

Regional Flash Flood Guidance System: Progress and Examples

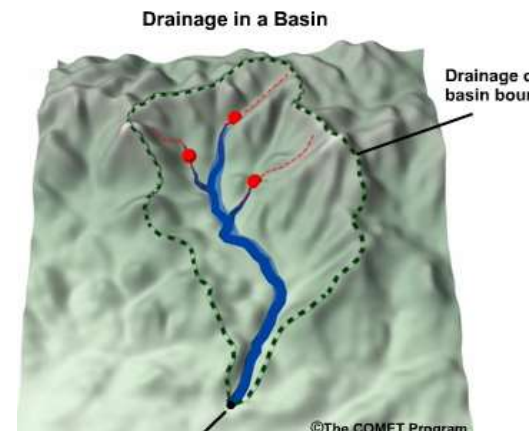
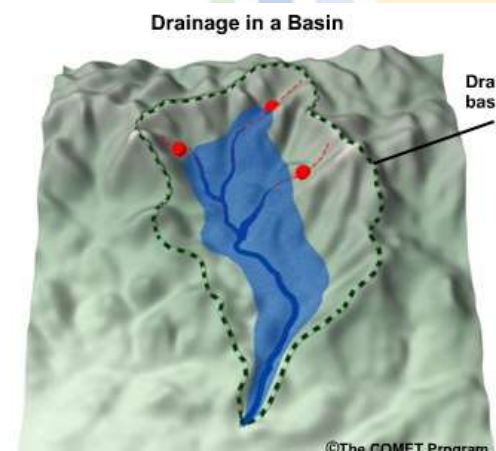
Eugene Poolman

21 November 2013

FCAST-PRE-20120111.001.1

How do you predict a flash flood?

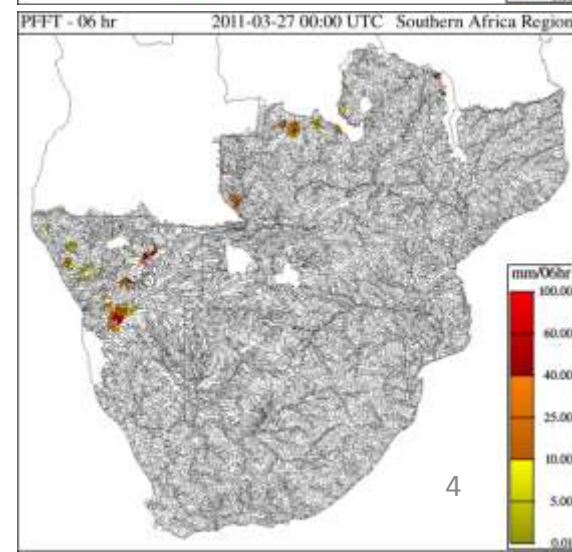
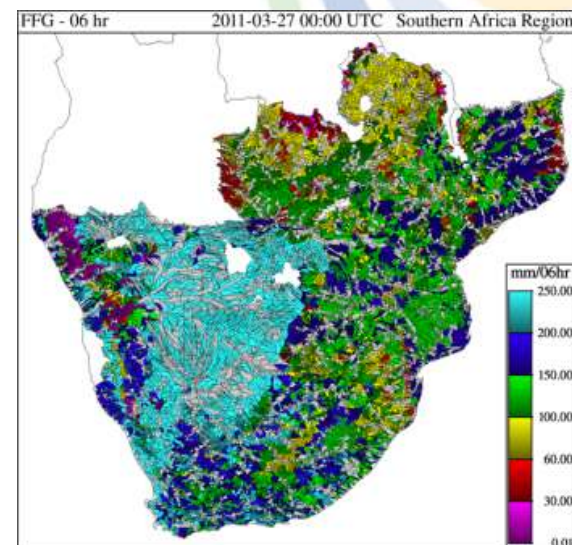
- Forecaster's question:
 - How much rain will cause a flood in this particular area?
- What do you need to know to answer this question?
 - How much water will run off?
 - How full is the stream?
 - What about recent rain?
 - How river basin responds - Hydrology
- How much rain is I expecting over this area?
 - Weather forecasting - Meteorology



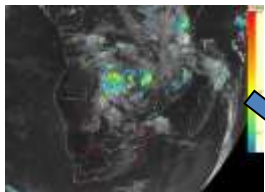


WMO Initiative on Implementing Regional Flash Flood Guidance Systems

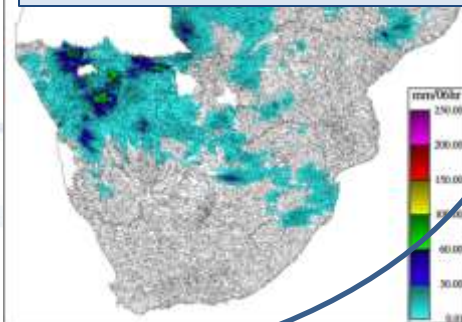
- WMO aims to improve flash flood warnings in sub-region around the world
- The FFGS already in Central America and Mekong River Basin
- SARFFG covers basins in over 9 SADC countries
 - Developed by US Hydrologic Research Center in San Diego
 - Funded by USAID
 - Managed by WMO Hydrology Unit



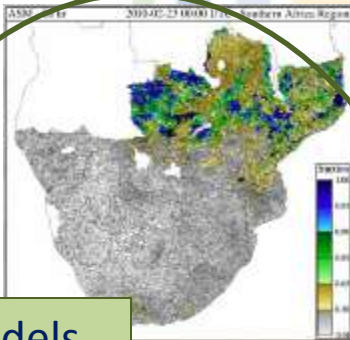
Flash Flood Guidance Process



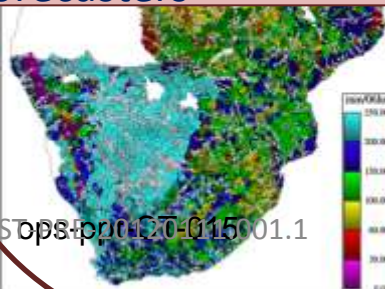
Calculate from satellite & rain gauge info the averaged rainfall over small basins



Hydrologic models determine likely soil moisture and rainfall runoff for small basins



