NOAA Technical Memorandum NWSTM PR-51

2003 Central North Pacific Tropical Cyclones

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ACKNOWLEDGMENTS

Appreciation is extended to Sam Houston for assisting with developing the best track data and to Treena Loos, who created the best track figures. Finally, it must be acknowledged that the writeup of Hurricane Jimena owes much to the work by Richard Pasch of the TPC.

Overview of the 2003 Central North Pacific Tropical Cyclone Season

Total tropical activity for the season was below normal, with two named systems occurring within the area of responsibility of the Central Pacific Hurricane Center (CPHC). One tropical cyclone (01-C) developed within the central Pacific, with one system (Jimena) moving into the area from the eastern Pacific. A third tropical system, Guillermo, weakened to a remnant low just to the east of CPHC's area of responsibility, and although CPHC issued one advisory on the system it will not be considered in the final count of tropical activity for the central Pacific for the season.

The season was generally quiet, but Hurricane Jimena still managed to take the spotlight. Jimena, at one point a category two hurricane, was the first direct threat to Hawaii in several years. Although it ended up passing about 100 nm south of the Big Island as a rapidly weakening tropical storm, it had the potential of coming closer as a hurricane.

As a final note, this was the first year that CPHC tropical cyclone track and intensity forecasts went out 5 days, or 120 hours. Previously forecasts were only made for 3 days or 72 hours.

Table 1. List of Tropical Cyclones

** denotes information for only that portion of the storm's lifetime in the central north Pacific (CPHC's area of responsibility).

Name	Dates	Minimum Pressure (mb)	Maximum Sustained Winds (kt)
Remnants of Tropical Storm Guillermo	Aug 12-13	n/a	25
Tropical Depression 01-C	Aug 15-17	1009	30
Hurricane Jimena	Aug 30-Sep 5**	970	90

Table 2. Overall Track Verification

Table entries are track forecast errors, measured in nautical miles. Values in parenthesis indicate the number of forecasts. Values in bold represent guidance forecast errors equal to or less than the official CPHC forecast.

Forecast	12-hr	24-hr	36-hr	48-hr	72-hr	96-hr	120-hr
CPHC	37 (25)	64 (21)	100 (18)	146 (16)	244 (12)	309 (8)	270 (4)
CLP5	49 (25)	102 (21)	179 (18)	275 (16)	404 (12)	555 (8)	636 (4)
GFDL	**35 (19)**	**51 (15)**	**80 (13)**	**107 (10)**	**154 (8)**	**236 (8)**	**233 (2)**
AVNI	40 (17)	83 (15)	112 (15)	**91 (12)**	**92 (7)**	129 (3)**	99 (1)**
AVNO	51 (17)	81 (13)	126 (9)	**114 (8)**	105 (5)**	120(3)**	**--**
BAMS	43 (25)	71 (21)	101 (18)	**135 (16)**	**175 (12)**	**231 (8)**	**235 (4)**
BAMM	46 (25)	69 (21)	**86 (18)**	**120 (16)**	**188 (12)**	**277 (8)**	412 (4)
BAMD	58 (25)	101 (21)	137 (18)	186 (16)	315 (12)	544 (8)	749 (4)
LBAR	48 (16)	96 (14)	137 (13)	219 (12)	293 (8)	173 (3)**	--

Table 3. Overall Wind Verification

Table entries are errors in maximum sustained wind speed forecasts, measured in knots. Values in the parenthesis indicate the number of forecasts. Values in bold represent guidance forecast errors equal to or less than the official CPHC forecast.

Forecast	12-hr	24-hr	36-hr	48-hr	72-hr	96-hr	120-hr
CPHC	9 (25)	14 (21)	20 (18)	25 (16)	35 (12)	43 (8)	42 (4)
AVNI	11 (17)	17 (16)	24 (15)	26 (12)	**25 (7)**	46 (3)**	53 (1)**
AVNO	21 (18)	19 (13)	**16 (9)**	**10 (8)**	8 (5)**	7 (3)**	--
GFDL	13 (19)	**14 (15)**	**16 (13)**	**23 (10)**	**24 (8)**	**28 (8)**	**9 (2)**
SHIP	**8 (25)**	**14 (21)**	21 (18)	28 (16)	36 (12)	**33 (8)**	**32 (4)**
SHF5	**7 (25)**	**11 (21)**	**15 (18)**	**20 (16)**	**10 (12)**	**12 (8)**	**16 (4)**

