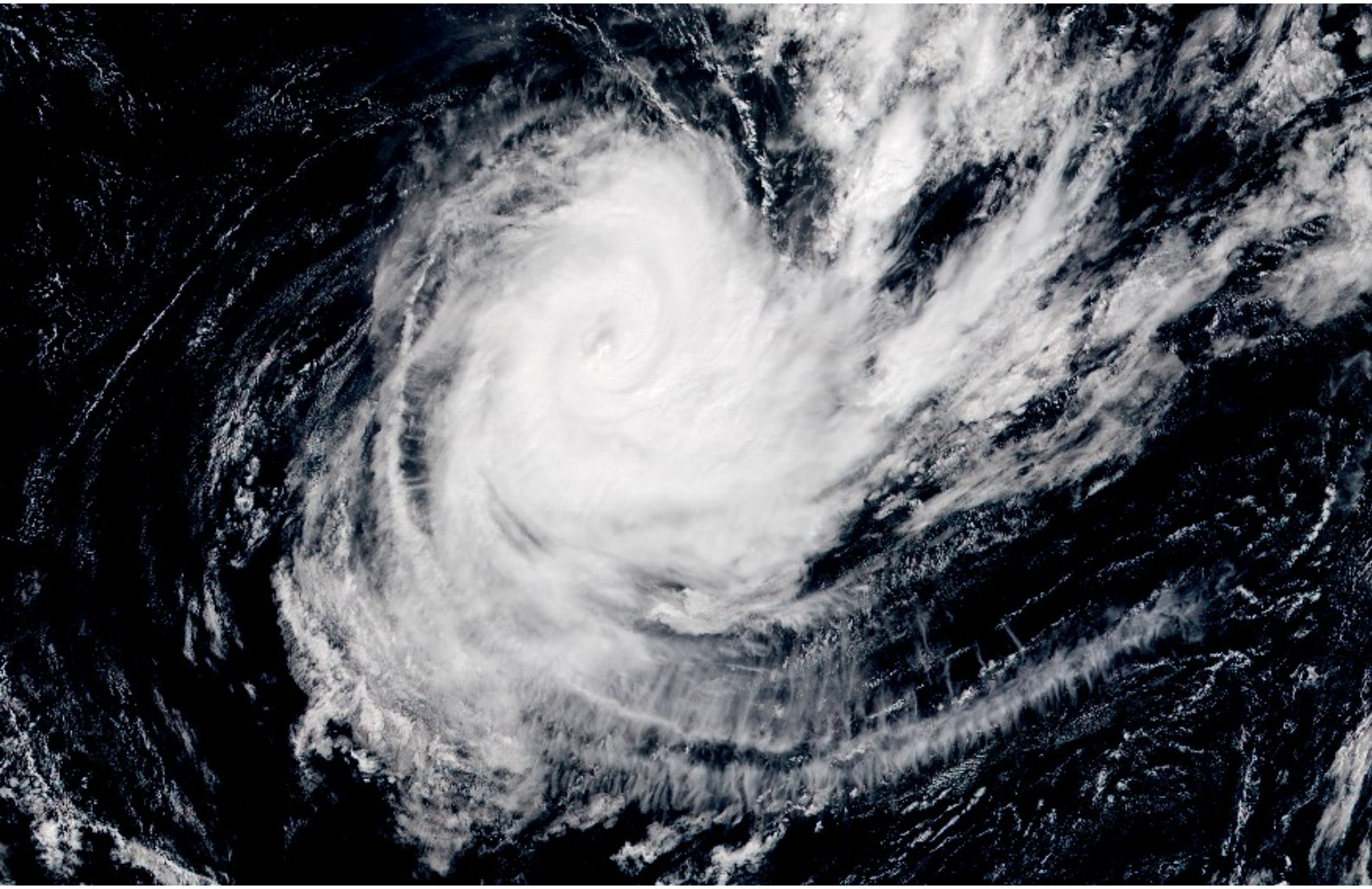
2017

Force Thirteen Cyclone Reports

Cyclone Cook (201714)



Cyclone Cook was the strongest tropical cyclone to make landfall in New Caledonia since Cyclone Erica of 2003 when it travelled through the South Pacific Ocean in April 2017.

Compiled by Nathan Foy at Force Thirteen, April 26, 2017
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Cover photo: Himawari-8 Image of Cyclone Cook shortly before landfall in New Caledonia, 02:00 UTC on April 10, 2017.

