2018

Force Thirteen
Cyclone Reports

Cyclone Berguitta (201804)

Cyclone Berguitta was the fourth cyclone of the year, and the second to reach major hurricane status according to Force Thirteen's analysis. Berguitta gravely threatened the islands of Mauritius and Réunion, but ultimately the worst effects were avoided by its slow movement and eventual weakening.

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Cover photo: Enhanced true-colour image of Cyclone Berguitta on January 15, 2018.

FORCE THIRTEEN

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1.1. Synoptic History

In the wake of Cyclone Irving, which passed through the central Indian Ocean as a Category 2 storm, a new area of disturbed weather distinguished itself from the general monsoonal pattern near the equator, and started to move towards the Mascarene islands. Late on January 10th, it was first picked up by the U.S. Navy and designated as Invest 97S. Later, on January 11th, the system was recognised by Metéo France La Réunion.

Into January 12th, the system displayed significant amounts of convection although maintained an asymmetric appearance for a time, and the circulation of the new tropical storm first became clear when the convection reduced on January 13th. By this time, peripheral clouds and showers from Berguitta were already reaching Mauritius.

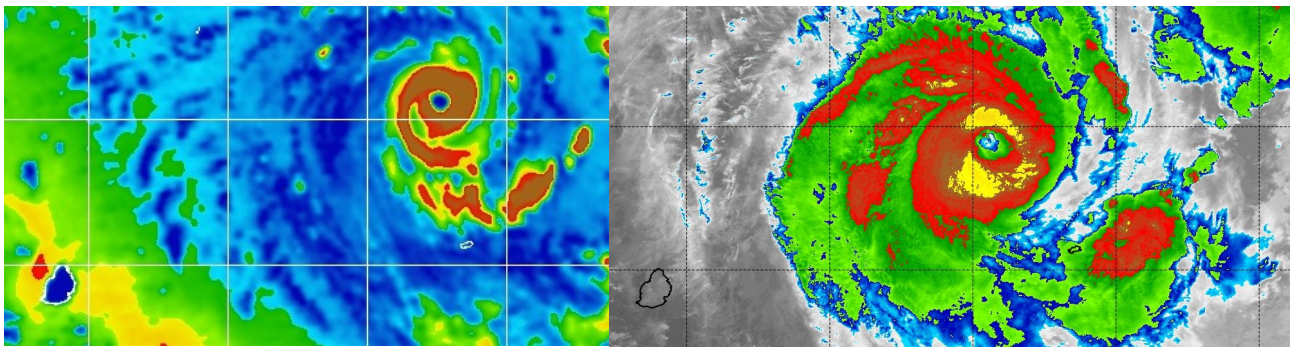
Berguitta gradually intensified and was expected to maintain a fairly constant speed towards the islands, passing barely 100 miles north of Rodrigues and unexpectedly stalled. Despite this stalling motion, the storm significantly intensified and by the early hours of January 15th, Berguitta displayed an eye for the first time. The storm initially moved towards the southwest by this time, and briefly peaked as an impressive Category 3 storm later on in the day, and was forecast to become stronger still until the eyewall, which had never been completed entirely, began to collapse.

Berguitta continued to move slowly at an average speed of around 4mph for the next two days whilst convection began to become displaced to the north at an increasing rate, either due to dry air, wind shear, or both of these. Later on the 17th, rain began to arrive in Mauritius and stormy conditions prevailed at times throughout the night, when the storm started moving more earnestly to the south and passed Mauritius barely 10 miles to the east.

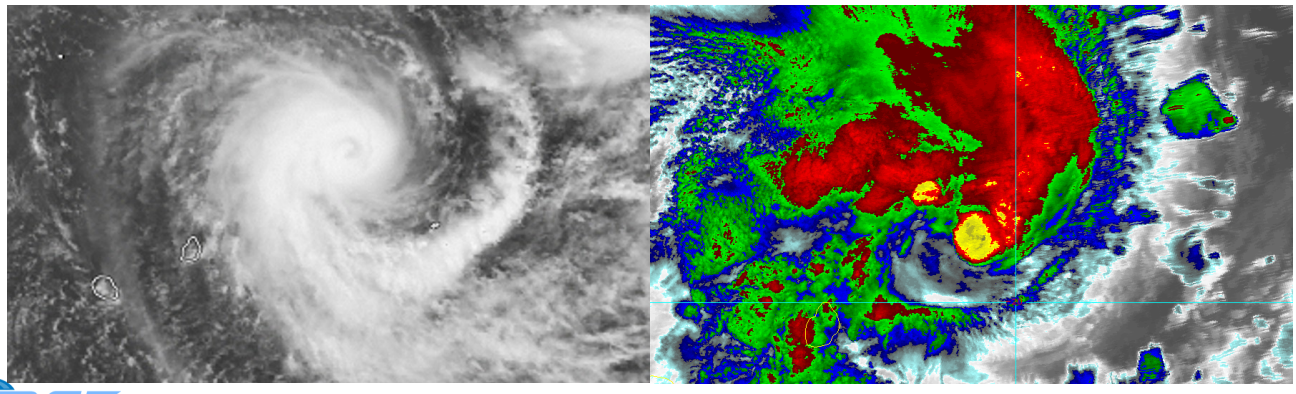
However, by the morning, the storm had weakened substantially, maintaining a tight central core along with weak spiral bands as it began to pass southwest of Mauritius and passing within 50 miles of Réunion. Late on January 18th, the storm regained some of its former convection and gave Réunion substantial wind gusts and flooding rains, before the storm drew clear and survived until January 20th when it turned to the south, clear of Madagascar to the east and turned extratropical.

