Nowcasting for aviation purposes in South Africa – a case study:
Part 2 – Evaluating the HKO's SWIRLS over OR Tambo International Airport

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26 July 2016

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Overview

- Background
- Radar Calibration monitoring
- Quality Control
- Quantitative Precipitation Estimation (QPE)
- Com-SWIRLS Installation at SAWS
- Case Study 21 December 2015

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Background

- Gematronik Meteor 600S S-band
  - Constructed November 2009
- Rain for Africa (R4A) - 2018
  - KNMI (Radar calibration monitoring)
  - SCOUT (Quality Control)
- AvRDP
  - ORTIA
  - Attended WMO VCP Nowcasting training in December 2015
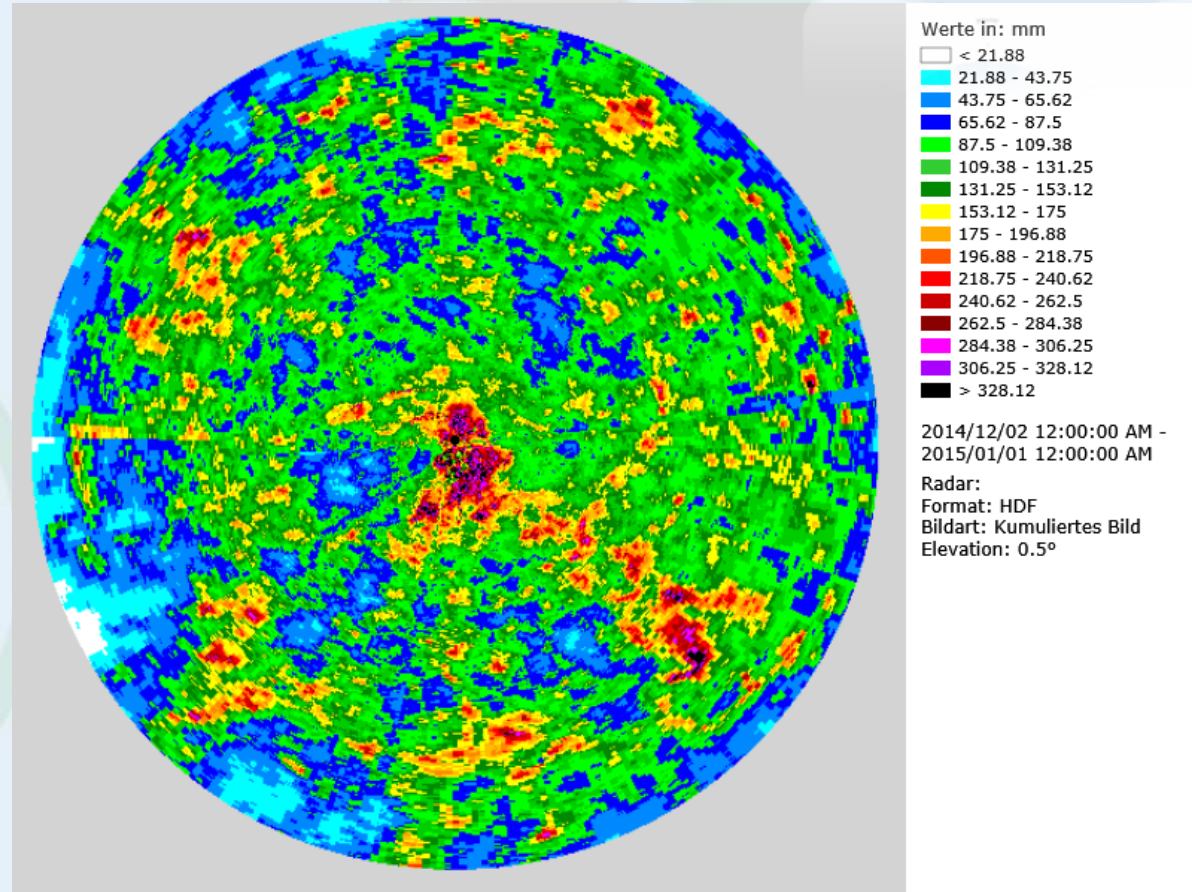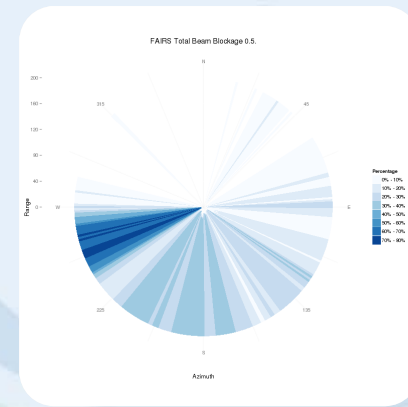 - Com-SWIRLS back to SA for testing