FORCE THIRTEEN

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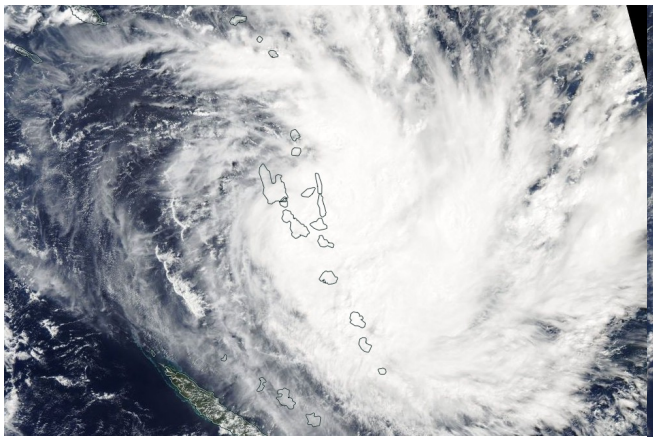
1.1. Synoptic History

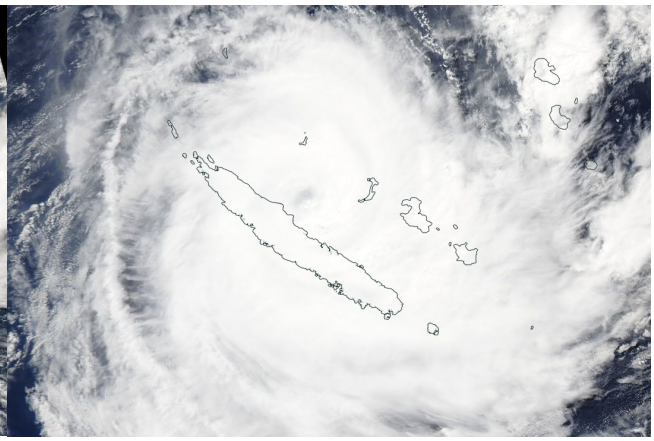
In early April, a new tropical disturbance formed to the northeast of Vanuatu, and struggled for a few days to obtain a circulation, something which it managed to do by April 8th. At the same time, significant strengthening began to occur and the cyclone was named Cook.
Cook passed through Vanuatu's main islands throughout the day, delivering significant rainfall and strong thunderstorms, particularly in the late evening hours, local time.
Three other bursts of substantial convection occurred before an eye became apparent on satellite imagery during the fourth burst on April 9th, when Cook was situated between Vanuatu and New Caledonia. Cloud tops remained very cold all the way until landfall in New Caledonia on April 10th, though the eye never became clear and indeed, was always shallow, a typical characteristic of a Category one or two hurricane. Convection flared up even more so when Cook made landfall, and for a brief period the land interaction was very clear on satellite imagery, from the apparent "cutting" effect into the southeastern eyewall caused by the landmass. This effect was very notable in other previous storms, particularly of the typhoons that impacted Taiwan in 2015 and 2016.

Cook degenerated substantially after landfall, and by the afternoon of April 10th, the western eyewall broke away, and by the end of the day, the entire storm reverted to a typical sheared tropical storm appearance with a plume of convection displaced slightly east of center, the northwestern half of the storm therefore being exposed.

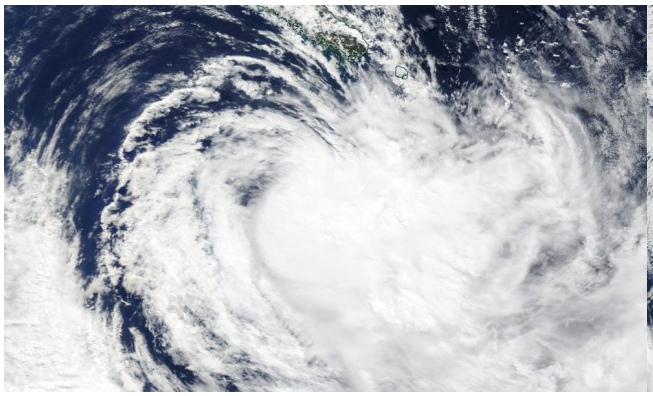
Cook turned post-tropical late on April 11th, and then went on to impact New Zealand in the days that followed. The extratropical remnants of Cook were absorbed by another system to the southeast of the Auckland Islands on April 15th.