Some days after its transition, some signs appeared that the storm may yet turn subtropical again, much like Carlos did for a short period in 2017, but this ultimately did not happen.

Selected Images of Berguitta



January 15



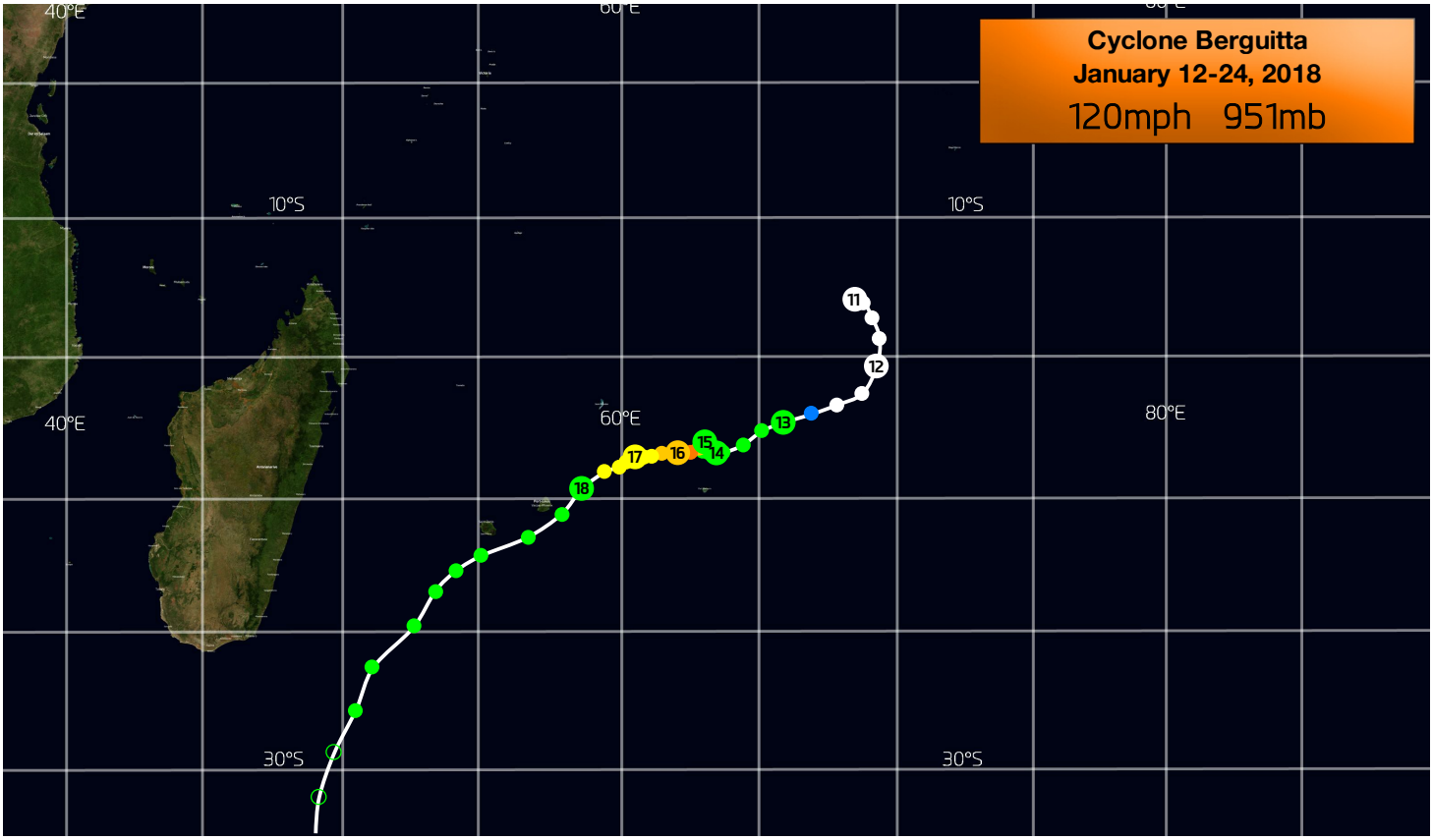
January 16 **January 17**

1.2. Best Track

Below is the best track analysis from Force Thirteen, using Force Thirteen's SATOPS—a tool which uses infrared satellite imagery and cloud temperatures to estimate a storm's wind speed and air pressure. SATOPS does not take precedence over surface observations.

