CGMS-39 EUM-WP-26
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Prepared by EUMETSAT
Agenda Item: G.II/4
Discussed in WGII

REPORT ON CREATION OF VALIDATION DATASETS FOR RAINFALL PRODUCTS

In response to CGMS action WGII 38.26:
Recognising limited validation datasets and the use of SEVIRI for GOES-R and MTG algorithm development, EUMETSAT and NOAA to coordinate with South Africa for creation of validation datasets for rainfall products and to report at CGMS-39.

In response to CGMS action WGII 38.26, this paper describes the precipitation validation datasets that are available at the South African Weather Service (SAWS), who operates a comprehensive rain gauge and radar network. SAWS has in the past contributed to the IPWG activities. Future collaboration, either in the framework of IPWG, or bilaterally with EUMETSAT or other international partners, should capitalise and build on this past experience.

Recommendation proposed: CGMS-39 WGII to take note and discuss.

Report on Creation of Validation Datasets for Rainfall Products

1 INTRODUCTION

A number of activities and algorithms exist to derive quantitative rainfall estimates from current and future geostationary satellite data, mainly from infrared channels. Algorithms should be demonstrated and validated, as e.g. outlined in CGMS-38 NOAA-WP-31. The product range covers instantaneous rainfall rates, rainfall potential and probability of rainfall. Following the discussion at CGMS-38, EUMETSAT and NOAA were tasked to coordinate with the South African Weather Service (SAWS) their possible contribution to validation datasets for rainfall products.

2 SAWS RAINFALL MEASUREMENT NETWORK

2.1 Rain Gauges

SAWS operates ~1,500 rain gauges reporting daily at 0600 UTC for the previous 24 hours. In 2009, additional 80 Automatic Rainfall Systems (ARS) have been installed providing rainfall information in real-time. Despite the obvious advantage of being able to measure rainfall in 5 minute intervals, this type of precipitation measurement is still too sparse to provide a comprehensive picture of hourly rainfall over the country.

Figure 1 shows the areal coverage of the rain gauge network.

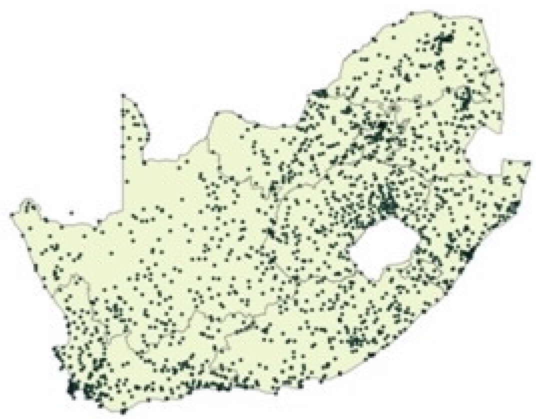

Figure 1: Location of the rain gauges of the South African Weather Service.

2.2 Radar Network

Until the end of 2009 SAWS' weather radar network consisted of ten C-band and two S-band radar systems that provide coverage over about two-thirds of the country. This network has been used extensively in support of weather predictions, storm identification and aviation applications. The spacing of these radars is not ideal for observing stratiform rain because such systems are relatively shallow, resulting in the radar beam overshooting the echo tops at long ranges. Convective storms, however, have relatively deep vertical dimensions allowing them to be observed, at least partially, at longer ranges. Despite the obvious advantages of this system, it still lacked Doppler capabilities and suffered from attenuation. SAWS is currently in the process of migrating to S-band (2.8 GHz) radar systems. The S-band radar signals undergo far less attenuation than that of the C-band signals. These new radars have sensitive Doppler capabilities with which it is possible to detect the internal wind structure of storms, mainly in support to storm nowcasting. The enhanced capabilities of the new radar systems will be used for improved radar based precipitation estimates. Although the coverage of the new radar network is improved, complete coverage of South Africa is still not possible, while the rest of southern Africa have very few radar systems available.

Figure 2 shows the SAWS radar network and the respective radar footprints.

