

Tropical Cyclone Report  
Hurricane Rick  
(EP202009)  
15-21 October 2009

John P. Cangialosi and Lixion A. Avila  
National Hurricane Center  
3 December 2009

Rick attained category five strength on the Saffir-Simpson Hurricane Scale and became the second strongest hurricane ever recorded (since accurate records began in the early 1970's) in the Pacific ocean east of the International Date Line, behind Hurricane Linda of 1997. It weakened to a tropical storm before it struck west-central Mexico near Mazatlan.

a. Synoptic History

Rick originated from a tropical wave that moved off the west coast of Africa late on 3 October. The wave became convectively active as it moved into the central Atlantic, and a small low formed along the wave axis on 8 October, when it was located a couple of hundred nautical miles east of the southern Windward Islands. The low dissipated as it moved over northern South America from 9 to 11 October, but the wave remained well defined in the low-level cloud and wind fields. The tropical wave entered the eastern North Pacific on 12 October, and the associated thunderstorm activity gradually improved in organization over the next few days as it moved westward south of Central America and the Gulf of Tehuantepec. Satellite images and scatterometer data indicated that the low acquired sufficient organized convection and circulation to be considered a tropical depression by 1800 UTC 15 October, centered about 300 n mi south-southwest of the Gulf of Tehuantepec. The "best track" chart of the tropical cyclone'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 1<sup>1</sup>.

Rick rapidly intensified almost immediately after formation to a tropical storm within 6 h and to a hurricane within 24 h, in an environment characterized by low vertical wind shear, high mid-level relative humidities, and sea surface temperatures near 30° C. An eye became apparent in microwave images around 1800 UTC 16 October and then in conventional satellite images about 6 h later. Rapid intensification continued for another 36 h and Rick attained major hurricane status by 1200 UTC 17 October, and reached its maximum intensity of 155 kt around 0600 UTC 18 October. While the tropical cyclone was undergoing rapid intensification, it moved in a general west-northwestward direction south of the coast of Mexico, steered by a deep-layer subtropical ridge.

After reaching its peak intensity, Rick weakened about as quickly as it strengthened. The main cause for the weakening was strong southwesterly upper-level winds to the east of an amplified shortwave trough that moved into the southwestern United States and extended several

---

<sup>1</sup> 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.

hundred nautical miles south-southwestward into the Pacific. Rick weakened below major hurricane status by 1200 UTC 19 October while it slowed down and turned toward the northwest and then north, influenced by the trough. Rick continued to rapidly weaken and became a tropical storm 18 h later, centered about 235 n mi south-southwest of the southern tip of Baja California. Microwave imagery at the time (Fig 4) showed a highly asymmetric structure with much of the associated deep convection confined to the northern semicircle of the cyclone. Rick then turned toward the northeast and accelerated while passing about 130 n mi south of the Baja peninsula late on 20 October, and made landfall near Mazatlan around 1400 UTC 21 October with estimated maximum sustained winds of 50 kt. Once inland, Rick quickly dissipated as it moved over the rugged terrain of west-central Mexico and encountered southwesterly shear of near 40 kt.

b. Meteorological Statistics

Observations in Rick (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), as well as flight-level, stepped frequency microwave radiometer (SFMR), and dropwindsonde observations from flights of the 53<sup>rd</sup> Weather Reconnaissance Squadron of the U. S. Air Force Reserve Command. Data and imagery from NOAA polar-orbiting satellites including the Advanced Microwave Sounding Unit (AMSU) instrument, the NASA Tropical Rainfall Measuring Mission (TRMM), the NASA QuikSCAT, and Defense Meteorological Satellite Program (DMSP) satellites, among others, were also useful in constructing the best track of Rick.

The estimated peak intensity of 155 kt from 0600 UTC to 1200 UTC 18 October is based on subjective Dvorak satellite intensity estimates of T 7.5 (155 kt) from TAFB and a peak 3-hr average objective satellite intensity estimate of T 7.5 (155 kt) at 0600 UTC 18 October from the Automated Dvorak Technique (ADT).

