



PAPER PRESENTATION

- APPLICATION OF SATELLITE INFORMATION IN DISASTER MANAGEMENT AND EMERGENCY RESPONSE IN MALAWI
- A case study of tropical cyclone Delfina
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INTRODUCTION

- The Malawi government has emphasized on the need to promote economic growth and advancing poverty reduction strategies.
- Weather and climate information can be a threat to production thereby contributing to decline in economic growth.
- Proper utilization of weather and climatic information can positively contribute to various sectors of the economy including disaster management.

INTRODUCTION CONT.

- So development of early warning system is crucial especially with improved human skills and appropriate technologies
- Therefore there is no doubt that satellite based information can contribute greatly to economic growth of Malawi.
- Satellite system technology is currently being used in a wide range of sectors such as: aviation, mapping and surveying, agriculture and natural resources, monitoring of environment including meteorology...

OBJECTIVES

- This presentation tries to illustrate how satellite data was used in now casting and short range forecast for tracking a tropical cyclone Delfina during 2002-3 cyclone season in South West Indian Ocean.
- To show the role of meteorological information in disaster management and emergency response in Malawi

METHODS USED FOR TRACKING AND FORECASTING SEVERE WEATHER SYSTEMS

- Analyses of synoptic charts and plotting cyclone positions
- Numerical weather prediction products ECMWF,NOAA
- Satellite imageries
- Bulletins from Regional Specialised Meteorological Centre La reunion

USE OF SATELLITE IMAGES

- Satellite images help in determining the position of the centre of the cyclone
- The eye's position is based on enhanced infrared and microwave satellite imagery
- Animated satellite images show the track that has been followed and can help to predict future direction of the cyclone

SUMMERY OF DELFINA

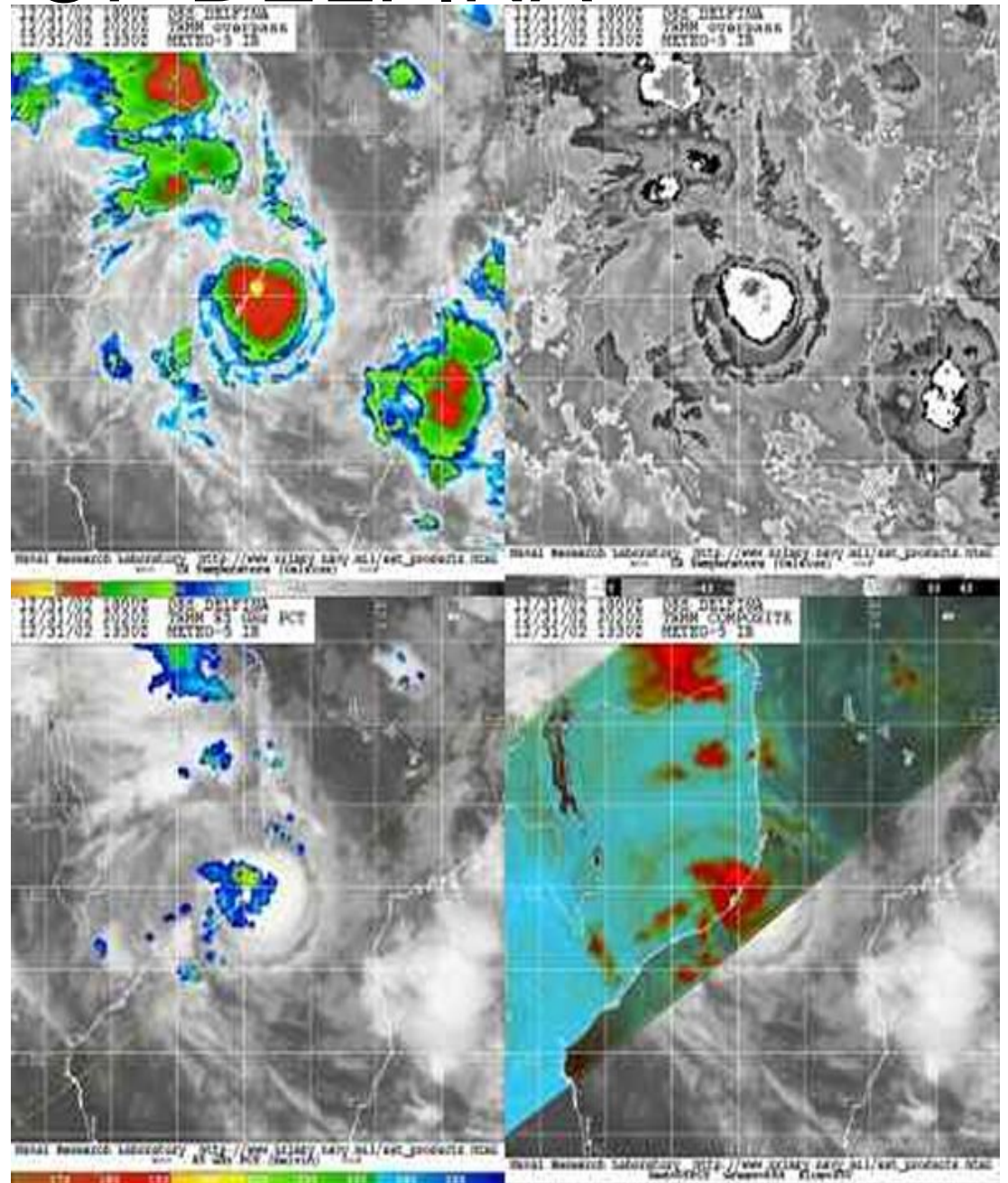
- **Tropical cyclone Delfina(08S) developed on 30 December 2002 and lived up to 4th January 2003.**
- **Tropical Cyclone 08s, Located Approximately 140 Nm East Of Mozambique In The Mozambique Channel**
- **Tropical Cyclone (TC) 08S developed quickly in the Mozambique Channel and attained a maximum intensity of 80 knots just prior to making landfall in Mozambique.**
- **After landfall, the cyclone rapidly weakened. Over land, TC 08S continued to move westward and entered Malawi.**
- **With the low level circulation center still identifiable, TC 08S then looped, headed southeast and re-entered the Mozambique Channel.**
- **After re-entering the Mozambique Channel, the cyclone tracked south for 72 hours before dissipating.**