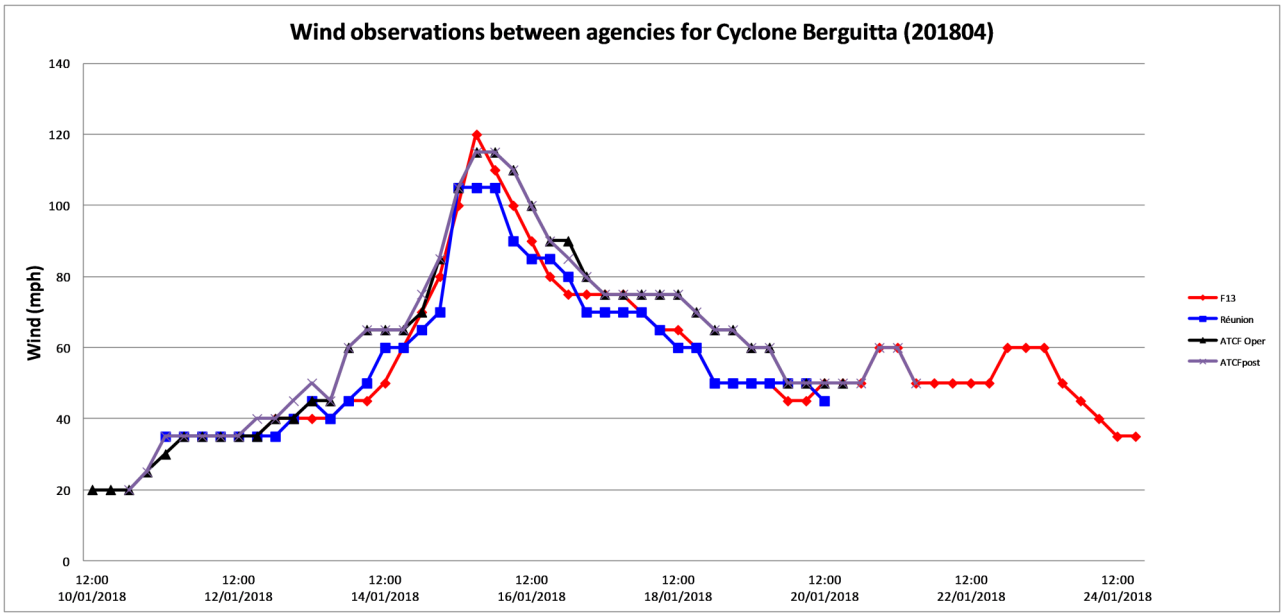
Date (dd/mm/yyyy)	Time	Latitude	Longitude	F13	F13	Stage
12/01/2018	18:00	-17	66.9	35	1002	Tropical Depression
13/01/2018	00:00	-17.4	65.8	40	1000	Tropical Storm
13/01/2018	06:00	-17.6	65.1	40	999	Tropical Storm
13/01/2018	12:00	-18.1	64.4	40	998	Tropical Storm
13/01/2018	18:00	-18.2	63.8	40	997	Tropical Storm
14/01/2018	00:00	-18.2	63.4	45	996	Tropical Storm
14/01/2018	06:00	-18.2	63.2	45	994	Tropical Storm
14/01/2018	12:00	-18.1	63.1	50	991	Tropical Storm
14/01/2018	18:00	-18	63.1	60	986	Tropical Storm
15/01/2018	00:00	-17.8	63.2	70	981	Tropical Storm
15/01/2018	06:00	-17.8	63.2	80	975	Category 1
15/01/2018	12:00	-18	63	100	966	Category 2
15/01/2018	18:00	-18	62.6	120	951	Category 3
16/01/2018	00:00	-18	62.1	110	956	Category 2
16/01/2018	06:00	-18	61.6	100	959	Category 2
16/01/2018	12:00	-18.1	61.2	90	966	Category 1
16/01/2018	18:00	-18.1	60.9	80	972	Category 1
17/01/2018	00:00	-18.1	60.6	75	974	Category 1
17/01/2018	06:00	-18.2	60.2	75	975	Category 1
17/01/2018	12:00	-18.5	59.9	75	976	Category 1
17/01/2018	18:00	-19	59.4	75	977	Category 1
18/01/2018	00:00	-19.7	58.5	70	979	Tropical Storm
18/01/2018	06:00	-20.7	57.6	65	983	Tropical Storm
18/01/2018	12:00	-21.5	56.6	65	984	Tropical Storm
18/01/2018	18:00	-22.1	55	60	986	Tropical Storm
19/01/2018	00:00	-22.8	54.2	50	987	Tropical Storm
19/01/2018	06:00	-23.8	53.4	50	988	Tropical Storm
19/01/2018	12:00	-24.9	52.5	50	988	Tropical Storm
19/01/2018	18:00	-26.1	51.2	50	989	Tropical Storm
20/01/2018	00:00	-27.9	50.4	45	990	Tropical Storm
20/01/2018	06:00	-29.5	49.6	45	992	Extratropical Storm
20/01/2018	12:00	-31	49.3	50	992	Extratropical Storm
20/01/2018	18:00	-32.5	49.3	50	991	Extratropical Storm
21/01/2018	00:00	-33.1	49.8	50	990	Extratropical Storm
21/01/2018	06:00	-33.5	50.7	60	990	Extratropical Storm
21/01/2018	12:00	-34.1	52.7	60	991	Extratropical Storm
21/01/2018	18:00	-34.2	54.3	50	993	Extratropical Storm
22/01/2018	00:00	-35.1	56	50	994	Extratropical Storm
22/01/2018	06:00	-35.5	57.6	50	994	Extratropical Storm
22/01/2018	12:00	-36.6	58.3	50	993	Extratropical Storm
22/01/2018	18:00	-37	60.5	50	992	Extratropical Storm
23/01/2018	00:00	-37.7	61.5	60	990	Extratropical Storm
23/01/2018	06:00	-37.6	62.3	60	988	Extratropical Storm
23/01/2018	12:00	-39.5	63.4	60	988	Extratropical Storm
23/01/2018	18:00	-39.6	63.6	50	990	Extratropical Storm
24/01/2018	00:00	-39.6	64	45	993	Extratropical Storm
24/01/2018	06:00	-39.7	64.9	40	995	Extratropical Storm
24/01/2018	12:00	-39.7	65.3	35	996	Extratropical Depression
24/01/2018	18:00	-39.7	65.4	35	996	Extratropical Depression

