

Tropical Cyclone Report
Hurricane Linda
(EP152009)
7 – 11 September 2009

Robbie Berg
National Hurricane Center
26 October 2009

Linda, a category 1 hurricane (on the Saffir-Simpson Hurricane Scale) over the eastern North Pacific Ocean, did not affect land.

a. Synoptic History

Hurricane Linda developed from a tropical wave that moved off the west coast of Africa on 18 August. The wave moved across the tropical Atlantic Ocean with little associated deep convection and then split when located east of the Lesser Antilles. The northern portion of the wave developed into Tropical Storm Danny east of the Bahamas on 26 August, while the southern part continued to move westward across the Caribbean Sea and Central America and entered the eastern Pacific basin on 28 August. Shower and thunderstorm activity remained limited for several days but began to increase on 3 September. An area of low pressure developed around 0000 UTC 6 September, and deep convection became organized enough for the low to be considered a tropical depression by 0600 UTC 7 September, about 980 n mi west-southwest of the southern tip of Baja California. The depression then strengthened to a tropical storm about 6 h later. The “best track” chart of Linda’s path is given in Fig. 1, with the wind and pressure histories shown in Figs. 2 and 3, respectively. The best track positions and intensities are listed in Table 1¹.

Linda moved very slowly to the west over the next day or so as the subtropical ridge to its north weakened and the steering currents collapsed. Another mid-level ridge developed east of the cyclone by 9 September, and Linda turned toward the northwest with some increase in forward speed. The storm gradually intensified during that time, and it is estimated to have become a hurricane by 1800 UTC 9 September. Linda then reached a peak intensity of 70 kt from 0000 to 1200 UTC 10 September. A short-lived eye formed, but microwave data suggest that this feature was quickly displaced to the northeast of the low-level center due to increasing southwesterly vertical shear (Fig. 4). The shear and cooler sea surface temperatures led to a quick degradation of the satellite presentation, and Linda weakened to a tropical storm by 0000 UTC 11 September. Lacking deep convection, the cyclone degenerated into a remnant low by 0000 UTC 12 September, centered about 1205 n mi west of the southern tip of Baja California. The remnant low moved generally southwestward for almost another three days under the

¹ A digital record of the complete best track, including wind radii, can be found on line at <ftp://ftp.nhc.noaa.gov/atcf>. Data for the current year’s storms are located in the *brk* directory, while previous years’ data are located in the *archive* directory.

influence of the low-level flow, eventually dissipating about 1040 n mi east of the Hawaiian Islands.

b. Meteorological Statistics

Observations in Linda (Figs. 2 and 3) include satellite-based Dvorak technique intensity estimates from the Tropical Analysis and Forecast Branch (TAFB) and the Satellite Analysis Branch (SAB) and intensity estimates from the CIMSS Advanced Microwave Sounding Unit (AMSU). Data and imagery from NOAA polar-orbiting satellites, Defense Meteorological Satellite Program (DMSP) satellites, National Aeronautics and Space Administration (NASA) satellites, including TRMM, QuikSCAT, and Aqua, the U.S. Navy WindSat, and the EUMETSAT ASCAT were also useful in constructing the best track of Linda.

The estimated peak intensity of 70 kt from 0000 UTC to 1200 UTC 10 September is based on a blend of subjective satellite intensity estimates of 77 kt and 65 kt from TAFB and SAB, respectively, a peak 3-hr average objective satellite intensity estimate of 70 kt at 0300 UTC 10 September from the Automated Dvorak Technique (ADT), an estimate of 70 kt from a 1402 UTC 10 September QuikSCAT pass, and several AMSU estimates ranging between 66 kt and 80 kt around that time.

There were no ship reports of winds of tropical storm force associated with Linda.

c. Casualty and Damage Statistics

There were no reports of damage or casualties associated with Linda.

d. Forecast and Warning Critique

The genesis of Linda was fairly well forecast. The precursor area of low pressure was first mentioned in the Tropical Weather Outlook (TWO) and given a low chance of development (less than 30% during the ensuing 48 h) almost 4 days before the system is estimated to have become a tropical depression. However, the TWO still indicated a low chance of development 48 h before the system became a depression and showed a high chance (greater than 50%) only 18 h before genesis.