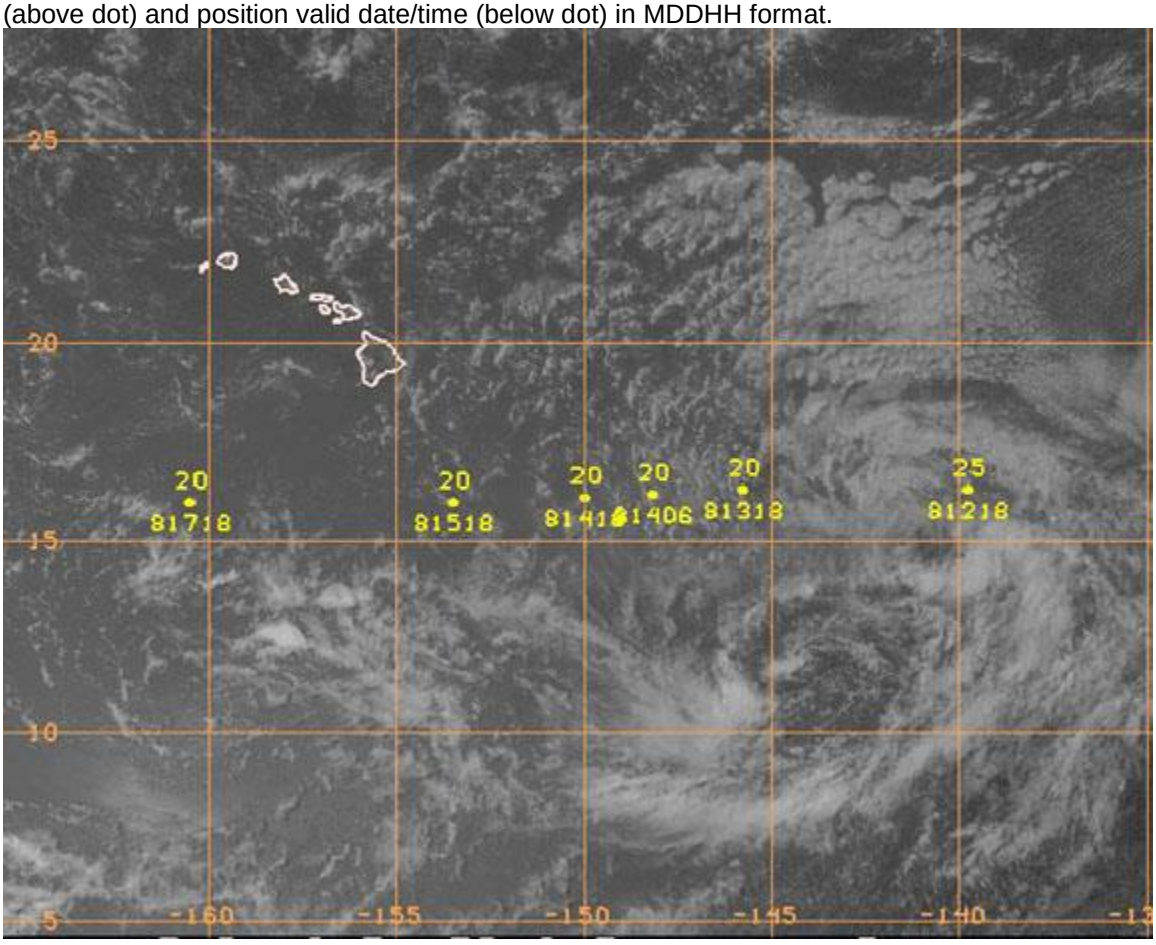
REMNANTS OF TROPICAL STORM GUILLERMO

12-13 August 2003

HISTORY. The remnants of an eastern Pacific Tropical Storm, Guillermo, moved west into the central Pacific across 140W between 1800 UTC 12 August and 0000 UTC 13 August. Real-time operational evaluation of the system classified it as a weak tropical depression, so the Central Pacific Hurricane Center (CPHC) issued a forecast advisory on Guillermo before downgrading it further. Post storm analysis indicated that the system had in fact weakened sufficiently 6 to 12 hours earlier to be classified as a remnant low at 139.8W, east of the CPHC area of responsibility.

The remnant low cloud swirl remained intact for a few more days as it drifted southwest and interacted with another weak low level circulation that ultimately developed into Tropical Depression 01-C.

Figure 1. Visible satellite image of Guillermo taken at 0030 UTC 13 August. Dots on the image are the initial and forecast positions from the forecast bulletin. Plotted values are the maximum forecast winds (above dot) and position valid date/time (below dot) in MDDHH format.



TROPICAL DEPRESSION 01-C

15-17 August 2003

HISTORY. The first tropical cyclone of the season in the central Pacific, Tropical Depression (TD) 01-C, developed within an active portion of the monsoon trough that formed in mid August to the southeast of the Hawaiian islands. The first CPHC advisory on TD 01-C was issued at 1800 UTC 15 August with the center near 13.8N 151.0W and estimated 30 kt winds in a small area north of the center. The depression was moving west at 10 kt remaining well south of the Hawaiian Islands with little effect on the islands' weather. TD 01-C never strengthened further as it moved generally westward. By 0000 UTC 17 August, TD 01-C had weakened into a remnant low level circulation. This weak remnant circulation did maintain itself for several more days as it moved west toward the Dateline with deep convection occasionally flaring up. It passed just south of Johnston Atoll at 1800 UTC 18 August and crossed the International Dateline near 16N into the western Pacific on 20 August.

SYNOPTIC FACTORS. Vertical wind shear was unfavorable for the development of TD 01-C as was the upper flow pattern that featured a large upper tropospheric trough to the northeast. The trough extended its cyclonically curved flow southwestward down over the depression. TD 01-C therefore did not develop beyond the tropical depression stage, and it commenced weakening on 16 August as the deep convection dissipated.