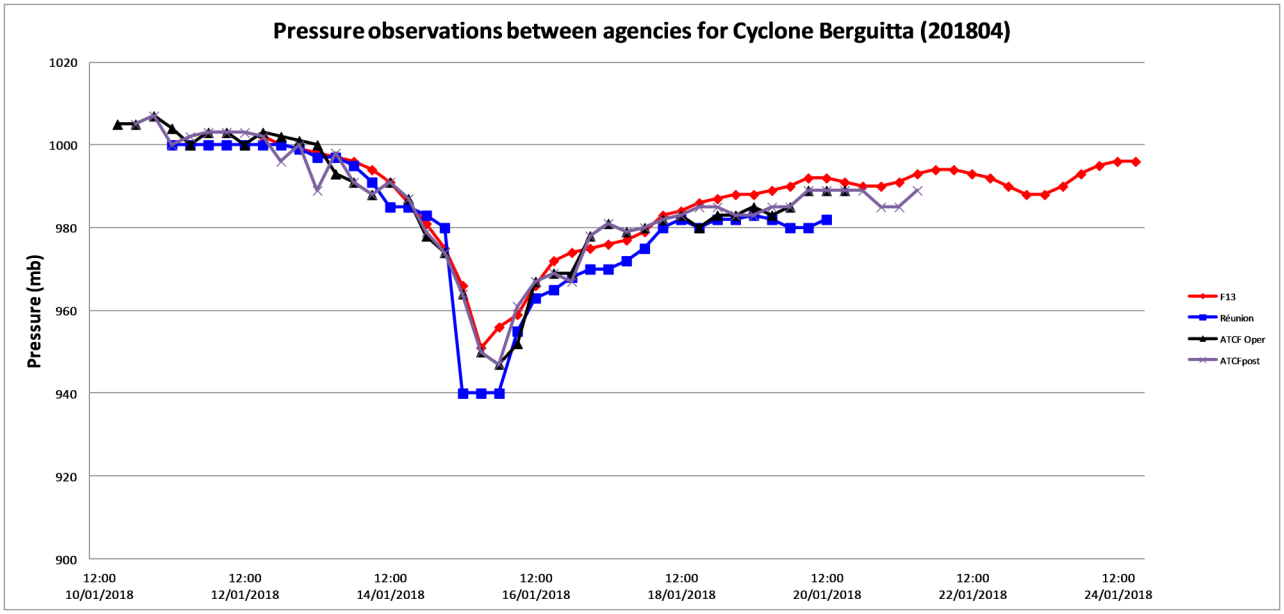
1.3. Track Chart



1.4. Comparison with other agencies

Berguitta was monitored by Metéo France La Réunion, and was observed by the JTWC (US Navy). Below shows comparisons between the agencies, and Force Thirteen's best track.





2. Effects on Land

Cyclone Berguitta caused significant surge and flooding in the Mauritian island of Rodrigues, which the storm stalled to the northwest of during its intensification phase. The storm then arrived in Mauritius, causing significant flooding, power outages and fallen power poles and street furniture. Additionally, in Réunion, rainfall was substantial towards the southeastern side of the island, and rivers swelled and overflowed.

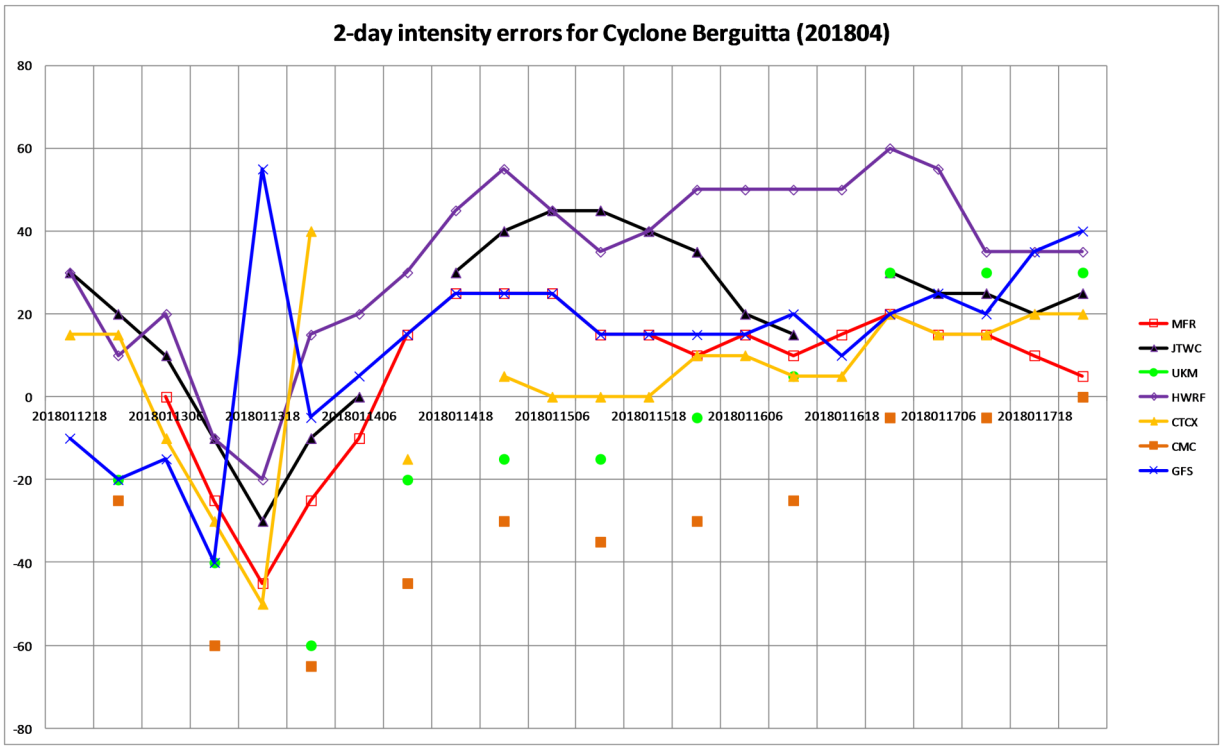
Although the potential for devastating damage was present, ultimately the storm's weakening helped to limit this. Public utilities were mostly restored within days, however some reports state that up to 600 homes were lost throughout Mauritius.