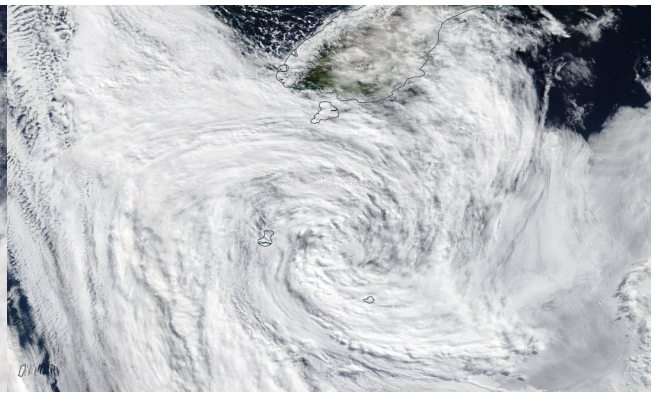
April 8th



April 10th



April 11th



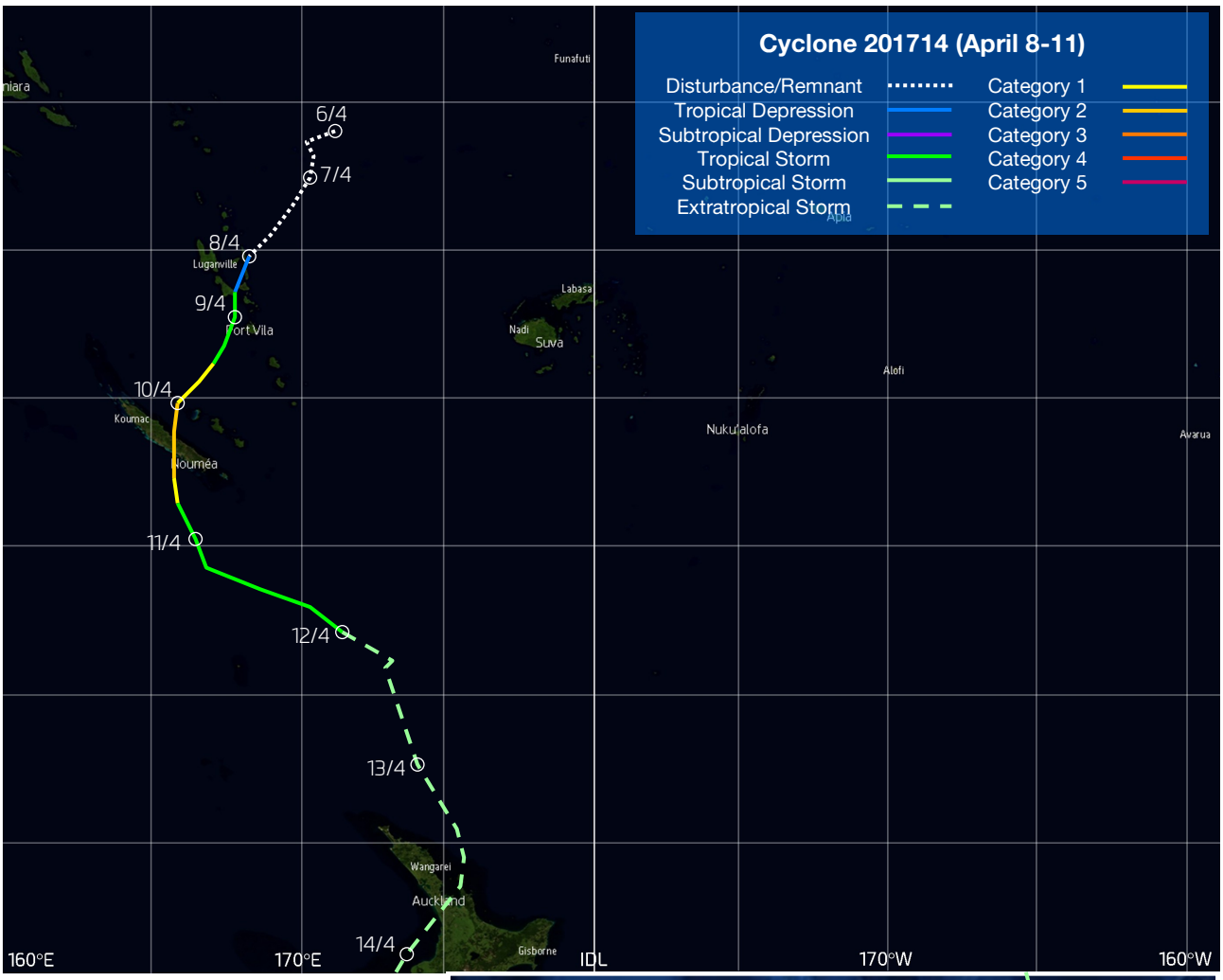
April 15th

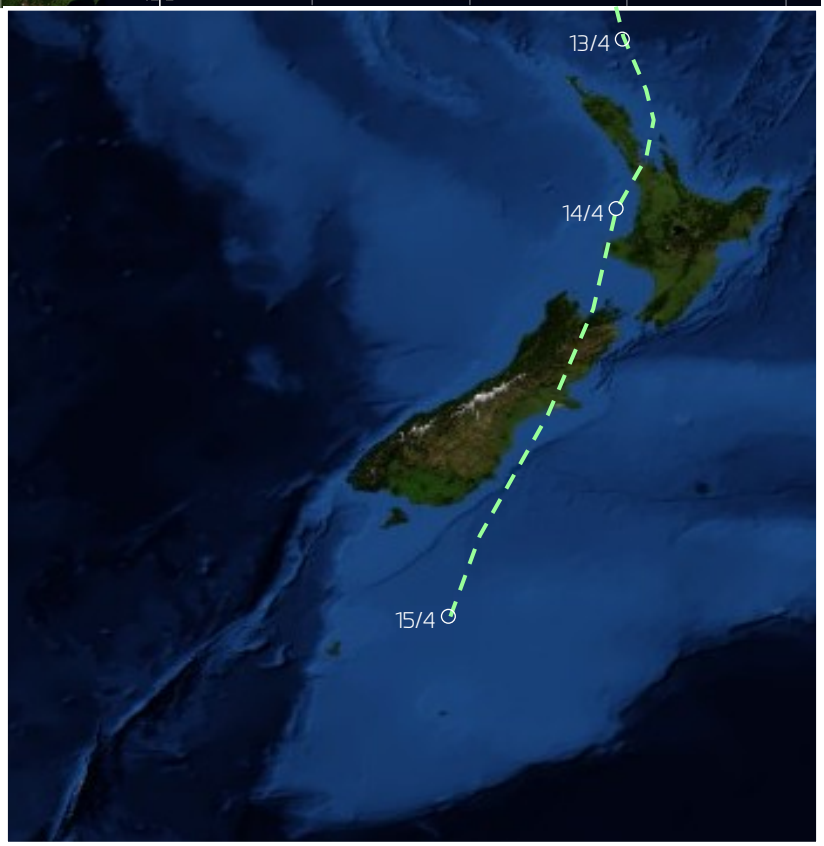
1.2. Best Track

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
05/04/2017	12:00					
05/04/2017	18:00					
06/04/2017	00:00	-11.1	171.1	20	1010	Tropical Disturbance
06/04/2017	06:00	-11.4	170.1	20	1010	Tropical Disturbance
06/04/2017	12:00	-11.8	170.2	20	1010	Tropical Disturbance
06/04/2017	18:00	-12.2	170.3	25	1008	Tropical Disturbance
07/04/2017	00:00	-12.9	170.2	25	1007	Tropical Disturbance
07/04/2017	06:00	-13.7	169.6	30	1005	Tropical Disturbance
07/04/2017	12:00	-14.4	168.9	30	1004	Tropical Disturbance
07/04/2017	18:00	-14.8	168.5	30	1003	Tropical Disturbance
08/04/2017	00:00	-15.2	168.1	35	1002	Tropical Depression
08/04/2017	06:00	-15.8	167.8	35	1000	Tropical Depression
08/04/2017	12:00	-16.4	167.6	40	997	Tropical Storm
08/04/2017	18:00	-17.1	167.6	45	994	Tropical Storm
09/04/2017	00:00	-17.5	167.6	50	991	Tropical Storm
09/04/2017	06:00	-18	167.3	60	985	Tropical Storm
09/04/2017	12:00	-18.5	166.8	75	978	Category 1