TRACK OF DELFINA

- 30 December 2002 1200Z it was centred at 16.0 S 43.0 E in the Mozambique channel with a central pressure 1007hPa
- General movement was westwards

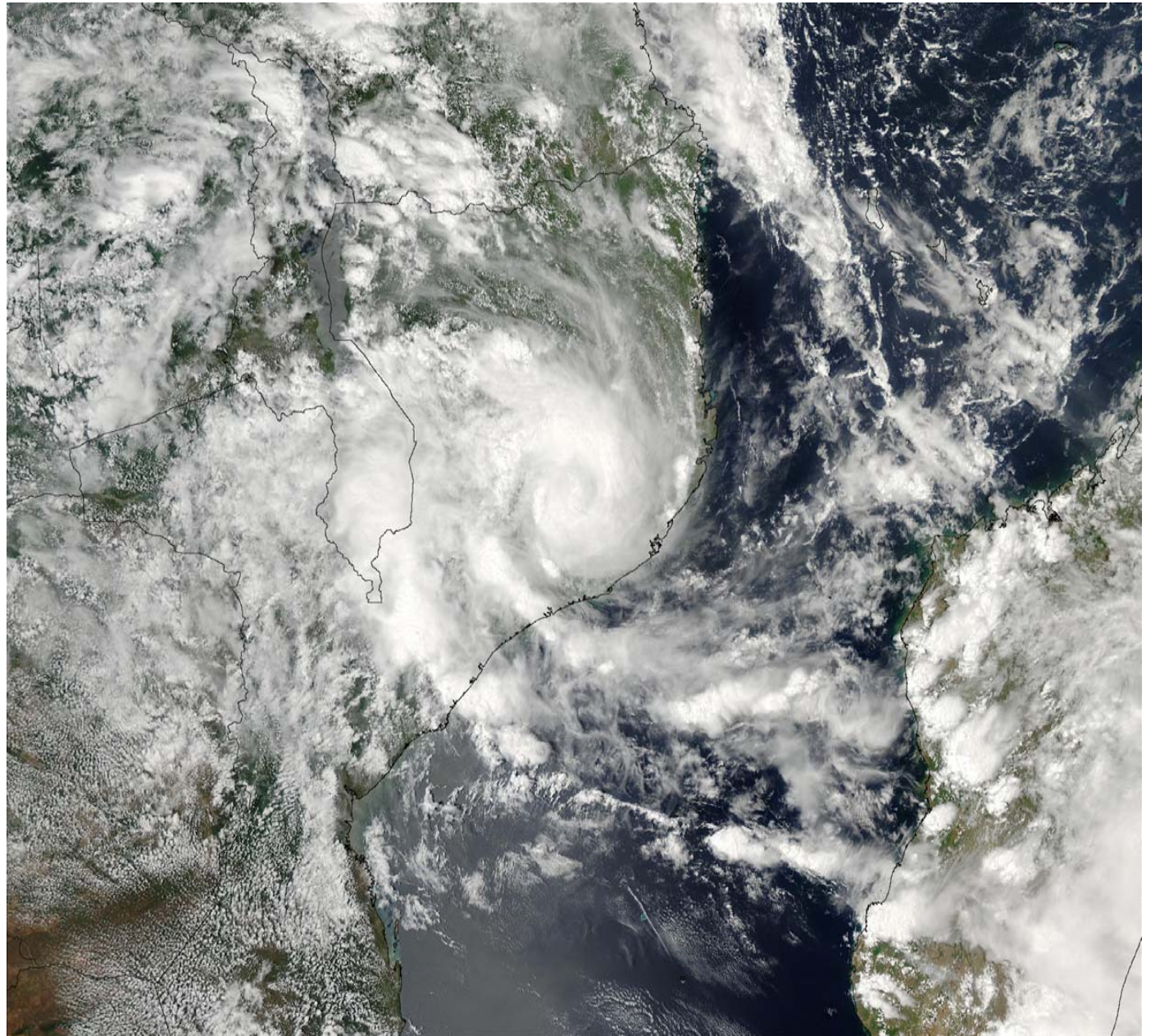
TRACK OF DELFINA

- It made a land fall Near Angoche, Mozambique during the night of 31st December, 2002
- 31 Dec 2020Z 55Kts
40.2 E 984hPa winds
of 33Kts
- DEC 31 0000 16.3 S
41.0 E 1000hPa



TRACK OF DELFINA CONT.

