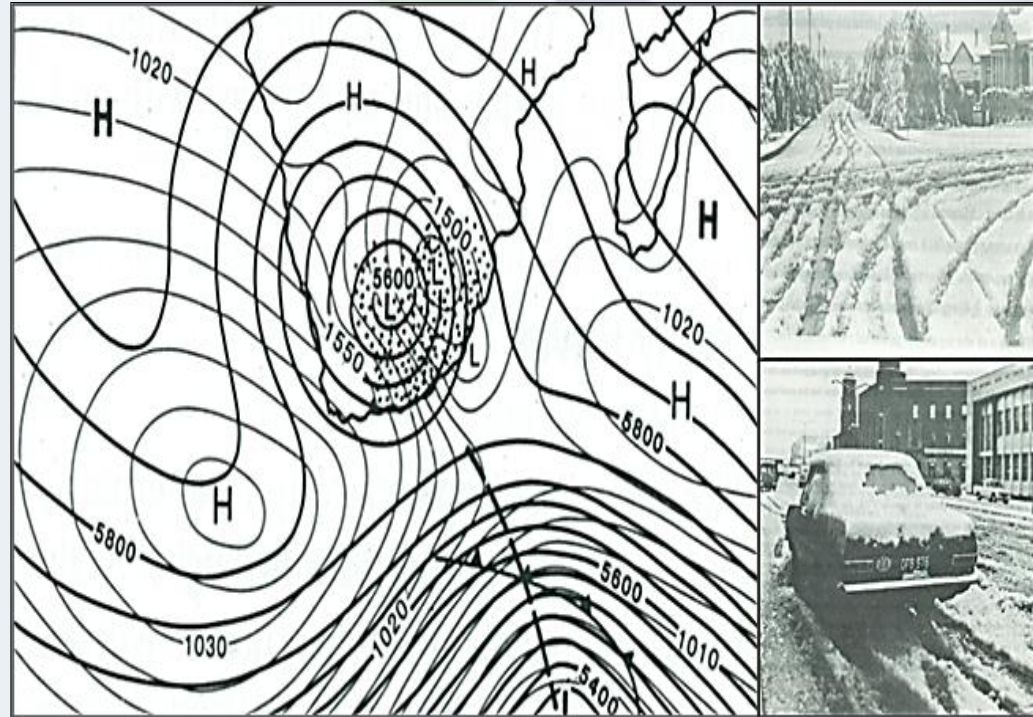
Stage 4:

COL dissipates – clear weather.

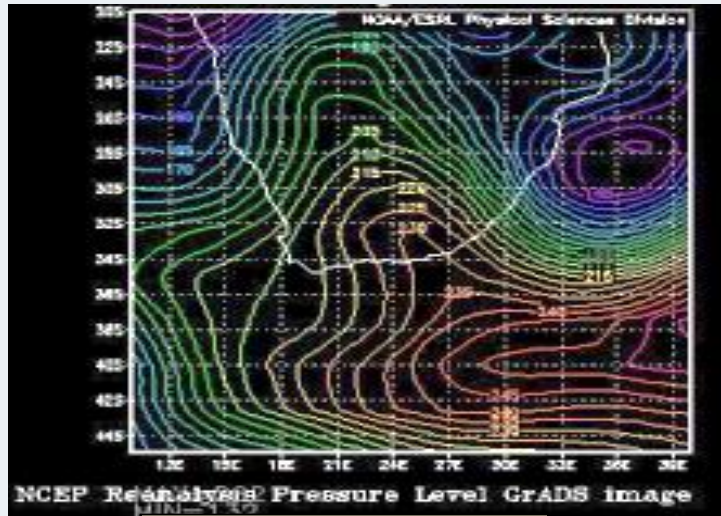


Example of an upper COL associated with a surface ridging high - Aug 1970

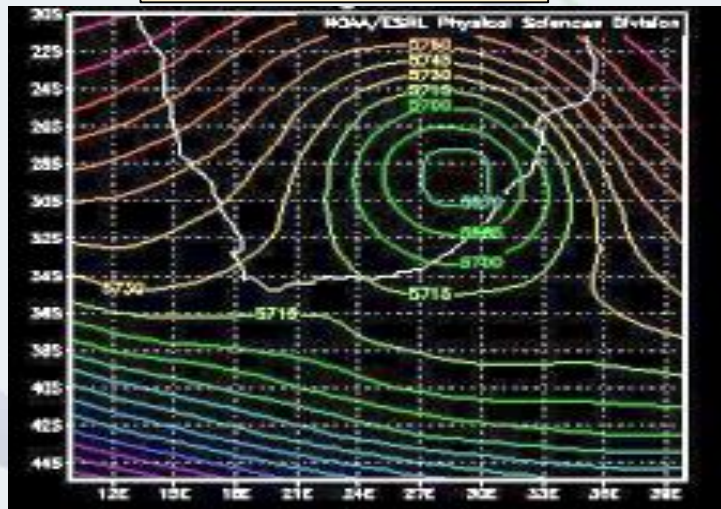
- 500 hPa cut off low circulation represented by thick black lines,
- mean sea level pressure and 850 hPa overland circulation, thin lines.
- Dotted areas are receiving precipitation (After Hayward and van den Berg, 1970) cited in Tyson and Preston-Whyte, 2000)).
- Photos of snow at Queenstown on 28 August 1970 by Mr. Kallaway cited in (Hayward and van den Berg, 1970)