09/04/2017	18:00	-19.3	166.2	90	969	Category 1
10/04/2017	00:00	-20.3	165.8	100	965	Category 2
10/04/2017	06:00	-21.6	165.7	100	962	Category 2
10/04/2017	12:00	-22.8	165.7	75	972	Category 1
10/04/2017	18:00	-23.8	166	65	980	Tropical Storm
11/04/2017	00:00	-24.9	166.6	50	989	Tropical Storm
11/04/2017	06:00	-25.8	167	50	992	Tropical Storm
11/04/2017	12:00	-26.3	168.6	45	995	Tropical Storm
11/04/2017	18:00	-26.7	170.3	45	995	Tropical Storm
12/04/2017	00:00	-27.8	171.9	45	995	Extratropical
12/04/2017	06:00	-28.7	173.2	50	992	Extratropical
12/04/2017	12:00	-29.2	172.8	40	996	Extratropical
12/04/2017	18:00	-30.6	173.4	40	995	Extratropical
13/04/2017	00:00	-32.5	174.4	40	994	Extratropical
13/04/2017	06:00	-34.6	175.4	40	992	Extratropical
13/04/2017	12:00	-35.5	175.7	40	992	Extratropical
13/04/2017	18:00	-36.9	175.5	40	992	Extratropical
14/04/2017	00:00	-39.3	173.7	40	991	Extratropical
14/04/2017	06:00	-42.1	172.2	40	990	Extratropical
14/04/2017	12:00	-45.4	170.9	40	989	Extratropical
14/04/2017	18:00	-50.3	169.5	40	988	Extratropical
15/04/2017	00:00	-51.9	169.8	35	990	Extratropical