- **JAN 01 0000
16.0 S 39.6 E
982 Inland of
Mozambique
011105Z
January 2003
image of TC
08S (Delfina),
located over
Mozambique,
with an
intensity of 30
knots.**
- **winds gusting
up 55Kts**

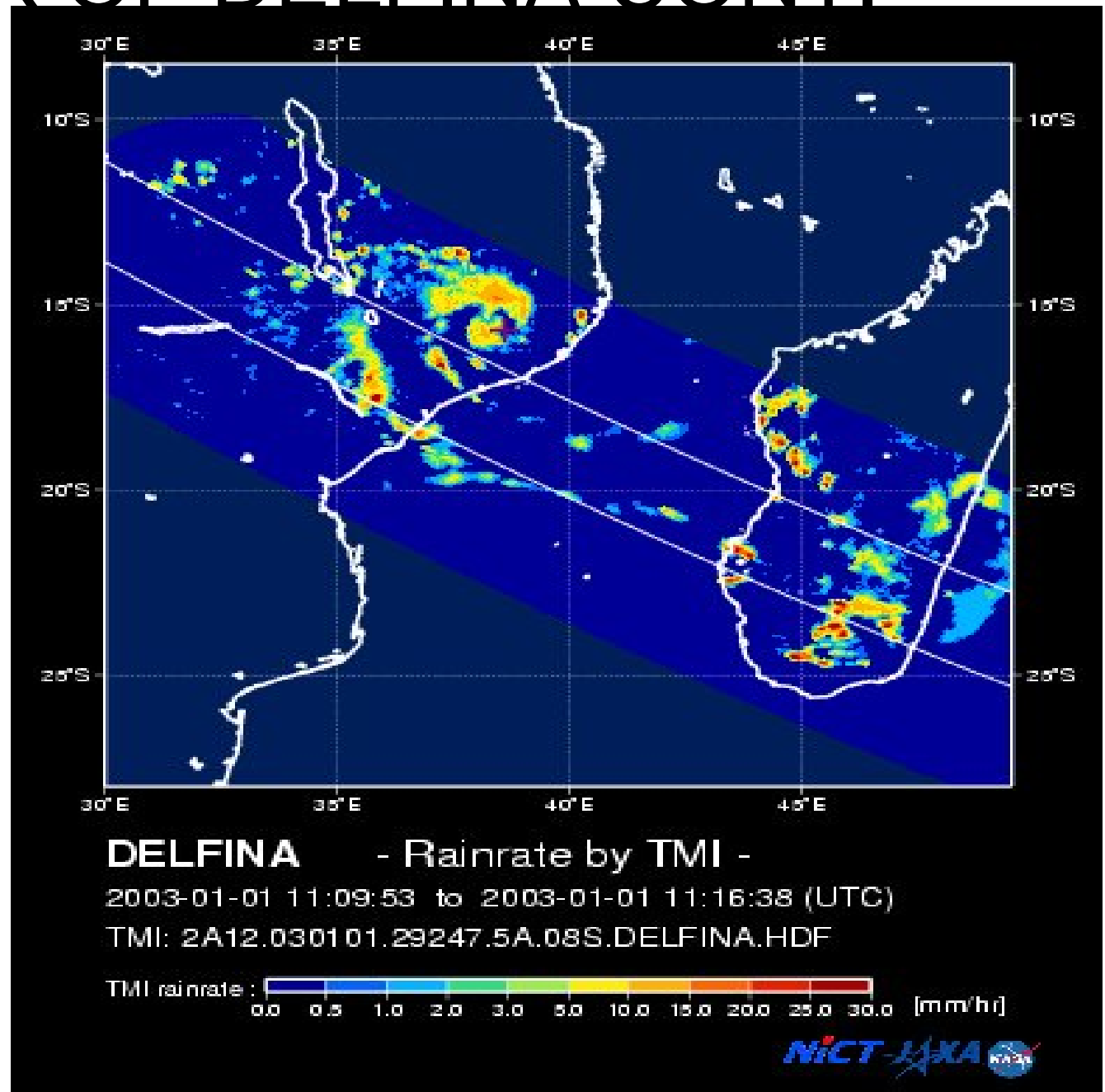


TRACK OF DELFINA CONT.

The storm weakened as it moved slowly westward across Mozambique and southern Malawi during January 1-2, 2003, bringing very heavy rainfall