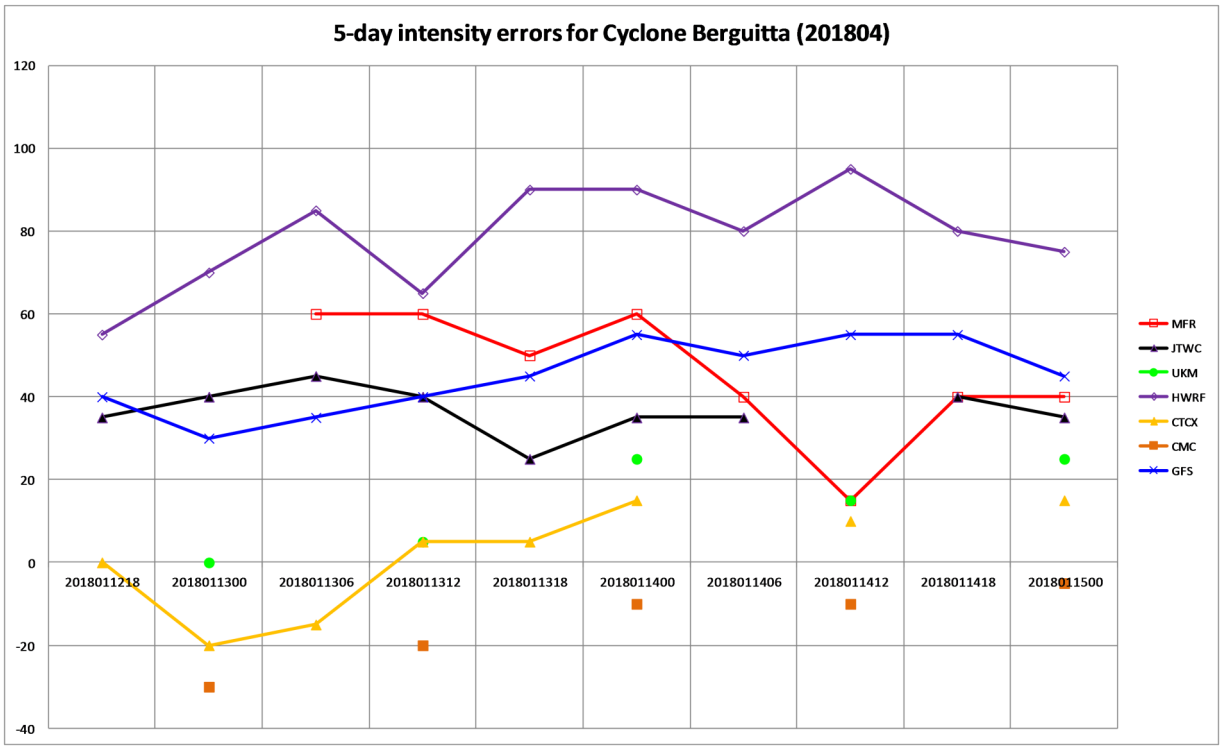
Satellite indicated rainfall totals are shown below:

Port Mathurin	300mm
St Brandon	20mm
Grand Baie	50mm
Port Louis	20mm
Mahebourg	40mm
Saint-Denis	70mm
Saint-André	90mm
Sainte-Rose	100mm
Saint-Philippe	90mm
Saint-Joseph	90mm
Saint-Pierre	80mm
Saint-Leu	80mm
Saint-Paul	60mm