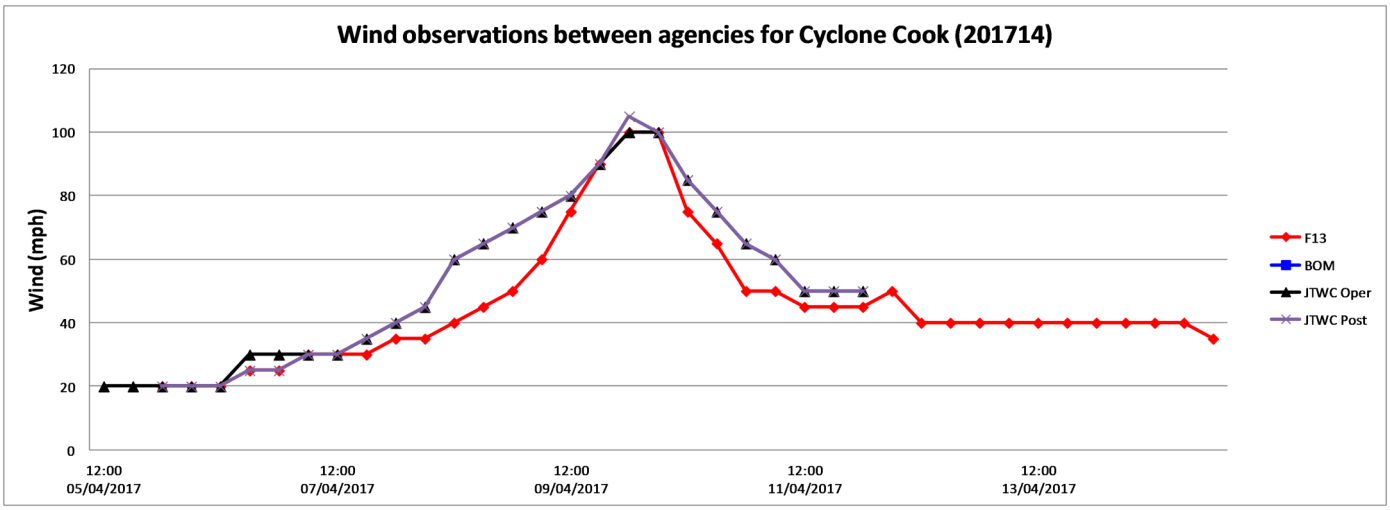
1.3. Track Chart

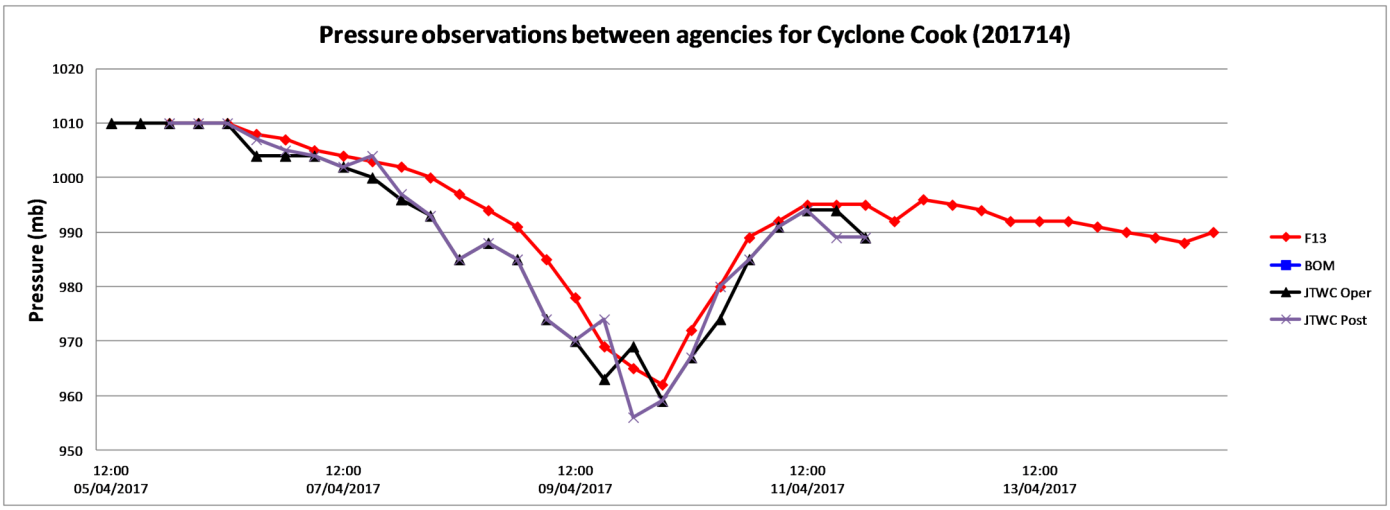




1.4. Comparison with other agencies

Cook was monitored by the Regional Specialized Meteorological Centre, in this instance the Australian Bureau of Meteorology, and by the U.S. Joint Typhoon Warning Center (JTWC). The charts below show comparisons between Force Thirteen's best track and the other agencies' observations.
Data from the BOM was not available at the time of publication.