Calibrations Monitoring

- True North
- Sensitivity
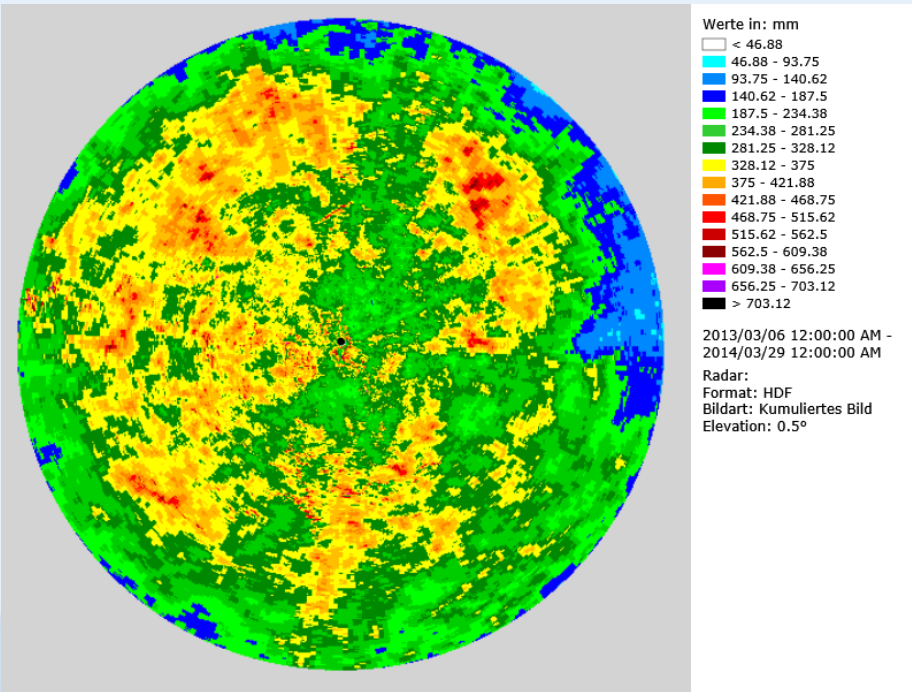- Angular bias
- Apparent Beam Width
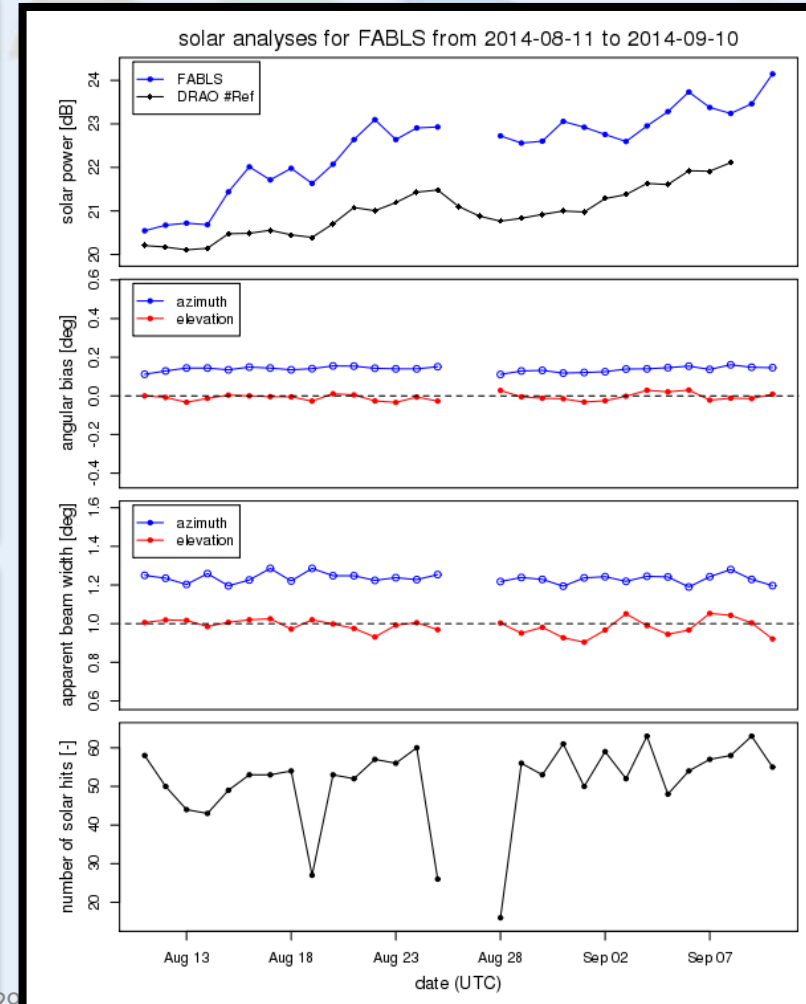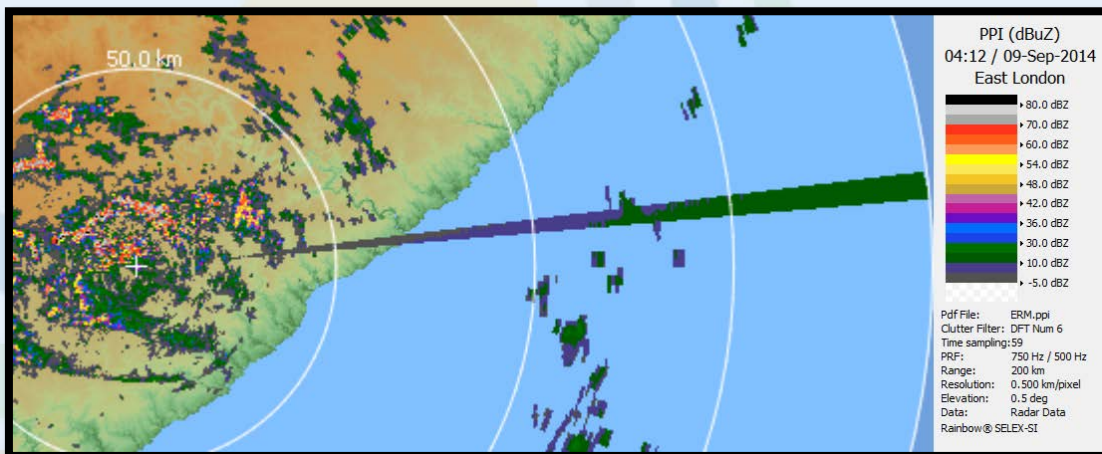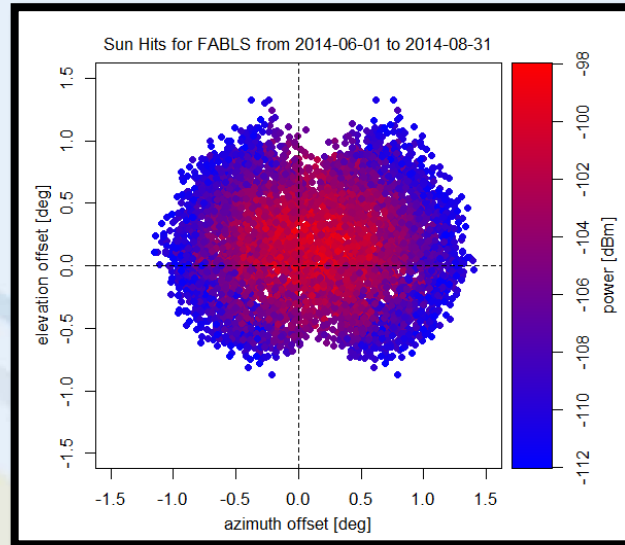
QC of data