July 1996 – disruptive snowfalls



Surface pressure

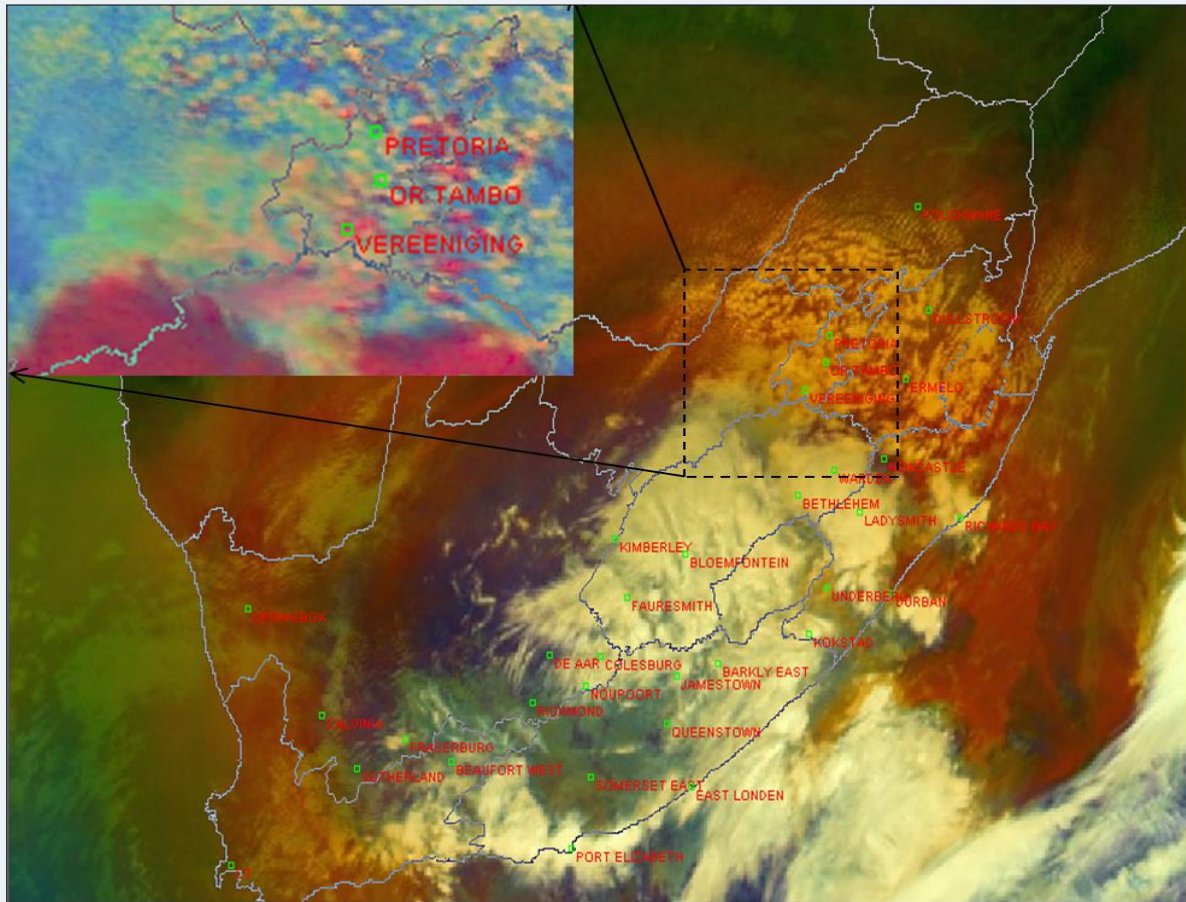


500 hPa pressure

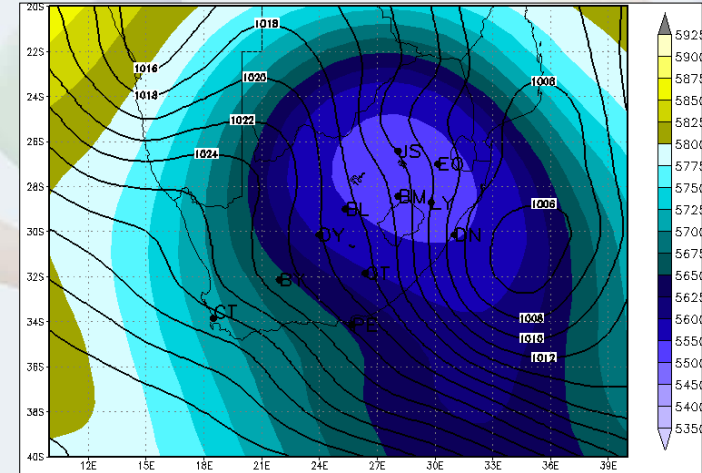


Monday 8 July 1996, Beeld, picture by Frans Coetzee - Bethlehem

Aug 2012 – Snow Gauteng



MSG satellite, Airmass RGB for 7 August 2012 at 1200 UTC



- mean sea level pressure in hPa (black solid lines),
- 500 hPa geopotential heights in metres (shaded) for 7 August at 1200 UTC

Weather Event of the 16 to 18 June 2020

Issued on 15 June at 1235pm

Media release



Private Bag X097, Pretoria, 0001 • Tel: + 27 (0) 12 367 6000 • www.weathersa.co.za • USSD: *120*7297#

Monday 15 June 2020

Cold weather is expected to continue over central and eastern South Africa (16 -18 June 2020)

The cold weather that gripped parts of South Africa during the past days, is expected to continue this week over the central and eastern parts, where it will get worse. This will be due to the cloudy conditions with showers of rain at times that are expected from tomorrow, Tuesday, 16 June until Thursday, 18 June, over North West, Free State, Gauteng, KwaZulu-Natal, Mpumalanga and some parts of Limpopo.

The cause of these extreme conditions is the cut off low (COL) system which will be situated over Free State on Tuesday and Wednesday, and then moving slowly north-eastwards by Thursday.

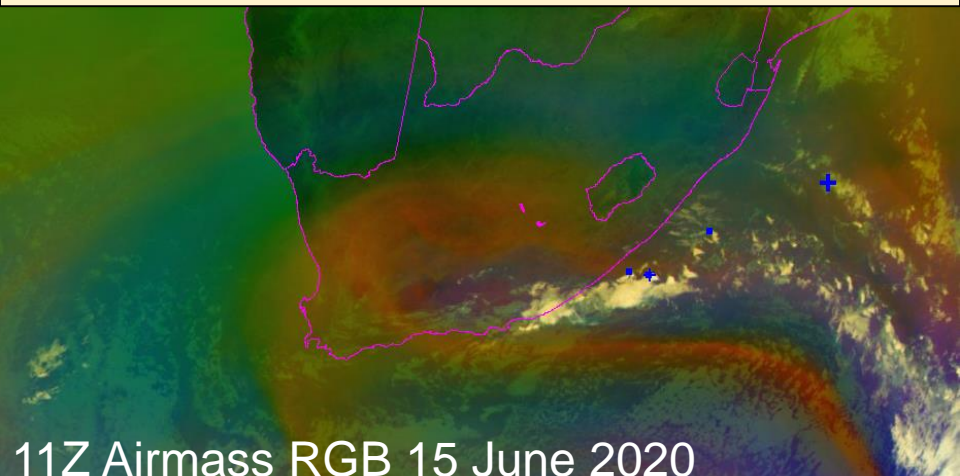
Furthermore, still as a result of this weather system, heavy rains which can lead to localized flooding are expected along the north coast of KwaZulu-Natal into southern Mozambique on Wednesday night into Thursday.