3. Forecasting Critique

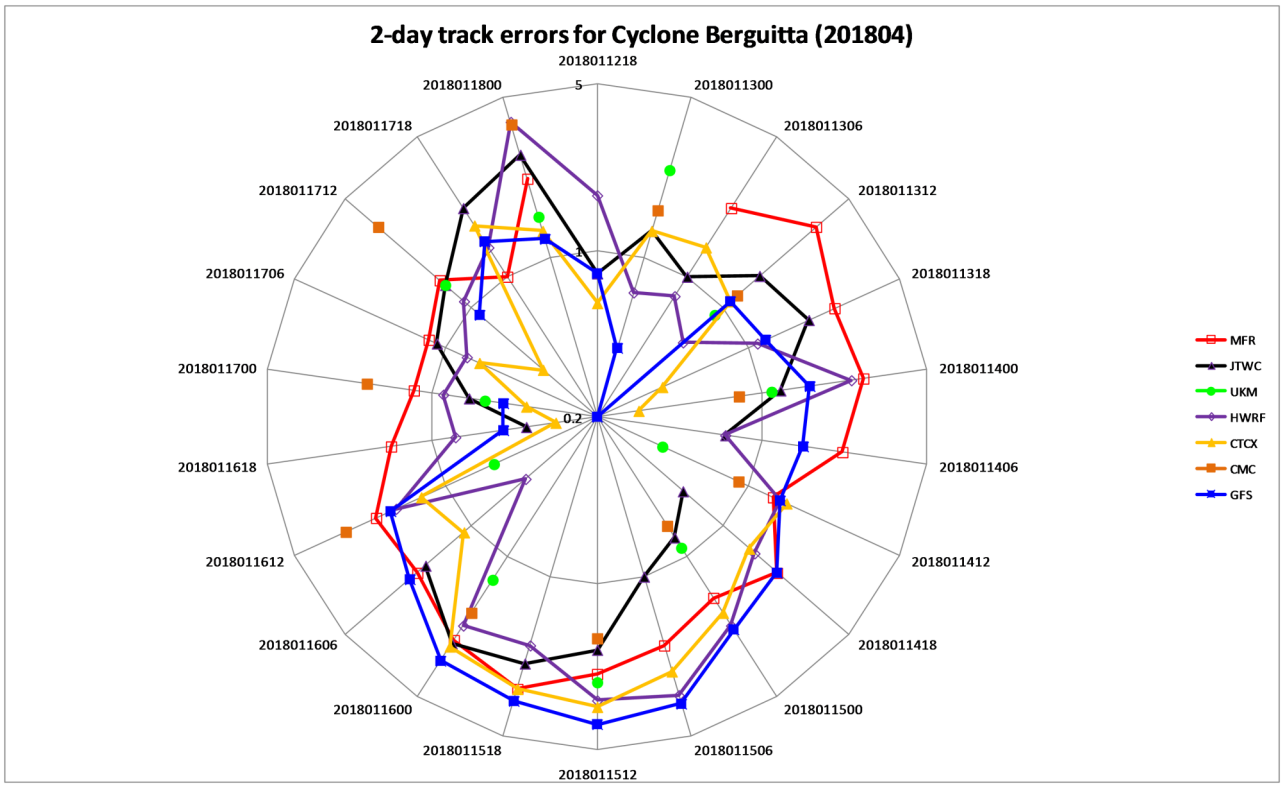
The next pages show the track and intensity forecast errors from the computer models and the two main agencies involved.
The intensity error charts show how many miles per hour the model predictions were from the observed intensity two and five days later. A value of 0 denotes a perfectly accurate prediction. Negative values correspond to predictions lower than the observation, and positive values show predictions higher than the observation.