Ship reports of winds of tropical storm force associated with Rick are given in Table 2, and selected surface observations from land stations are given in Table 3.

c. Casualty and Damage Statistics

Media reports indicate that there were two deaths associated with large waves caused by Hurricane Rick. A 38-year-old man fishing from a rocky point was swept out to sea on 18 October at Los Cabos harbour, in San Jose del Cabo. On 19 October, a 16-year old boy drowned at El Medano Beach in Cabo San Lucas.

d. Forecast and Warning Critique

The genesis of Rick was reasonably well forecast. The tropical wave that played a role in Rick's development was introduced by the National Hurricane Center into its Tropical Weather Outlook (TWO) product 48 h prior to genesis. The formation probability reached the medium (30-50%) category 18 h prior to formation, and the high (greater than 50%) category 6 h prior to

development. It should be noted that even prior to genesis nearly all of the model guidance suggested that Rick would become a hurricane.

A verification of NHC official track forecasts for Rick is given in Table 4a. Official forecast track errors were lower than the mean official errors for the previous five-year period from 12 h to 72 h, but greater than the long-term means at 96 h and 120 h. A homogeneous comparison of the official track errors with selected guidance models is given in Table 4b. The model consensus (TVCN) was the best performer and slightly better than the official forecast at most forecast times. The large errors at 96 h and 120 h were due mainly to the pronounced left-of-track bias of much of the model guidance at the time of recurvature and a higher than expected acceleration as it approached west-central Mexico.

A verification of NHC official intensity forecasts for Rick is given in Table 5a. Official forecast intensity errors were significantly greater than the mean official errors for the previous five-year period. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 5b. The very large intensity errors were due primarily to the rapid intensification and rapid weakening of Rick. While some of the models captured these trends, there was disagreement on the timing and magnitude of the intensity changes.

Watches and warnings associated with Rick are given in Table 6.

Table 1. Best track for Hurricane Rick, 15-21 October 2009.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
15 / 1800	11.9	96.6	1005	30	tropical depression
16 / 0000	12.1	97.3	1002	40	tropical storm
16 / 0600	12.3	98.1	997	50	"
16 / 1200	12.6	98.9	991	60	"
16 / 1800	12.9	99.7	984	70	hurricane
17 / 0000	13.3	100.4	975	85	"
17 / 0600	13.8	101.4	966	95	"
17 / 1200	14.2	102.5	942	120	"
17 / 1800	14.6	103.9	928	135	"
18 / 0000	14.9	105.3	914	150	"
18 / 0600	15.2	106.6	906	155	"
18 / 1200	15.7	107.8	906	155	"
18 / 1800	16.2	109.0	921	140	"
19 / 0000	16.7	109.9	936	125	"
19 / 0600	17.1	110.7	952	110	"
19 / 1200	17.7	111.3	965	95	"
19 / 1800	18.2	111.6	977	75	"
20 / 0000	18.7	111.8	984	65	"
20 / 0600	19.3	111.6	986	60	tropical storm
20 / 1200	19.8	111.2	989	55	"
20 / 1800	20.2	110.5	989	55	"
21 / 0000	20.8	109.7	989	55	"
21 / 0600	21.7	108.6	989	55	"
21 / 1200	22.8	107.2	989	50	"
21 / 1800	23.9	105.7	1000	30	tropical depression
22 / 0000					dissipated
18 / 0600 - 1200	15.2	106.6	906	155	minimum pressure and maximum winds
21/1400	23.3	106.5	989	50	landfall near Mazatlan, Mexico

Table 2. Selected ship reports with winds of at least 34 kt for Hurricane Rick, 15-21 October 2009.

Date/Time (UTC)	Ship call sign	Latitude (°N)	Longitude (°W)	Wind dir/speed (kt)	Pressure (mb)
16 / 0600	A8BZ6	12.7	97.5	160 / 40	1004.0
21 / 0600	C6FR3	20.9	105.8	200 / 50	1009.0

Table 3. Selected surface observations for Hurricane Rick, 15-21 October 2009.

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)	Storm tide (ft)	Total rain (in)
	Date/time (UTC)	Press. (mb)	Date/time (UTC) <sup>a</sup>	Sustained (kt) <sup>b</sup>	Gust (kt)			
Mexico								
Mazatlan (MMMZ)	21/1226	989.9	21/1226	34	53			

<sup>a</sup> Date/time is for sustained wind when both sustained and gust are listed.