A verification of NHC official track forecasts for Linda is given in Table 2a. Official forecast track errors were lower than the mean official errors for the previous five-year period (2004 – 2008) for all forecast periods except 96 h. This occurred despite CLIPER5 (OCD5) errors being larger than their respective five-year means for the 48, 72, and 96 h forecast periods. A homogeneous comparison of the official track errors with selected guidance models is given in Table 2b. Only the consensus model TVCC performed better than the official forecast at all forecast periods, although TVCN and GUNA also performed well at most forecast times. The

official track forecast errors were lower than those from most of the other guidance, being bested only by the Florida State Superensemble (FSSE) at 24 h.

A verification of NHC official intensity forecasts for Linda is given in Table 3a. Official forecast intensity errors were lower than the mean official errors for the previous five-year period for all forecast periods except 24 h (where the mean error was only 0.1 kt higher). A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. GHMI, HWFI, GFNI, and FSSE—as well as the consensus ICON—had lower errors than the official forecast between 24 and 48 h. The official forecast had the lowest errors at 12 h.

Table 1. Best track for Hurricane Linda, 7 – 11 September 2009.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
06 / 0000	14.5	121.5	1009	25	low
06 / 0600	14.6	122.4	1009	25	"
06 / 1200	14.7	123.2	1008	25	"
06 / 1800	14.9	123.9	1008	25	"
07 / 0000	15.2	124.6	1008	25	"
07 / 0600	15.3	125.3	1006	30	tropical depression
07 / 1200	15.3	126.0	1004	35	tropical storm
07 / 1800	15.2	126.7	1002	40	"
08 / 0000	15.1	127.3	1000	45	"
08 / 0600	15.0	127.7	997	50	"
08 / 1200	15.0	127.9	997	50	"
08 / 1800	15.1	128.1	997	50	"
09 / 0000	15.3	128.3	994	55	"
09 / 0600	15.5	128.5	994	55	"
09 / 1200	15.8	128.7	990	60	"
09 / 1800	16.3	128.9	987	65	hurricane
10 / 0000	16.8	129.2	985	70	"
10 / 0600	17.4	129.5	985	70	"
10 / 1200	18.0	129.7	985	70	"
10 / 1800	18.6	129.9	987	65	"
11 / 0000	19.2	130.2	994	55	tropical storm
11 / 0600	19.7	130.5	1000	45	"
11 / 1200	20.1	130.8	1002	40	"
11 / 1800	20.5	131.2	1005	35	"
11 / 2100	20.6	131.3	1006	30	tropical depression
12 / 0000	20.7	131.4	1007	30	low
12 / 0600	20.9	131.7	1007	30	"
12 / 1200	21.0	132.0	1008	25	"
12 / 1800	21.0	132.3	1008	25	"
13 / 0000	20.9	132.5	1009	20	"
13 / 0600	20.7	132.7	1009	20	"
13 / 1200	20.4	132.9	1009	20	"
13 / 1800	20.1	133.2	1009	20	"
14 / 0000	20.0	133.6	1009	20	"
14 / 0600	19.9	134.1	1009	20	"
14 / 1200	19.9	134.8	1009	20	"
14 / 1800	19.9	135.6	1009	20	"
15 / 0000	19.9	136.4	1009	20	"
15 / 0600					dissipated
10 / 0000	16.8	129.2	985	70	maximum wind and minimum pressure

Table 2a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Linda, 7 – 11 September 2009. Mean errors for the five-year period 2004-8 are shown for comparison. Official errors that are smaller than the five-year means are shown in boldface type.

