

Tropical Cyclone Report  
Hurricane Celia  
19-25 July 2004

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Hurricane Celia remained over the open waters of the northeast Pacific Ocean and threatened no land areas.

a. Synoptic History

A fairly vigorous tropical wave moved off the west coast of Africa on 5 July. As is the case with most tropical waves this time of the year, the deep convection weakened and eventually dissipated by the next day. The wave moved westward across the tropical Atlantic and northern South America for the next week before it emerged over the northeast Pacific Ocean near Panama on 13 July. Upon reaching the warm waters of the Pacific, thunderstorms re-developed near a weak low-level circulation that had formed along the wave axis as indicated by conventional and QuikSCAT microwave satellite imagery, and also surface and upper-air observations.

By 15 July, the low-level circulation had become better defined and convection also became better organized about 400 n mi south-southwest of Acapulco, Mexico. However, development of the disturbance was arrested by unfavorable upper-level winds for the next 3 days. By late 18 July, the upper-level environment had become more favorable and convective banding features improved enough for Dvorak satellite classifications to begin. By early 19 July, convective organization and circulation had increased sufficiently for the system to be designated as a tropical depression at 0000 UTC about 540 n mi south-southwest of the southern tip of Baja California, Mexico. 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.

Steady development continued for the next 36 h as the cyclone moved west-northwestward at 8-10 kt around the southern periphery of a subtropical high pressure ridge. Dvorak satellite intensity estimates suggest that the depression became Tropical Storm Celia at 1200 UTC on 19 July when the cyclone was centered about 570 n mi southwest of Baja California. The very favorable upper-level outflow pattern and low vertical shear allowed for deep convection to gradually develop around the low-level circulation center. While not apparent in conventional satellite imagery, a well-defined eye did develop in the center of a cold CDO (Central Dense Overcast) cloud mass, as seen in a 0928 UTC 22 July AMSR-E AQUA-1 microwave image (Fig. 4). It is estimated that Celia’s intensity reached a peak of 75 kt at about 0600 UTC 20 July.

After reaching its maximum intensity, Celia began a slow weakening trend as the cyclone moved over cooler water and started to entrain stable low-level stratocumulus clouds from the

northwest. The forward motion decreased to 5-7 kt and the cyclone turned westward on a track that roughly paralleled the cooler sea-surface temperatures. This probably kept the weakening on a slow rather than a rapid trend. Celia eventually weakened back to a tropical storm late on 22 July and to a tropical depression on 24 July, before finally degenerating into a non-convective low pressure system at 0000 UTC 26 July. Shortly thereafter, the remnant circulation of Celia dissipated about 1510 n mi west-southwest of the southern tip of Baja California Mexico.

b. Meteorological Statistics

Observations in Hurricane Celia (Figs. 2 and 3) include satellite-based Dvorak technique intensity estimates from the Tropical Analysis and Forecast Branch (TAFB), the Satellite Analysis Branch (SAB) and the U. S. Air Force Weather Agency (AFWA). Microwave imagery from NOAA polar-orbiting satellites, the NASA Tropical Rainfall Measuring Mission (TRMM), the NASA QuikSCAT program, and the Defense Meteorological Satellite Program (DMSP) was also useful in tracking Hurricane Celia.

There were no reports of winds of tropical storm force associated with Hurricane Celia.

c. Casualty and Damage Statistics

There were no reports of damage or casualties associated with Hurricane Celia.

d. Forecast and Warning Critique

Average official (OFCL) track errors (with the number of cases in parentheses) for Celia were 30 (26), 60 (24), 91 (22), 117 (20), 164 (15), 208 (12), and 284 (8) n mi for the 12, 24, 36, 48, 72, 96, and 120 h forecasts, respectively. Through 72 h, the OFCL errors are less than the average official track errors for the 10-yr period 1994-2003<sup>1</sup> of 38, 70, 100, 127, 180, 210, and 247 n mi, respectively (Table 2). NHC track errors are comparable at 96 h, but much higher than average at 120 h. Nearly all of the global and regional models considerably outperformed the OFCL forecasts, especially the GUNS (GFDL-UKMET-NOGAPS) model consensus. Uncharacteristically, the GFS (NOAA/NCEP Global Forecast System) operational and interpolated models performed poorly with Celia, which degraded the GUNA (GFDL-UKMET-NOGAPS-GFS) model consensus forecasts. This likely explains the higher than average OFCL errors, since those forecasts were weighted more toward the GUNA consensus model due to it typically being one of the better performing NHC models.