<sup>b</sup> Sustained wind averaging periods are 2 min.

Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Rick, 15-21 October 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	<b>22.2</b>	<b>30.8</b>	<b>47.3</b>	<b>63.9</b>	<b>105.5</b>	181.7	282.8
OCD5	46.9	101.2	174.3	249.1	328.9	283.4	228.9
Forecasts	23	21	19	17	13	9	5
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 4b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Hurricane Rick, 15-21 October 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 4a due to the homogeneity requirement.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	23.0	31.9	50.6	67.0	104.0	195.4	320.1
OCD5	46.4	99.0	181.8	258.9	314.5	275.7	<b>247.9</b>
GFSI	37.1	58.0	83.9	113.2	184.2	275.2	392.6
GHMI	25.6	39.3	59.1	78.0	104.0	<b>139.4</b>	<b>207.9</b>
HWFI	27.9	46.9	70.8	94.4	108.3	<b>123.0</b>	<b>229.8</b>
GFNI	30.6	57.3	88.1	112.7	177.4	234.1	377.9
NGPI	32.0	50.5	81.7	100.9	135.1	236.8	473.9
EMXI	27.3	37.7	51.1	<b>64.6</b>	<b>82.9</b>	<b>112.7</b>	<b>277.1</b>
TVCN	23.1	<b>30.0</b>	<b>46.3</b>	<b>66.1</b>	<b>96.1</b>	<b>186.9</b>	337.0
TVCC	31.2	43.5	57.2	72.0	110.1	233.7	<b>311.7</b>
FSSE	24.6	32.1	51.0	68.2	<b>100.3</b>	197.0	320.5
AEMI	45.1	64.0	101.3	137.5	234.6	341.9	419.3
BAMS	60.4	113.4	189.6	272.8	393.1	466.2	382.0
BAMM	34.3	53.7	88.1	140.5	251.2	389.5	427.6
BAMD	27.1	55.0	81.9	102.4	196.7	319.4	480.7
LBAR	33.0	63.8	109.8	157.5	199.4	233.2	354.6
Forecasts	20	18	17	15	11	8	4

Table 5a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Hurricane Rick, 15-21 October 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	11.7	22.4	31.1	35.3	37.3	46.7	50.0
OCD5	13.0	21.7	27.2	31.6	32.4	18.2	11.4
Forecasts	23	21	19	17	13	9	5
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 5b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Hurricane Rick, 15-21 October 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 5a due to the homogeneity requirement.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	12.4	23.7	31.1	34.1	37.1	48.8	47.5
OCD5	13.3	<b>22.5</b>	<b>26.6</b>	<b>29.1</b>	<b>28.1</b>	<b>16.3</b>	<b>11.0</b>
HWFI	13.8	26.7	37.7	44.9	43.3	<b>48.4</b>	58.8
GHMI	13.9	23.9	<b>29.0</b>	<b>32.8</b>	<b>21.7</b>	<b>27.0</b>	<b>29.8</b>
DSHP	12.5	24.1	31.9	35.7	<b>34.9</b>	<b>43.6</b>	47.8
LGEM	12.4	<b>22.9</b>	<b>28.3</b>	<b>33.1</b>	<b>27.7</b>	<b>24.9</b>	<b>26.8</b>
ICON	12.4	<b>22.9</b>	<b>29.7</b>	36.4	<b>31.3</b>	<b>36.3</b>	<b>40.8</b>
FSSE	<b>10.6</b>	<b>19.5</b>	<b>25.3</b>	<b>32.8</b>	<b>28.8</b>	<b>42.3</b>	54.3
GFNI	19.0	30.4	34.9	36.7	<b>32.9</b>	51.9	<b>37.0</b>
NF	21	19	18	16	12	8	4



Table 6. Watch and warning summary for Hurricane Rick, 15-21 October 2009.