- Current Filters:
  - Beam Blockage Correction
  - Ground Clutter Removal
  - Speckle Filter
  - Reverse Speckle
  - Gabella Filter
  - Interpolation

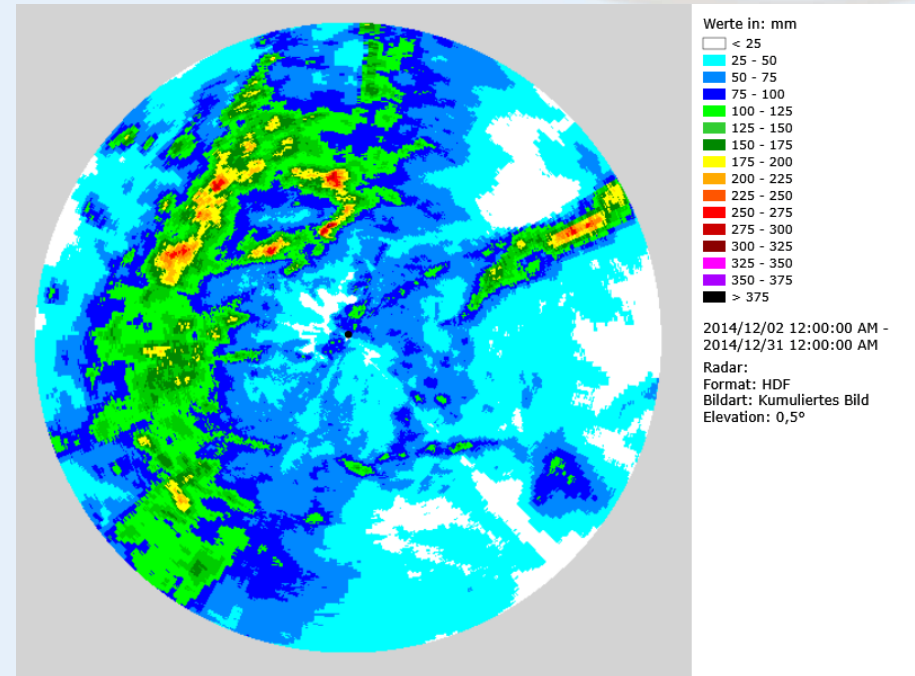- Pseudo CAPPI
  - 3km
  - ~1.5km

Werte in: mm

☐	< 21.88
■	21.88 - 43.75
■	43.75 - 65.62
■	65.62 - 87.5
■	87.5 - 109.38
■	109.38 - 131.25
■	131.25 - 153.12
■	153.12 - 175
■	175 - 196.88
■	196.88 - 218.75
■	218.75 - 240.62
■	240.62 - 262.5
■	262.5 - 284.38
■	284.38 - 306.25
■	306.25 - 328.12
■	> 328.12

2014/12/02 12:00:00 AM -
2015/01/01 12:00:00 AM
Radar:
Format: HDF
Bildart: Kumuliertes Bild
Elevation: 0.5°

QC at other Radars

Ermelo

Werte in: mm
- ☐ < 46.88
- 46.88 - 93.75
- 93.75 - 140.62
- 140.62 - 187.5
- 187.5 - 234.38
- 234.38 - 281.25
- 281.25 - 328.12
- 328.12 - 375
- 375 - 421.88
- 421.88 - 468.75
- 468.75 - 515.62
- 515.62 - 562.5
- 562.5 - 609.38
- 609.38 - 656.25
- 656.25 - 703.12
- > 703.12

2013/03/06 12:00:00 AM -
2014/03/29 12:00:00 AM

Radar:
Format: HDF
Bildart: Kumuliertes Bild
Elevation: 0.5°

Durban

Werte in: mm
- ☐ < 25
- 25 - 50
- 50 - 75
- 75 - 100
- 100 - 125
- 125 - 150
- 150 - 175
- 175 - 200
- 200 - 225
- 225 - 250
- 250 - 275
- 275 - 300
- 300 - 325
- 325 - 350
- 350 - 375
- > 375