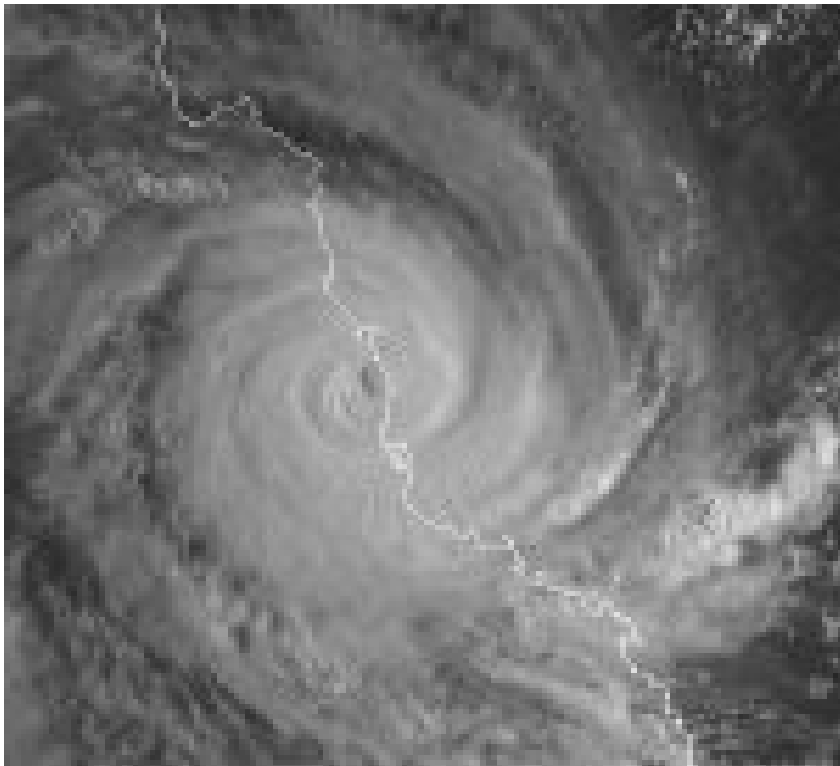
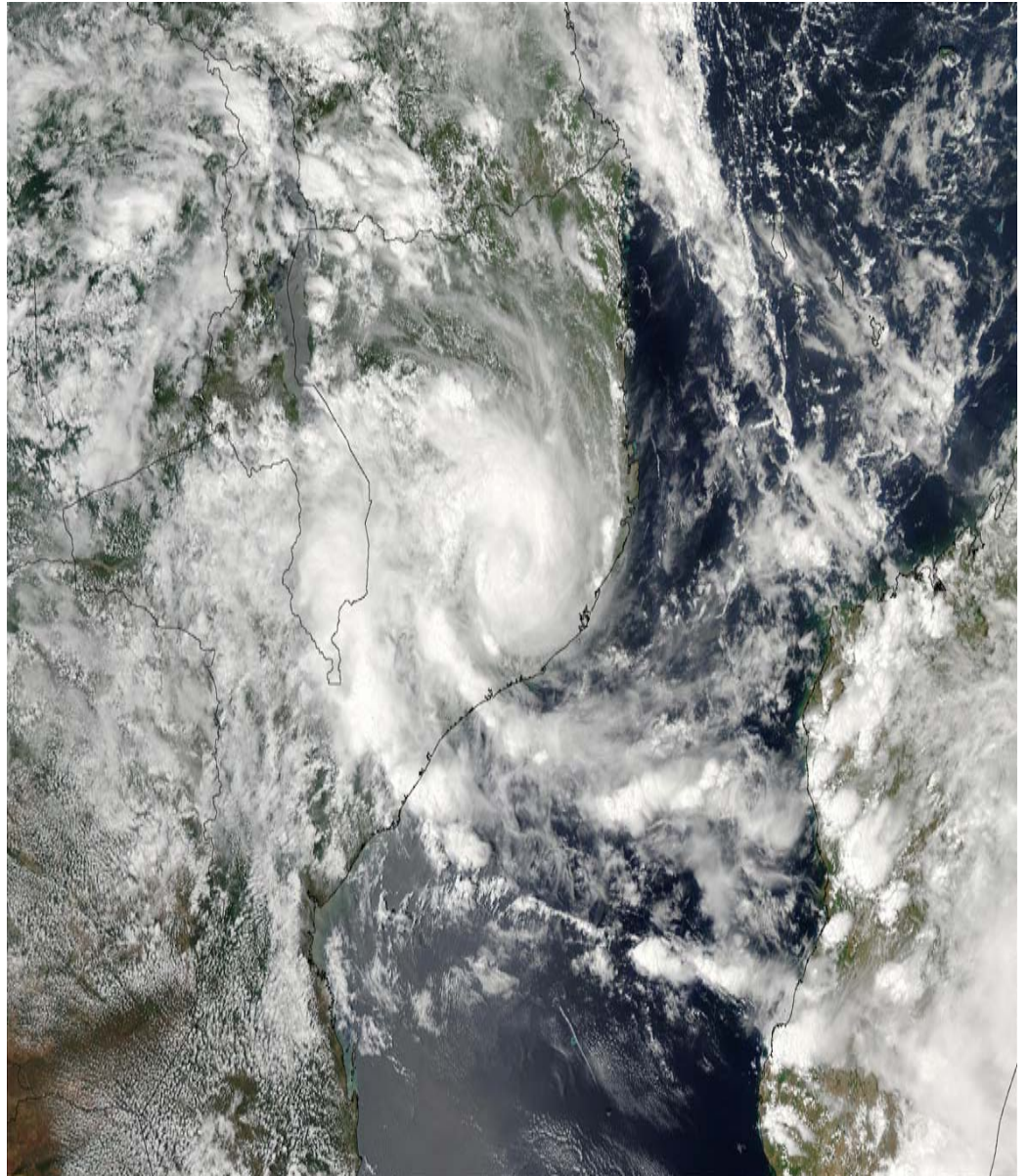
A Japan polar satellite image taken on Jan 1, 2003 at 11:12UTC during orbit number 29247