BEST TRACK AND VERIFICATION

Table 4. Best Track Data

Date/Time (UTC)	Latitude (N)	Longitude (W)	Pressure (mb)	Wind Speed (kt)	Stage/Notes
15 / 1800	13.6	151.0	1009	30	tropical depression
16 / 0000	13.9	152.9	1009	30	"
16 / 0600	14.2	154.4	1009	30	"
16 / 1200	14.4	155.7	1009	30	"
16 / 1800	14.6	156.8	1009	25	"
17 / 0000	14.7	158.1	1009	25	remnant low

Table 5. Track Verification

Table entries are track forecast errors, measured in nautical miles. Values in parenthesis indicate the number of forecasts. Values in bold represent guidance forecast errors equal to or less than the official CPHC forecast. (**) refers to guidance with too few forecasts to make a comparison with.

Forecast	12-hr	24-hr	36-hr	48-hr	72-hr	96-hr	120-hr
CPHC	31 (3)	103 (1)	--	--	--	--	--
CLP5	77 (3)	160(1)**	--	--	--	--	--
GFDL	42(1)**	--	--	--	--	--	--
AVNI	32 (2)	--	--	--	--	--	--
AVNO	64 (2)	106 (1)	--	--	--	--	--
BAMS	58 (3)	136 (1)	--	--	--	--	--
BAMM	77 (3)	209 (1)	--	--	--	--	--

BAMD	**100 (3)**	**256 (1)**	**--**	**--**	**--**	**--**	**--**
LBAR	**67 (3)**	**180 (1)**	**--**	**--**	**--**	**--**	**--**

Table 3. Wind Verification Table entries are errors in maximum sustained wind speed forecasts, measured in knots. Values in the parenthesis indicate the number of forecasts. Values in bold represent guidance forecast errors equal to or less than the official CPHC forecast. (**) refers to guidance with too few forecasts to make a comparison with.

Forecast	12-hr	24-hr	36-hr	48-hr	72-hr	96-hr	120-hr
CPHC	**5 (3)**	**12 (1)**	**--**	**--**	**--**	**--**	**--**
AVNI	**2 (2)**	**2 (1)**	**--**	**--**	**--**	**--**	**--**
AVNO	**5 (3)**	**2 (1)**	**--**	**--**	**--**	**--**	**--**
GFDL	**10 (1)****	**--**	**--**	**--**	**--**	**--**	**--**
SHIP	**7 (3)**	**18 (1)**	**--**	**--**	**--**	**--**	**--**
SHF5	**6 (3)**	**15 (1)**	**--**	**--**	**--**	**--**	**--**