2014/12/02 12:00:00 AM -
2014/12/31 12:00:00 AM

Radar:
Format: HDF
Bildart: Kumuliertes Bild
Elevation: 0,5°

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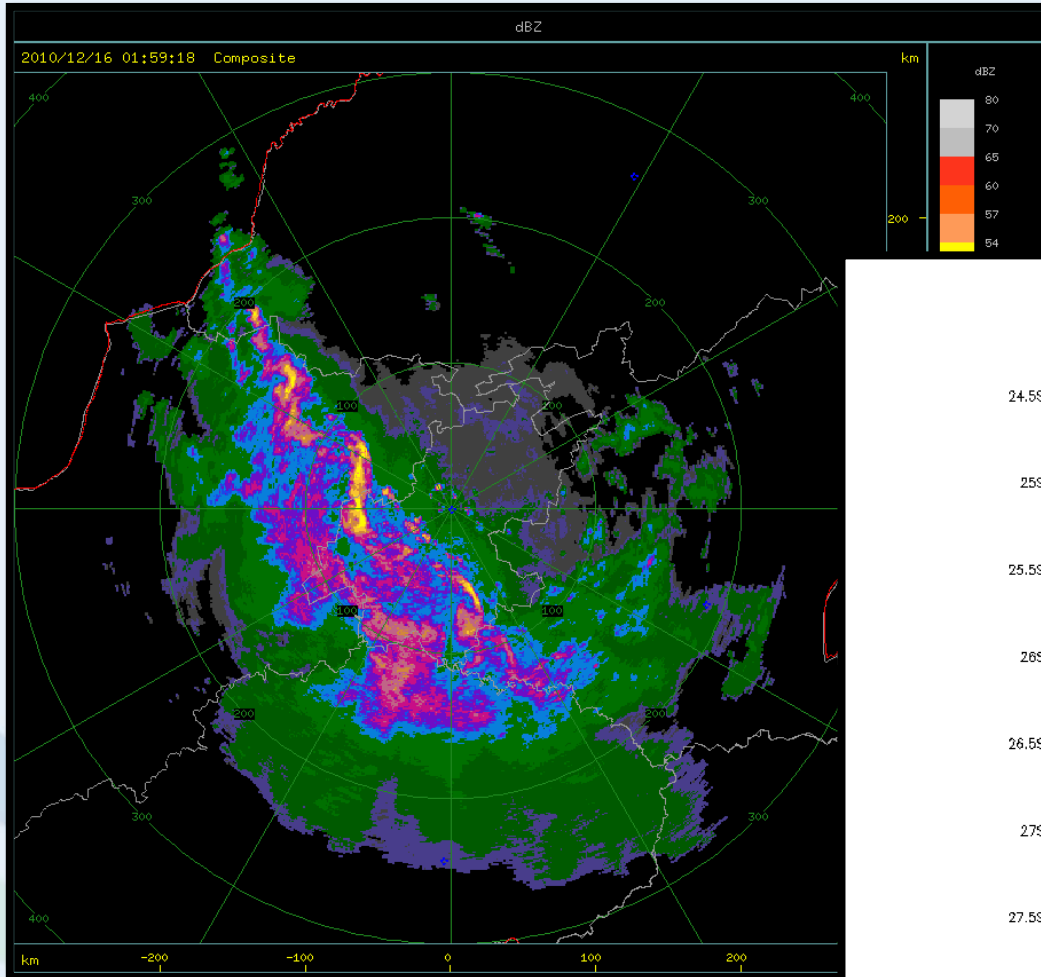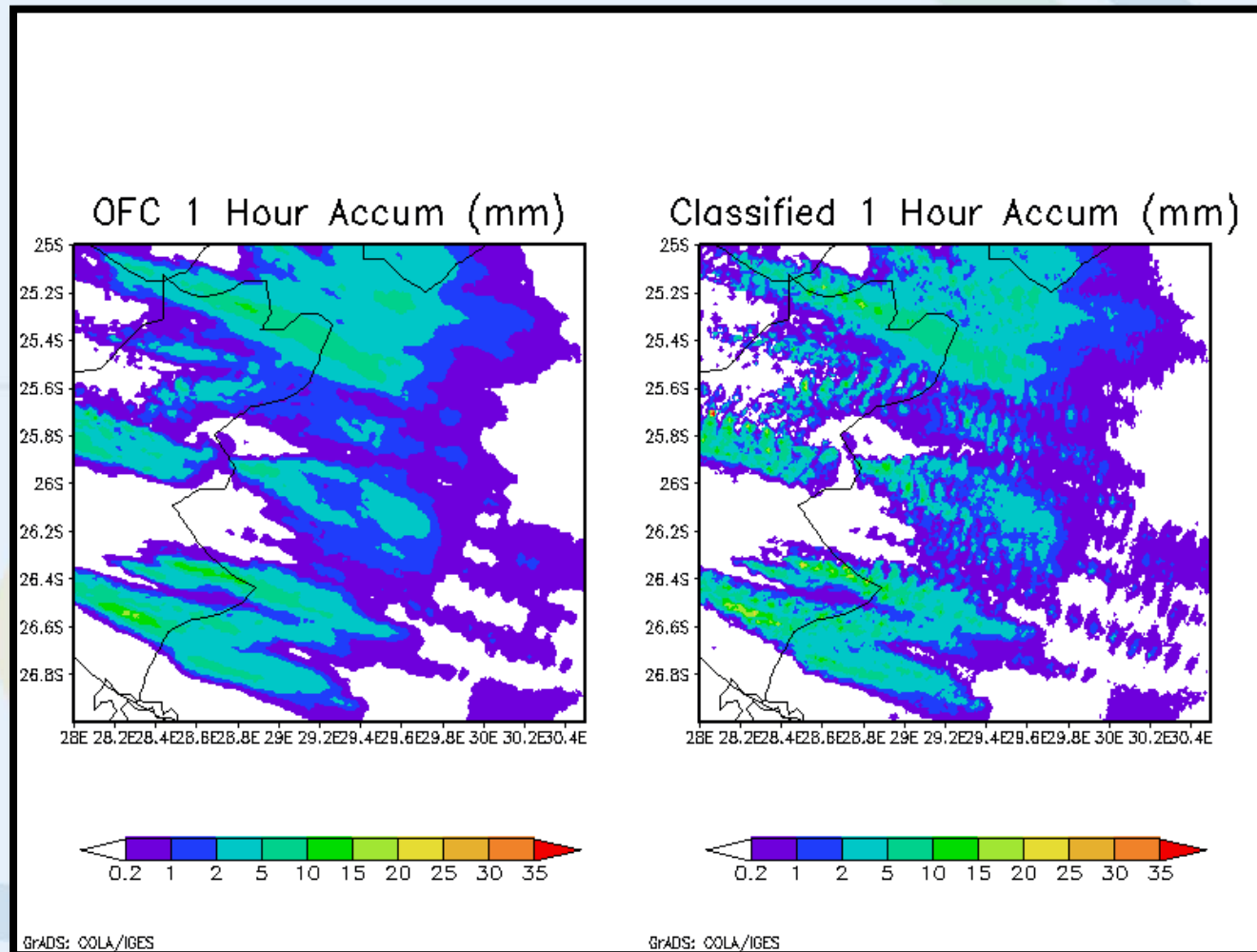
Radar – QPE (Classification)