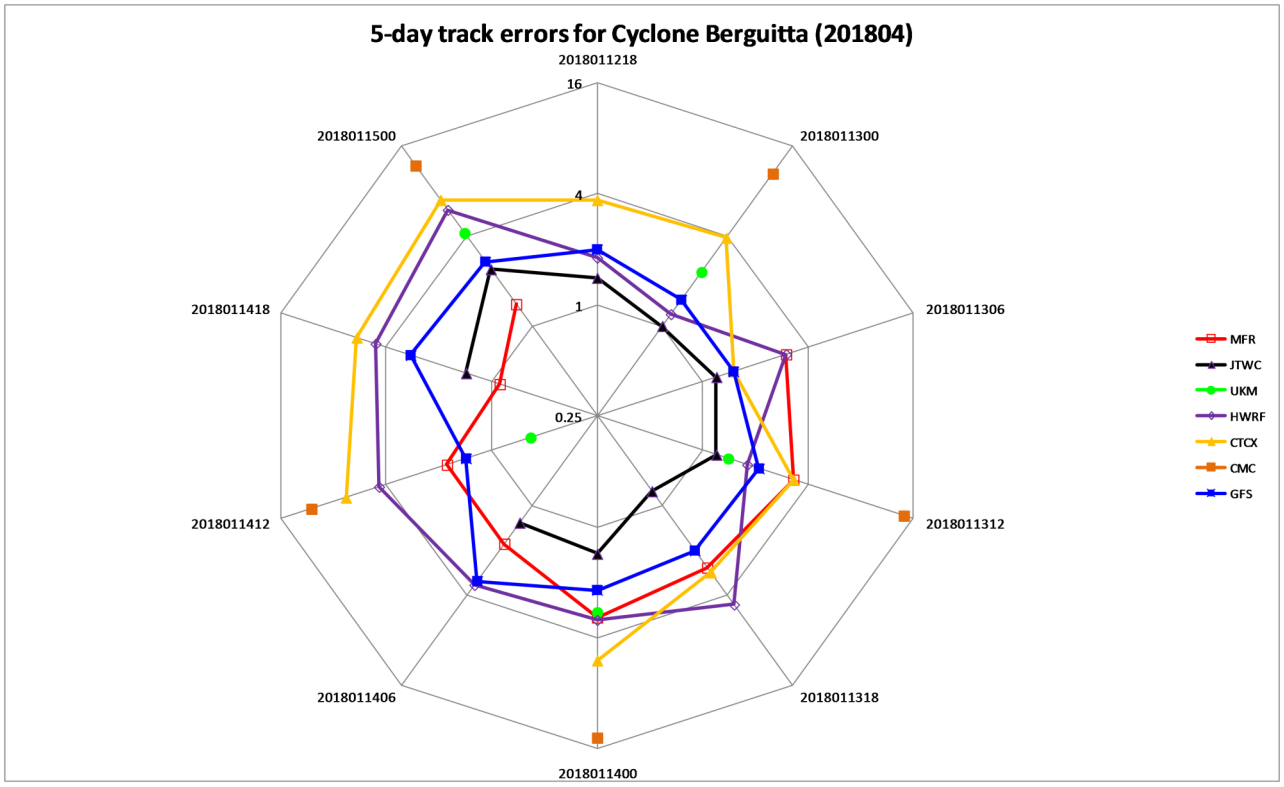




3. Forecasting Critique

The track error graphics show how far away from a perfectly accurate positional prediction the computer models and the agencies predicted two and five days before the fact. Values are expressed in angular degrees, and a value closer to 0 (the center of the graphic) indicates a more accurate prediction.





3. Forecasting Critique

Data from the charts are published below.

2-day forecast intensity error							
Run	MFR	JTWC	UKM	HWRF	CTCX	CMC	GFS
2018011218		30		30	15		10
2018011300		20	20	10	15	25	20
2018011306	0	10		20	10		15
2018011312	25	10	40	10	30	60	40
2018011318	45	30		20	50		55
2018011400	25	10	60	15	40	65	5
2018011406	10	0		20			5
2018011412	15		20	30	15	45	15
2018011418	25	30		45			25
2018011500	25	40	15	55	5	30	25
2018011506	25	45		45	0		25
2018011512	15	45	15	35	0	35	15
2018011518	15	40		40	0		15
2018011600	10	35	5	50	10	30	15
2018011606	15	20		50	10		15
2018011612	10	15	5	50	5	25	20
2018011618	15			50	5		10
2018011700	20	30	30	60	20	5	20
2018011706	15	25		55	15		25
2018011712	15	25	30	35	15	5	20
2018011718	10	20		35	20		35
2018011800	5	25	30	35	20	0	40

5-day forecast intensity error							
Run	MFR	JTWC	UKM	HWRF	CTCX	CMC	GFS
2018011218		35		55	0		40
2018011300		40	0	70	20	30	30
2018011306	60	45		85	15		35
2018011312	60	40	5	65	5	20	40
2018011318	50	25		90	5		45
2018011400	60	35	25	90	15	10	55
2018011406	40	35		80			50
2018011412	15		15	95	10	10	55
2018011418	40	40		80			55
2018011500	40	35	25	75	15	-5	45

Overall 2-day and 5-day intensity errors combined

Model	Average Error	Predictions
MFR	25.2	28
JTWC	28.8	29
UKM	21.3	16
HWRF	49.4	32
CTCX	13.8	30
CMC	24.4	16
GFS	29.0	32

3. Forecasting Critique

Data from the charts are published below.

2-day forecast track error								
Run	MFR	JTWC	UKM	HWRF	CTCX	CMC	GFS	Average
2018011218		0.8		1.7	0.6		0.8	1
2018011300		1.3	2.4	0.7	1.3	1.6	0.4	1.3
2018011306	2.2	1		0.8	1.4		0.2	1.1
2018011312	3.3	1.6	0.9	0.6	1.1	1.2	1.1	1.4
2018011318	2.5	1.9		1.1	0.4		1.2	1.4
2018011400	2.7	1.2	1.1	2.4	0.3	0.8	1.6	1.4
2018011406	2.2	0.7		0.7			1.5	1.3
2018011412	1.3		0.4	1.4	1.5	0.9	1.4	1.2
2018011418	2	0.6		1.5	1.4		2.0	1.5
2018011500	1.6	0.8	0.9	2.2	1.9	0.7	2.3	1.5
2018011506	2	1		3.3	2.6		3.6	2.5
2018011512	2.4	1.9	2.6	3.1	3.3	1.7	3.9	2.7
2018011518	3.1	2.4		2	3.1		3.5	2.8
2018011600	2.6	2.7	1.3	2.2	2.8	1.9	3.3	2.4
2018011606	2	1.8		0.5	1.1		2.2	1.5
2018011612	2.1		0.6	1.7	1.3	2.9	1.8	1.7
2018011618	1.5	0.4		0.8	0.3		0.5	0.7
2018011700	1.2	0.7	0.6	0.9	0.4	1.9	0.5	0.9
2018011706	1.2	1.1		0.8	0.7		1,1	1
2018011712	1.5	1.4	1.4	1.1	0.4	3.3	0.9	1.4
2018011718	1	2.2		1.4	1.8		1.5	1.6
2018011800	2.2	2.8	1.5	3.9	1.3	3.8	1.2	2.4

Model	**Average**	**Predictions**
MFR	2.03	20
JTWC	1.42	20
UKM	1.25	11
HWRF	1.59	22
CTCX	1.38	21
CMC	1.88	11
GFS	1.70	22
Average	1.58	

Therefore, the best agency for track predictions was the JTWC, and the best model was the UKMET.

3. Forecasting Critique

Data from the charts are published below.