Figure 2. Best Track for TD-01C

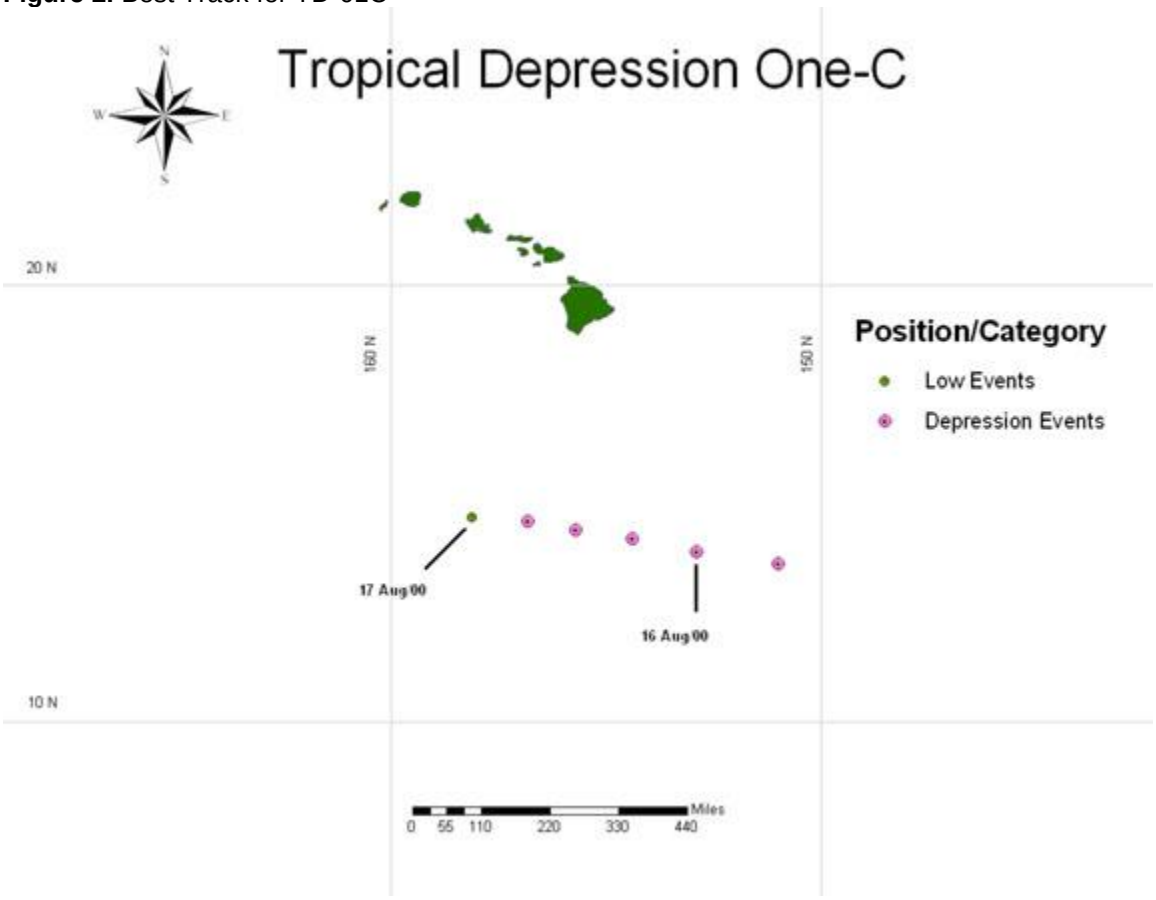
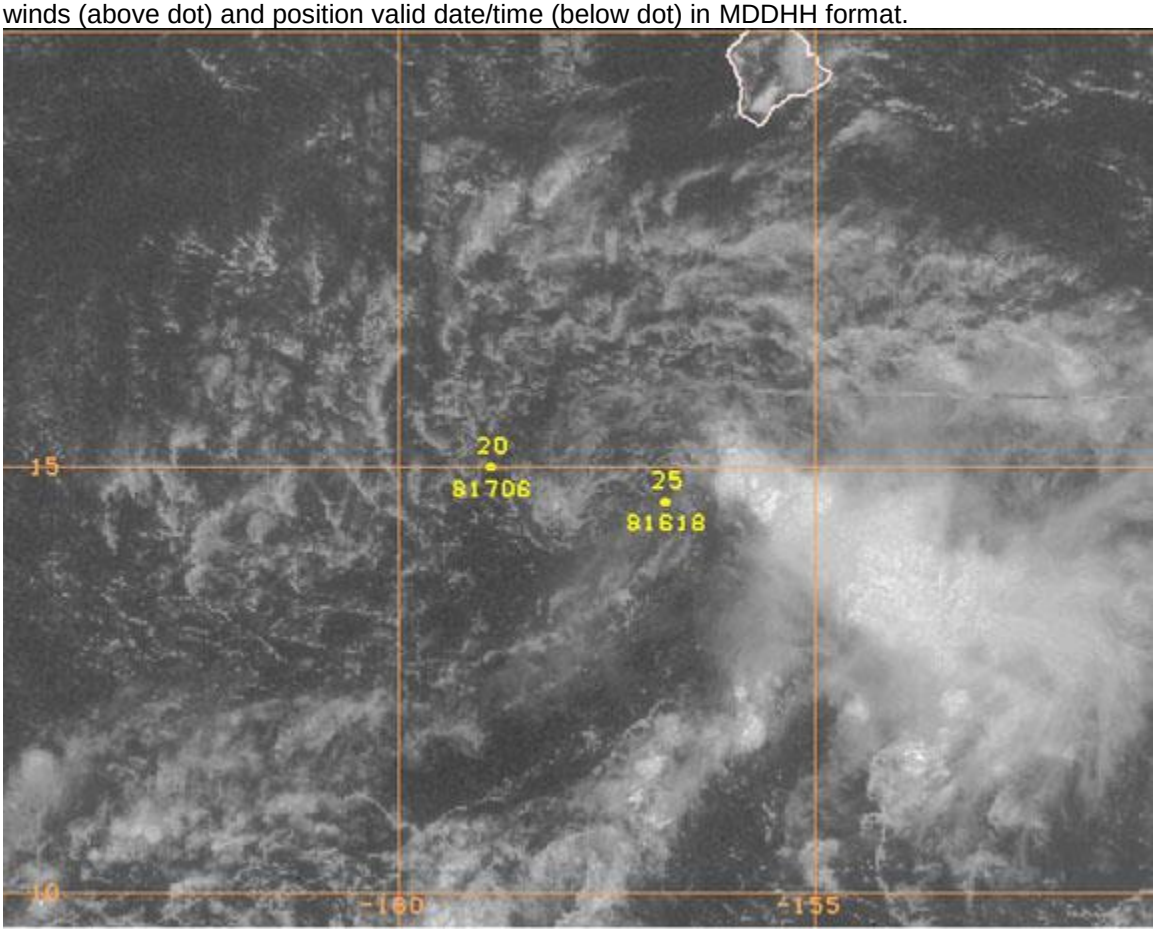


Figure 3. Visible satellite image of 01-C taken at 2100 UTC 16 August. Dots on the image are the initial and forecast positions from the 2100 UTC forecast bulletin. Plotted values are the maximum forecast

winds (above dot) and position valid date/time (below dot) in MDDHH format.



HURRICANE JIMENA

28 August - 5 September 2003

Additional information concerning Hurricane Jimena can be found here.

HISTORY. Tropical Depression 10-E formed around 0600 UTC 28 August from an area of convection some 1500 nm east southeast of Hilo, Hawaii. The depression gained tropical storm intensity at 1800 UTC 28 August and was named Jimena. Tropical Storm Jimena continued the rapid strengthening trend and reached hurricane force just 18 hours later at 1200 UTC 29 August about 1200 miles east-southeast of Hilo.