Date/Time (UTC)	Action	Location
19/0900	Hurricane Watch issued	Santa Fe to San Evaristo
20/0300	Tropical Storm Watch issued	Agua Blanca to La Paz
20/0300	Hurricane Watch discontinued	All
20/0900	Tropical Storm Watch modified	Buena Vista to La Paz
20/0900	Tropical Storm Watch issued	El Roblito to Altata
20/0900	Tropical Storm Warning issued	Agua Blanca to Buena Vista
20/2100	Tropical Storm Watch discontinued	All
20/2100	Tropical Storm Warning issued	San Blas to Altata
21/1500	Tropical Storm Warning discontinued	Agua Blanca to Buena Vista
21/1800	Tropical Storm Warning discontinued	All

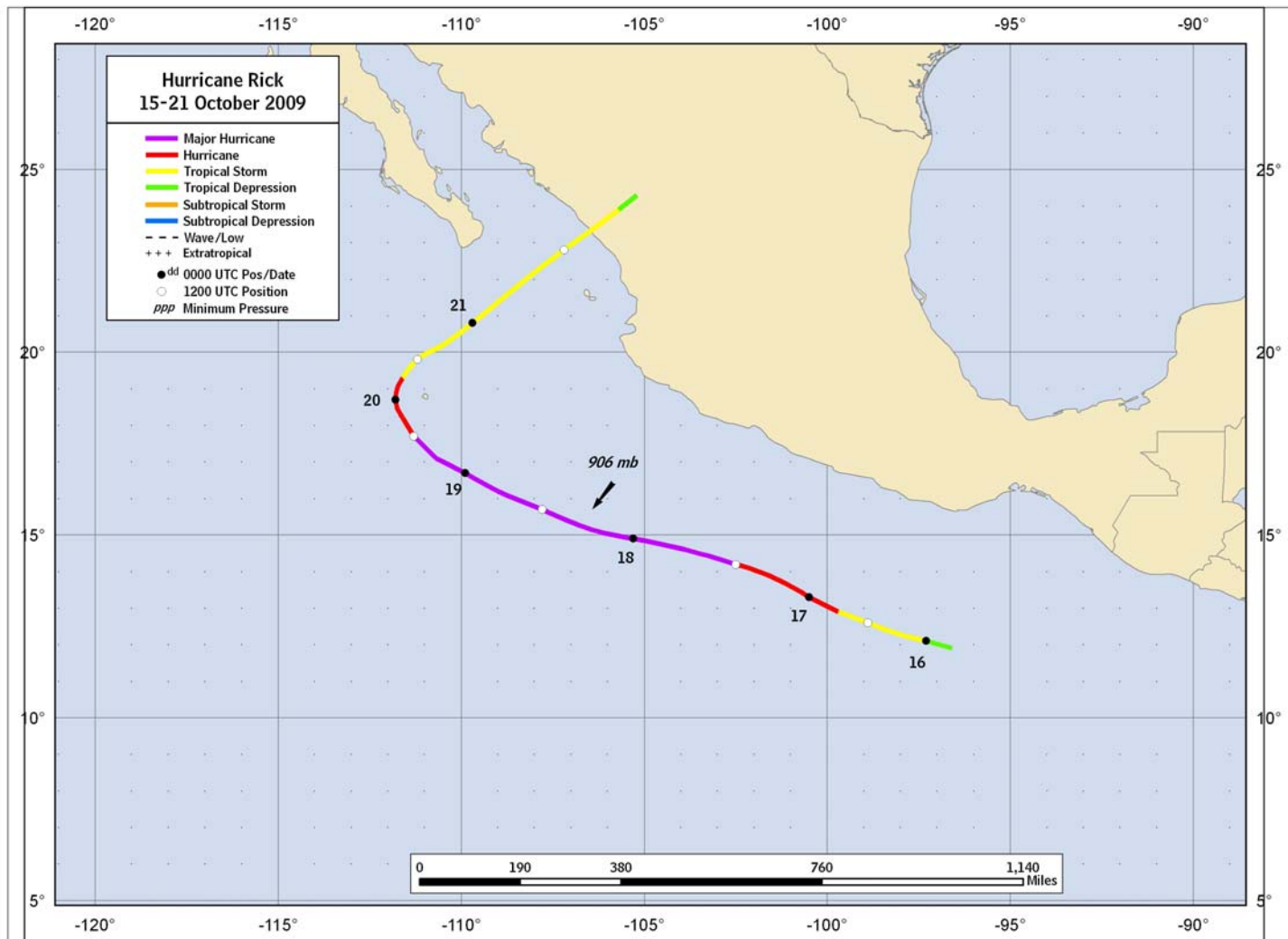


Figure 1. Best track positions for Hurricane Rick, 15-21 October 2009.