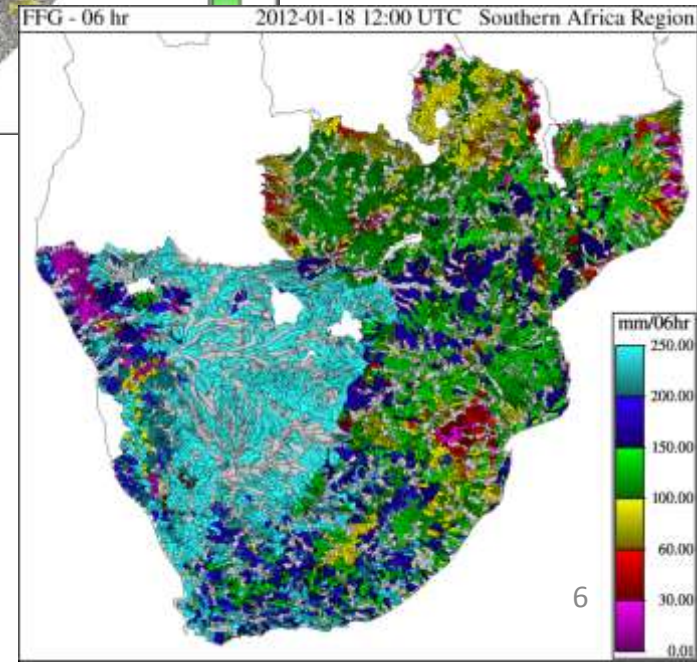
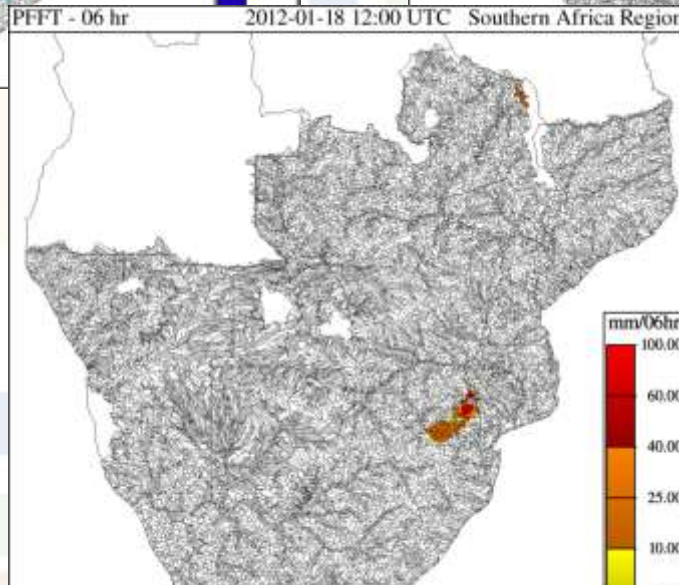
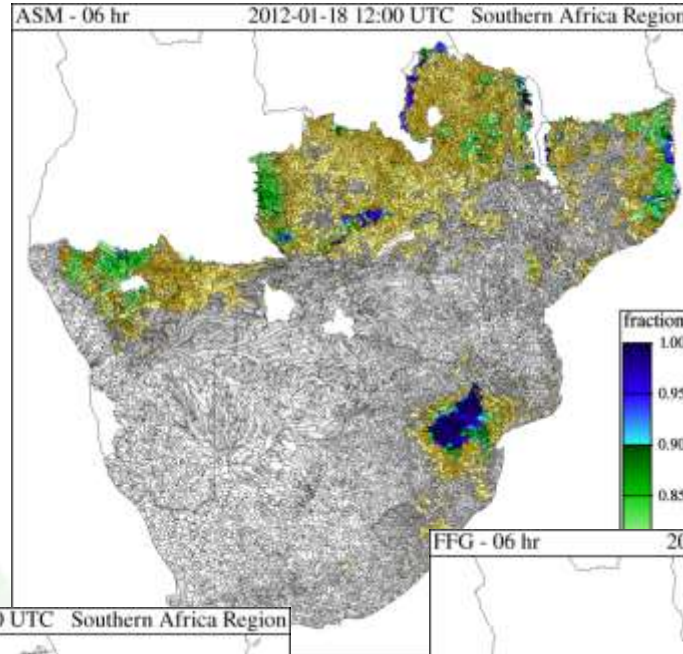
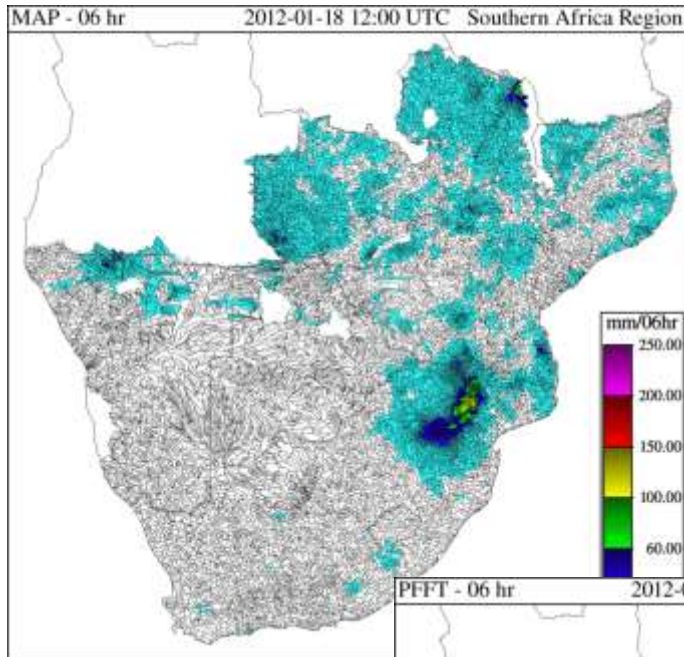
Determines potential for flash floods as guidance to forecasters