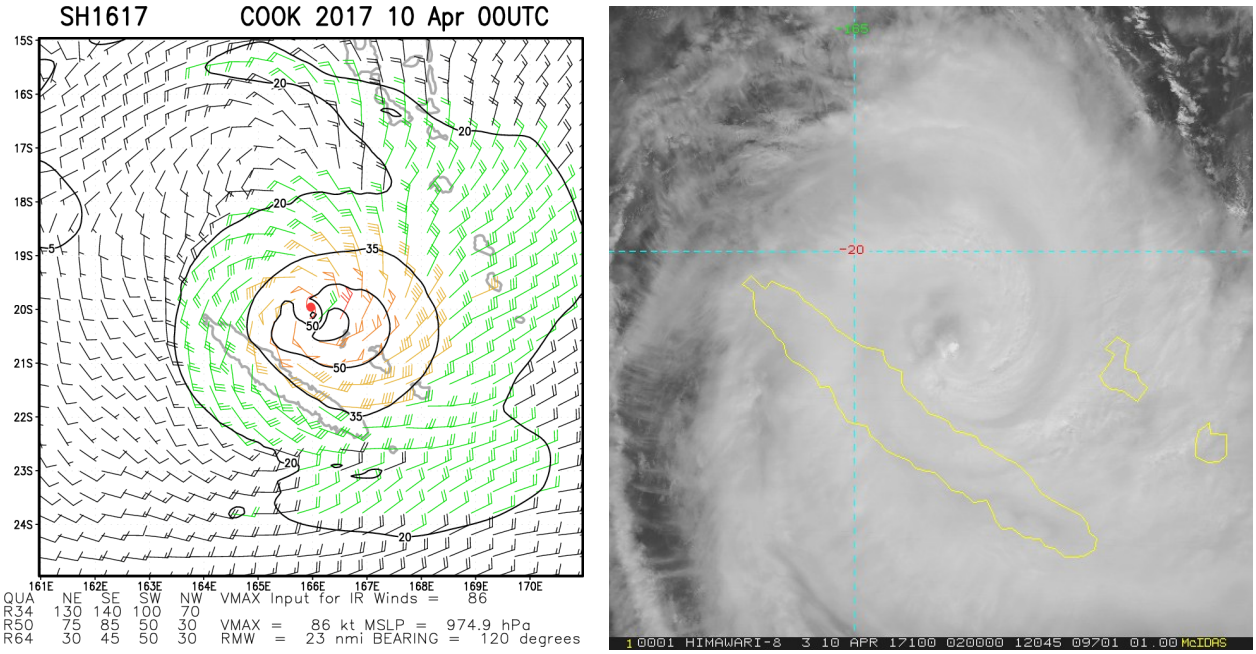
2. Effects on Land

Cyclone Cook delivered its worst conditions to Vanuatu and New Caledonia, where flooding and downed trees were reported. The remnants of Cook also delivered widespread storm conditions to New Zealand late in its life. Not much is known or reported in terms of damages.

Below is a list of rainfall totals derived from satellite observations.

Solomon Islands	
Matamotu	20mm
Sola	10mm
Vanuatu	
Naone	20mm
Abwatunbuliva	100mm
Lonorore	80mm
Craig Cove	100mm
Jlei	70mm
Malekoula	120mm
Valesdir	130mm
Tongoa	140mm
Siwo	90mm
Port Vila	80mm
Ipota	60mm
Aniwa	30mm
Futuna	80mm
Anatom	110mm
New Caledonia	
Tiga	100mm
La Roche	40mm
Houailou	30mm
Kouaoua	100mm
Canala	90mm
Bouloupari	80mm
Noumea	40mm
Gadji	70mm
Kuto	60mm

Norfolk Island	20mm
New Zealand	
Paihia	10mm
Kawakawa	10mm
Hikurangi	10mm
Parua Bay	20mm
Ruakaka	10mm
Waipu	10mm
Mangawhai	10mm
Leigh	10mm
Wellsford	10mm
Warkworth	10mm
Coromandel	10mm
Whitianga	10mm
Pauanui	10mm
Whangamata	10mm
Waihi Beach	30mm
Katikati	40mm
Te Aroha	40mm
Morrinsville	30mm
Hamilton	30mm
Tamahere	40mm
Cambridge	50mm
Matamata	60mm
Tirau	70mm
Putaruru	70mm
Tokoroa	60mm
Te Awamutu	40mm



Satellite estimated winds and visible satellite image of Cyclone Cook near peak intensity.

2. Effects on Land

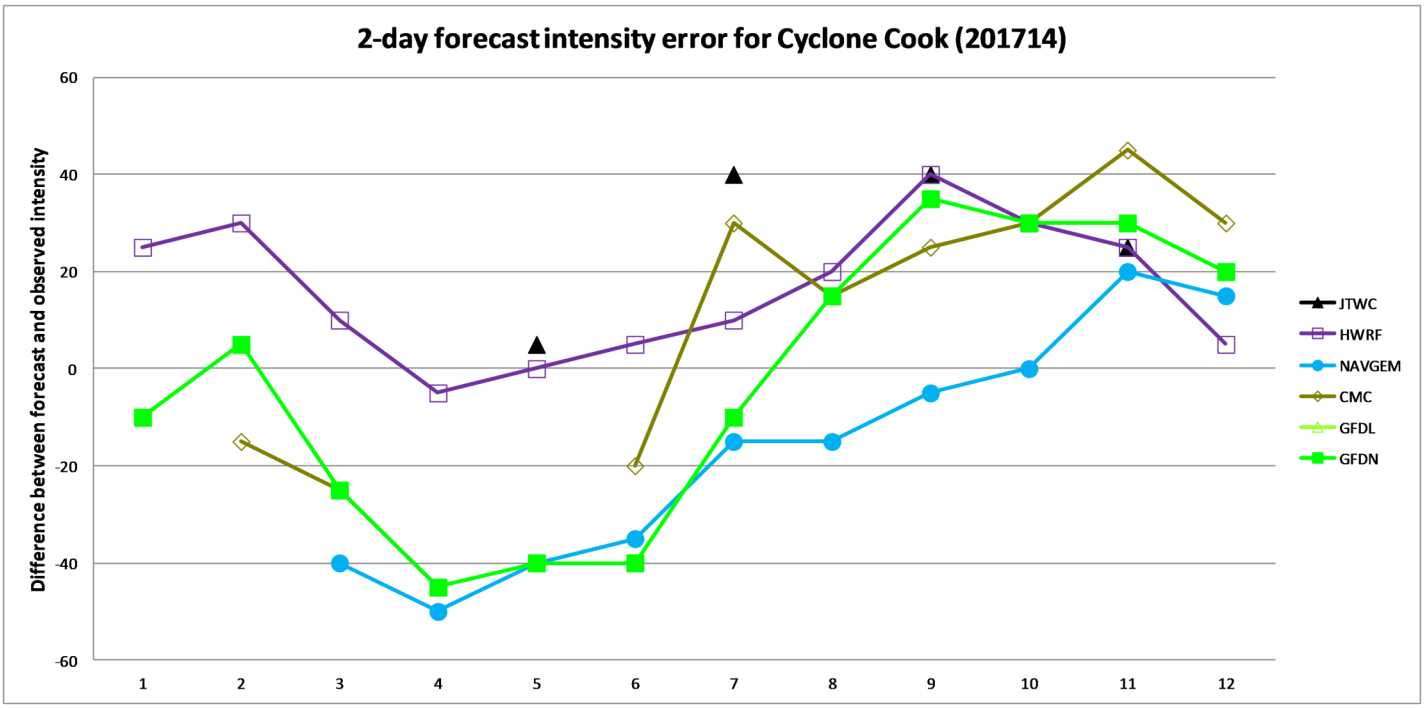
List of rainfall totals derived from satellite observations (continued)