Hurricane Jimena continued to develop as it moved just north of due west and directly toward the Hawaiian Islands. Jimena crossed 140W and entered the CPHC's area of responsibility at 0600 UTC 30 August, with maximum winds of 85 kt. Jimena continued its intensification for another six hours, reaching 90 kt, category 2 on the Saffir-Simpson scale, at 1800 UTC 30 August while about 700 nm east of the Big Island of Hawaii. Jimena began to slowly weaken after 0600 UTC 31 August while continuing to move west- northwestward toward the Big Island of Hawaii. Jimena lost strength dramatically beginning about 1800 UTC 31 August as it came under strong upper level shear from the south. At about that time, the first of a series of flights by the 53rd Weather Reconnaissance Squadron of the U. S. Air Force Reserve

Command commenced. Data from the first flight indicated the strongest flight-level (700 mb) wind speed was 71 kt with the lowest pressure measured by dropwindsonde of 990 mb.

Jimena began to turn and track south of due west after 0000 UTC 1 September, and weakened further, rapidly dropping below hurricane force by 0600 UTC 1 September when it was located a few hundred miles south-southeast of the Big Island of Hawaii. Tropical Storm Jimena passed about 105 nm south of South Point on the Big Island of Hawaii about 1500 UTC 1 September.

Tropical Storm Jimena continued to weaken as it moved west-southwest, well south of the remainder of the Hawaiian Islands. Jimena dropped below Tropical Storm strength by 0000 UTC 3 September, when it was about 400 miles southwest of Kauai. Tropical Depression Jimena continued to track westward, eventually crossing the Dateline and out of CPHC's area of responsibility after 0600 UTC 5 September.

IMPACTS. Jimena was the first tropical storm or hurricane to pose a considerable threat to Hawaii since Daniel in 2000. Based upon forecasts initially by the Tropical Prediction Center (TPC) and continued by the CPHC of Jimena passing about 50 nm south of the Big Island, a Hurricane Watch was posted at 0000 UTC 31 August for the Big Island. This was followed by a Tropical Storm Warning posted at 0300 UTC 1 September. Ultimately the center of Jimena passed a little more than 100 nm south of the Big Island as a weakening and increasingly disorganized tropical storm. Thus the effects on the Big Island were minimal. Highest wind gusts were 46 kt at South Point and 50 kt on Kahoolawe which is exposed to accelerated winds flowing between Maui and the island of Hawaii. Jimena produced rainfall amounts of 6 to 10 inches, with higher isolated amounts, across the windward sections of the Big Island. No significant flooding occured. High surf with heights of 10 to 15 feet was reported along the southeast-facing shores of the Kau district and up to 11 feet along the coast just north of Hilo on the island of Hawaii. The Hurricane Watch was discontinued at 1500 UTC 1 September with the Tropical Storm Warning cancelled at 2100 UTC 1 September.

BEST TRACK AND VERIFICATION

Table 7. Best Track Data (While in the Central Pacific)

Date/Time (UTC)	Latitude (N)	Longitude (W)	Pressure (mb)	Wind Speed (kt)	Stage/Notes
30 / 1200	17.3	141.3	972	85	hurricane
30 / 1800	17.3	142.9	970	90	
31 / 0000	17.6	144.4	976	90	
31 / 0600	17.8	146.1	980	90	
31 / 1200	18.0	147.8	984	85	
31 / 1800	18.2	149.6	991	75	
01 / 0000	18.1	151.3	1000	65	
01 / 0600	17.8	153.0	1000	55	tropical storm
01 / 1200	17.4	154.5	1002	45	
01 / 1800	17.0	156.1	1002	40	
02 / 0000	16.5	157.6	1005	35	
02 / 0600	16.1	159.0	1006	35	
02 / 1200	15.6	160.4	1005	35	
02 / 1800	15.3	161.9	1005	35	
03 / 0000	15.1	163.4	1009	30	tropical depression
03 / 0600	14.9	164.9	1009	30	
03 / 1200	14.7	166.5	1009	25	
03 / 1800	14.7	168.2	1009	25	
04 / 0000	14.7	170.0	1009	25	
04 / 0600	14.7	171.8	1009	30	
04 / 1200	14.6	173.6	1009	30	
04 / 1800	14.2	175.5	1010	30	
05 / 0000	13.7	177.4	1009	30	
05 / 0600	13.6	179.4	1009	30	moving out of central Pacific

Table 8. Track Verification

Table entries are track forecast errors, measured in nautical miles. Values in parenthesis indicate the number of forecasts. Values in bold represent guidance forecast errors equal to or less than the official CPHC forecast. (**) refers to guidance with too few forecasts to make a comparison with.