- 2D Classification (Chumchean et al., 2008)
- Dual Z-R relationship
- Stratiform$(Z = 200R^{1.6})$
- Convective $(Z = 300R^{1.4})$

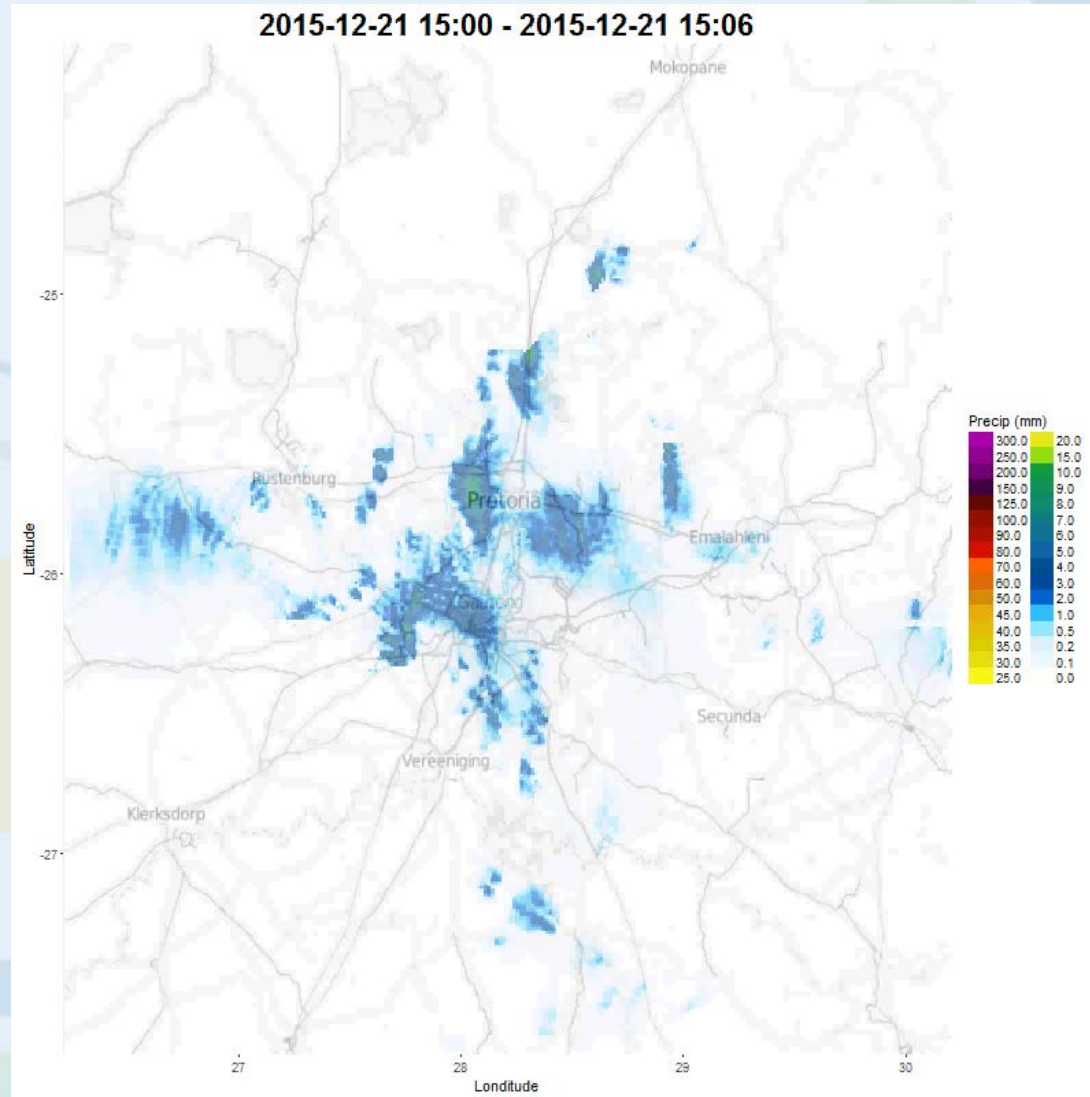Classified Rainfall 201012160200
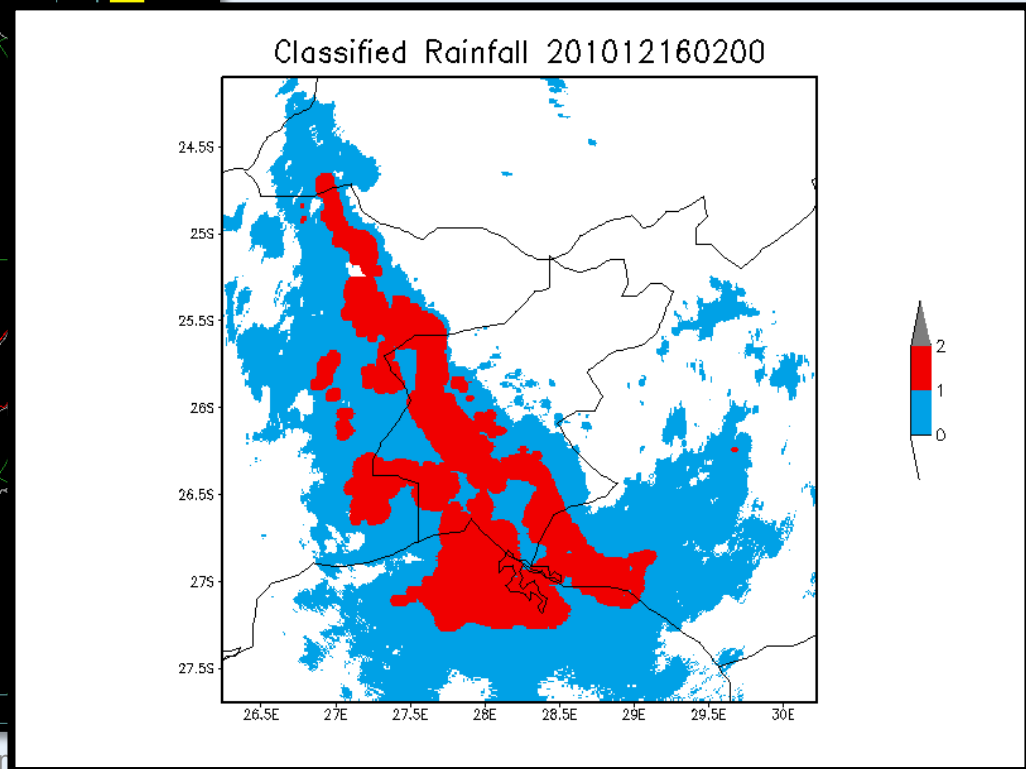
Radar – QPE (Optical Flow)