COL Events 16 to 18 June

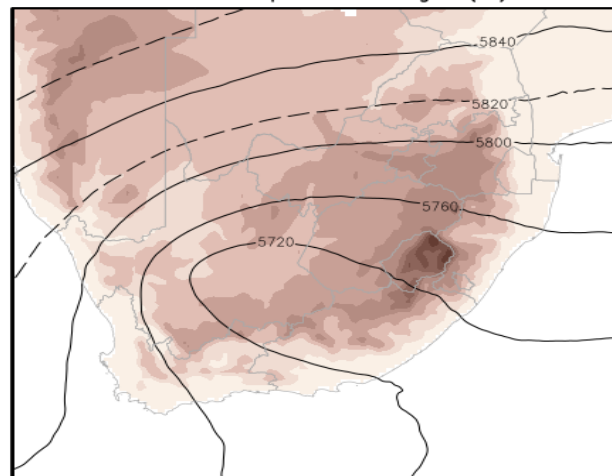
- Winter weather over eastern half of RSA due to a Cut-off low in the mid to upper atmosphere.
- Lowered the freezing levels
- Was stationary for 2 days over central part of country.
- Ridging high advected moisture in lower levels from Moz channel
- Snow fall over Malutis, between Memel and Vrede (E-FS), Drakensberg and southern high lying areas of Mpumalanga.
- Sleet/ice rain reported for short periods in the night over Gauteng.

15 June 2020 - Mid to upper level wind structure (500 to 300 hPa)

Monitor the 500 hPa to 300 hPa upper level pressure level to identify and monitor the movement

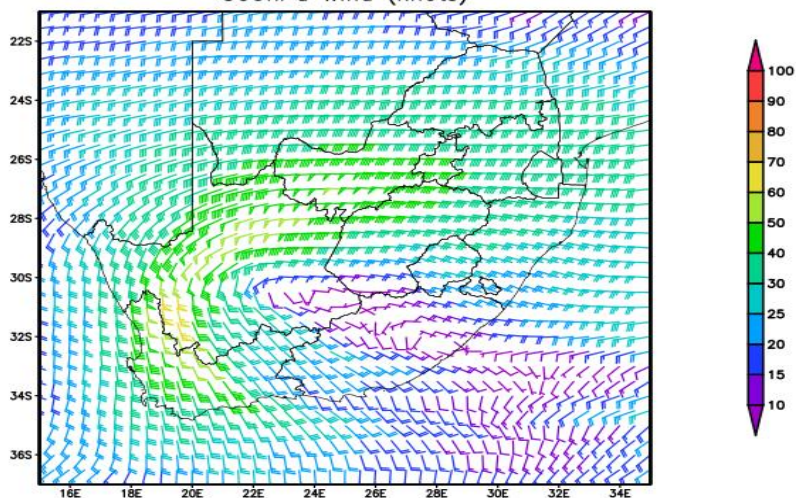


ECMWF 16 km Forecast – 00 Run:
500hPa Geopotential Height (m)



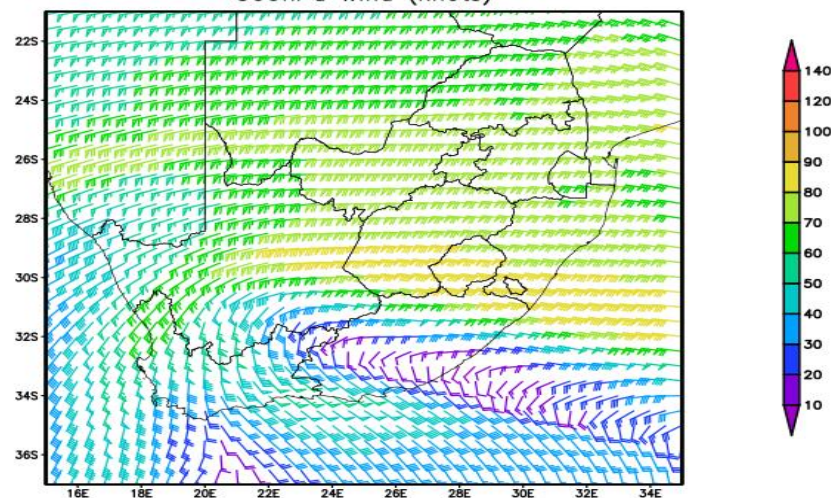
12hr Forecast from 00 15 JUN 2020 – for 12 15 JUN 2020

ECMWF 16 km Forecast – 00 Run:
500hPa Wind (knots)