This image is Showing rain rate between 11.10 and 11.16UTC



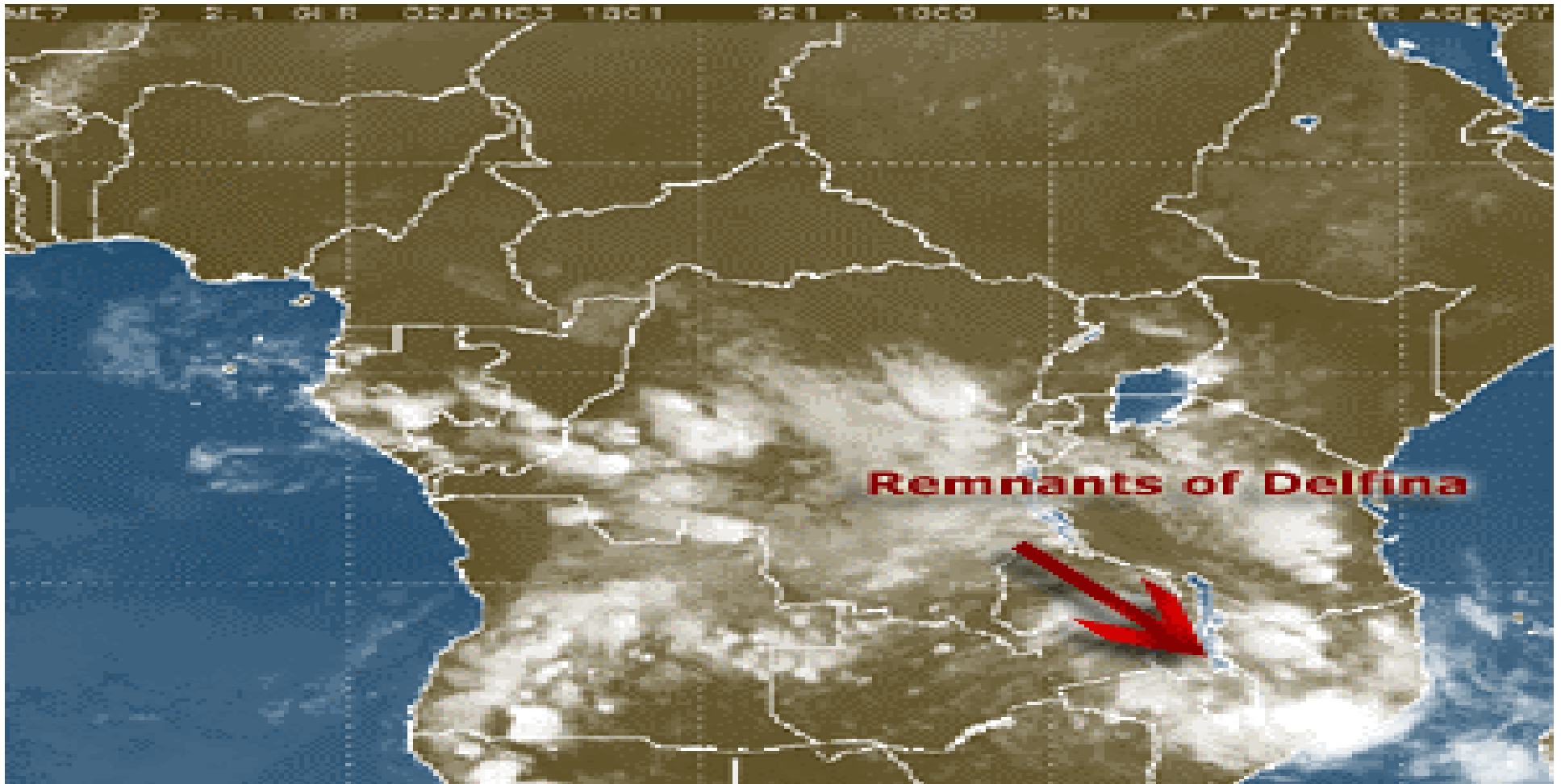
TRACK OF DELFINA CONT.

- On 2nd January 2003 it was centred at 16S and 35E and had moved to southern Malawi



Remnants of Delfina 4th January

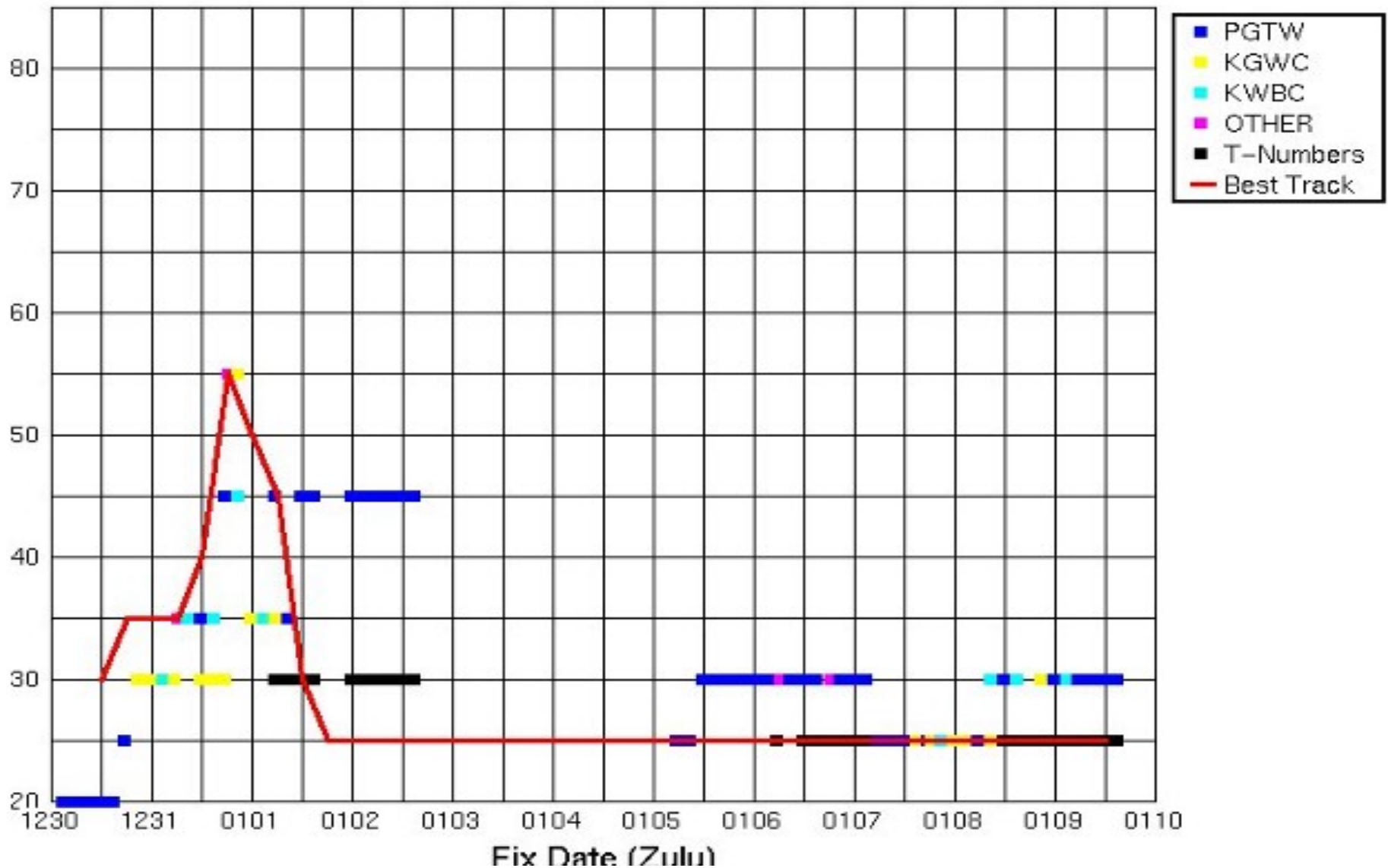
- On 3rd January 2003 turned into an ordinary low pressure located at 16.27S and 34.89E



