

VCP MET-ATM Workshop

O.R. Tambo International Airport (ORTIA), Johannesburg, South Africa

Morné Gijben

Erik Becker, Stephanie Landman

8 to 10 October 2018, Hong Kong, China



Content

- O.R. Tambo International Airport
- Enabling technology
- Progress so far
- Future work

ORTIA Airport information

- O.R Tambo International Airport (ORTIA)
 - Johannesburg, South Africa:
 - 26° 08' 21" S and 28° 14' 46" E
 - 20km east-north-east of the city of Johannesburg and 40km south of Pretoria,
 - situated almost on the plateau of South Africa with two runways, both above 5500ft (1694m) above MSL.
- The surrounding area consists of hilly country sloping gradually from south-west to north-east. The highest terrain within a radius of 40km is 1902m to the south of the airport. Most of the areas directly around the airport are built up areas.

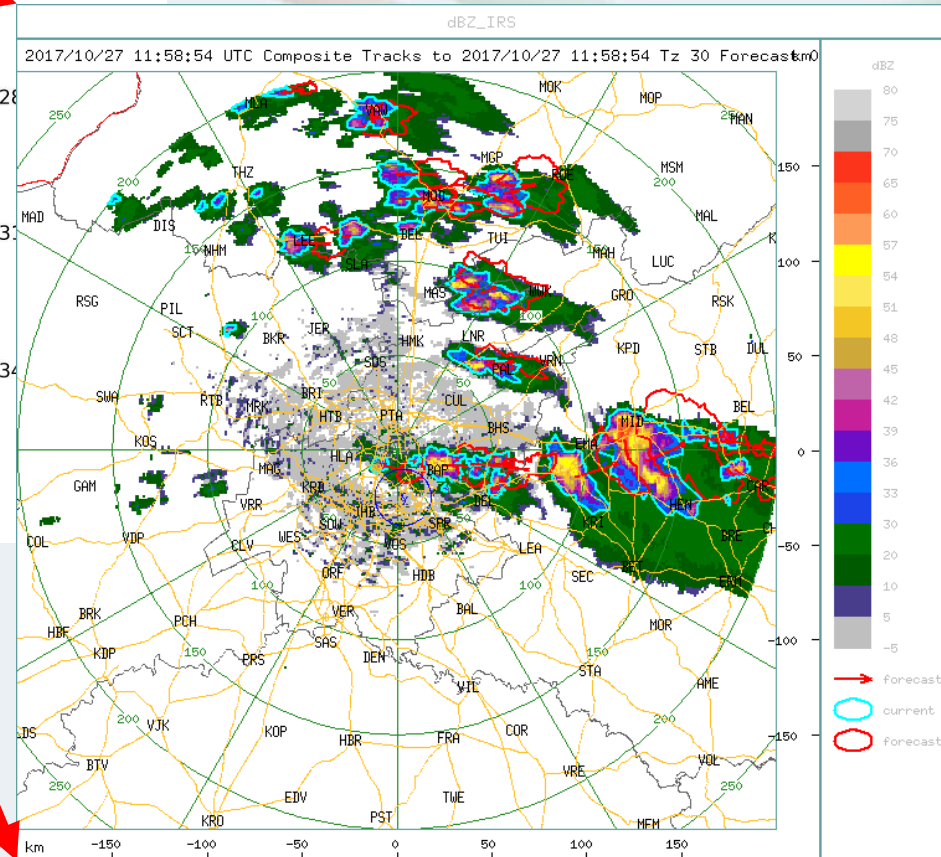
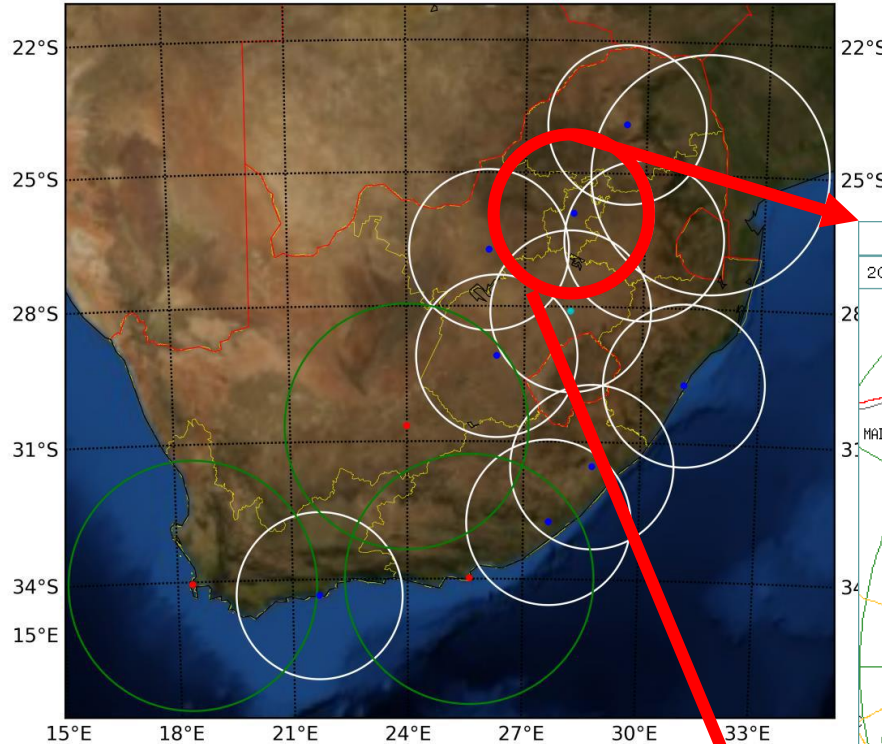