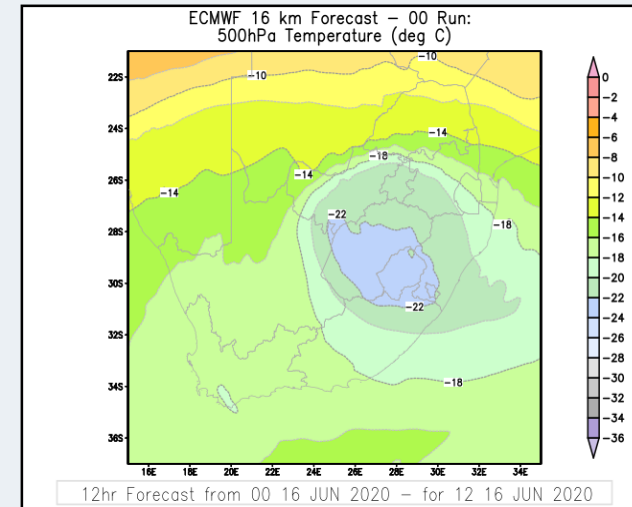
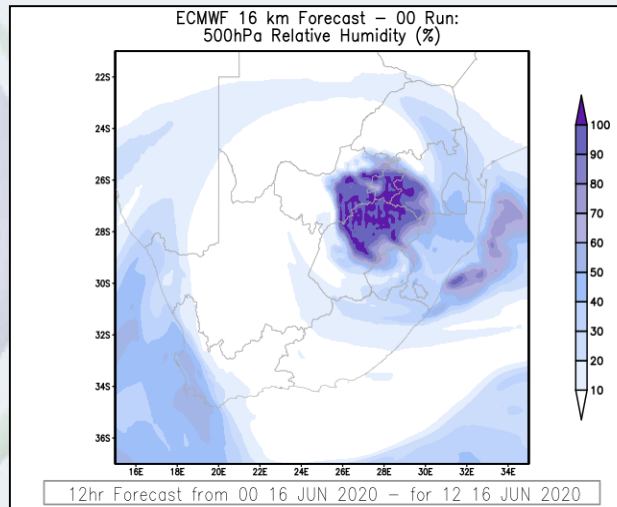
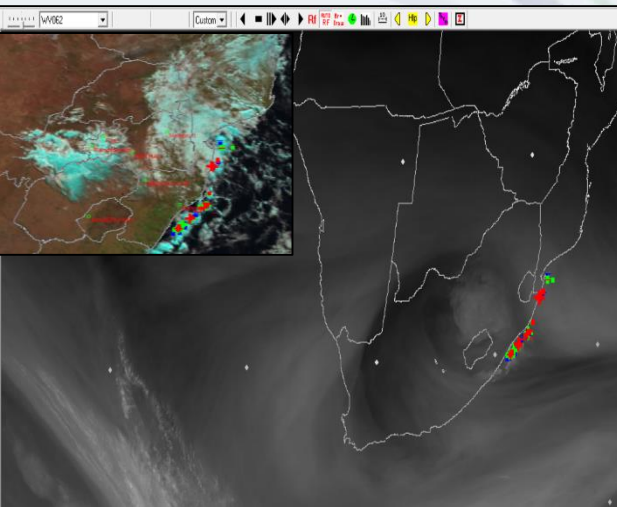
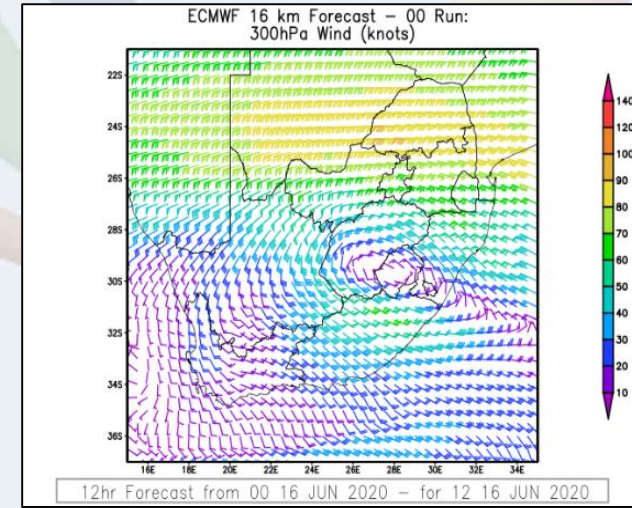
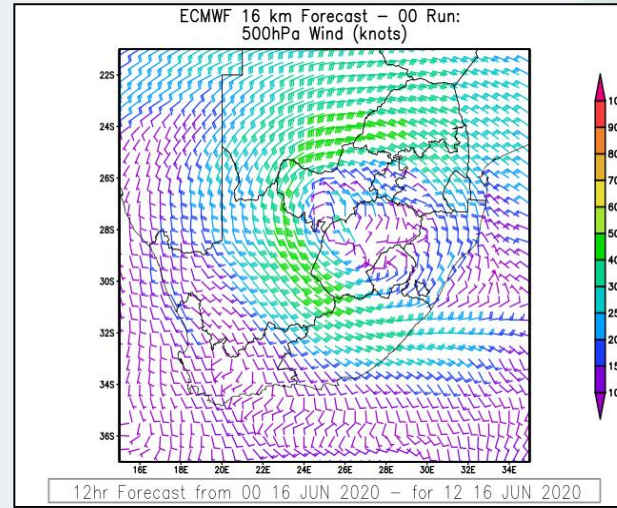
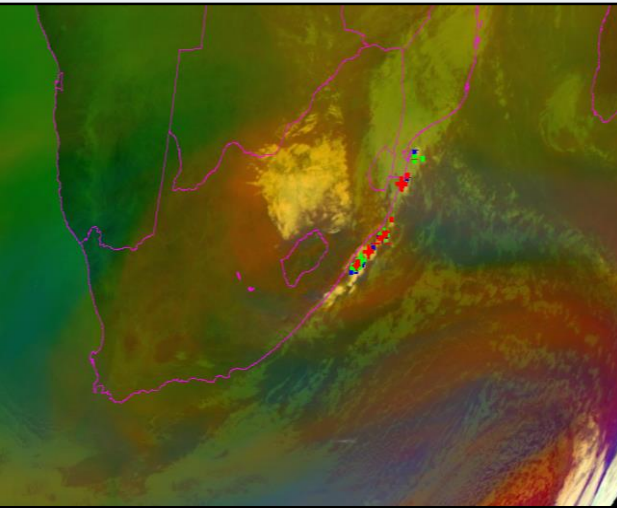
12hr Forecast from 00 15 JUN 2020 – for 12 15 JUN 2020

ECMWF 16 km Forecast – 00 Run:
300hPa Wind (knots)