New Zealand

Pirongia	20mm	Carterton	10mm
Otorohanga	20mm	Wellington	10mm
Waitomo	30mm	Picton	30mm
Te Kuiti	10mm	Blenheim	40mm
Pyes Pa	20mm	Nelson	50mm
Paengaroa	20mm	Motueka	20mm
Rotorua	20mm	Westport	80mm
Mangakino	50mm	Dunedin	10mm
Matata	30mm	Alexandra	40mm
Kawerau	60mm		
Whakatane	20mm		
Opotiki	10mm		
Reporoa	30mm		
Kaingaroa Forest	60mm		
Murupara	60mm		
Wairakei	40mm		
Taupo	30mm		
Turangi	40mm		
Waiouru	30mm		
Taihape	20mm		
Mangaweka	20mm		
Takapau	30mm		
Dannevirke	30mm		
Ashhurst	30mm		
Woodville	30mm		
Palmerston North	20mm		
Pahiatua	40mm		
Foxton	10mm		
Shannon	10mm		
Levin	10mm		
Eketahuna	30mm		
Masterton	30mm		

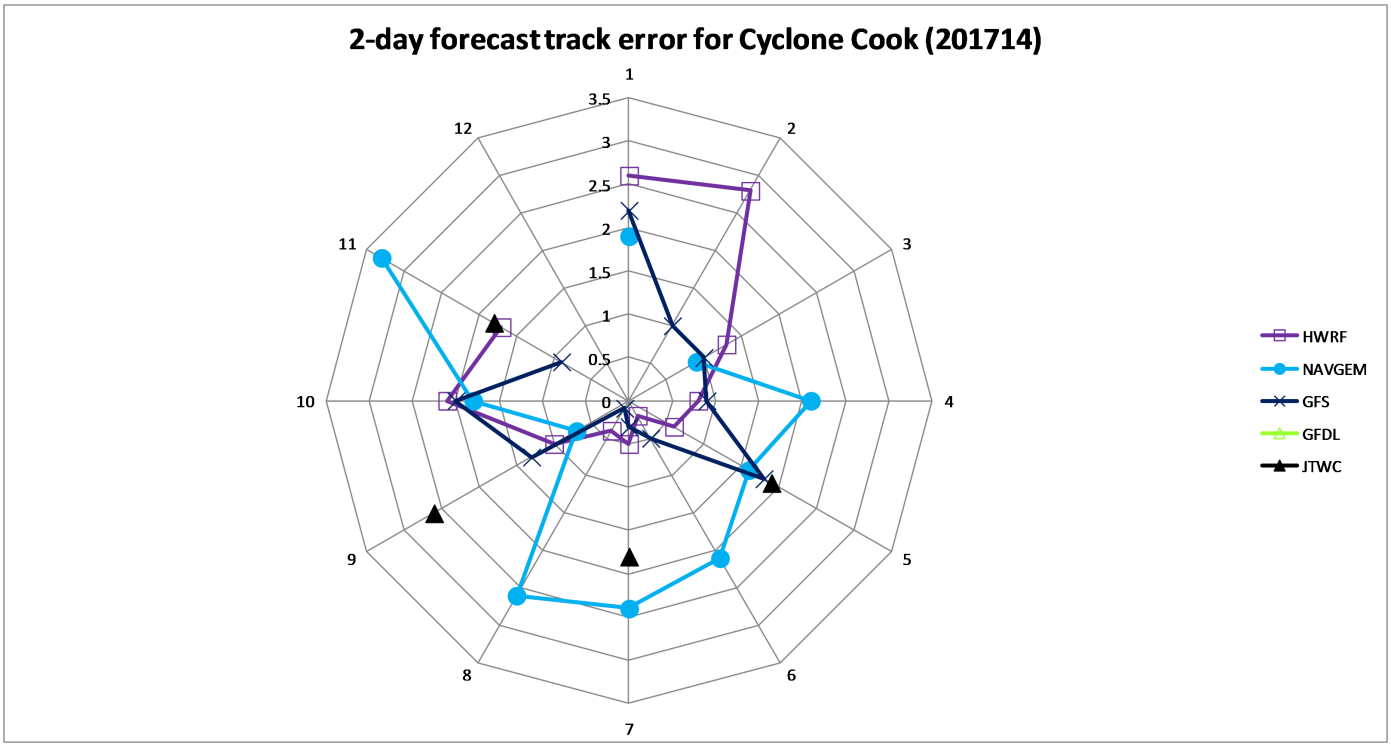
3. Forecasting Critique

The next pages show the track and intensity forecast error from the computer models and the JTWC during Cyclone Cook. Since the storm turned post-tropical within five days of the first model runs, five day error data is not available.
The intensity error chart shows 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 JTWC 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	JTWC	BOM	HWRF	GFS	NAVGEM	GFDN	CMC	GFDL
2017040700			25		-10	-10		
2017040706			30			5	-15	
2017040712			10		-40	-25	-25	
2017040718			-5		-50	-45	-45	
2017040800	5		0		-40	-40		
2017040806			5		-35	-40	-20	
2017040812	40		10		-15	-10	30	
2017040818			20		-15	15	15	
2017040900	40		40		-5	35	25	
2017040906			30		0	30	30	
2017040912	25		25		20	30	45	
2017040918			5		15	20	30	

Model	**Average**	**Predictions**
JTWC	27.5	4
BOM	0	0
HWRF	17.1	12
GFS	0	0
NAVGEM	22.3	11