	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	30.1	49.3	56.3	73.3	112.8	163.7	
OCD5	34.0	69.8	107.8	163.1	293.3	397.3	
Forecasts	18	16	14	12	8	4	
OFCL (2004-8)	31.0	51.7	71.7	90.2	123.6	161.3	201.8
OCD5 (2004-8)	38.4	73.6	111.9	149.1	214.2	261.1	311.5

Table 2b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Hurricane Linda, 7 – 11 September 2009. Errors smaller than the NHC official forecast are shown in boldface type. The number of official forecasts shown here will generally be smaller than that shown in Table 2a due to the homogeneity requirement.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	30.3	43.9	47.1	63.2	99.5		
OCD5	34.2	67.7	115.8	176.1	339.4		
GFSI	43.1	73.0	96.2	125.4	161.4		
GHMI	39.6	64.1	78.9	109.3	176.2		
HWFI	52.5	81.1	108.9	142.5	223.1		
GFNI	36.0	55.7	75.1	99.7	139.5		
NGPI	33.3	47.4	55.5	72.7	133.0		
UKMI	39.8	75.1	107.3	119.8	169.5		
EGRI	39.8	75.1	107.3	119.8	169.5		
AEMI	41.6	64.1	82.6	106.9	177.8		
FSSE	31.2	42.1	52.9	72.3	107.6		
TCON	34.1	47.0	54.5	69.3	105.3		
TVCN	30.8	40.1	47.7	62.9	102.0		
TVCC	30.0	34.8	38.9	47.0	65.6		
GUNA	30.7	40.5	44.5	57.5	84.7		
LBAR	45.7	98.4	152.1	223.5	367.6		
BAMD	77.6	129.3	160.0	199.5	250.2		
BAMM	63.0	103.2	132.7	169.5	198.8		
BAMS	53.6	87.8	125.6	161.5	187.1		
NAMI	43.1	87.6	143.5	174.8	169.1		
Forecasts	12	10	8	7	4		

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Hurricane Linda, 7 – 11 September 2009. Mean errors for the five-year period 2004-8 are shown for comparison. Official errors that are smaller than the five-year means are shown in boldface type.

	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	5.6	10.3	11.9	10.5	12.1	8.3	
OCD5	7.0	13.4	14.4	13.7	15.9	14.0	
Forecasts	18	16	14	12	8	4	
OFCL (2004-8)	6.2	10.2	13.3	15.1	17.7	19.0	18.8
OCD5 (2004-8)	7.1	11.5	14.7	16.8	18.9	20.3	20.2

Table 3b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Hurricane Linda, 7 – 11 September 2009. Errors smaller than the NHC official forecast are shown in boldface type. The number of official forecasts shown here will generally be smaller than that shown in Table 3a due to the homogeneity requirement.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	5.4	11.0	13.1	11.4	5.0		
OCD5	8.2	15.1	13.5	11.0	13.8		
GFSI	8.5	11.8	9.0	10.9	14.5		
GHMI	6.8	10.1	5.8	6.7	7.5		
HWFI	7.2	9.8	8.4	7.6	12.5		
GFNI	7.8	9.9	6.8	6.4	16.5		
NGPI	8.4	15.7	15.9	13.9	7.5		
UKMI	7.8	13.7	15.1	12.9	5.3		
FSSE	6.7	10.6	7.8	6.6	2.8		
NAMI	7.7	15.2	15.8	12.1	9.5		
DSHP	7.0	12.3	11.5	10.9	3.8		
LGEM	8.0	14.9	16.5	15.1	7.8		
ICON	6.6	10.0	7.4	6.9	2.5		
Forecasts	12	10	8	7	4		