Airport local climatology

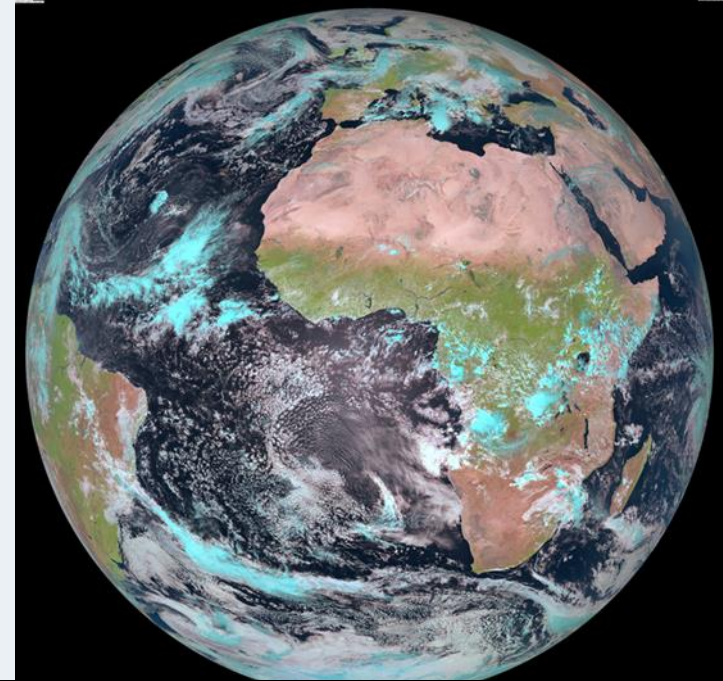
- Fog: radiation fog/advection from SE, mostly early am (2-3 days per month)
- Low clouds/poor visibility, early am
- Smog: temperature inversion, winter months, early am
- Precipitation: thunderstorms, summer, pm, early evening
- Hail: 5 days per year, Oct-Dec
- 70 days of lightning per year in vicinity of airport
- Rain: max in Dec/Jan (600-800 mm per year)
- Frost: winter, 30 days per year
- Wind direction: Mostly NW wind
- Wind speed: 3.3-4.6 m/s