GFDN	25.4	12
CMC	28	10
GFDL	0	0

Therefore, the best model for intensity was the HWRF

3. Forecasting Critique

Data from the charts are published below.

2-day forecast track error								
Run	JTWC	BOM	HWRF	GFS	NAVGEM	GFDN	CMC	GFDL
2017040700			2.6	2.2	1.9			
2017040706			2.8	1				
2017040712			1.3	1	0.9			
2017040718			0.8	0.9	2.1			
2017040800	1.9		0.6	1.8	1.6			
2017040806			0.2	0.5	2.1			
2017040812	1.8		0.5	0.3	2.4			
2017040818			0.4	0.1	2.6			
2017040900	2.6		1	1.3	0.7			
2017040906			2.1	2	1.8			
2017040912	1.8		1.7	0.9	3.3			
2017040918								

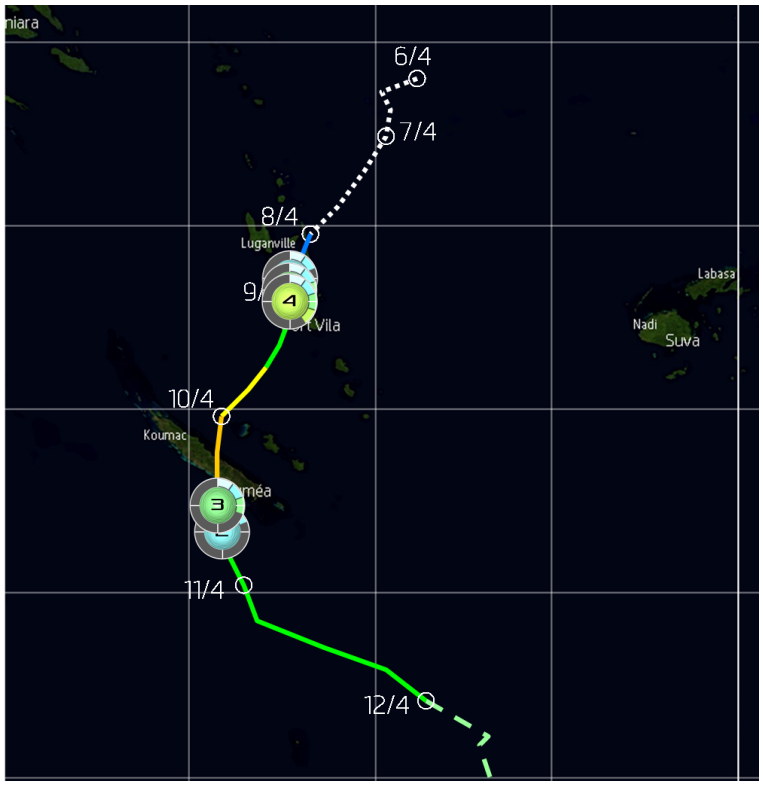
Model	**Average**	**Predictions**
JTWC	2.0	4
BOM	0	0
HWRF	1.3	11
GFS	1.1	11
NAVGEM	1.9	10
GFDN	0	0
CMC	0	0
GFDL	0	0

Therefore, the best model for track predictions was the GFS.

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 Cook was the twelfth storm to be observed by Force Thirteen using the CDPS—a method which was adopted in January 2017.

Cook was a mid-range Stage 4 cyclone at peak.

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 Cook

Force Thirteen's primary operations had taken a scheduled vacation during the life of Cyclone Cook, and Force Thirteen Australia took charge of providing video updates during the storm. There were three updates issued on Cook in its storm phase. Due to opposition to the Force Thirteen Australia operation by Texas and Mexico-based insurgents, the approval rating of the videos were skewed downwards, but were otherwise well received.

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