DELFINA INTENSITY

Time Intensity for 08S

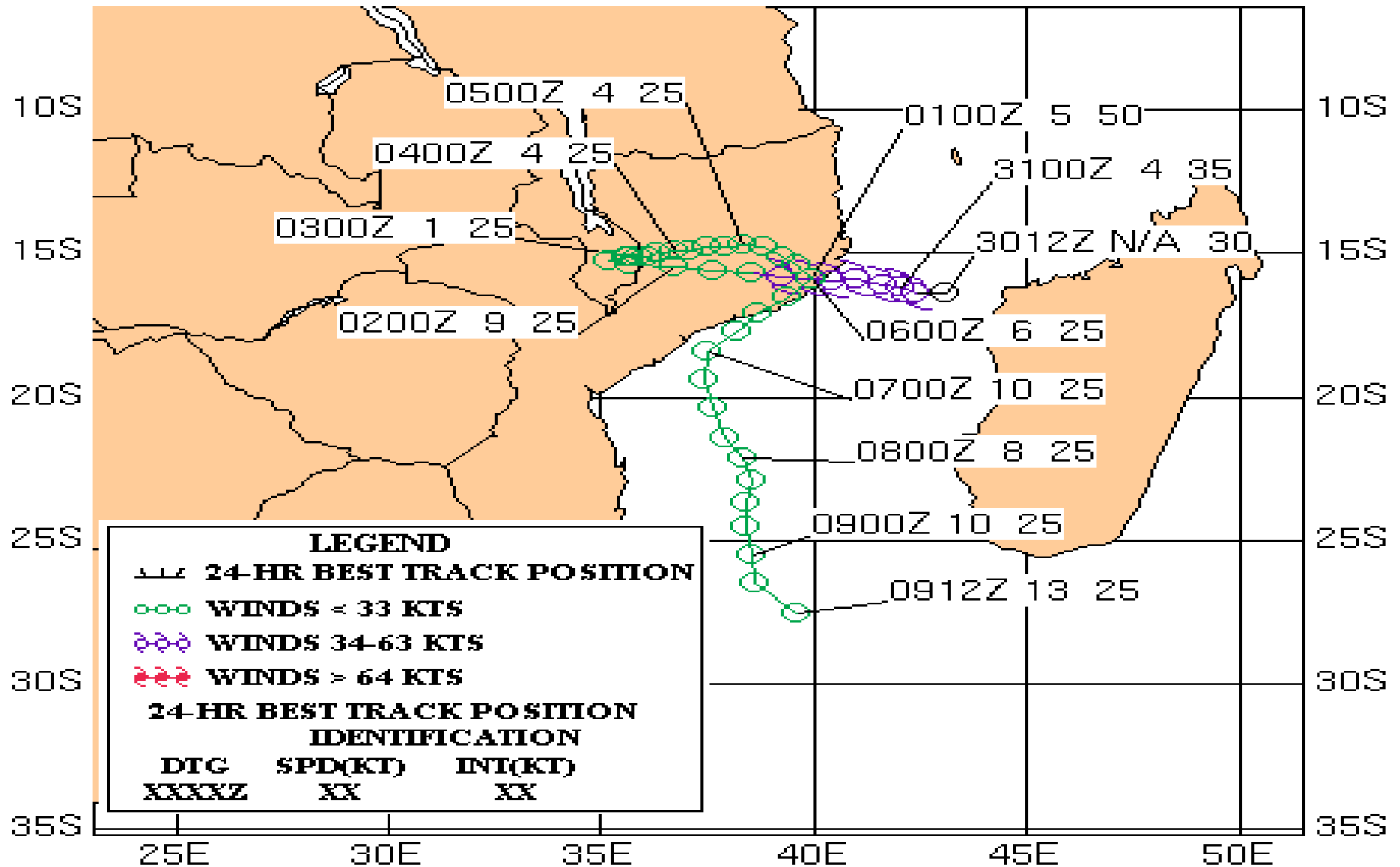
Intensity (kts)



TRACK OF DELFINA

TROPICAL CYCLONE 08S (DELFINA)

30 DEC 2002 - 01 JAN 2003



Impacts of Tropical Cyclone Delfina

- Wide spread rains
- Strong winds
- Flooding
- Damages of infrastructure such roads, bridges railway line, power line
- 9 people were feared dead and one missing
- 30,000 people were displaced
- Many hectares of crop fields were washed away
- Many people were prone to hunger
- The president of Malawi declared a state of disaster on 11th January 2003 describing the flooding as a disaster of the highest proportion