12hr Forecast from 00 15 JUN 2020 – for 12 15 JUN 2020

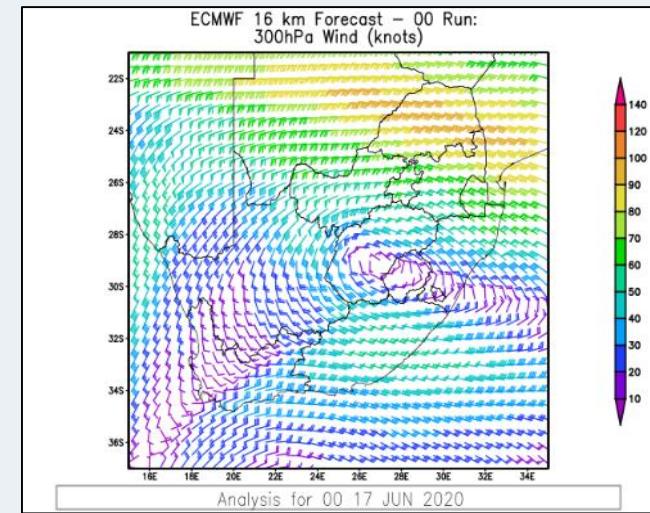
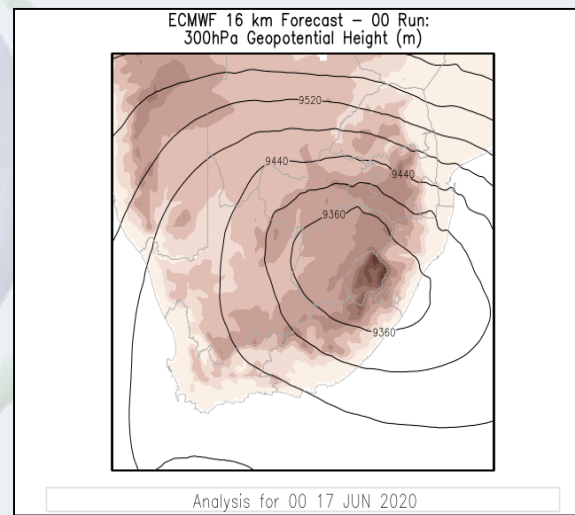
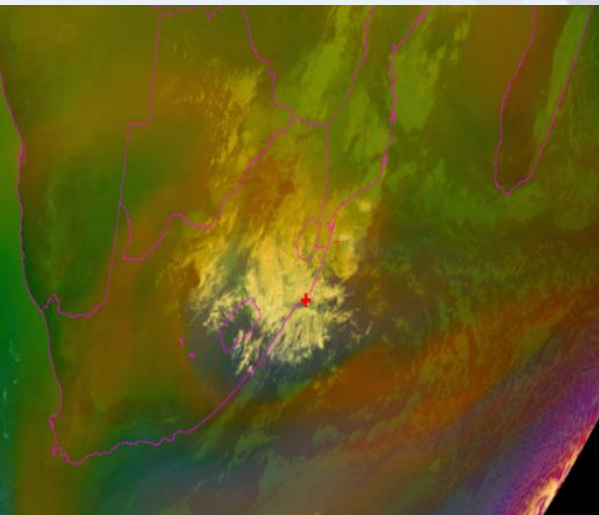
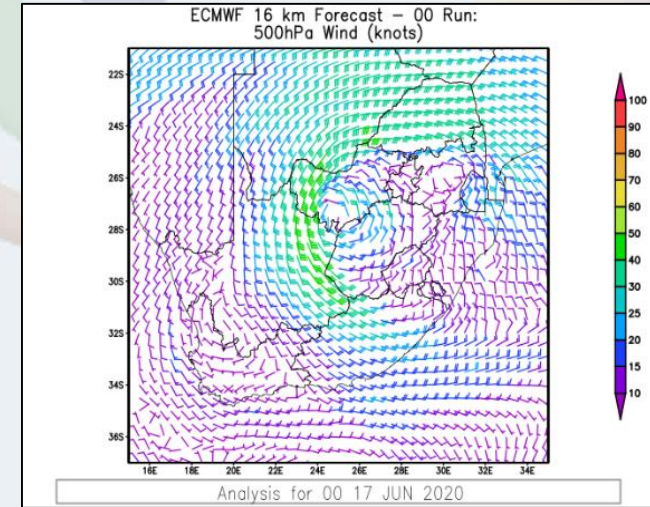
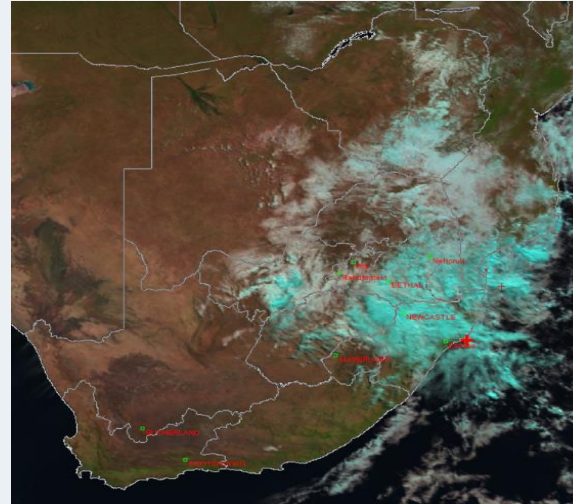
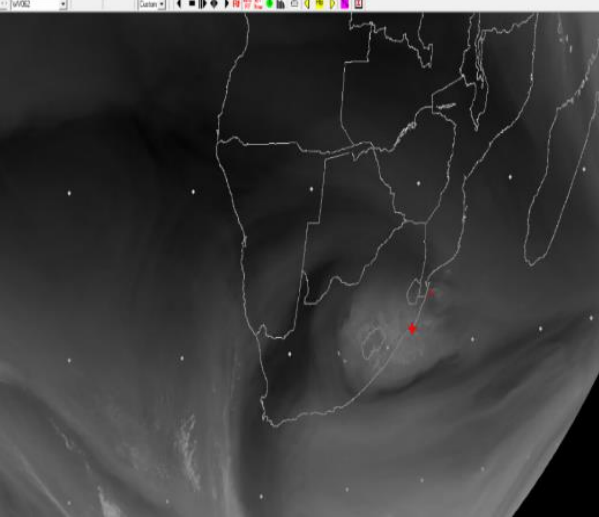
16 June 2020 – tracking of movement and intensity of mid to upper level COL core