5-day forecast track error								
Run	MFR	JTWC	UKM	HWRF	CTCX	CMC	GFS	**Average**
2018011218		1.4		1.8	3.7		2.0	2.2
2018011300		1	2.3	1.2	3.9	10.5	1.5	3.4
2018011306	3	1.2		3	1.5		1.5	2
2018011312	3.3	1.2	1.4	1.8	3.3	14.1	2.1	3.9
2018011318	2.6	0.8		4.6	2.8		2.0	2.6
2018011400	3.1	1.4	2.9	3.2	5.3	13.9	2.2	4.6
2018011406	1.8	1.3		3.4			3.2	2.4
2018011412	1.8		0.6	4.4	6.8	10.7	1.4	4.3
2018011418	0.9	1.4		4.6	5.9		2.9	3.1
2018011500	1.4	2.4	4.2	6	7	11.9	2.7	5.1

Model	**Average**	**Predictions**
MFR	2.23	8
JTWC	1.34	9
UKM	2.28	5
HWRF	3.40	10
CTCX	4.47	9
CMC	12.2	5
GFS	2.20	10
Average	3.36	

Therefore, the best agency for track predictions was the JTWC, and the best model was the GFS.

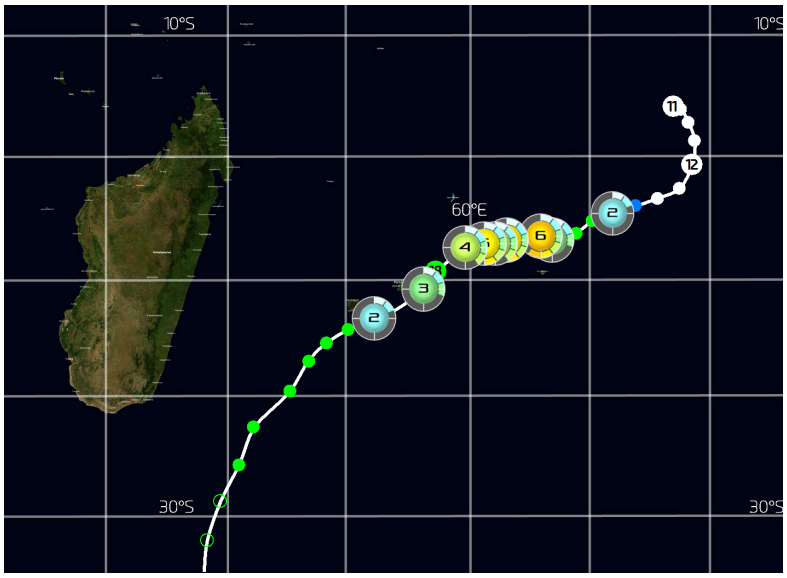
Overall 2-day and 5-day track errors combined

Model	**Average Error**	**Predictions**
MFR	2.09	28
JTWC	1.39	29
UKM	1.57	16
HWRF	2.15	32
CTCX	2.31	30
CMC	5.11	16
GFS	1.80	32
Average	2.13	

4. Cyclone Destruction Potential Scale

The Cyclone Destruction Potential Scale (CDPS) is a new way of measuring cyclone impacts in a more meaningful way. For the past 45 years, storms worldwide have been measured using the Saffir-Simpson Hurricane Wind Scale, split into five categories. However, this scale measures wind alone, and does not correlate well with actual impacts on land, measured by monetary damage.
The CDPS measures other factors, such as storm size and forward speed as well as intensity to create a ten tiered scale that encompasses tropical storms as well as hurricanes.

Stage 1—Small or weak storms that are unlikely to cause a significant impact.
Stage 2—Generally disorganised storms that can cause significant damage.
Stage 3—Further organised systems that are likely to cause significant damage.
Stage 4—Somewhat powerful storms that are likely to cause extensive damage.
Stage 5—Powerful storms that are likely to cause devastating damages.
Stage 6—Very powerful storms that are likely to cause catastrophic damage.
Stage 7—Extremely powerful storms that are likely to cause catastrophic damage.
Stage 8—Super storms that are likely to cause incredible damage.
Stage 9—Super storms that may cause total damage.
Stage 10—Super storms that are likely to cause total damage.



Cyclone Berguitta was observed by Force Thirteen using the CDPS—a method which was adopted in January 2017.

Berguitta reached CDPS Stage 6.

The Cyclone Destruction Potential Scale was created by Devon Williams in 2016. More information can be found at: https://drive.google.com/file/d/0B7pEWk6yHKggSE1STHg2UFJmbHM/view

5. Force Thirteen's Coverage on Berguitta

Force Thirteen issued eighteen hours of live coverage, twelve video updates for Mauritius, and six video updates for Réunion. Additionally, for the first time the channel established a partnership with another voluntary organisation, *Météo et Cyclone Maurice (MCM)*, who also posted the videos and simulcasted some of the live coverage on their Facebook page.

The videos received a 95.8% approval rating overall.

Overall, the channel reached approximately 268,170 viewers during the life of Berguitta, broken down geographically:

Mauritius	152,747
United States	36,493
United Kingdom	13,274
South Africa	6,832
Réunion	6,138
France	4,560
Australia	4,309
Philippines	3,995
Canada	3,855
India	2,942

Additionally, approximately 119,000 viewed the updates on the MCM Facebook page.

Comments, suggestions and inquiries should be directed to contact@force-13.com, or any of Force Thirteen's online platforms.