Warnings to Disaster Management and Public

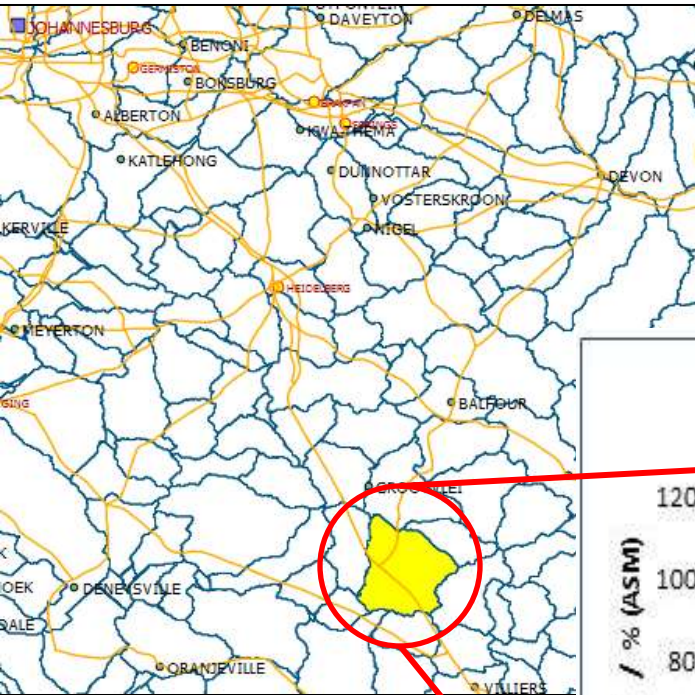
SARFFG products

Tropical Cyclone Dando - 18 Jan 2012

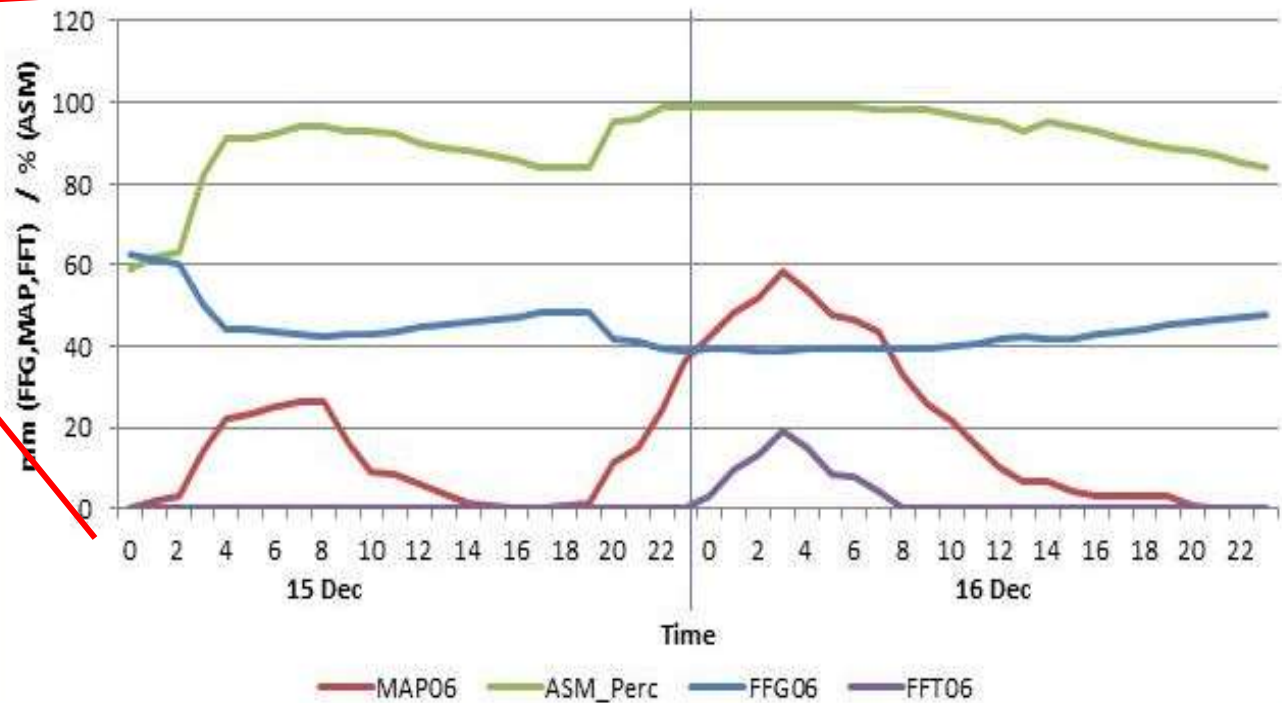


SARFFG 06hr
Products for 18 Jan
2012 12:00 UTC

Response of a single SAFFG Basin



Time-series of hourly SAFFG Parameters for basin # 2001803476 for 15 and 16 Dec 2010