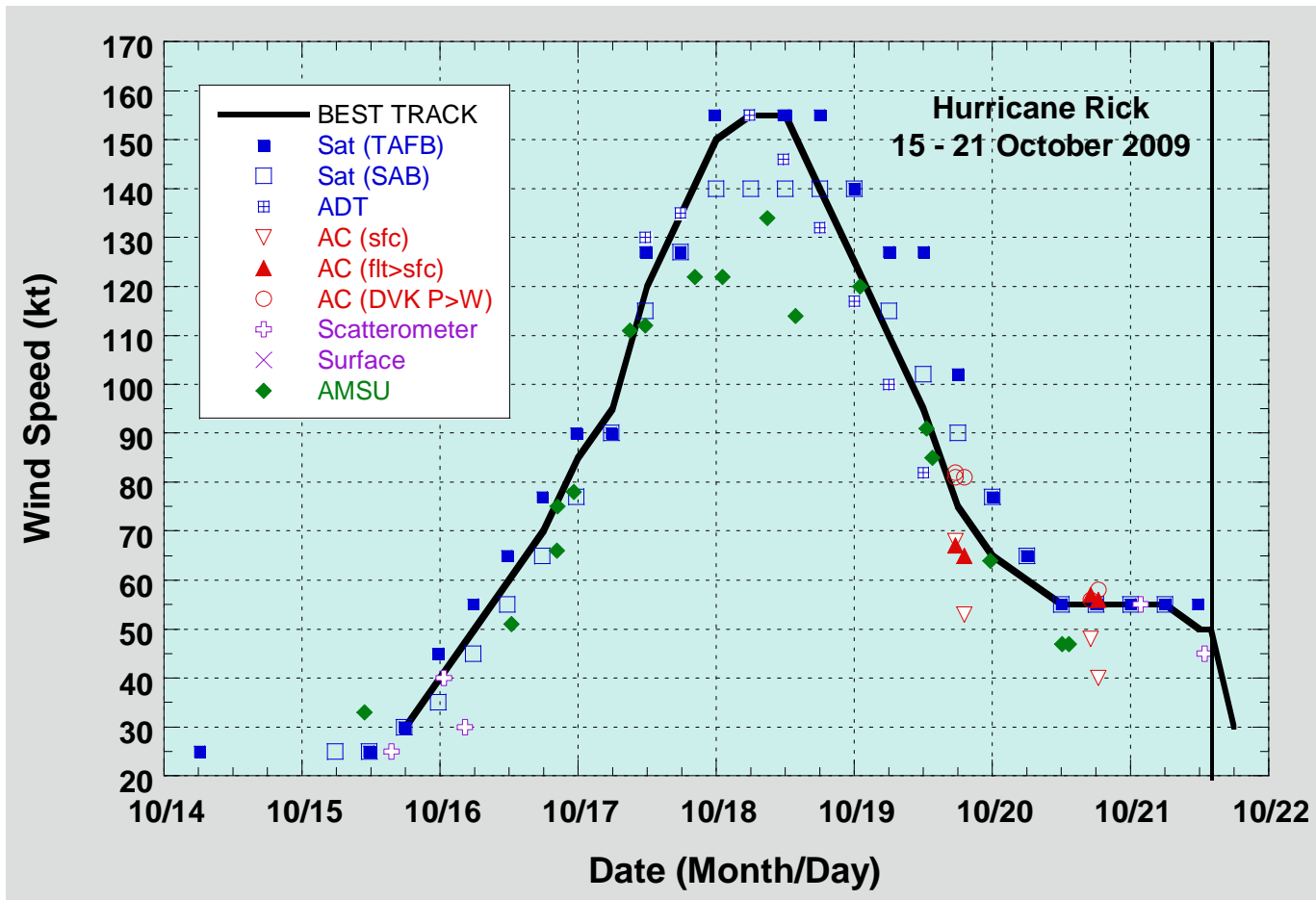


Figure 2.

Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Rick, 15-21 October 2009. Aircraft observations have been adjusted for elevation using 90%, 80%, and 80% adjustment factors for observations from 700 mb, 850 mb, and 1500 ft, respectively. 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. Solid vertical line depicts landfall.



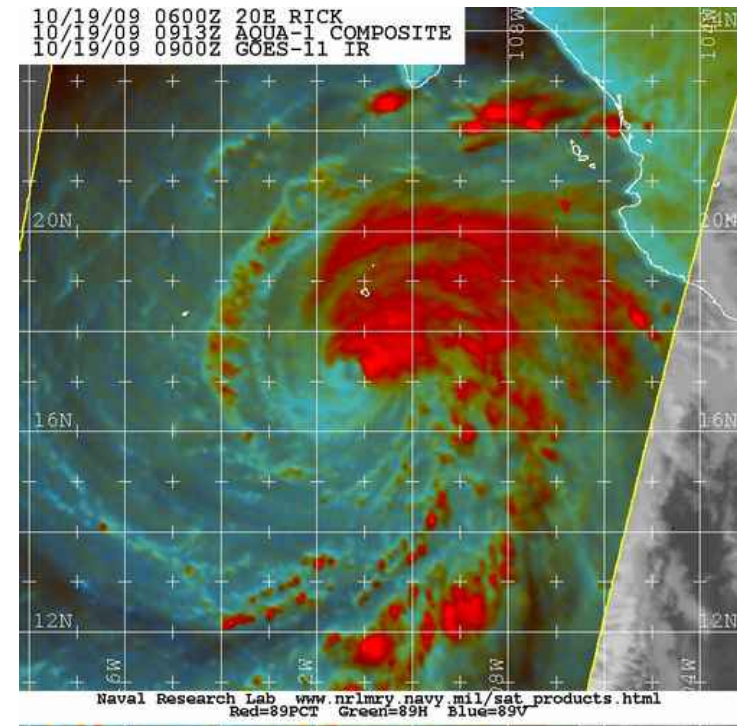
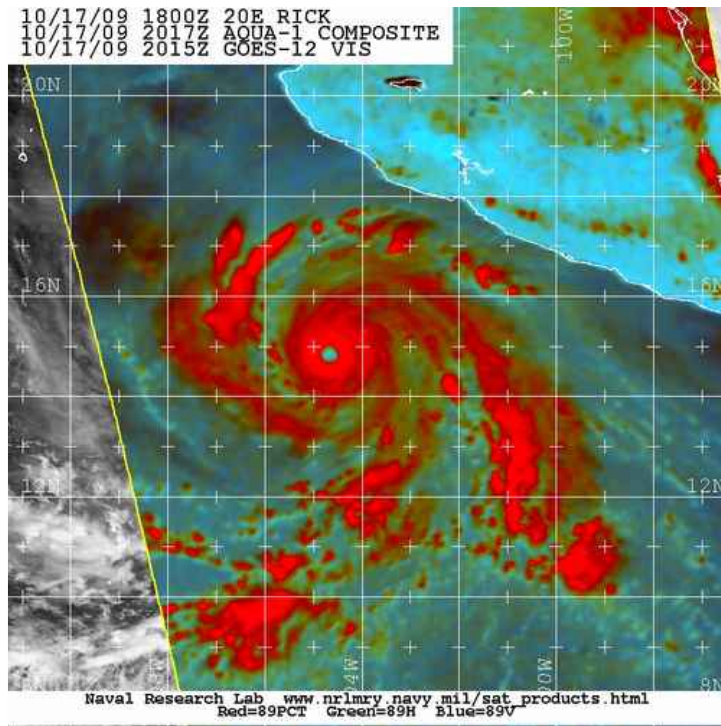


Figure 4. A comparison of 89 GHZ AMSR-E imagery for Hurricane Rick near the time of its peak intensity (left) and after it had endured about 24 hours of south to southwesterly shear (right). Images courtesy of the Fleet Numerical Meteorology and Oceanography Center.