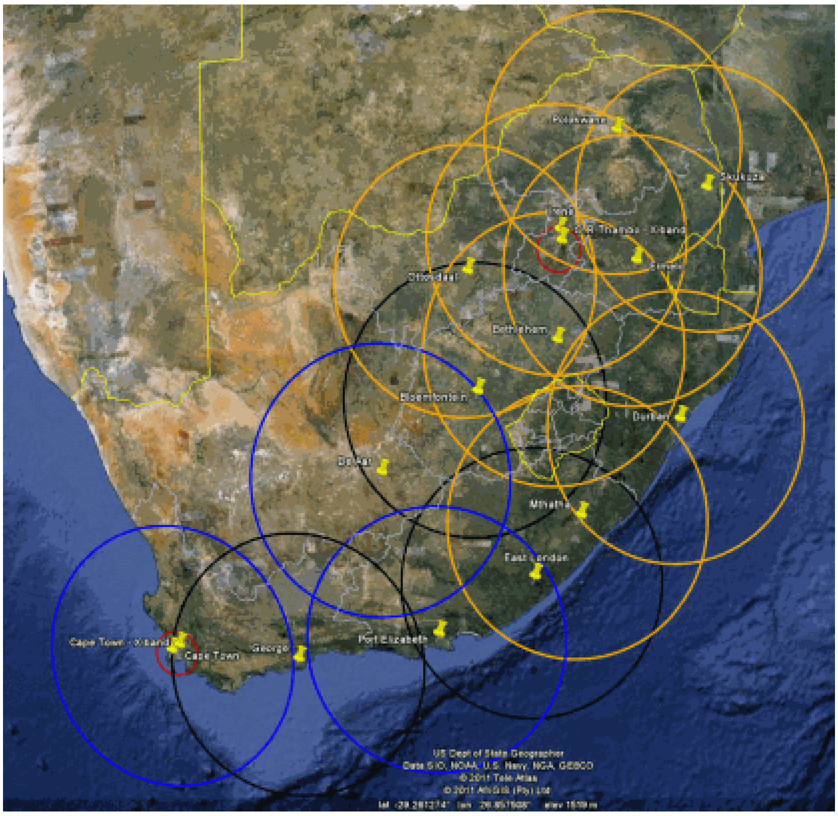

Figure 2: SAWS radar network.
Blue: C-band
Black: S-band (planned)
Orange: S-band (in operations)
Red: X-band radar at the major airports, not operational

Radar based precipitation estimates are available at 6 minute intervals, with the above mentioned shortcomings with respect to stratiform rain.

All radar data are archived at SAWS. The radar network, however, is not available on a 24/7 basis (outages because of e.g. maintenance, power supply outages, problems with the communications network etc.). Typical availability figures are 60-70% on average, but can occasionally drop below 10% for a given radar site.

A full description of the new S-band radar system can be found in

De Coning, E., 2010: Flood warning. The introduction of Doppler radar systems in South Africa. **Met. Tech. Intern'l**, June 2010, 120-123.

3 COLLABORATION WITH EUMETSAT AND OTHER PARTNERS

The archived rainfall data (gauges and radar) are only available at a cost. Costs depend on the actual data volume and on the usage (e.g. research vs. commercial usage). SAWS would need to be contacted with a specific request to get a committed cost estimate.

SAWS is, however, very willing to collaborate on the issue of validating space based rainfall estimates. In the past, SAWS has contributed monthly statistics to the International Precipitation Working Group (IPWG) and is willing to take up that role again upon request.

Scientific collaboration with EUMETSAT and/or other international partners is also welcomed by SAWS, where e.g. the data policy and data cost problem could be overcome: Data would physically stay at SAWS, and only the validation results would be shared and jointly published. SAWS should be approached with a corresponding proposal.

4 CONCLUSIONS

The SAWS rainfall measurements, based on a dense gauge network and satisfactory radar coverage, provides a comprehensive dataset for rainfall validation. All data are archived and are in principle available to the community. Data usage and evaluation should be done in close collaboration with SAWS, not only to minimise data purchase costs but also capitalise on the already existing knowledge at SAWS and on the work performed in the past in support to IPWG.