Forecast	12-hr	24-hr	36-hr	48-hr	72-hr	96-hr	120-hr
CPHC	**38 (22)**	**63 (20)**	**100 (18)**	**146 (16)**	**244 (12)**	**309 (8)**	**270 (4)**
CLP5	**46 (22)**	**99 (20)**	**179 (18)**	**275 (16)**	**404 (12)**	**555 (8)**	**636 (4)**
GFDL	**35 (18)**	**51 (15)**	**80 (13)**	**107 (10)**	**154 (8)**	**236 (8)**	**233 (2)**
AVNI	**41 (15)**	**83 (15)**	**112 (15)**	**91 (12)**	**92 (7)**	**129 (3)****	**99 (1)****
AVNO	**49 (15)**	**79 (12)**	**126 (9)**	**114 (8)**	**105 (5)****	**120(3)****	**--**
BAMS	**41 (22)**	**67 (20)**	**101 (18)**	**135 (16)**	**175 (12)**	**231 (8)**	**235 (4)**
BAMM	**41 (22)**	**62 (20)**	**86 (18)**	**120 (16)**	**188 (12)**	**277 (8)**	**412 (4)**
BAMD	**53 (22)**	**93 (20)**	**137 (18)**	**186 (16)**	**315 (12)**	**544 (8)**	**749 (4)**
LBAR	**44 (13)****	**90 (13)**	**137 (13)**	**219 (12)**	**293 (8)**	**173 (3)****	**--**

Table 9. Wind Verification Table entries are errors in maximum sustained wind speed forecasts, measured in knots. Values in the parenthesis indicate the number of forecasts. Values in bold represent guidance forecast errors equal to or less than the official CPHC forecast. (**) refers to guidance with too few forecasts to make a comparison with.

Forecast	12-hr	24-hr	36-hr	48-hr	72-hr	96-hr	120-hr
CPHC	**9 (22)**	**14 (20)**	**20 (18)**	**25 (16)**	**35 (12)**	**43 (8)**	**42 (4)**
AVNI	**13 (15)**	**19 (15)**	**24 (15)**	**26 (12)**	**25 (7)**	**46 (3)****	**53 (1)****
AVNO	**24 (15)**	**21 (12)**	**16 (9)**	**10 (8)**	**8 (5)****	**7 (3)****	**--**
GFDL	**14 (18)**	**14 (15)**	**16 (13)**	**23 (10)**	**24 (8)**	**28 (8)**	**9 (2)**
SHIP	**8 (22)**	**14 (20)**	**21 (18)**	**28 (16)**	**36 (12)**	**33 (8)**	**32 (4)**
SHF5	**7 (22)**	**11 (20)**	**15 (18)**	**20 (16)**	**10 (12)**	**12 (8)**	**16 (4)**

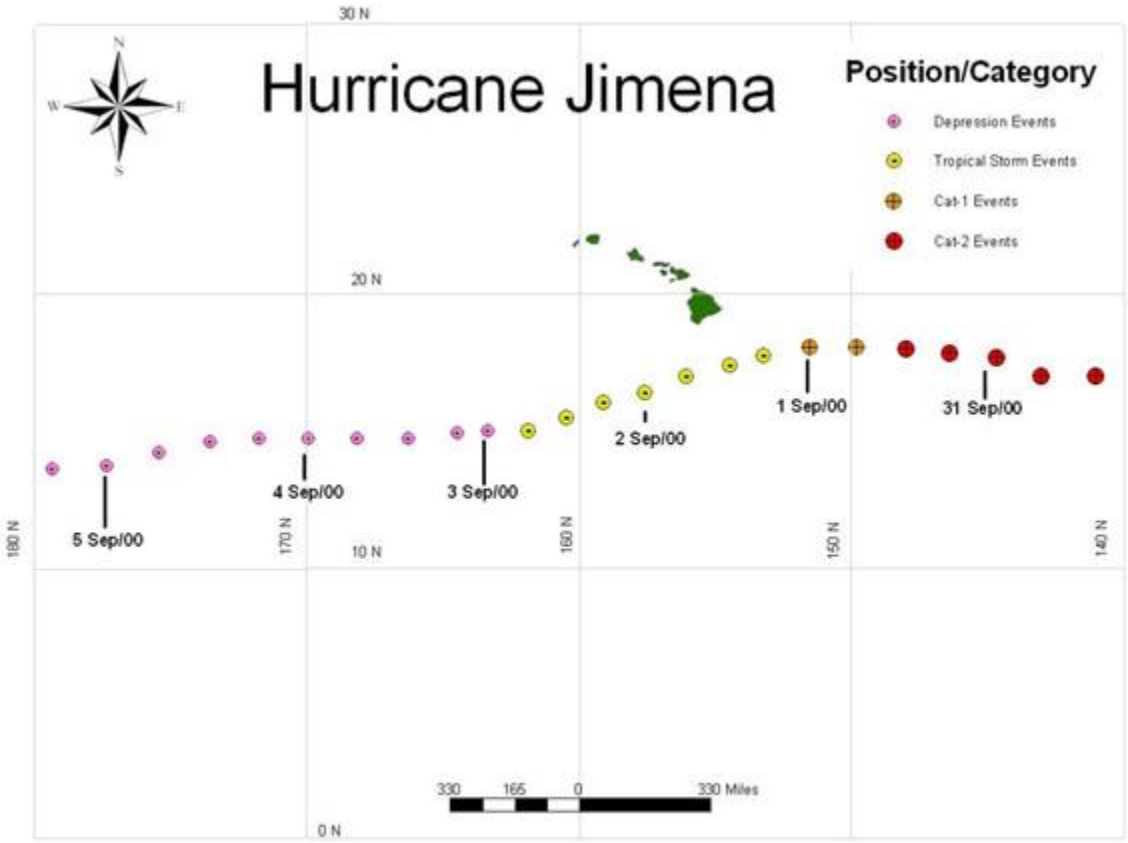


Figure 5. Visible satellite image taken at 1900 UTC 31 August. Dots on the image are the initial and forecast positions from the forecast bulletin. Plotted values are the maximum forecast winds (above dot)

and position valid date/time (below dot) in MDDHH format.