Com-SWIRLS

- CAPPI data converted to IRIS format with the assistance from HKO.

- 2015-12-21 15:00

- Irene Radar domain – 200km range.

- 400x400 pixel grid with valid data.

- 1kmx1km

- 9hr extrapolation (default)

- Running in "research" mode

2015-12-21 15:00 - 2015-12-21 15:06

Radar – QPF (1hr Accum)

2015-12-21 15:00 - 2015-12-21 15:06
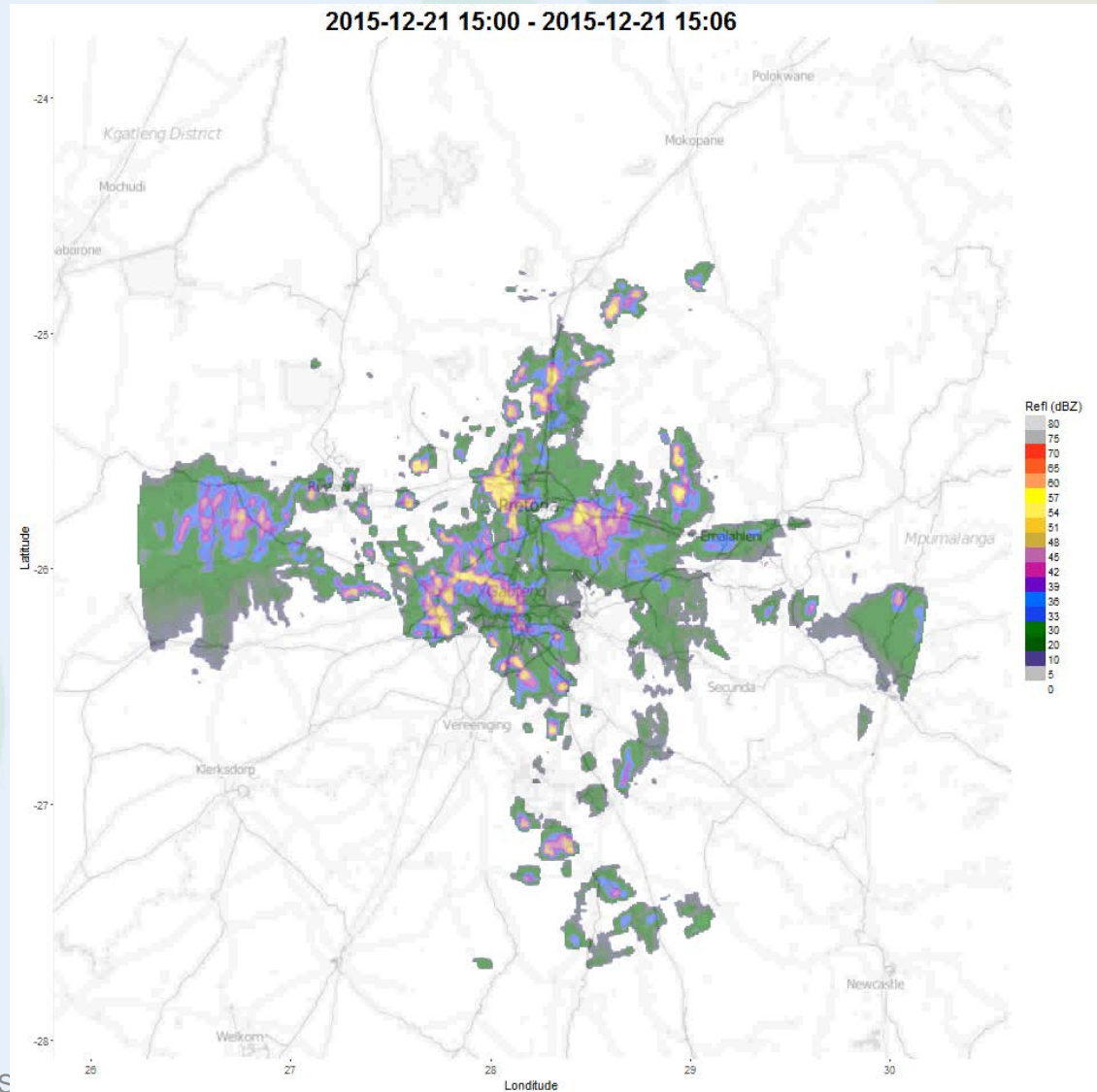
QPF Verification

- Verification was performed using the 21st of December 2015 case.

- A simple gridded pixel analysis using the reflectivity values
  - Contingency tables
  - 15dBZ threshold (~0.2mm/h MP)

- Radar QPE/QPF compared to the 5min ARS data recorded at ORTIA.