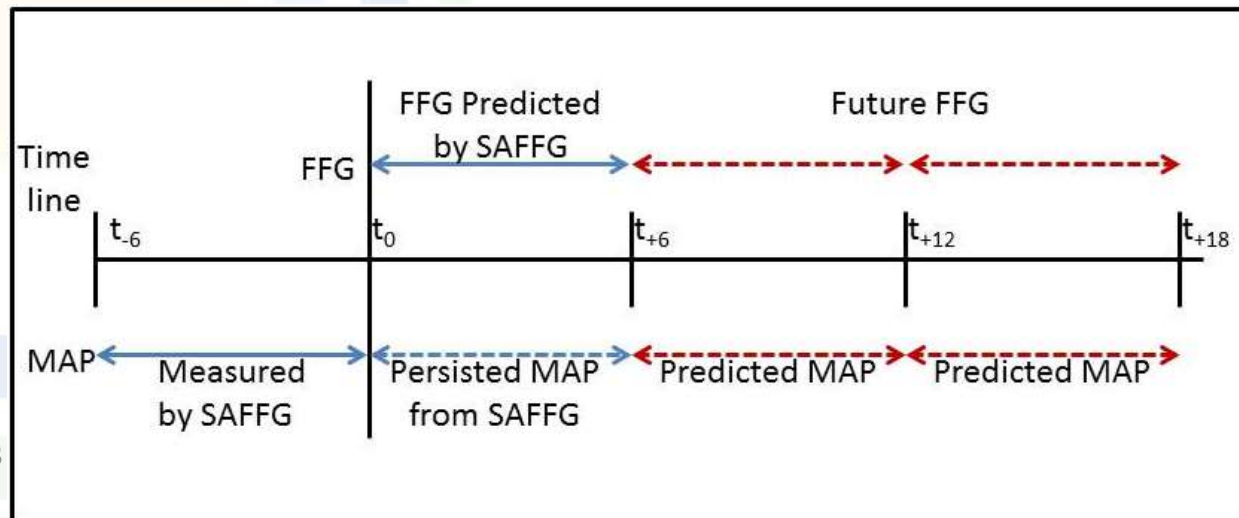


Strengths and Weaknesses

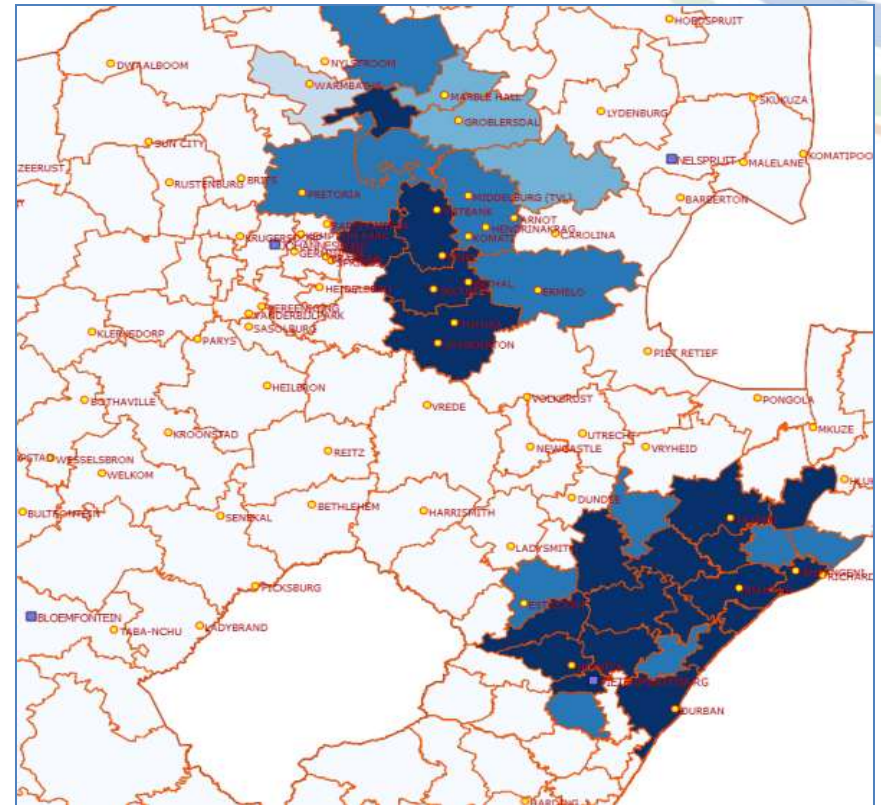
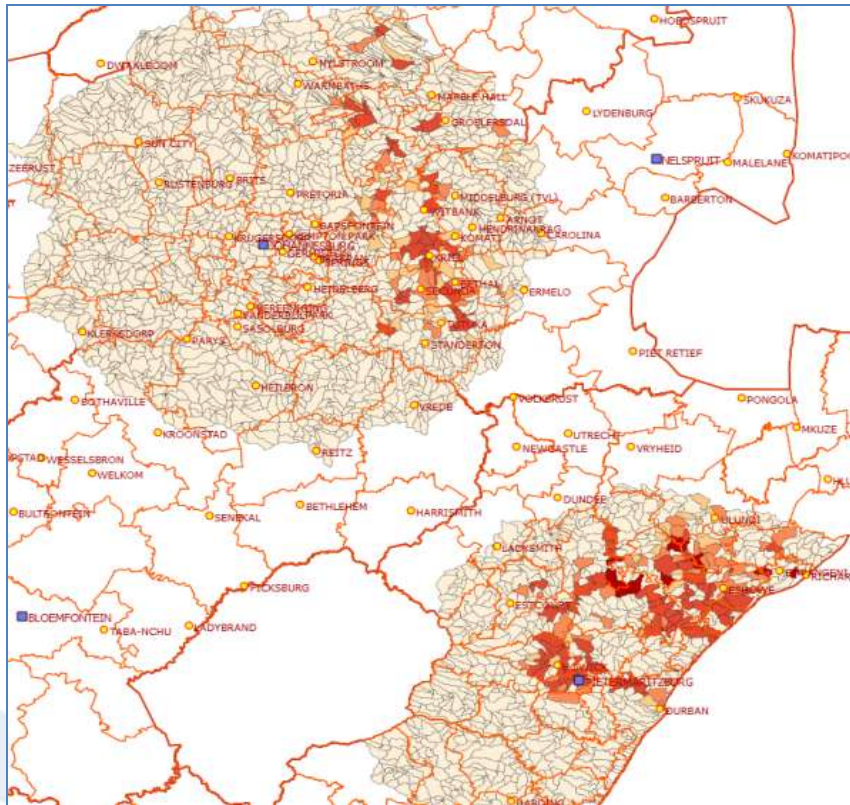
- SARFFG is based only on satellite rainfall estimation – HE
 - Will deal well with larger scale events (TCs, MCSs, etc)
 - Will struggle with smaller scale high intensity events (individual T/S)
 - Will struggle with heavy rain from stratiform clouds (however this is mostly a problem for southern and south-western coastal regions of South Africa)
- Deals not very well with urban flooding where water accumulate on tarred roads and parking areas, and into storm-water channels – it assumes a “naturalized” basin with little interference
 - Very small percentage of the basins in the system (<0.1%), but important
- However, SARFFG still provided very valuable guidance to forecasters of a hazard that we have no information on in the past
- **Hydrological response of small streams to rain – flash flood potential**

Future Developments

- Continuous development around the FFGS technology:
 - How to deal with urban flood events
 - Extending the lead time of FFGS from 6 hours, to a 24 or 36 hour outlook using NWP and Short-range EPS
 - Develop enhanced products to alert forecasters
 - Develop enhanced products for Disaster Management decision making



Example of enhanced forecast products based on NWP



0-18 hour FFP (left) and LM-FFH (right) fields of the UM xaang run of 07th 00-hour based on the 06-hour FFG

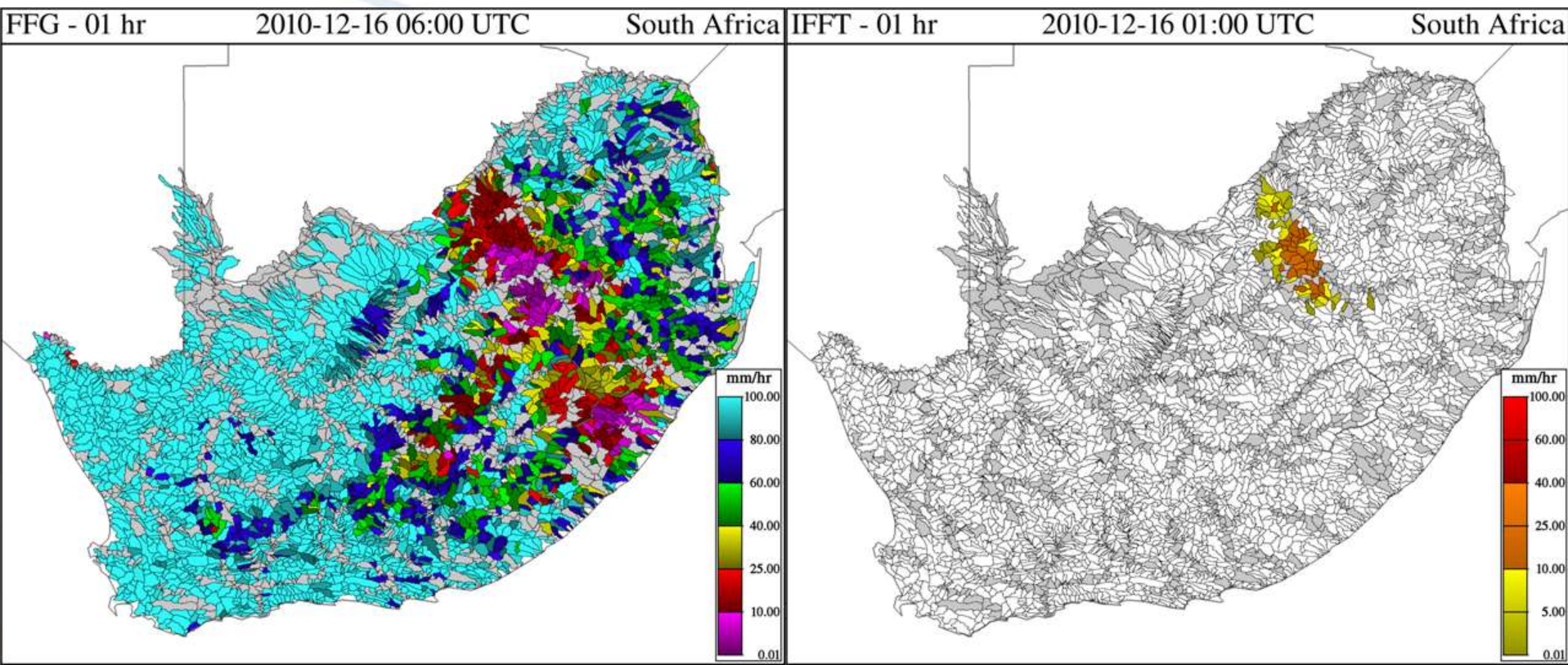


EXAMPLES

Case 1:

Flooding in Gauteng: 15-16 Dec 2010

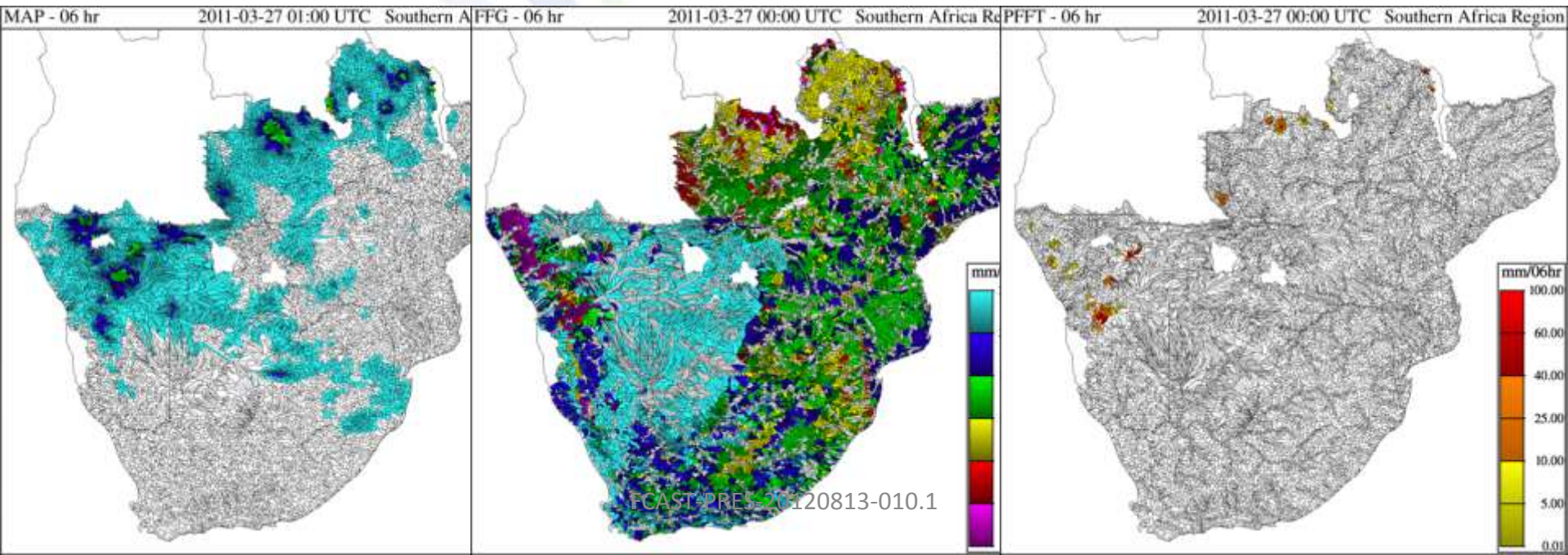
- Severe flash flooding occurred in various places with some fatalities, severe disruption and infrastructure damage
- SARFFG was able to capture this event successfully



Case 2:

Flash flood events in Namibia: 2011/3/27

- Captured flash flooding in central Namibia quite well
- Also provided useful info to hydrologists in Namibia's river flood dilemma in early 2011