Enabling Technology: Radar

South African Weather Service Radar Network

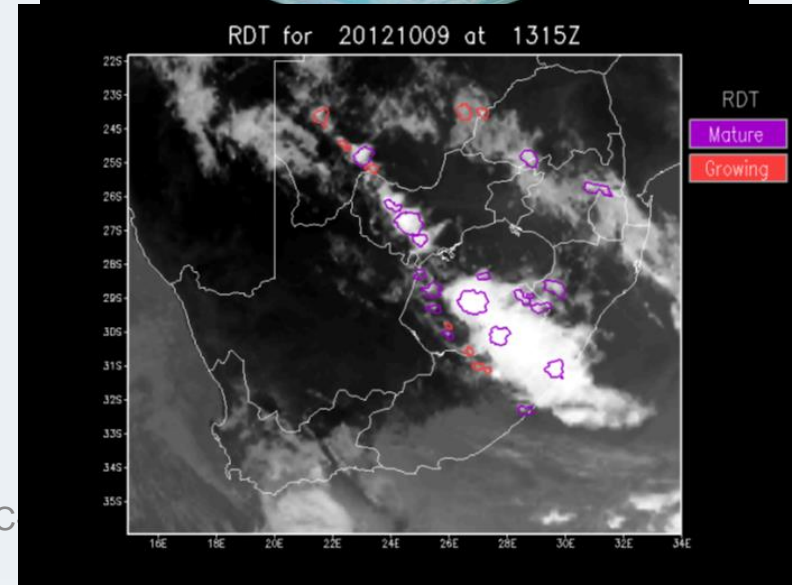


Lightning + Satellite

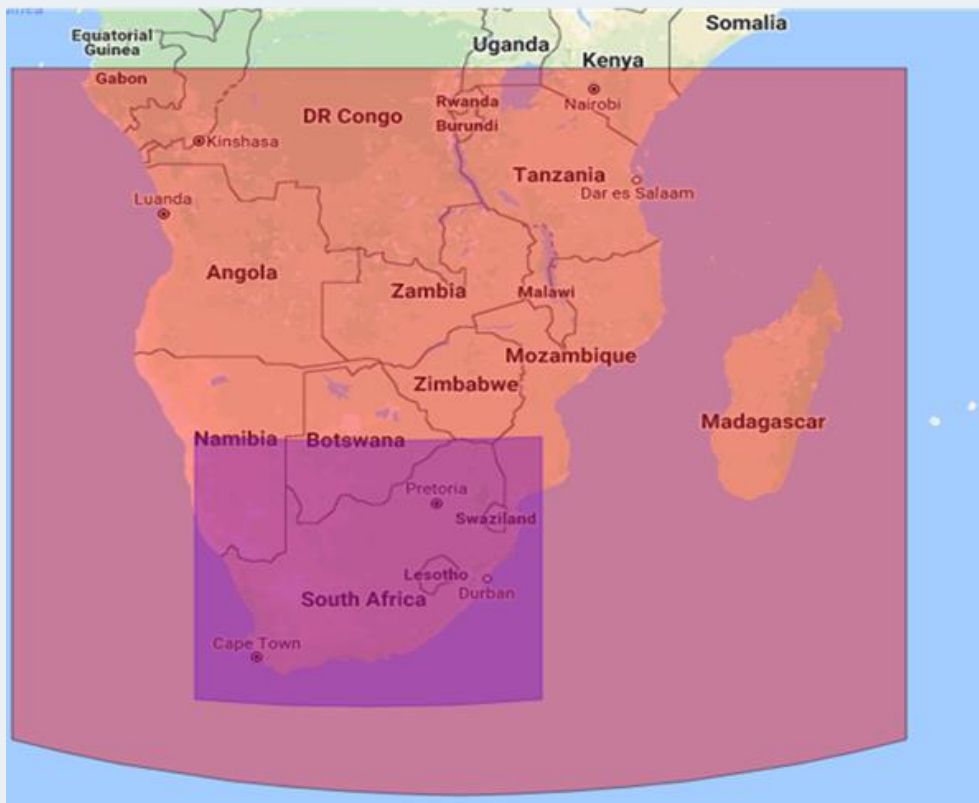


2019/05/22

Doc Ref no: RES-PPT-AvRDP-SSC



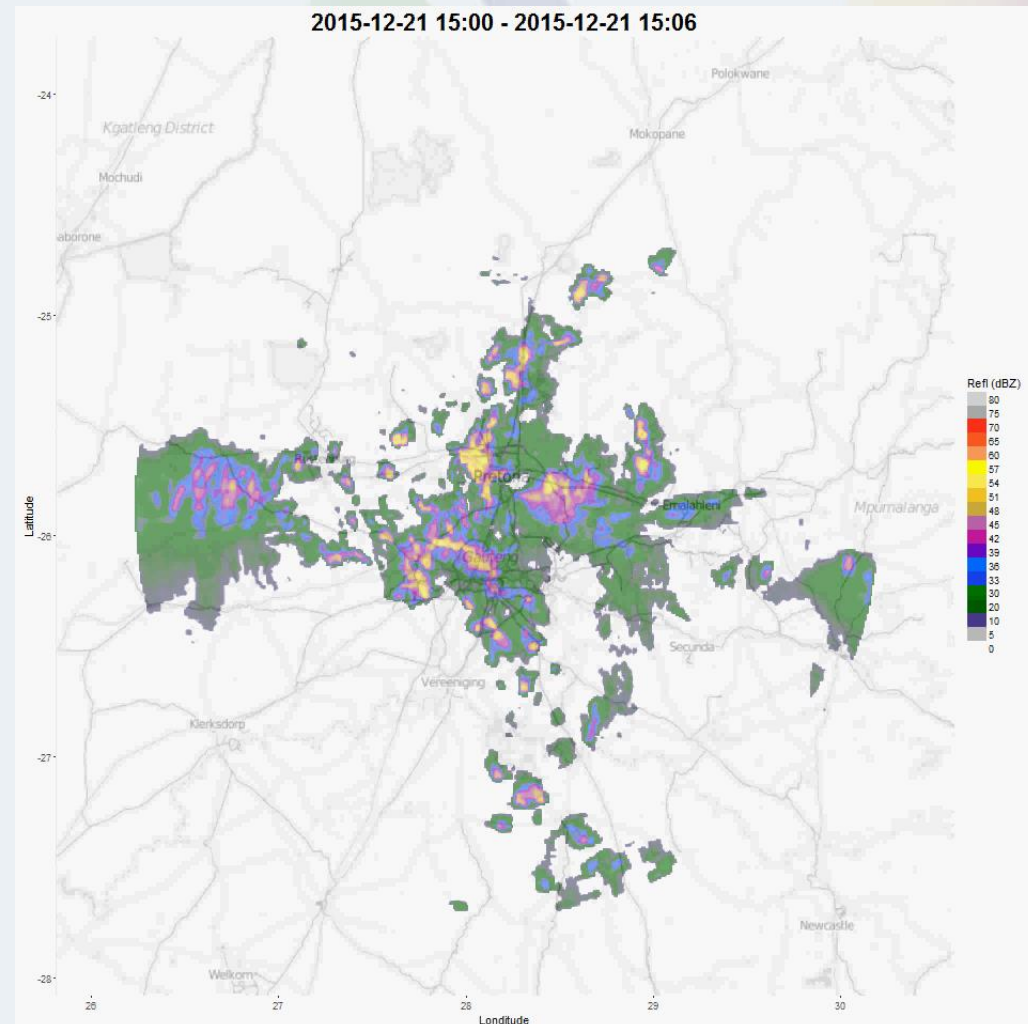
NWP models



- Local Version of UK Met Office Unified Model (SA4.4 & SA1.5)
- Vertical resolution of 70 levels; model top at 38.5 km
- Initialized at 00, 06, 12 and 18 UTC

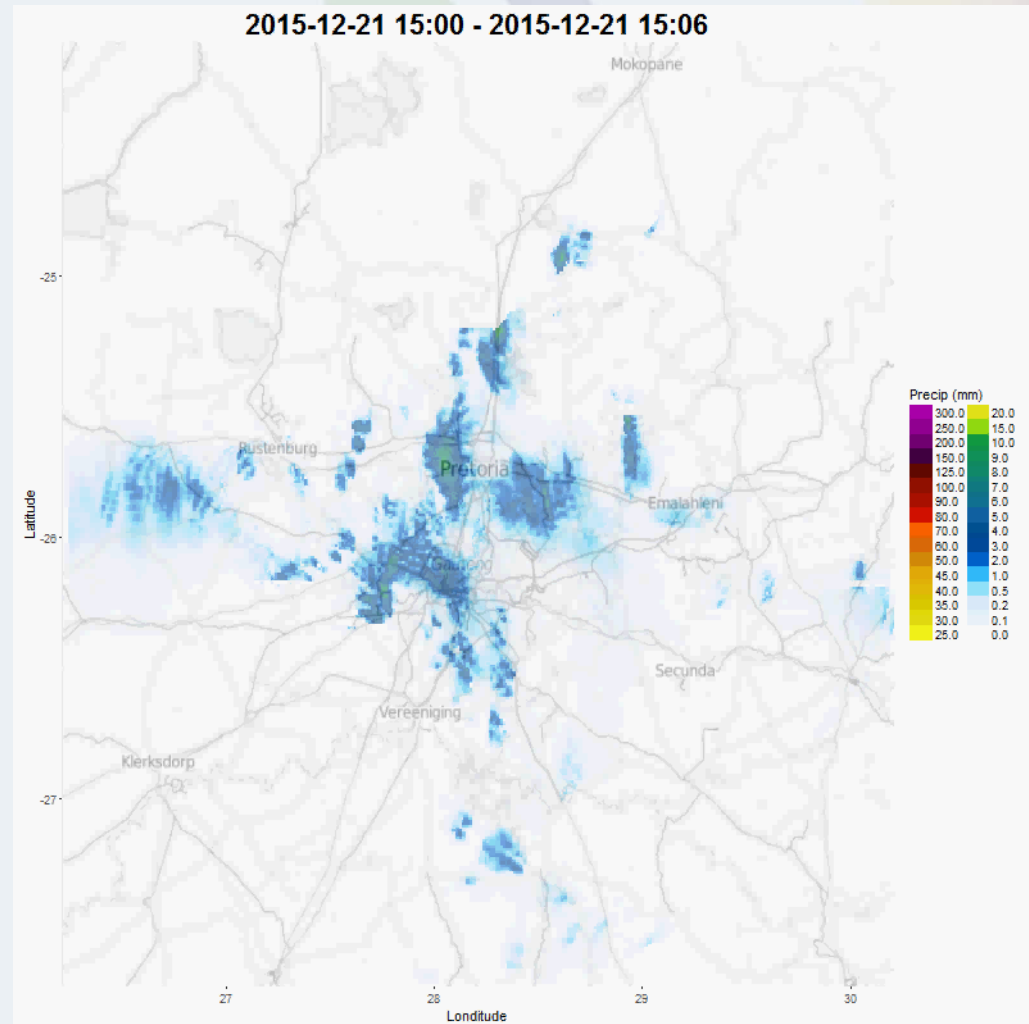
Community- Short-range Warning of Intense Rainstorms in Localized Systems (Com-SWIRLS)