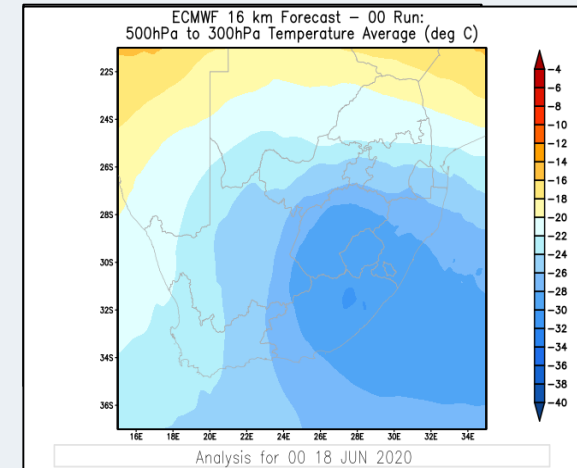
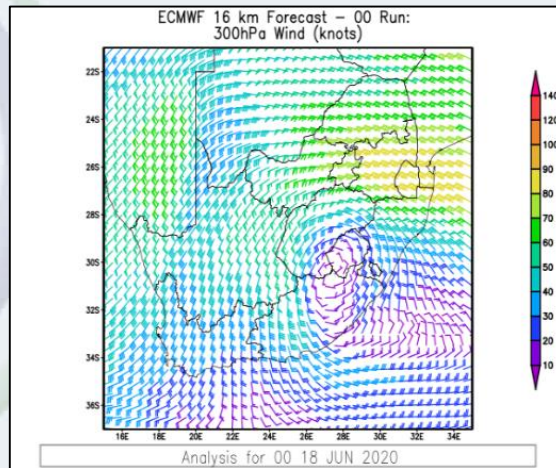
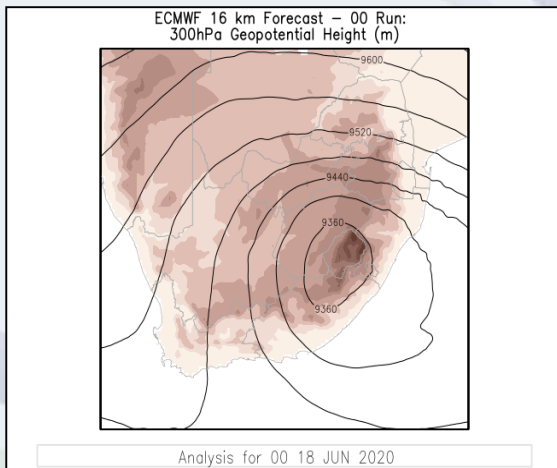
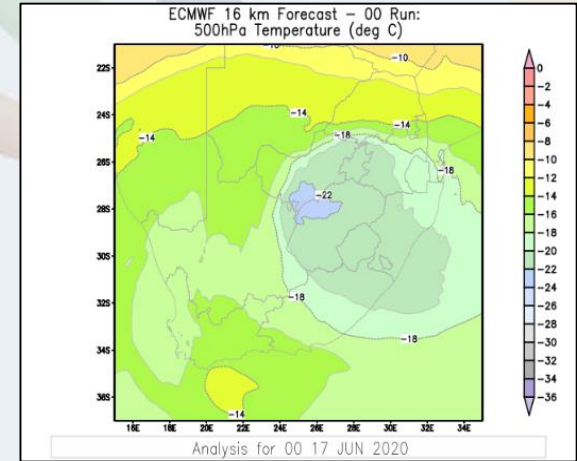
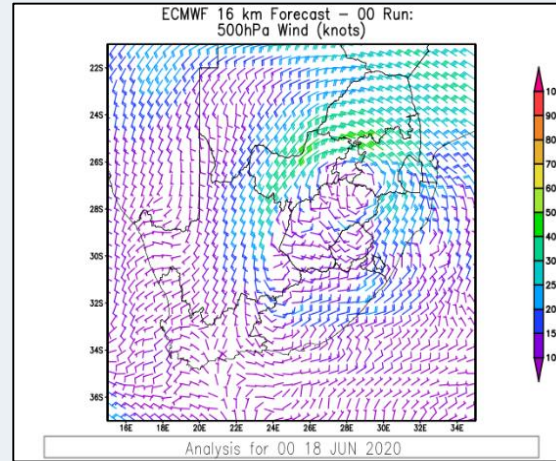
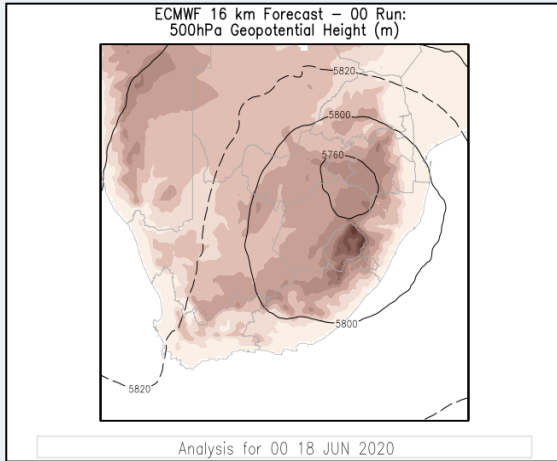
Weather Service