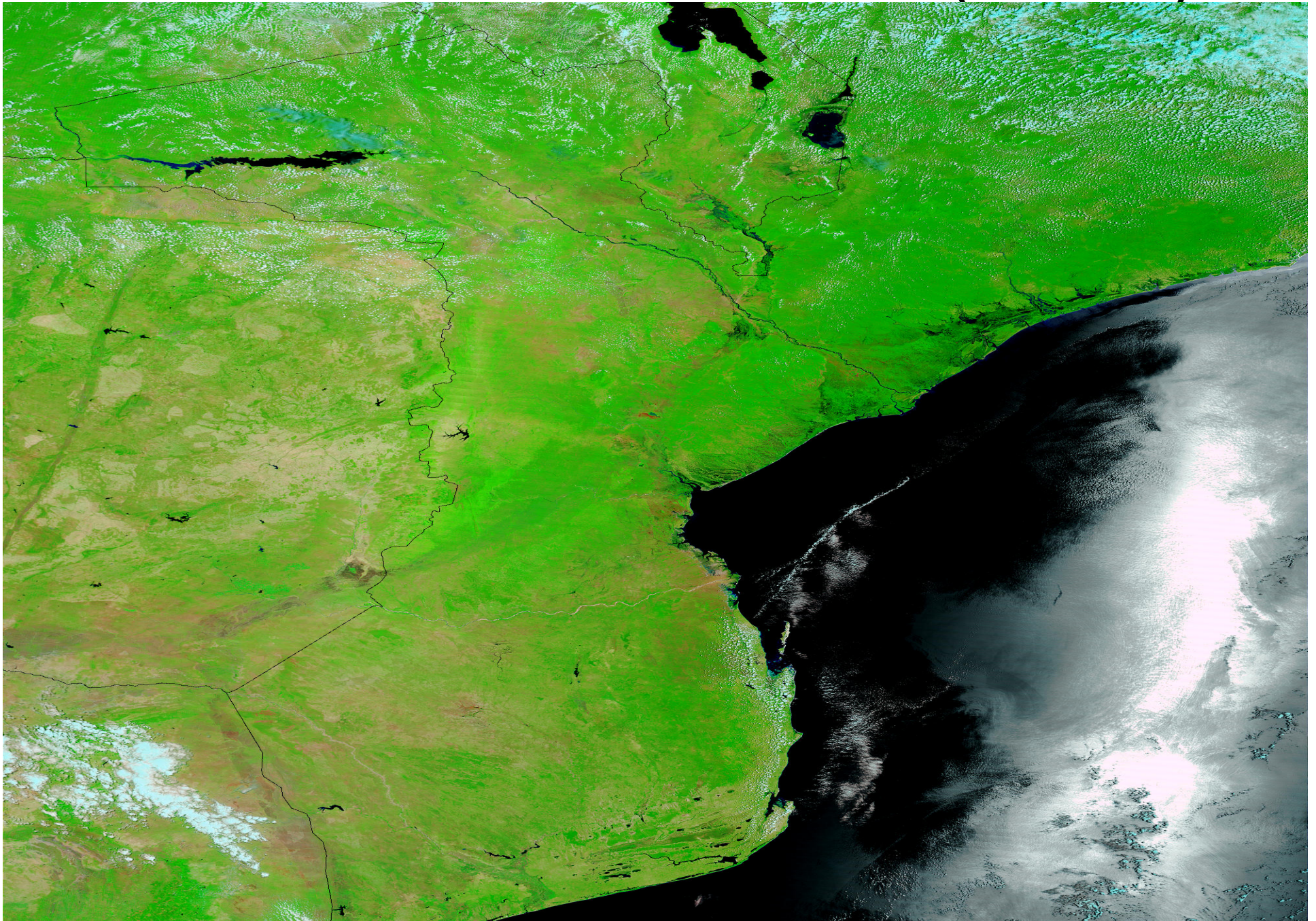
Impacts of Tropical Cyclone Delfina

- Press reports indicated that TC 08S brought heavy rains and winds to Mozambique, causing a reported 58 fatalities.
- Reports further indicated that the cyclone left approximately 300,000 persons homeless, damaged crops, and causing infrastructure damage costing \$3.5 million

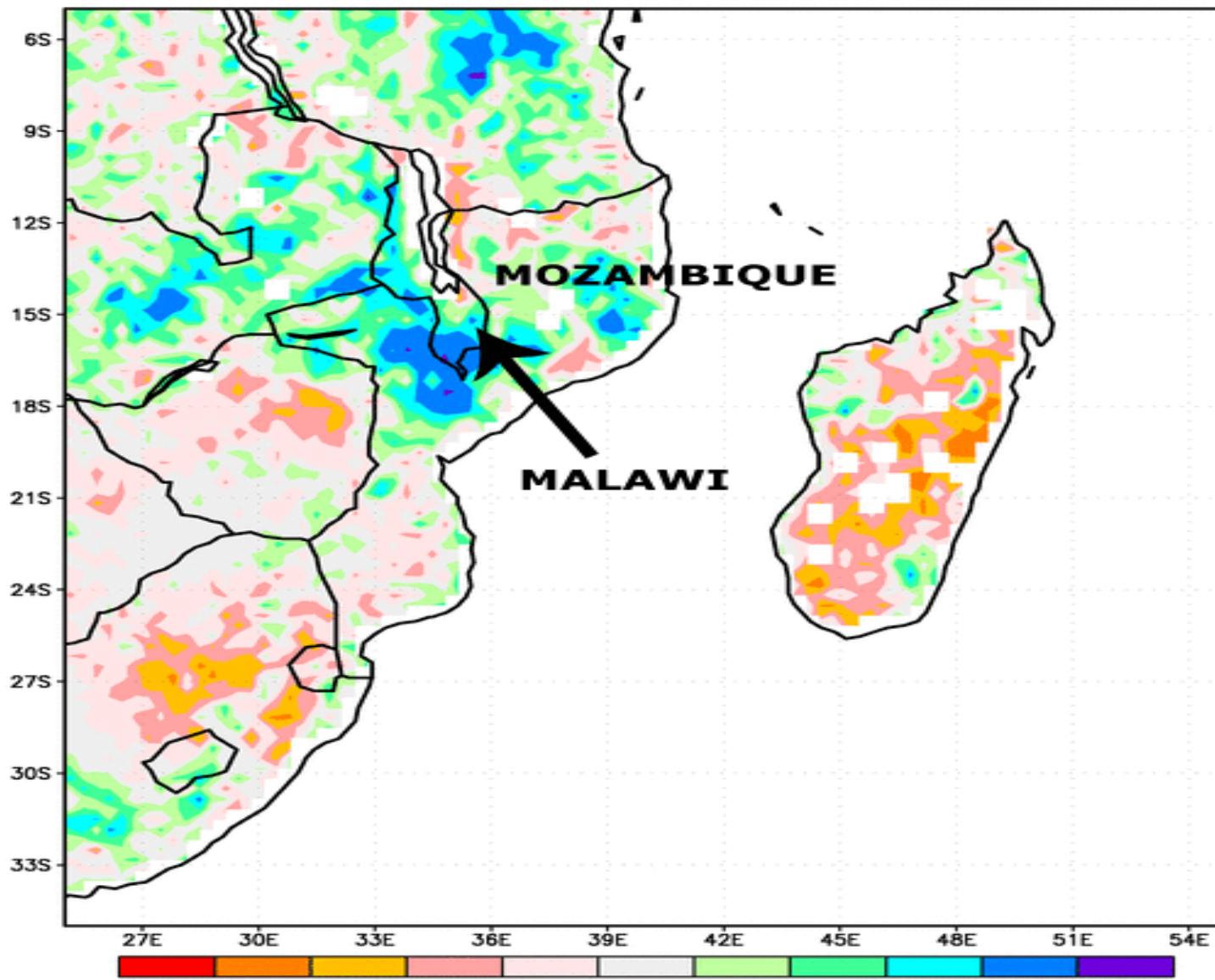
Actual rainfall amounts (mm) for 1,2,3 January 2003 3 day totals, 10 day totals and 10day normal for selected stations