- Produces extrapolated nowcasts from CAPPI reflectivity data
- Extrapolation is based on Optical Flow vector calculation using consecutive time steps.
- Growth and Decay not taken into consideration.
- SWIRLS installed over:
 - Irene Radar domain – 200km range.
 - 400x400 pixels (1kmx1km)
 - 9hr extrapolation (possible)

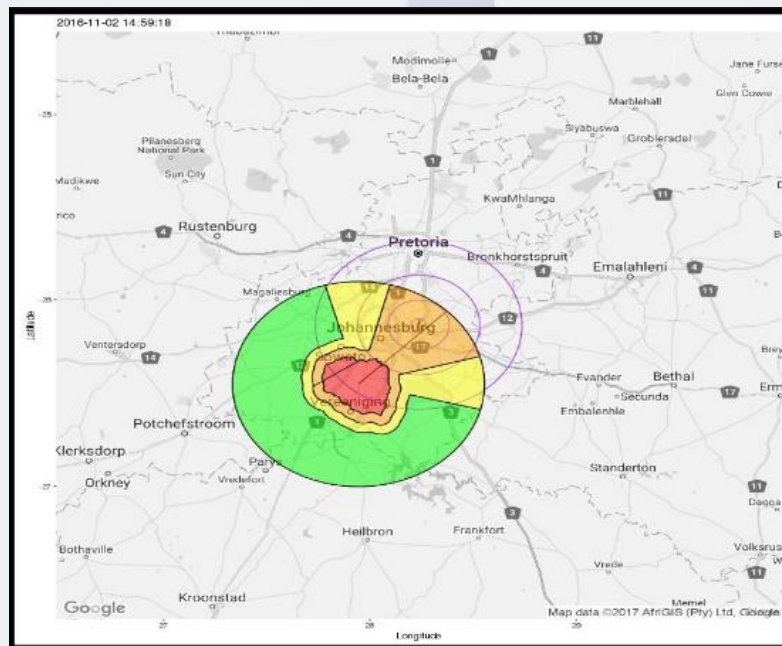
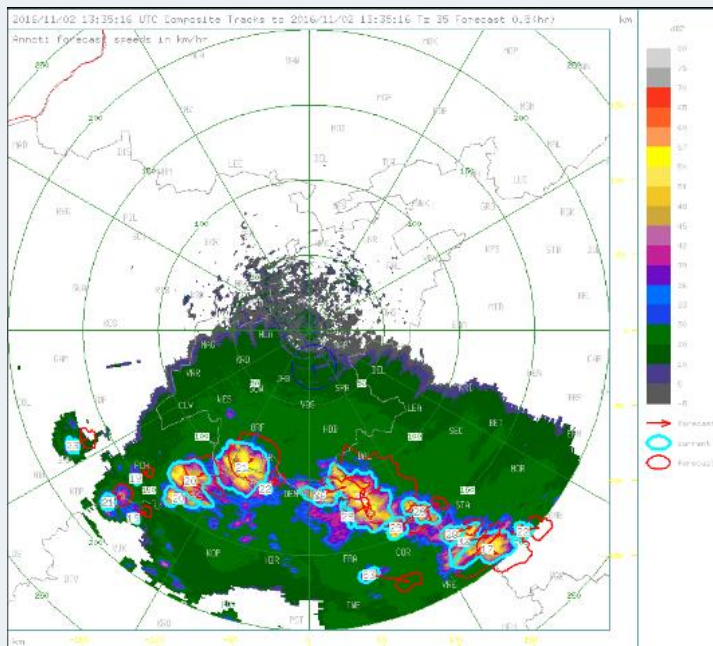


Radar QPF (1hr accumulation)

- Com-SWIRLS running for QPF.