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QPF Verification

15dBZ threshold Scores
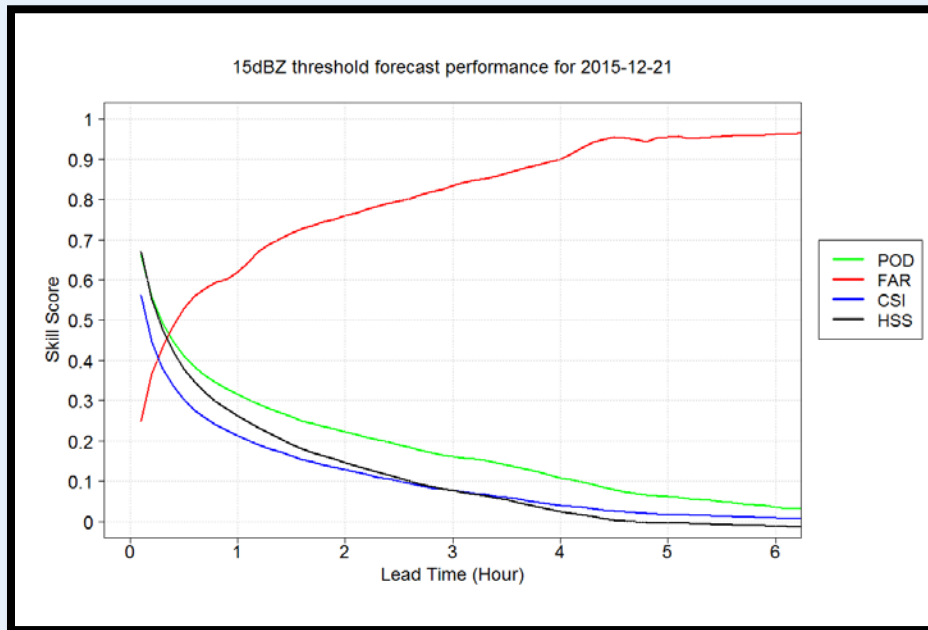
HSS time series – 2015-12-21
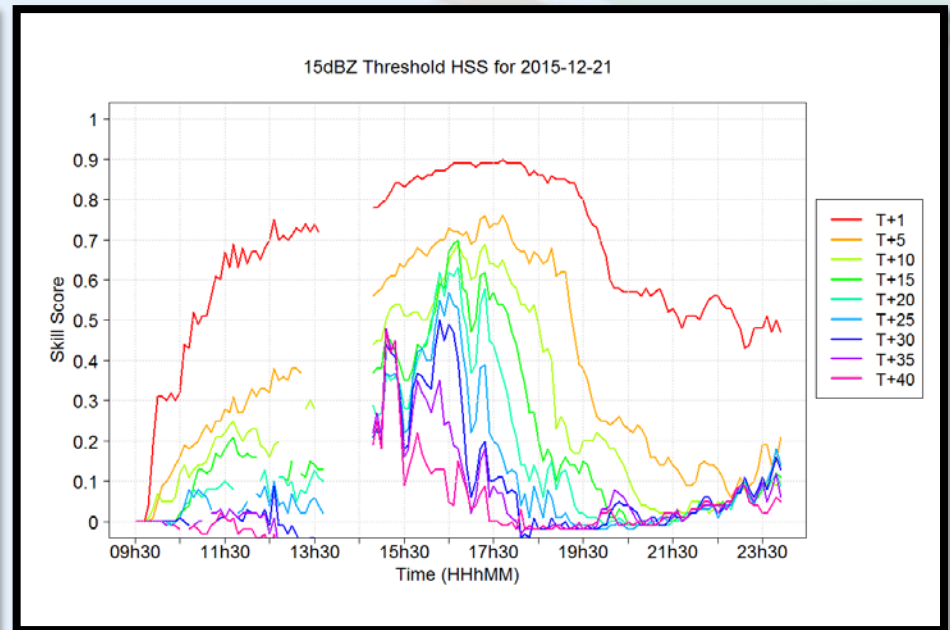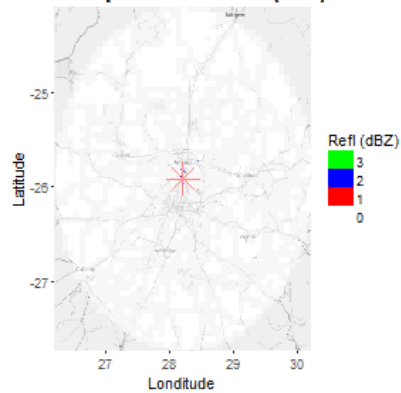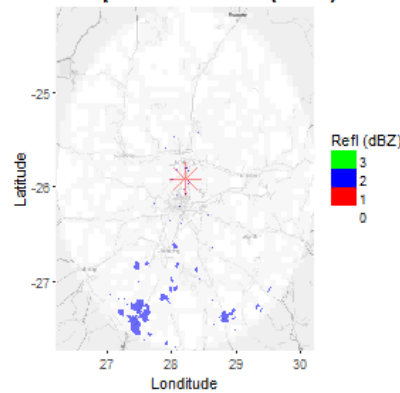
QPF Verification

2015-12-21 09:30 (UTC)

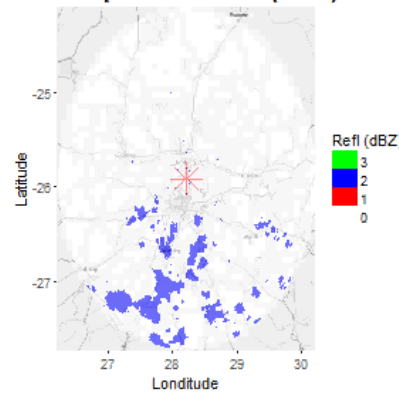15dBZ Threshold HSS for 2015-12-21
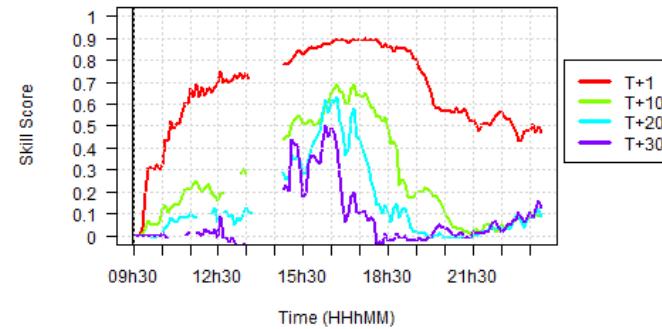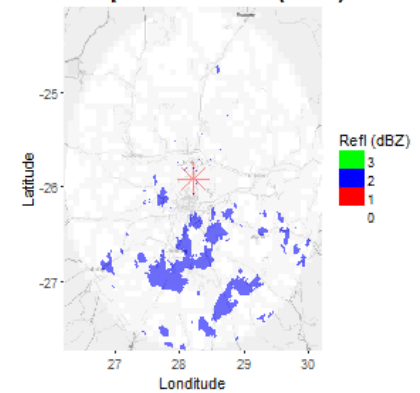
Overlap of Obs vs Fct (T+1)