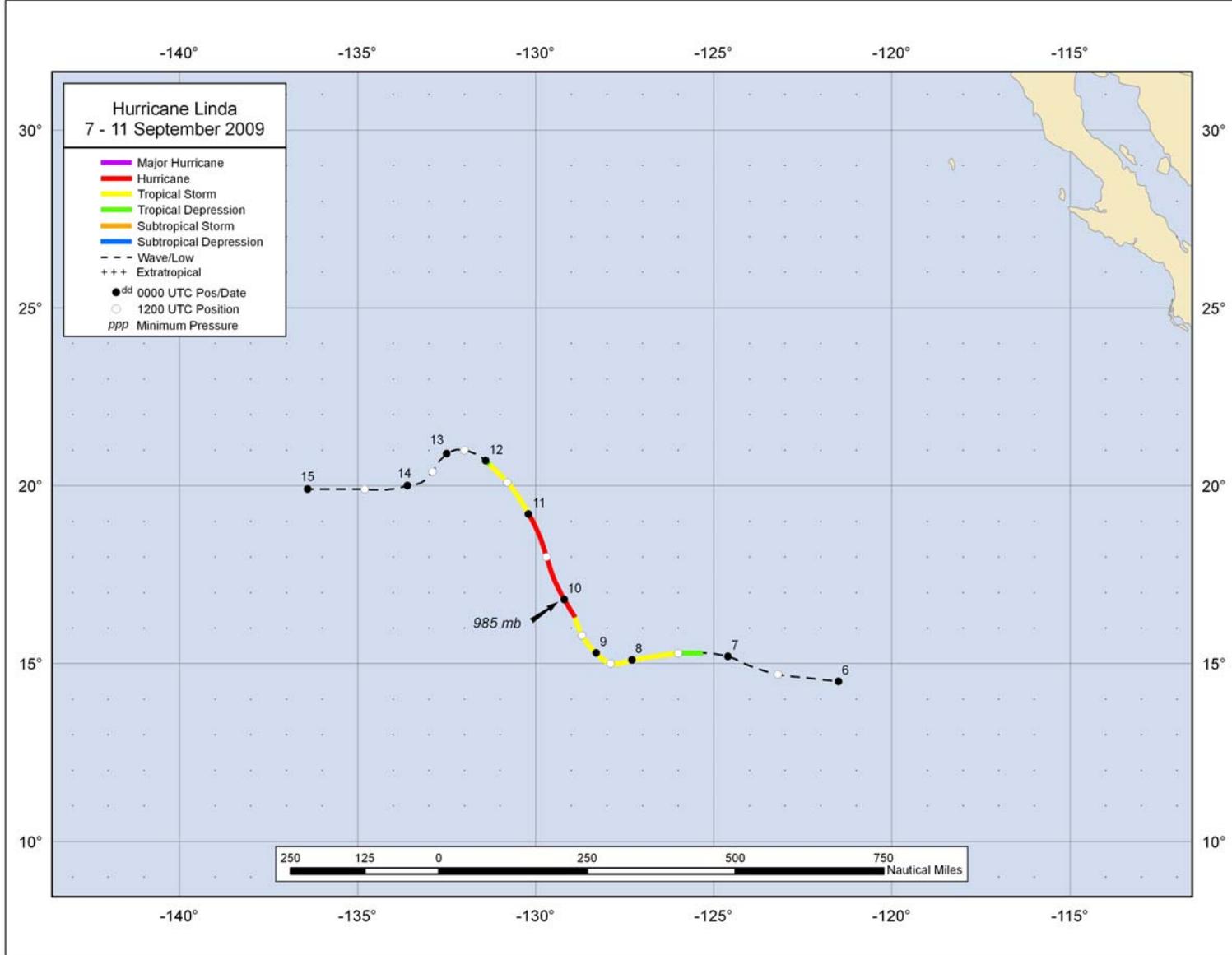


Figure 1. Best track positions for Hurricane Linda, 7 – 11 September 2009.