17 June 2020 – tracking of movement and intensity of mid to upper level COL core

WV 6.2 830Z 17 June 2020

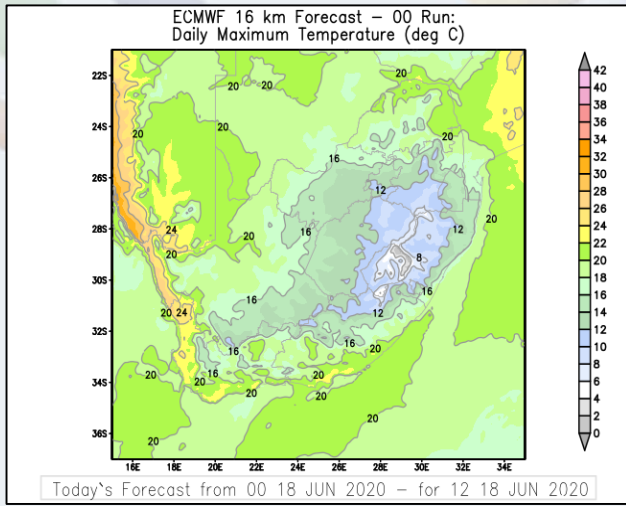
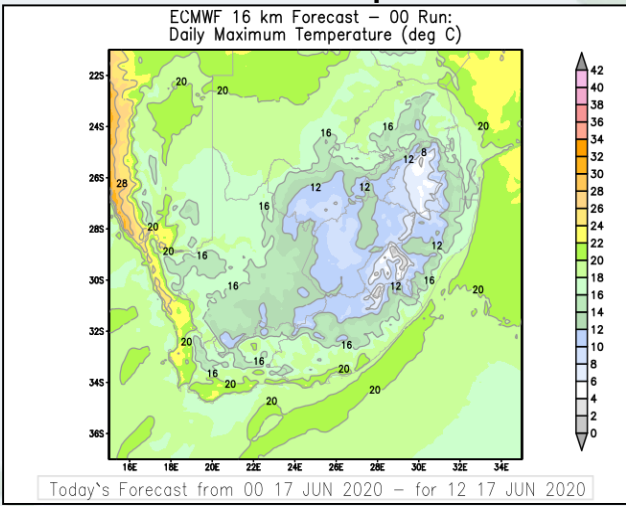
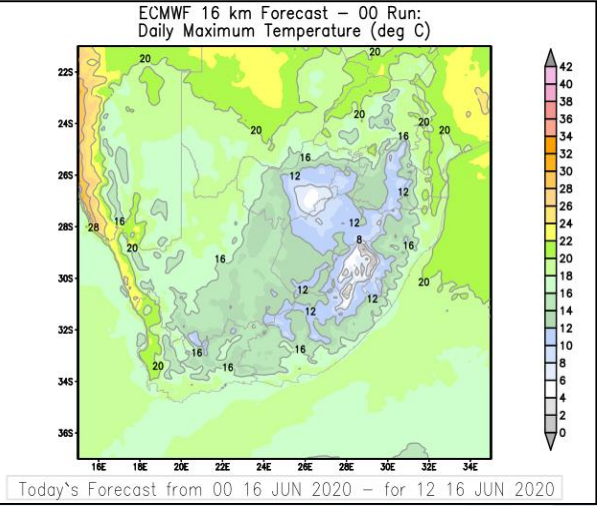


18 June 2020 – tracking of movement and intensity of mid to upper level COL core

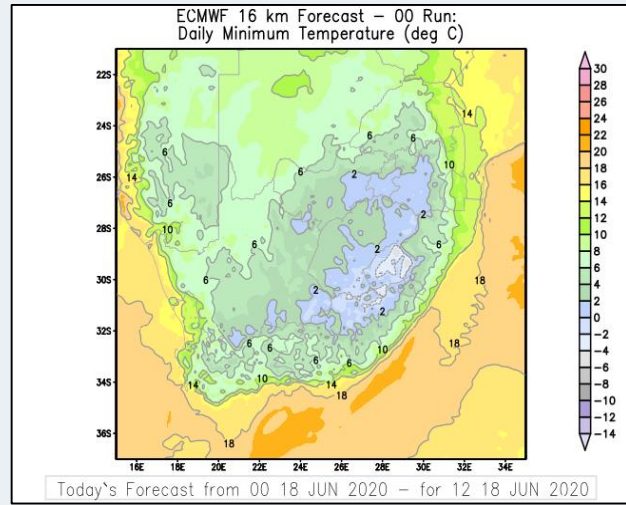
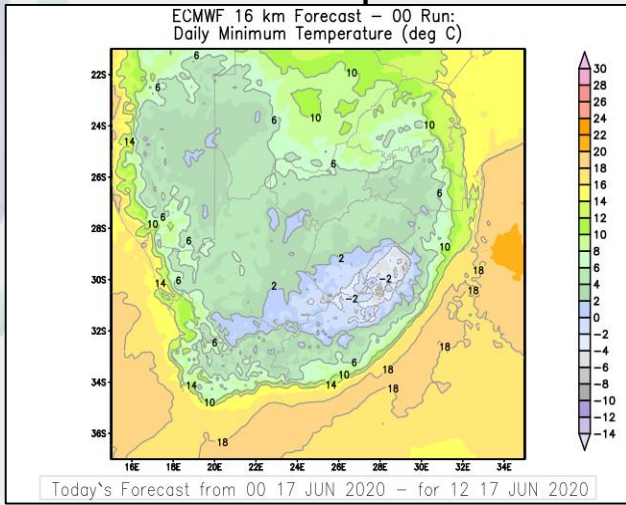
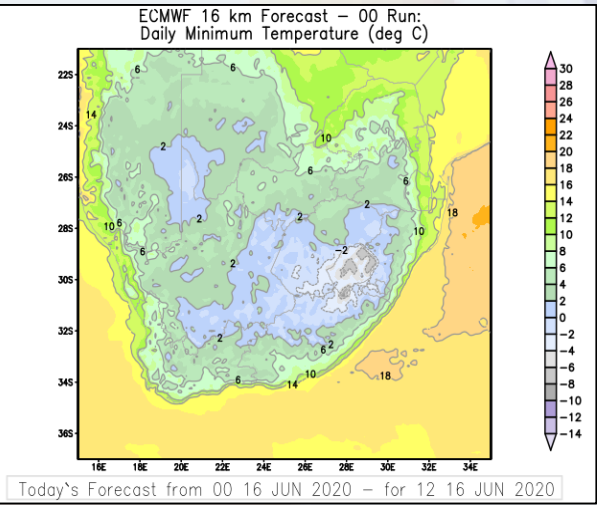