Case 3: Tropical Cyclone Dando - 18 Jan 2012

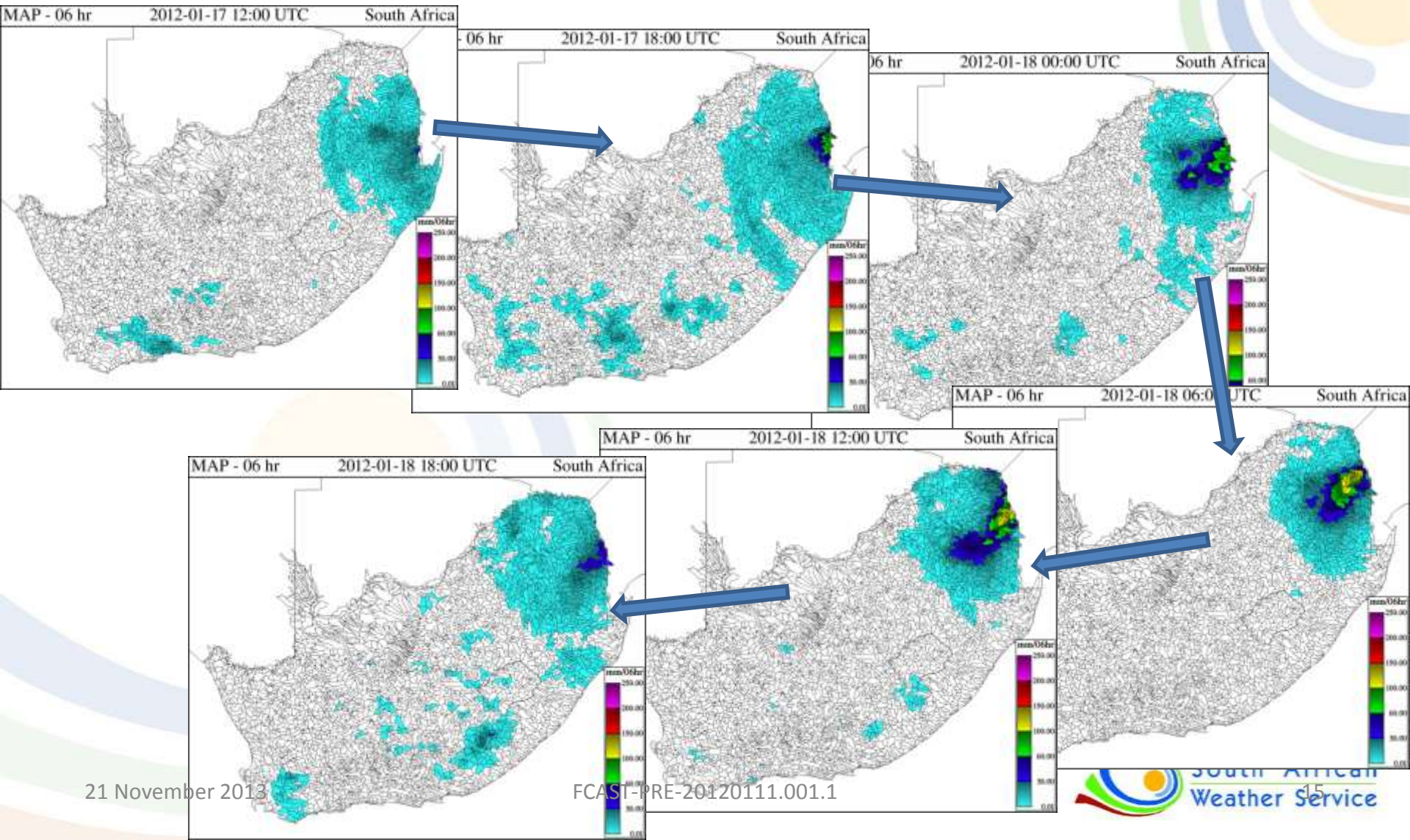


BACKGROUND

- Dando caused significant flooding in Southern Africa particularly Mozambique and South Africa
- Kruger Game Reserve severely hit where the rest camps are on the river banks.

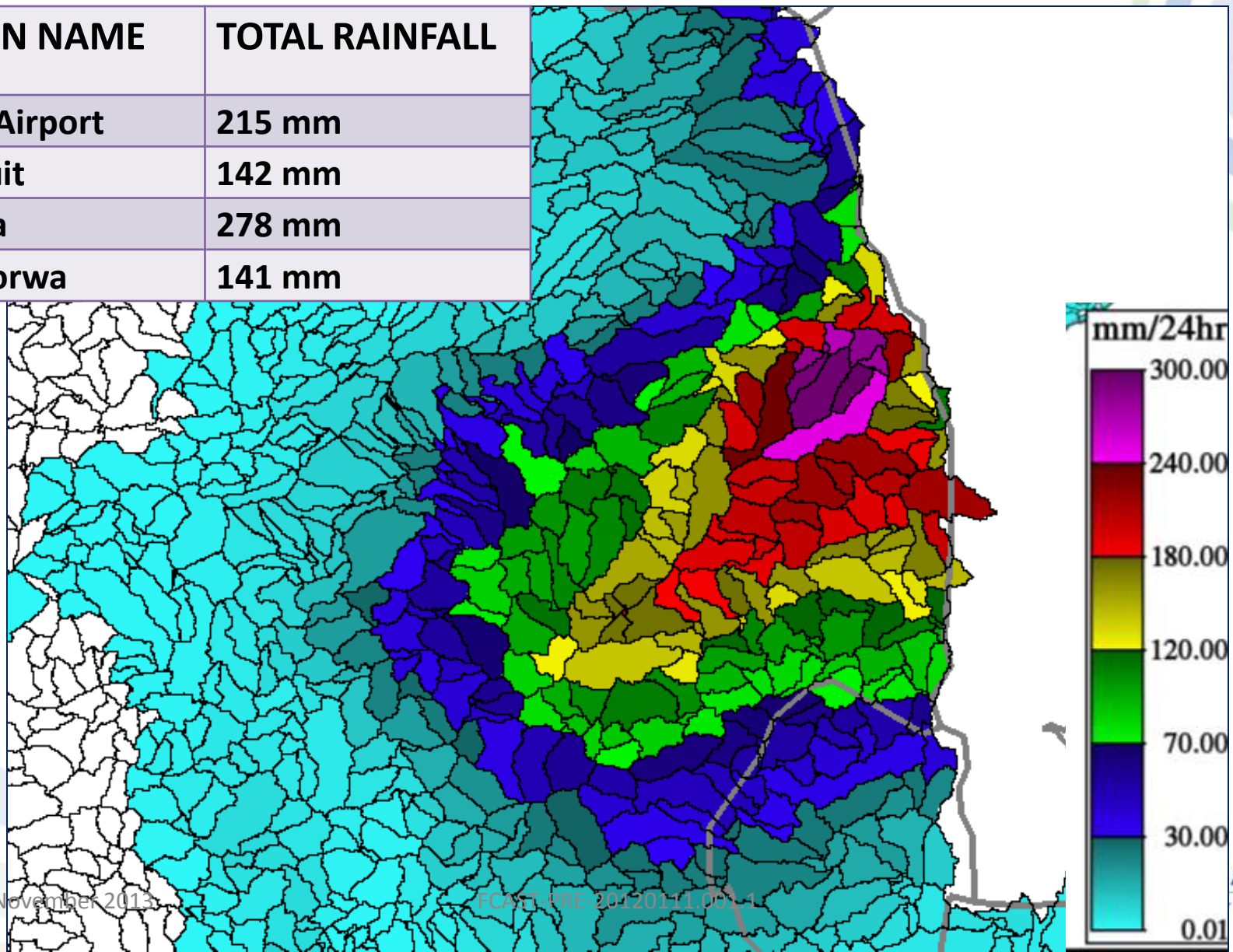
Some enjoyed it, though!

Sequence of 06 hour rainfall measured from 17th 12:00 till 18th 18:00

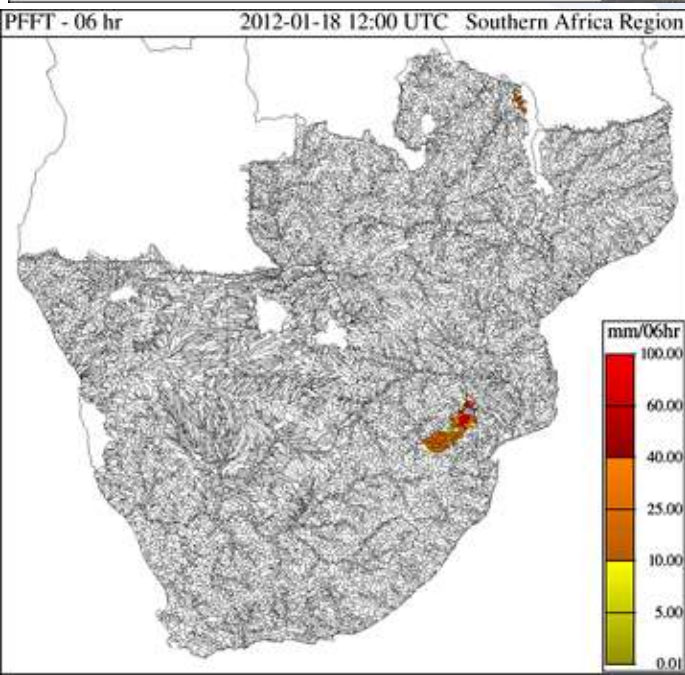
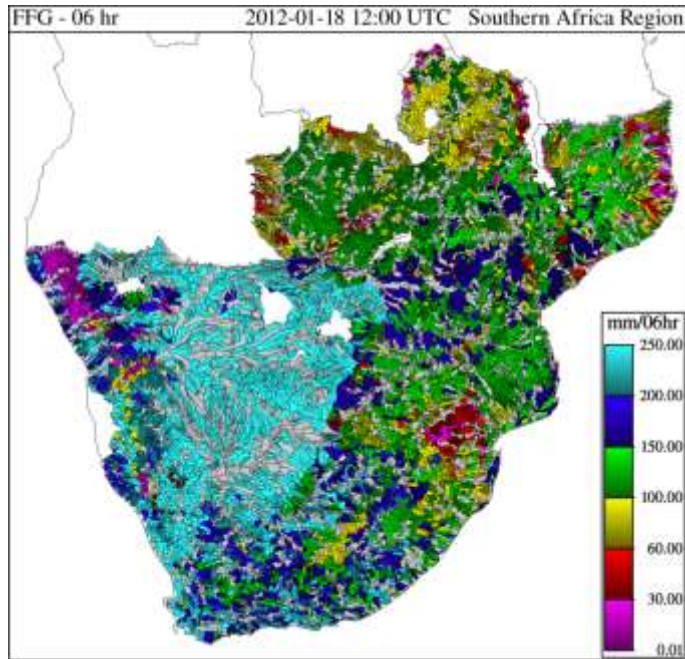