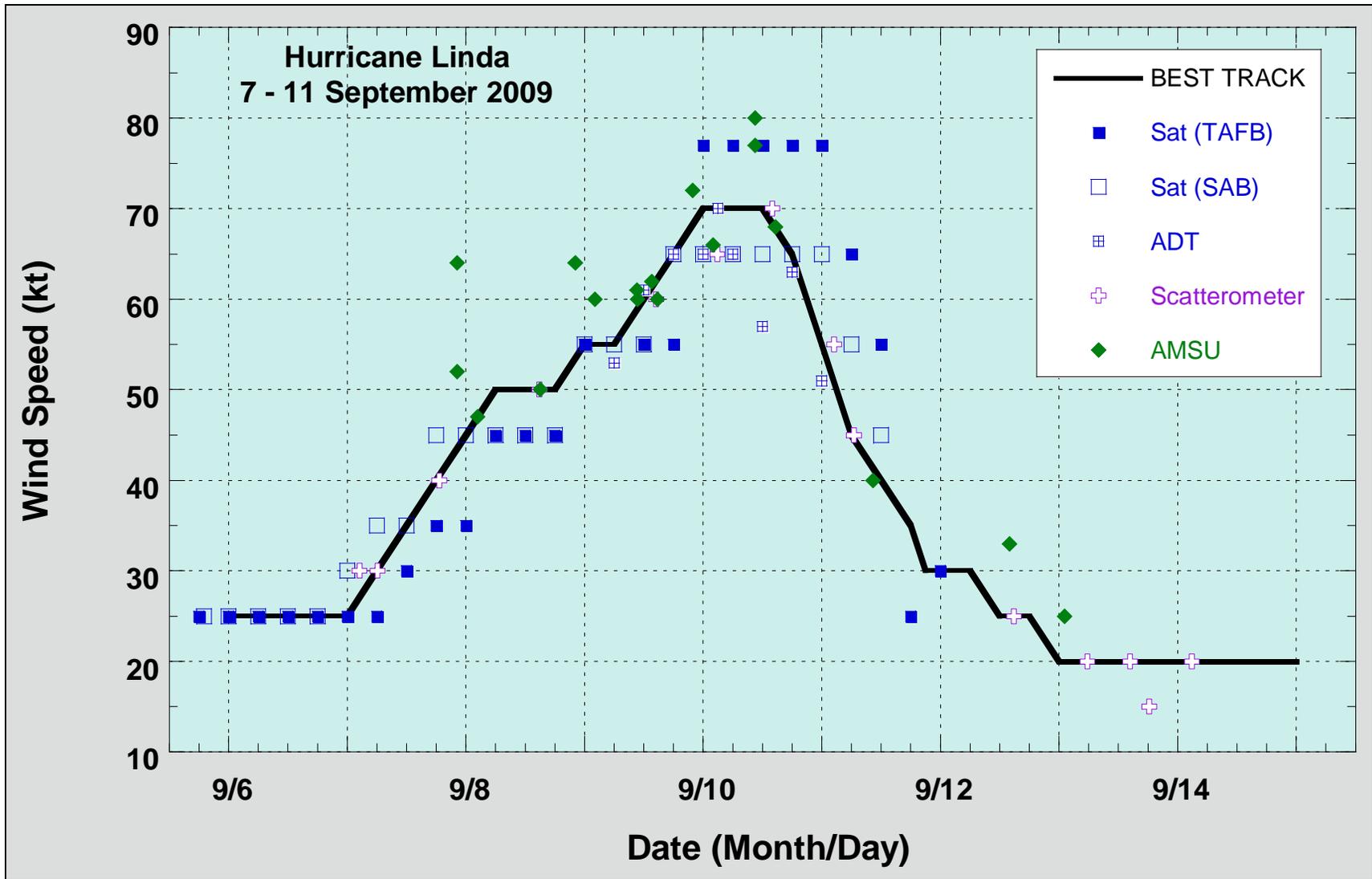


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Linda, 7 – 11 September 2009. Advanced Dvorak Technique estimates represent linear averages over a three-hour period centered on the nominal observation time. Dashed vertical lines correspond to 0000 UTC.