Thunderstorm Table



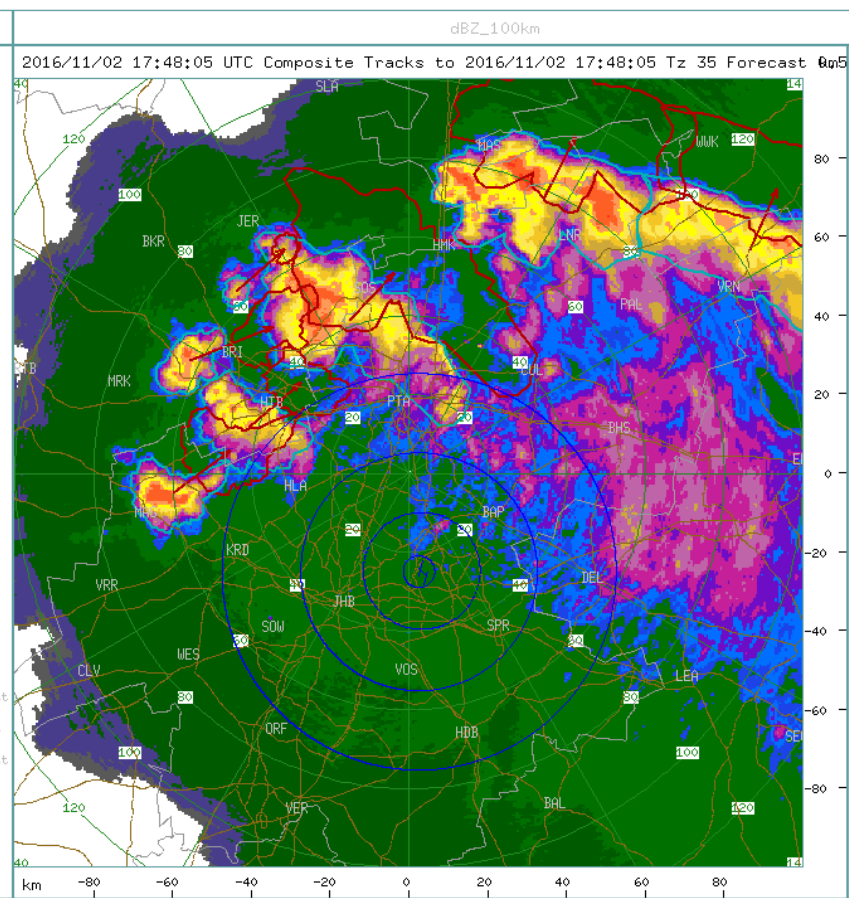
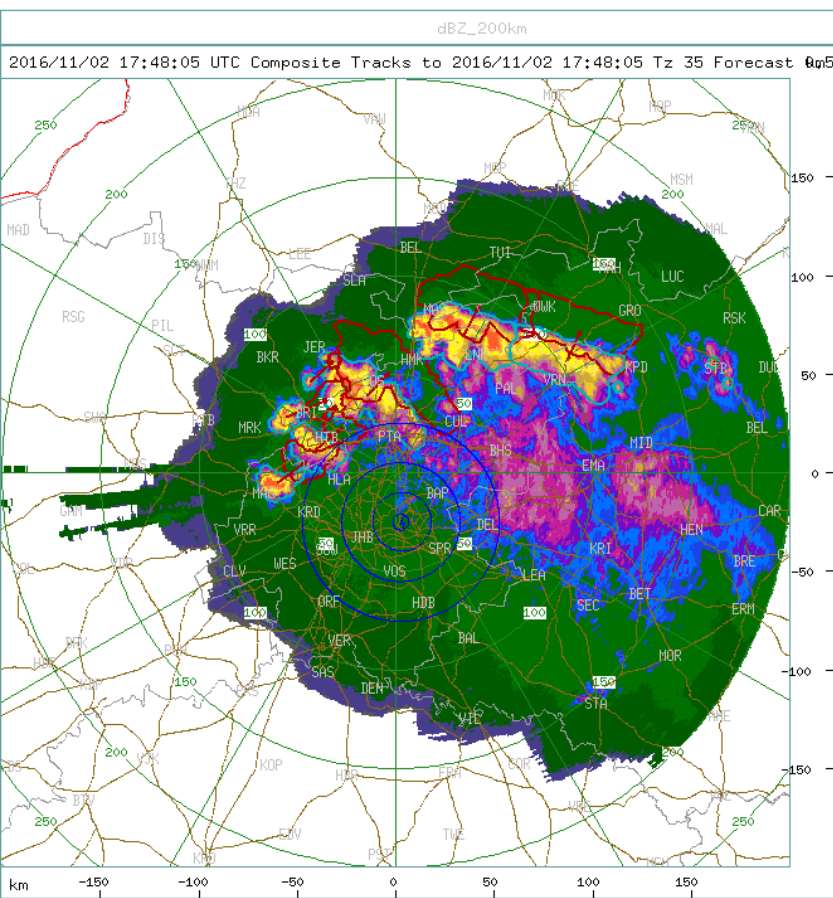
Risk Matrix Table

Likelihood	High		2	6	10
	Medium		1	5	9
	Low			4	8
	Very Low			3	7
		Minimal	Minor	Significant	Severe
		Impact			

2016-11-02 13:35:16								
	0 min	10 min	20 min	30 min	45 min	60 min	90 min	120 min
4 km								
15 km								
30 km								
50 km								

2016-11-02 17:48:05

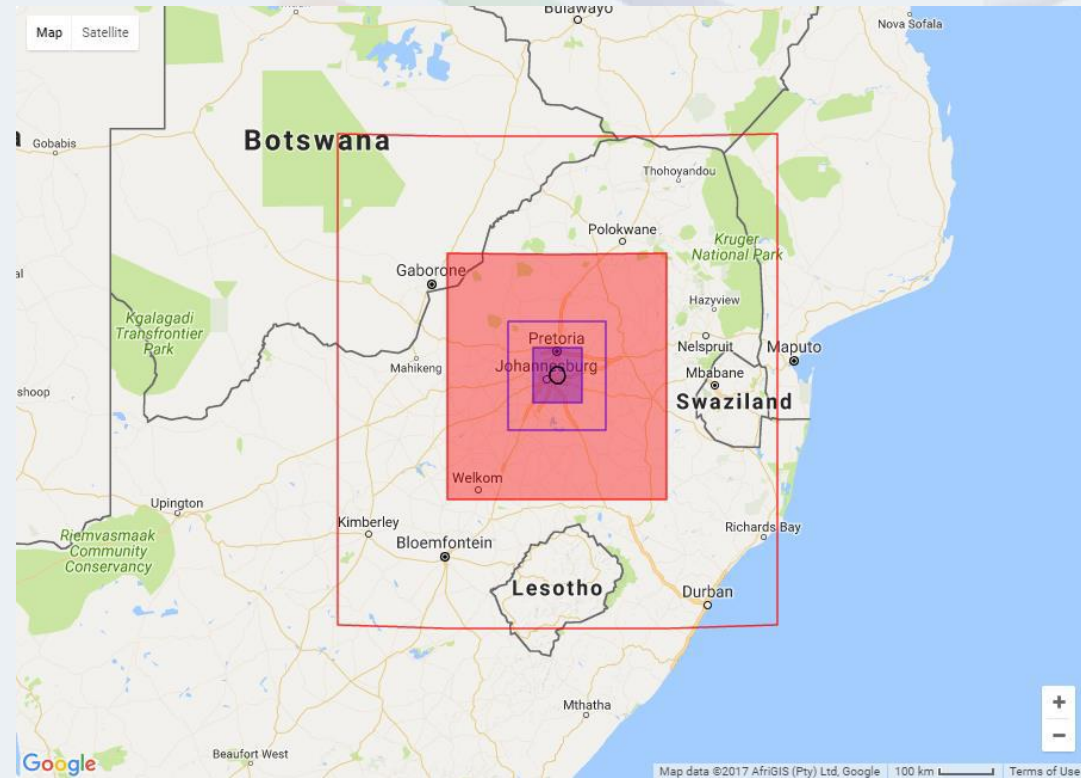
	0 min	10 min	20 min	30 min	45 min	60 min	90 min	120 min
4 km								
15 km								
30 km								
50 km								