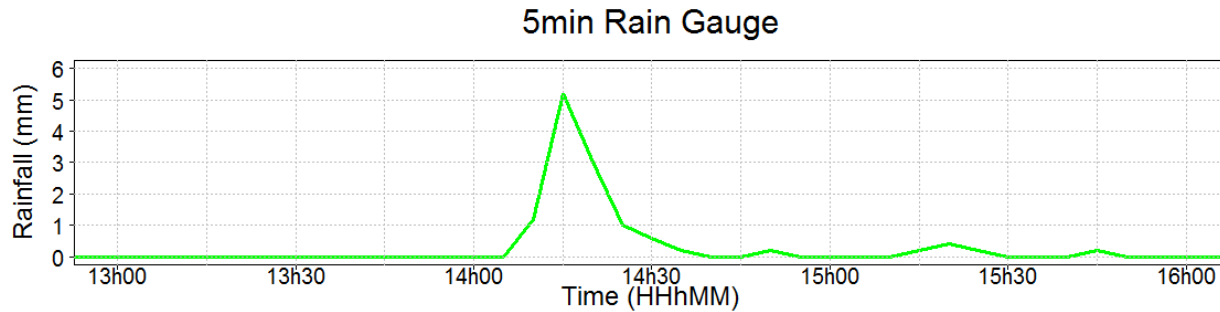Overlap of Obs vs Fct (T+10)
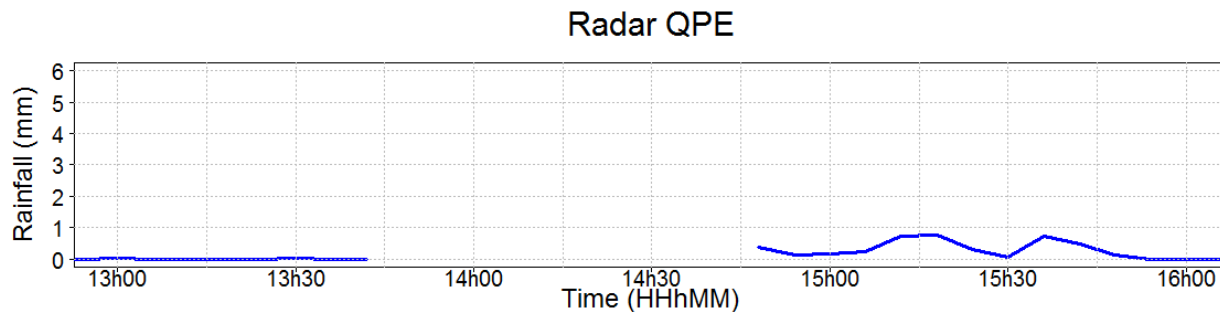
Overlap of Obs vs Fct (T+20)
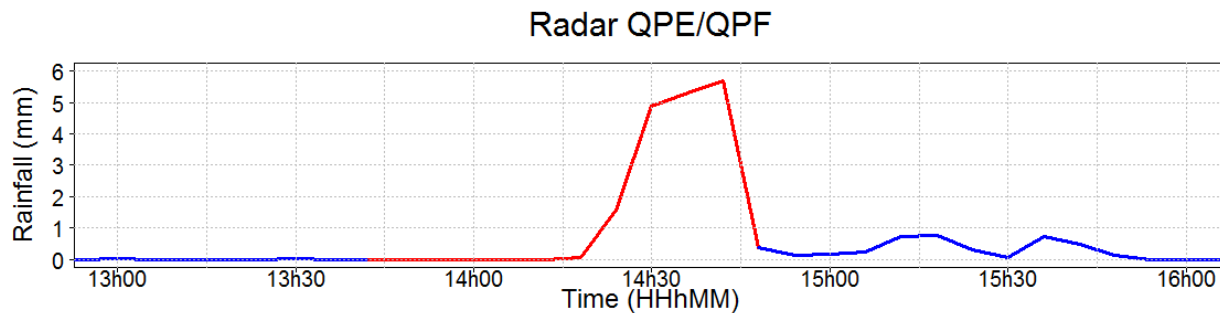
Overlap of Obs vs Fct (T+30)

2015-12-21 5min Gauge Data at ORTIA

Total = 12.4 mm

Total = 4.15 mm

Total = 21.68 mm

Summary

- Previously no capability to quantify radar based precipitation forecasts. Com-SWIRLS now made this possible.

- Com-SWIRLS performs reasonably well for the 21 December 2015 case up to the 2 hour lead time.

- A higher skill is observed when the weather system covers a larger area compared to the single cell storms.

- Extrapolated motion is slower than the motion of the weather systems.

- Future plans include:

  – Making com-SWIRLS available for operational use. Will depend on funds from R4A project to procure server and storage for radar data processing.

  – A proposal was submitted for funding to investigate the possibility of running a high temporal and spatial model with assimilated radar data using WRFDA. Then attempt to increase lead-time skill by blending the model with com-SWIRLS extrapolation.

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Thank You

Questions?

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