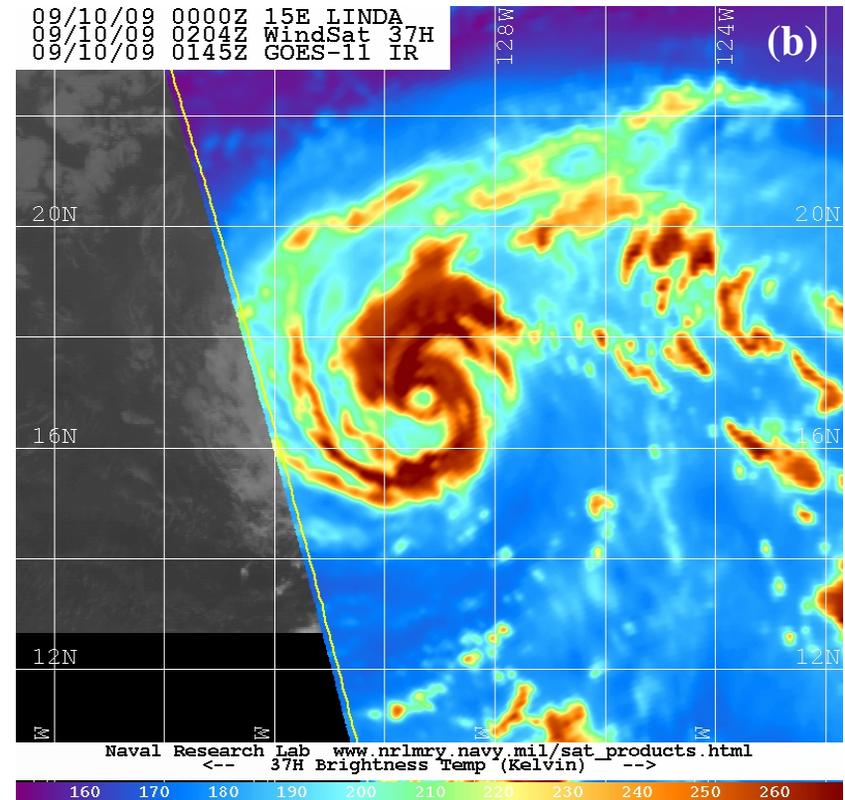
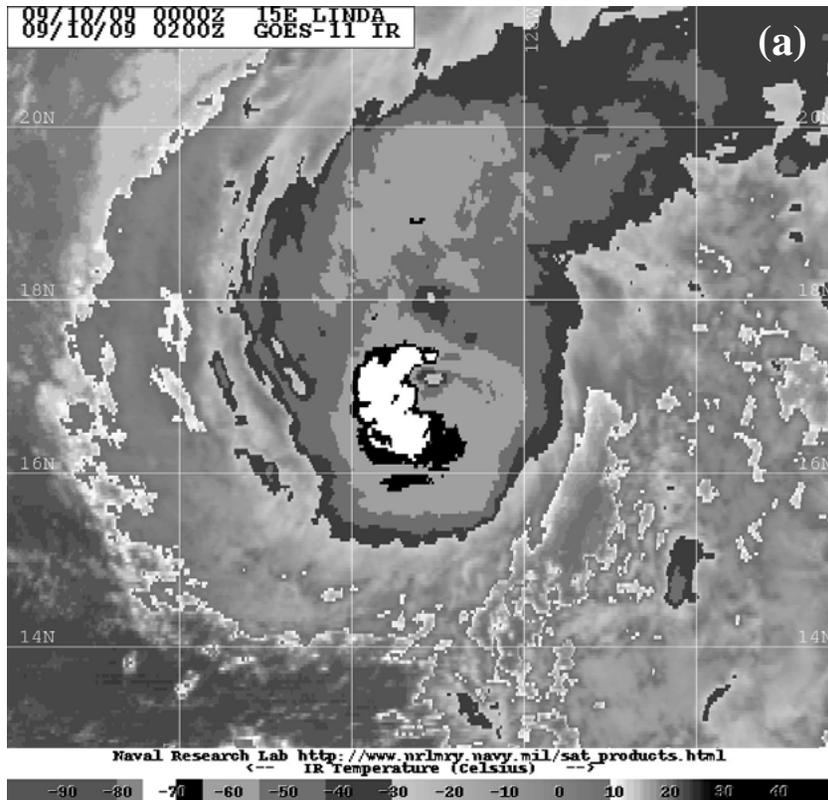


Figure 4. Infrared GOES-West image of Hurricane Linda at 0200 UTC 10 September (a) and a 37 GHz WindSat image at 0204 UTC 10 September (b). The satellite data indicate that the eye noted in the infrared image (a) was located about 20 n mi to the northeast of the low-level center noted in the WindSat image (b), due to southwesterly shear over the system. Images courtesy of the Naval Research Laboratory in Monterey, CA.