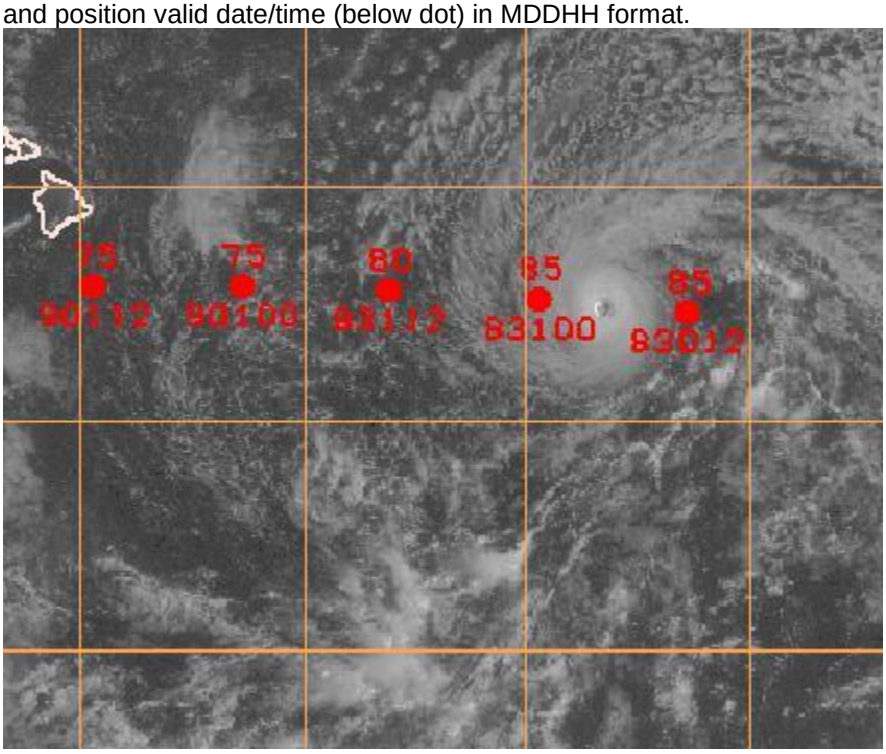


Figure 6. Infrared satellite imagery taken at 1600 UTC 1 September.