Predicted Surface temperature 16 to 18 June 2020

Maximum Temperature

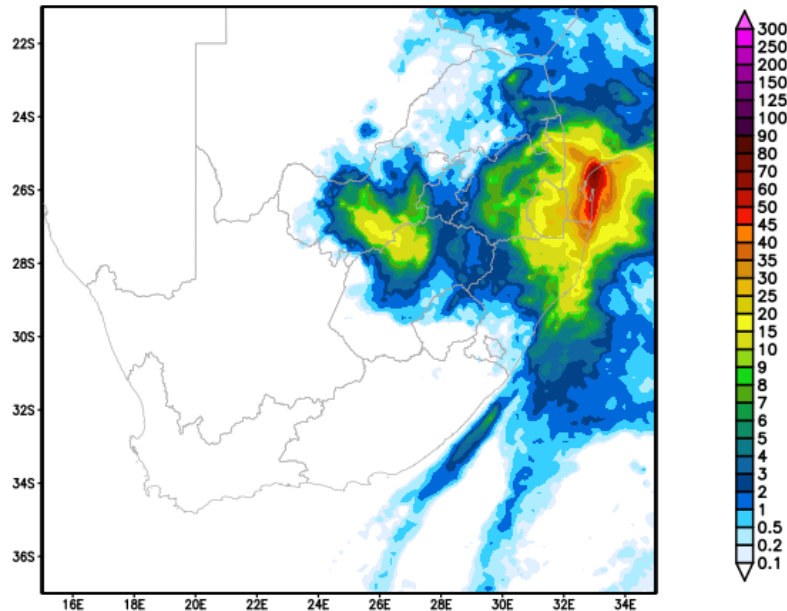


Minimum Temperature



Precipitation forecast for 17 June

ECMWF 16 km Forecast – 00 Run:
Total Accumulating Precipitation for past 24 hours (mm)



24hr Forecast from 00 17 JUN 2020 – to 00 18 JUN 2020

THE REGIONAL WEATHER FORECAST FOR TODAY: 2020-06-17

ISSUED AT 04:30 SAST BY THE SOUTH AFRICAN WEATHER SERVICE.

THIS FORECAST WILL BE UPDATED AT 05:00 SAST.

WARNINGS:

1. Extremely high fire danger conditions are expected along the Northern

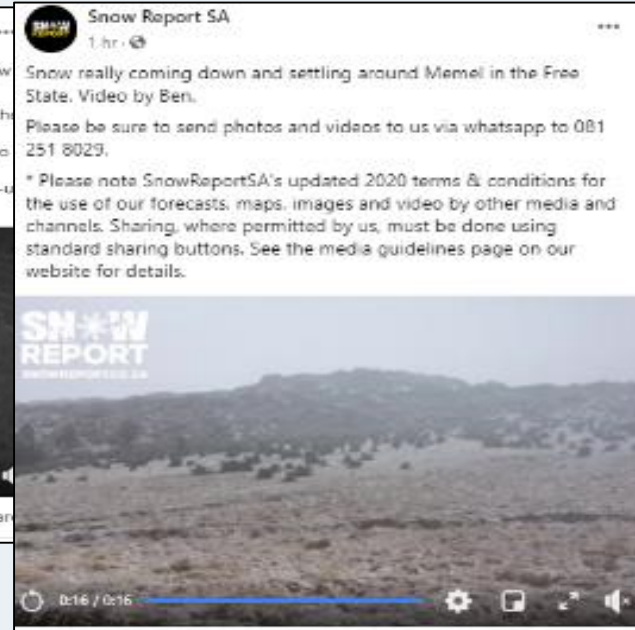
Cape coast.

WATCHES:

1. Heavy rain leading to localised flooding is expected along the

north coast of KwaZulu-Natal.

Verification of Snowfall: Social Media



Rainfall measured by SAWS

HERE IS THE RAINFALL REPORT FOR THE 24 HOURS
ENDING AT 08:00 SAST on 2020-06-17 (PRELIMINARY DATA)

GAUTENG

BRONKHORSTSPRUIT AWS	5	IRENE WO	10
JOHANNESBURG INT WO	10	LANSERIA WO	15
PRETORIA - PRESIDENCY ARS	2	PRETORIA UNISA	5
PRETORIA UNIVERSITY PROEFP	1	SPRINGS	5
WONDERBOOM AIRPORT	2	ZUURBEKOM AWS	18

MPUMALANGA

AMERSFOORT ARS	8	BARBERTON PRISON ARS	10
BELFAST	1	BOURKE'S LUCK AWS	7
ERMELO WO	3	GRASKOP AWS	21
KOMATIDRAAI	10	KRUGER MPUMALANGA INT. AIR	7
NELSPRUIT	6	SKUKUZA	6

LIMPOPO PROVINCE

MUKUMBANI TEA ESTATE - VEN	6	ROODEWAL BOS ARS	3
THOHOYANDOU AWS	2	THOHOYANDOU WO	3
TSHANOWA PRIMARY SCHOOL	11	TSHIVHASIE TEA VENDA	14
TZANEEN-WESTFALIA ESTATE	2		

NORTH-WEST

BUFFELSPOORT II AGR	9	HARTEBEEPOORT DAM	18
KLERKSDORP	40	KLIPFONTEIN ARS	7
LICHTENBURG	9	LICHTENBURG PLAASVERLIES A	5
MAFIKENG WO	2	OTTOSDAL	24
PILANESBERG	2	POTCHEFSTROOM	11
RUSTENBURG	3		

KWAZULU-NATAL

BABANANGO	5	CHARTERS CREEK	10
KING SHAKA AWOS	2	KING SHAKA INTERNATIONAL A	5
LADYSMITH	1	MAKATINI RESEARCH CENTRE	6
MANDINI	17	MARGATE	5
MBAZWANA AIRFIELD	20	MOUNT EDGECOMBE	4
MTUNZINI	20	PENNINGTON SOUTH	19
PONGOLA	4	PORT EDWARD	1
RICHARDS BAY AIRPORT	4	ULUNDI	2
ULUNDI WASTE WATER ARS	2	UNIVERSITY OF ZULULAND	5
VRYHEID	4		