Sub-kilometer model

Convective scale model (300 m) using the UK Met Office Unified Model

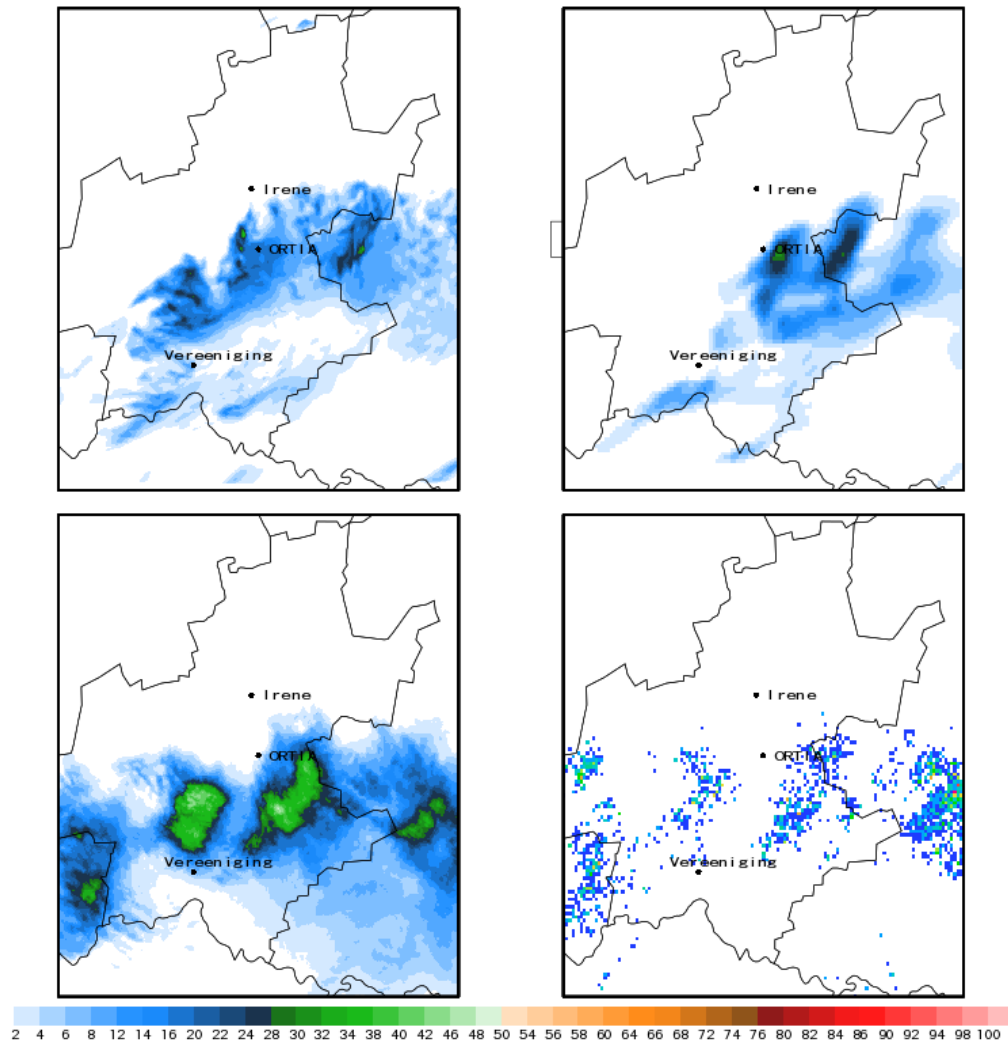
- ORTIA nested domain
- 300 m resolution
- Vertical resolution of 70 levels
- Lead-time 36-hours but initialized at 00, 06, 12 and 18 UTC
- Red (1,5 km) & Purple (300 m)
- 300x300 (shaded) & 600x600 (non-shaded)
- Black circle ORTIA aerodrome



Information from Stephanie Landman

Sub-kilometer model

UM Total Rainfall Forecast: 20161102 16UTC



Information from Stephanie Landman

smartsheet

Row 2

Adverse weather type Thunderstorm

Date of event 2018/09/28

No. of flights delayed	46
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Diversions

Cancellations No

Safety Incidents	No
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[illegible]

South African Weather Service

Information from ATM

Central Airspace Management Unit Demand Forecast for 28 September 2018



Central Airspace Management Unit Demand Forecast for 28 September 2018



Telephone
Email

Central Airspace Management Unit Demand Forecast for 28 September 2018

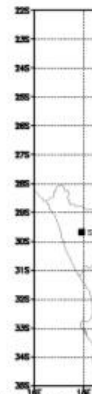
Central Airspace Management Unit Demand Forecast for 28 September 2018

Telephone Number: 011 928 6433
Email: camuhelpdesk@atns.co.za

Last Update: Thursday, 27 September 2018 16:44 South African local time
Teleconference commences at 0630UTC daily

Thursday

Analysis: 00Z 27 SEP 2018



Thunderstorm
Shaded area=TS

Summary of

FAJA: Gauter
afternoon.
FACA: Wester
in the morning

Primary

Local

FAOR

FACT

FALE

FALA

FAGG

FAPE

FAEL

FABL

FAKN

FAPP

FAKM

Secondary

Local

Warning

Wa

SIG

SIG

W

Vo

Trop

Weather Conditions – Qualitative Overview for 28 Sep 18

	Thunderstorms		Low Cloud/Visibility		Wind/Turbulence	
	AM	PM	AM	PM	AM	PM
FAOR	FM 1200Z	UNTIL 1800Z				
FACT			UNTIL 0600Z			
FALE						
FALA						
FAGG			FM 0600Z	UNTIL 1200Z		
FAPE			FM 0900Z	UNTIL 1200Z		
FAEL						
FABL						
FAKN						
FAPP						
FAKM						