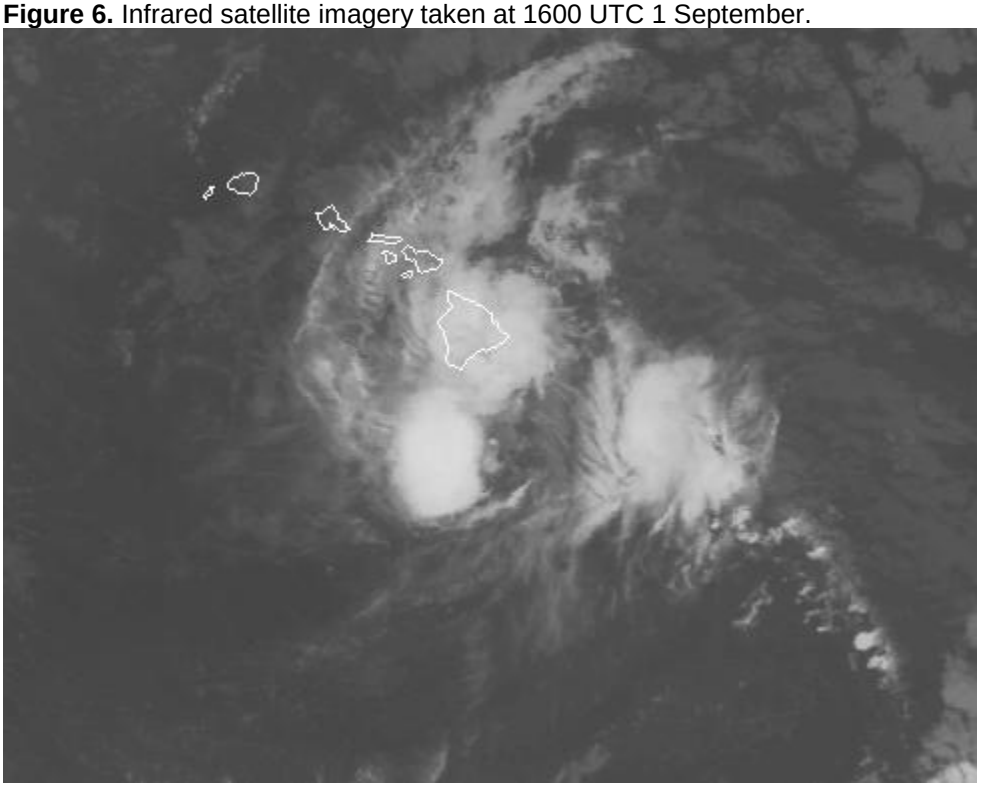
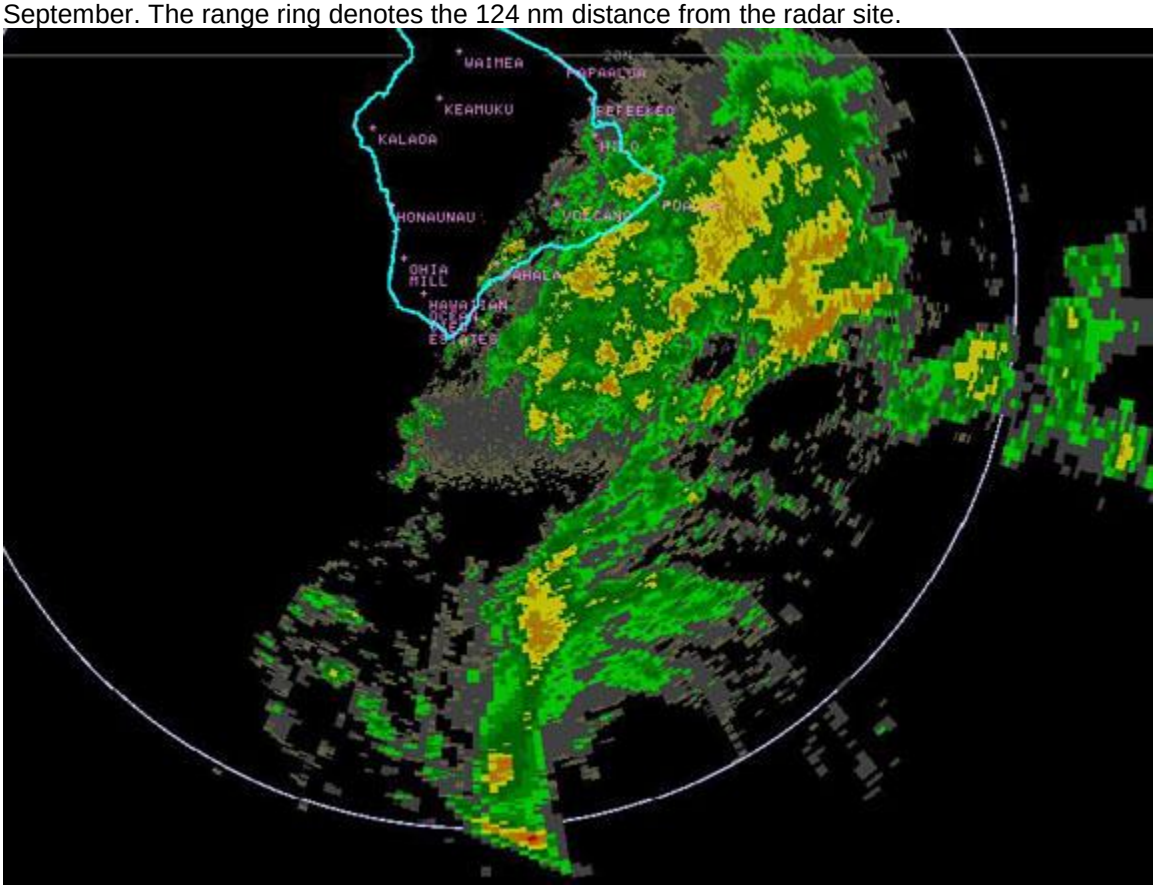


Figure 7. Radar reflectivity (0.5 degree elevation) from the South Hawaii 88D (PHWA) at 0345 UTC 1 September. The range ring denotes the 124 nm distance from the radar site.



ACRONYMS that may have been used in this report.	
Acronym	**Full Spelling/Definition**
AOR	**Area of Responsibility**
AVNO	**Operation global forecast system model**
BAMD	**Deep Layer Beta Advection Model (mean layer averaged between 850 hPa and 250 hPa)**
BAMM	**Medium Layer Beta Advection Model (mean layer averaged between 850 hPa and 400 hPa)**
BAMS	**Shallow Layer Beta Advection Model (mean layer averaged between 850 hPa and 700 hPa)**
CLIP	**Climatology and Persistence**
CPHC	**Central Pacific Hurricane Center**
GFDL	**Geophysical Fluid Dynamics Laboratory model**
hPa	**Hectopascal (formerly millibar)**
ITCZ	**Inter-tropical Convergence Zone**
JTWC	**Joint Typhoon Warning Center**

kts	**knots**
LBAR	**Barotropic limited area sine transform**
mb	**millibars**
NA	**Not Available**
NGPS	**NOGAPS (Navy Operational Global Atmospheric Prediction System) Vortex Tracking Routine**
NHC	**National Hurricane Center**
nm	**nautical miles**
P91E	**Pacific Statistical Dynamic Model (adapted from NHC90 for the Eastern Pacific)**
SHIFR	**Statistical Hurricane Intensity Forecast**
SHIP	**Statistical Hurricane Intensity Prediction**
SST	**Sea Surface Temperature**
TD	**Tropical Depression**
TPC	**Tropical Prediction Center, Miami, FL**
TUTT	**Tropical Upper Tropospheric Trough**
UTC	**Universal Time Coordinated**
WFO	**Weather Forecast Office**