DATE	1	2	3	3day total	10day total	10 day normal
Balaka	25.8	7.5	54.3	150.6	166.2	52.5
Chancellor colage	60.8	122.5	40.7	163.5	231.3	107.0
Chikwawa	61.6	27.5	29.4	118.5	236.3	60.8
Mimosa	66.1	81.8	20.8	168.7	314.1	91.4
Monkeybay	5.2	57.2	60.4	122.8	159.6	64.9
Mulanje	85.3	50.7	20.4	156.4	397.3	108.4
Mwanza	40.6	100.0	22.9	163.5	264.0	72.1
Nchalo	38.6	88.6	17.1	144.3	224.9	50.6
Nsanje	69.5	52.9	15.5	137.9	214.9	56.7
Ntaja	41.0	52.5	33.0	126.5	151.7	69.9
Toleza	15.4	53.8	27.5	96.7	122.7	62.5
Thyolo	41.5	34.1	55.5	131.1	317.9	66.6
Zomba	43.4	94.1	36.5	174.0	242.9	73.0
Dedza	15.9	90.9	100.6	207.4	342.6	79.1
Ntcheu	29.1	296.5	23.1	348.7	358.3	92.9
Salima	0.7	50.3	96.5	147.5	206.7	81.3

FLOODS OVER MALAWI (NASA)



SATELLITE DERIVED SURFACE WETNESS ANOMALIES – SE AFRICA
STANDARDIZED (GAMMA) ANOMALIES FOR JANUARY 1 – 7, 2003
BASE PERIOD 1988 – 2002



Very Dry

Dry

Normal

Wet

Very Wet















WEATHER RELATED DISASTER WARNING PROCEDURES

- The department of Meteorology is a member of National Disaster and emergency response committee of Malawi
- The Department as a member of the committee is responsible for monitoring and prediction, issuing of warnings and forecasts of weather and climatic hazards.
- The task of WMO and National weather services involves developing and sharing information on natural hazards, ensuring that the disaster management community, decision makers and the public understand the risks posed by these hazards and recognise the onset of hazardous weather.
- Right now the department has initiated a project on linking with other members of the committee to be connected on line for easy sharing of information.
- Other members in the committee include ; Department of Disaster preparedness in the Office of President and Cabinet, Ministry of Agriculture, Ministry of Defence and Internal Security, ministry of water development...

WARNING PROCEDURES

- **INFORMATION STAGE**
- When a tropical cyclone is located at 45-50E and 5-20S
- The following are informed;
- commissioner for disaster relief and rehabilitation,
 - principal secretary for ministry of transport,
 - Army and police
 - Water development

WARNING PROCEDURES

- **ALERT STAGE**
- Cyclone within 500-1000Km from Malawi boarder in the channel and the cyclone is likely to affect Malawi
- Warning is updated every 6 hours
- At this stage evacuation preparation starts
- The following are informed
 - National road authority,
 - Escom
 - Agriculture
 - Office of the president and cabinet

WARNING PROCEDURES

- **WARNING STAGE**
- Cyclone within 500Km for Malawi boarder
- The warning is updated every 3hours
- The following are informed
 - Malawi Telecommunication Limited,
 - Director of information
 - Media houses
 - General public

CONCLUSION

- During this period the disaster warning and emergency response system was at work in Malawi without which the impacts would have been a catastrophe
- Satellite information played a crucial role in this system by tracking the position and likely areas to be affected.
- So every individual, families, and communities have to work with NMSs and disaster prevention and mitigation bodies to be informed, to be prepared and to be safe.

CONCLUSION CONT.

- Malawi weather service identifies and monitors potential weather hazards and issue warnings and thus play a critical role in preventing a hazards from developing into a disaster.
- Disaster warning system can be reliable if tools and satellite technologies are well understood by those dealing with disaster prevention, mitigation and emergence response.
- So this training is very relevant to Malawi and department of meteorology in particular as it will enhance already existing satellite technologies

ACKNOWLEDGEMENT

- EUMETSAT.
- NOAA/NASA.
- Japan Aerospace Exploration Agency (JAXA);
tropical cyclone data base
- Nation News Paper in Malawi dated 7 January
volume 10 number 4.

ITS TIME FOR
COMMENTS