Favourable

Minimal impact to operations expected

Marginal

Some potential for operations to be impacted on

Unfavourable

Impact on operations likely

AT
20

ATNS/
2018

2019/05/22

ATNS/CAMU/00/11
2018

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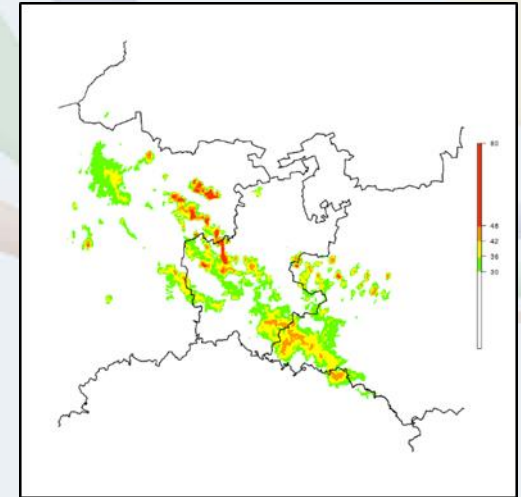
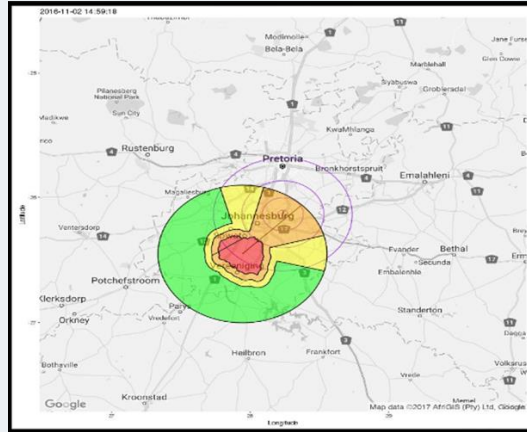
27 September

Work in progress

- Testing of sub-kilometre model
- Finalize the blending of sub-kilometre model with SWIRLS to extend thunderstorm table to 6-hours ahead (or even 9-hours).
- Extending thunderstorm tables to 36 hours with sub-kilometre input.
- Linking of meteorological data with data received from airport management centre to translate the thunderstorm table into an impact table.

Impact Forecasts

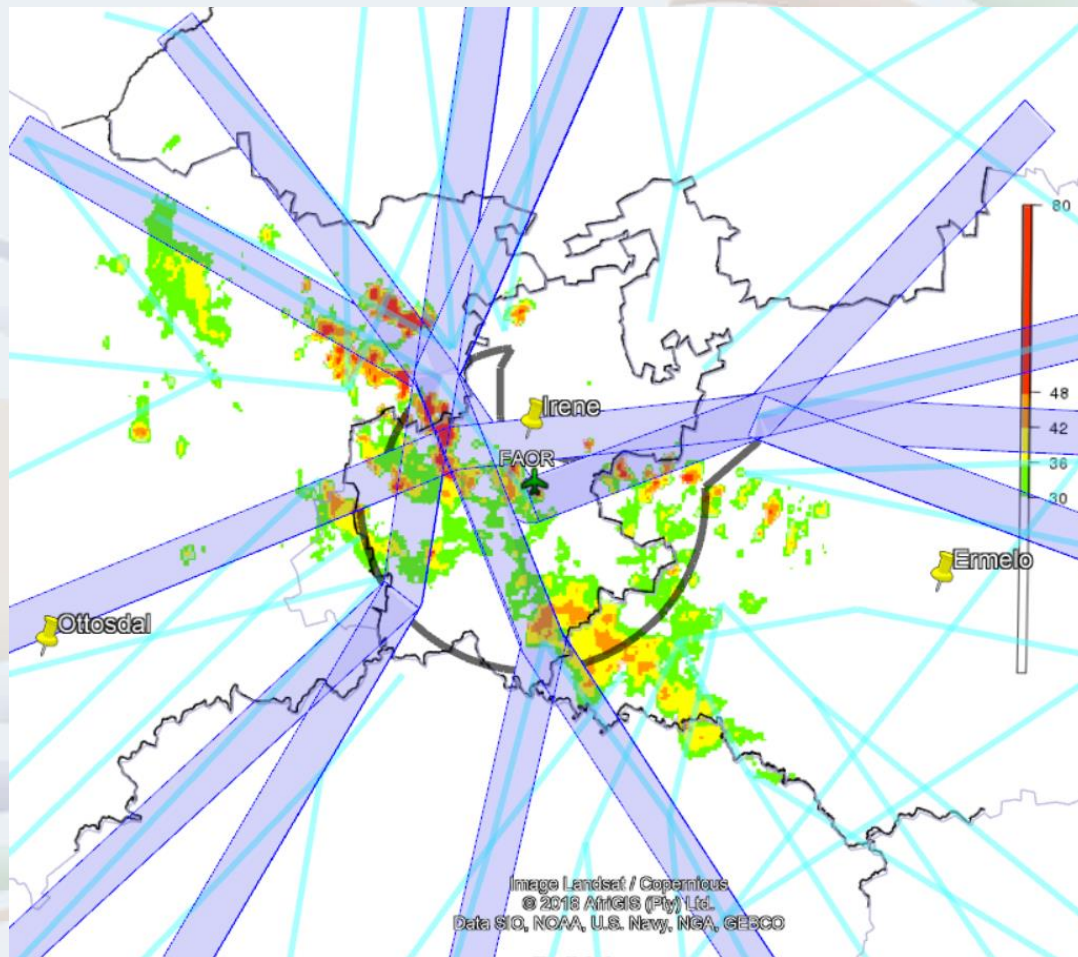
LIKELIHOOD	High	3	9	13	15
	Medium	2	8	12	14
	Low	1	5	10	11
	Very Low	0	4	6	7
		Minimal (<36dBZ)	Minor (<42dBZ)	Significant (<48dBZ)	Severe (>48dBZ)
IMPACT					