Past 24 Hour Basin Average Rainfall on 18th 12:00 UTC as Measured by Satellite

STATION NAME	TOTAL RAINFALL
Kruger Airport	215 mm
Nelspruit	142 mm
Skukuza	278 mm
Phalaborwa	141 mm



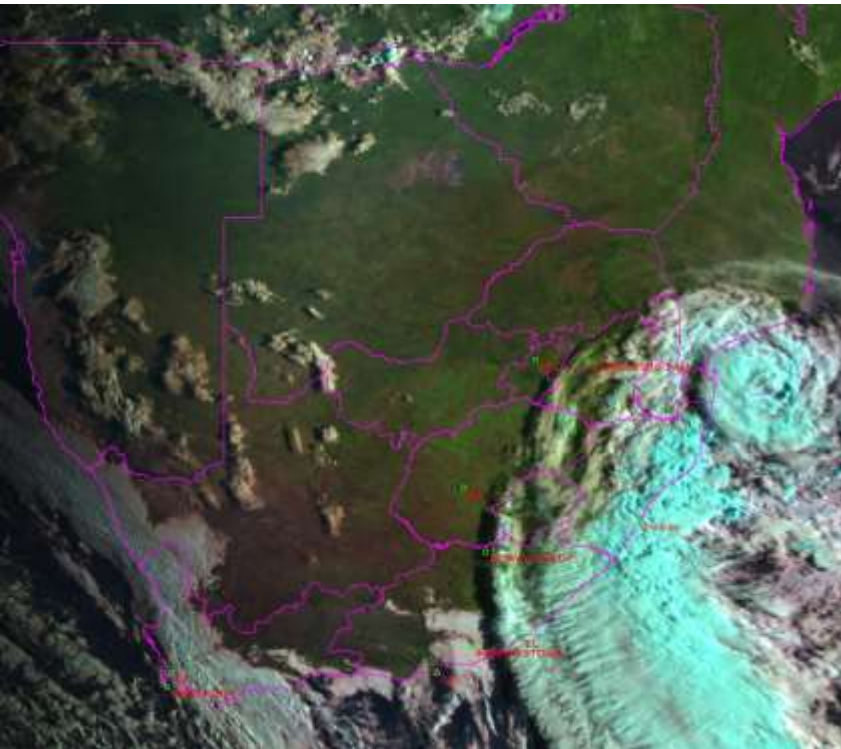
Dando continued.....



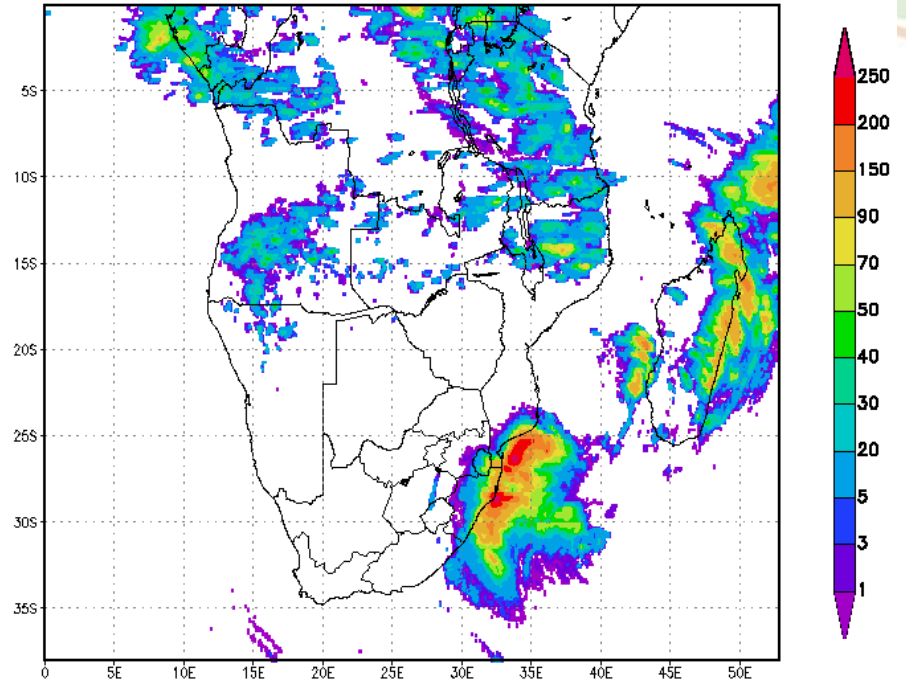
- Though not operational yet, SARFFG indicated excellent potential.
- Satellite based rainfall estimation proved to be quite useful for large scale systems
- Based on other guidance general flood warnings were issued to Disaster Management in both Mozambique and South Africa

CASE 4:

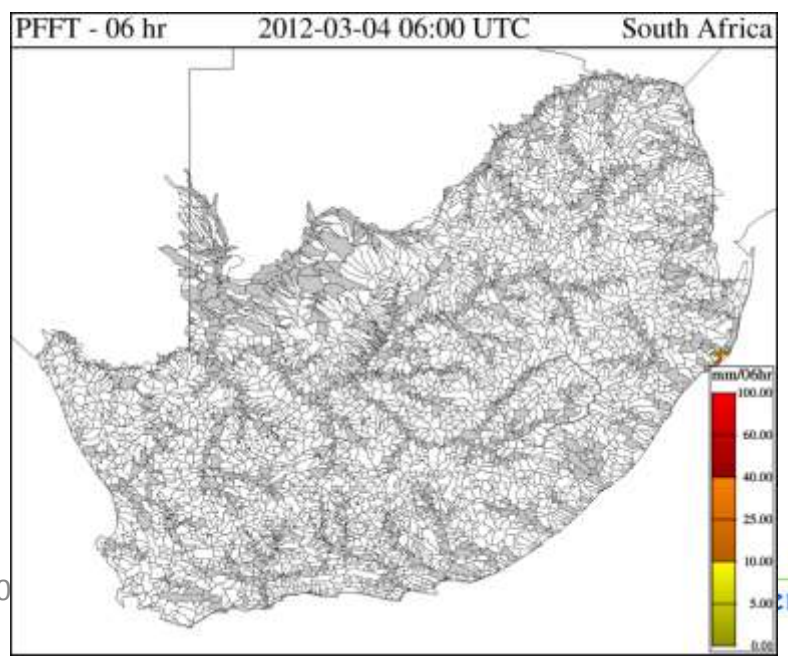
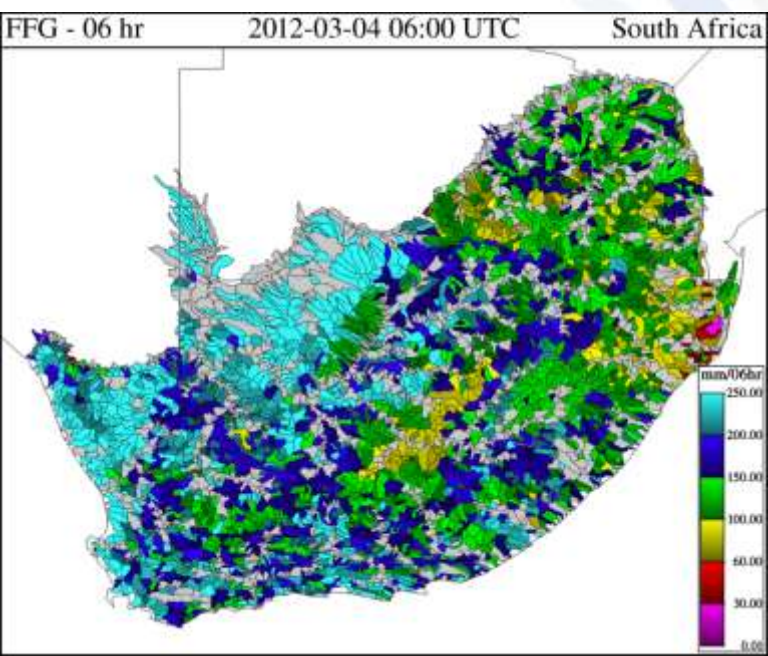
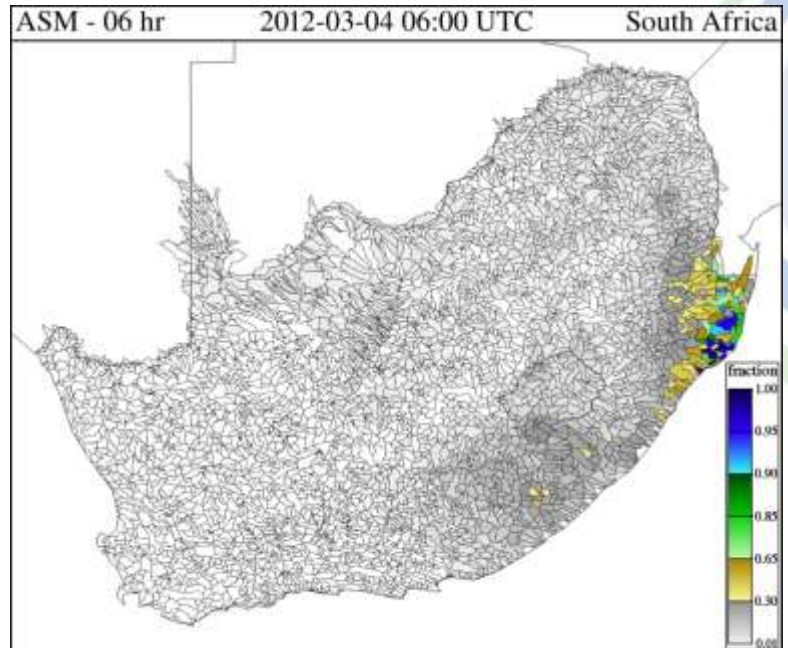
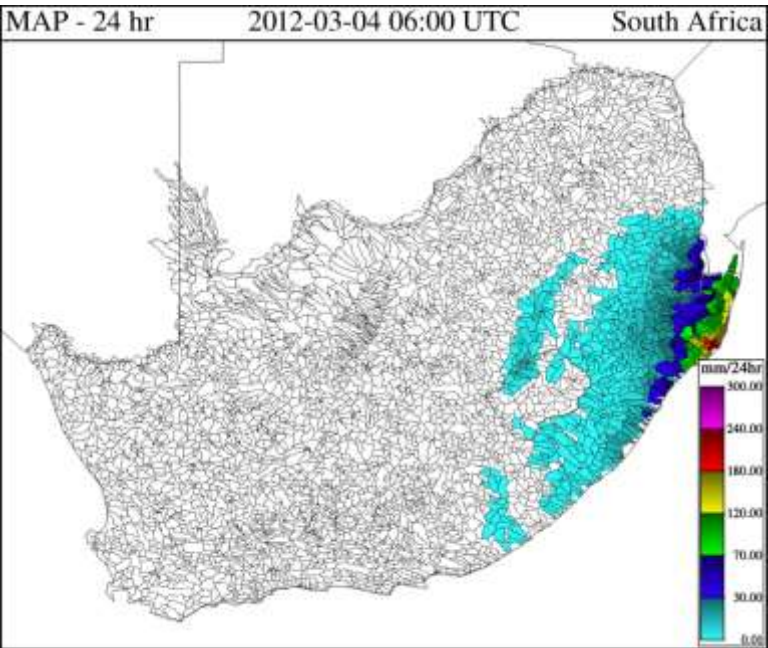
Tropical Cyclone IRINA- KZN: 4 March 2012



Hydro-Estimator Rainfall Total mm past 24 hours
20120303 04:00Z – 20120304 04:00Z



Flash Flood Guidance System



FCAST-PRE-20

Implementation of SARFFG

- Beta-system already running on at HRC in San Diego for a year
- Case studies has demonstrated its potential for flash flood guidance, and hydrologists in Namibia found it useful even in river flood situations
- Transfer of system scheduled for 2013 or early 2014 to RSMC Pretoria at SAWS
- NMCs in countries will have internet access to the system for their own countries
- Training event will be conducted for forecasters and hydrologists of these countries probably in Feb 2014, depending WMO Hydrology



Thank you