	Risk level	Impact	Possible adverse weather
15	High likelihood of severe disruptions at aerodrome.	There is a high likelihood of reduced rates, delays, and stoppages. Diversions or cancellations also possible.	Frequent lightning, heavy rainfall, strong winds, reduced visibility, and hail.
14	Medium likelihood of severe disruptions at aerodrome	There is a medium likelihood of reduced rates, delays, and stoppages. Diversions or cancellations also possible.	Frequent lightning, heavy rainfall, strong winds, reduced visibility, and hail.
13	High likelihood of significant disruptions at aerodrome	There is a high likelihood of reduced rates and/or stoppages and/or delays. Diversions or cancellations not impossible.	Moderate to heavy rainfall, moderate winds, reduced visibility, moderate lightning activity.
12	Medium likelihood of significant disruptions at aerodrome	There is a medium likelihood of reduced rates and/or stoppages and/or delays. Diversions or cancellations not impossible.	Moderate to heavy rainfall, moderate winds, reduced visibility, moderate lightning activity.
11	Low likelihood of severe disruptions at aerodrome	There is a low likelihood of reduced rates, delays, and stoppages. Diversions or cancellations also possible.	Frequent lightning, heavy rainfall, strong winds, reduced visibility, and hail.
10	Low likelihood of significant disruptions at aerodrome	There is a low likelihood of reduced rates and/or stoppages and/or delays. Diversions or cancellations not impossible.	Moderate to heavy rainfall, moderate winds, reduced visibility, moderate lightning activity.
9	High likelihood of minor disruptions at aerodrome	There is a high likelihood of reduced rates and/or delays. Stoppages also not impossible. Diversion or cancellations not expected.	Moderate rainfall, reduction in visibility, moderate winds, occasional lightning strikes
8	Medium likelihood of minor disruptions at aerodrome	There is a medium likelihood of reduced rates and/or delays. Stoppages also not impossible. Diversion or cancellations not expected.	Moderate rainfall, reduction in visibility, moderate winds, occasional lightning strikes
7	Very low likelihood of severe disruptions at aerodrome	There is a very low likelihood of reduced rates, delays, and stoppages. Diversions or cancellations also possible.	Frequent lightning, heavy rainfall, strong winds, reduced visibility, and hail.
6	Very low likelihood of significant disruptions at aerodrome	There is a very low likelihood of reduced rates and/or stoppages and/or delays. Diversions or cancellations not impossible.	Moderate to heavy rainfall, moderate winds, reduced visibility, moderate lightning activity.
5	Low likelihood of minor disruptions at aerodrome	There is a low likelihood of reduced rates and/or delays. Stoppages also not impossible. Diversion or cancellations not expected.	Moderate rainfall, reduction in visibility, moderate winds, occasional lightning strikes
4	Very low likelihood of minor disruptions at aerodrome	There is a very low likelihood of reduced rates and/or delays. Stoppages also not impossible. Diversion or cancellations not expected.	Moderate rainfall, reduction in visibility, moderate winds, occasional lightning strikes
3	High likelihood of minimal disruptions at aerodrome	There is a high likelihood that minimal disruptions can occur. Reduced rates or delays not impossible. Stoppages, diversions and cancellations not expected.	Light rain, reduction in visibility, low to moderate winds.
2	Medium likelihood of minimal disruptions at aerodrome	There is a medium likelihood that minimal disruptions can occur. Reduced rates or delays not impossible. Stoppages, diversions and cancellations not expected.	Light rain, reduction in visibility, low to moderate winds.
1	Low likelihood of minimal disruptions at aerodrome	There is a low likelihood that minimal disruptions can occur. Reduced rates or delays not impossible. Stoppages, diversions and cancellations not expected.	Light rain, reduction in visibility, low to moderate winds.
0	Very low likelihood of minimal disruptions at aerodrome	There is a very low likelihood that minimal disruptions can occur. Reduced rates or delays not impossible. Stoppages, diversions and cancellations not expected.	Light rain, reduction in visibility, low to moderate winds.

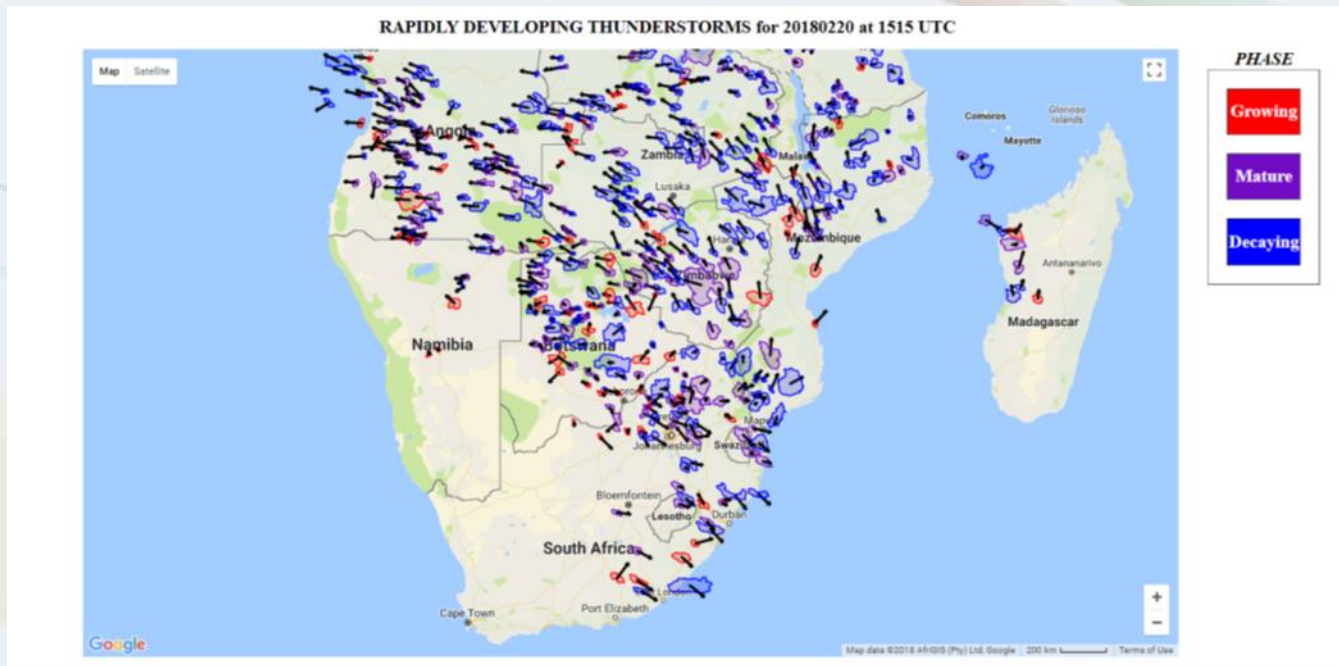
Work in progress

- Extending products to flight corridors on approach and departures



Work in progress

- Extending impact tables to flight corridors far beyond aerodrome.



Work in progress

- Investigate other weather conditions such as fog, high temperatures, winds and frost and create separate impact tables.
- Evaluating all products together with aviation forecasters and Airport Management Centre.
- Incorporate new ideas from MET-ATM workshop.



Thank You