Average official intensity errors were 5, 8, 8, 8, 8, 6, and 9 kt for the 12, 24, 36, 48, 72, 96, and 120 h forecasts, respectively, which were much better than the average official intensity errors over the 10-yr period 1994-2003 of 6, 11, 15, 17, 20, 18, and 19 kt, respectively.

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<sup>1</sup> Errors given for the 96 and 120 h periods are averages over the three-year period 2001-3.

Table 1. Best track for Hurricane Celia, 19-25 July 2004.

Date/Time (UTC)	Latitude (EN)	Longitude (EW)	Pressure (mb)	Wind Speed (kt)	Stage
19 / 0000	14.4	113.1	1008	30	tropical depression
19 / 0600	14.5	114.0	1008	30	"
19 / 1200	14.7	114.9	1005	35	tropical storm
19 / 1800	14.9	115.7	1000	45	"
20 / 0000	15.0	116.3	1000	45	"
20 / 0600	15.2	116.9	1000	45	"
20 / 1200	15.3	117.4	1000	45	"
20 / 1800	15.5	118.0	997	50	"
21 / 0000	15.9	118.7	997	50	"
21 / 0600	16.0	119.3	997	50	"
21 / 1200	16.1	119.8	994	55	"
21 / 1800	16.2	120.5	991	60	"
22 / 0000	16.3	121.0	987	65	hurricane
22 / 0600	16.3	121.5	981	75	"
22 / 1200	16.3	122.2	984	70	"
22 / 1800	16.3	123.0	990	60	tropical storm
23 / 0000	16.3	123.9	997	50	"
23 / 0600	16.2	124.6	1002	40	"
23 / 1200	16.1	125.3	1004	35	"
23 / 1800	16.1	126.1	1004	35	"
24 / 0000	16.4	126.9	1004	35	"
24 / 0600	16.7	127.6	1004	35	"
24 / 1200	17.0	128.4	1005	30	tropical depression
24 / 1800	17.3	129.6	1005	30	"
25 / 0000	17.6	130.7	1006	30	"
25 / 0600	17.9	131.9	1006	30	"
25 / 1200	18.4	133.0	1006	30	"
25 / 1800	18.7	134.1	1007	25	"
26 / 0000	19.1	135.2	1009	25	remnant low
26 / 0600	19.1	136.6	1010	25	"
26 / 1200					dissipated
22 / 0600	16.3	121.5	981	75	minimum pressure

Table 2. Preliminary forecast evaluation (heterogeneous sample) for Hurricane Celia, 19-25 July 2004. Forecast errors (n mi) are followed by the number of forecasts in parentheses. Errors smaller than the NHC official forecast are shown in bold-face type. Verification includes the depression stage, but does not include the extratropical stage, if any.

Forecast Technique	Forecast Period (h)						
	12	24	36	48	72	96	120
CLP5	<b>27</b> (26)	<b>50</b> (24)	<b>85</b> (22)	118 (20)	208 (16)	282 (12)	304 ( 8)
GFNI	34 (24)	<b>54</b> (22)	<b>60</b> (20)	<b>70</b> (18)	<b>81</b> (14)	<b>135</b> (10)	<b>235</b> ( 6)
GFDI	32 (25)	<b>59</b> (23)	<b>81</b> (21)	<b>93</b> (19)	<b>144</b> (15)	<b>194</b> (11)	<b>213</b> ( 7)
GFDL	36 (26)	<b>56</b> (24)	<b>82</b> (22)	<b>95</b> (20)	<b>138</b> (16)	<b>181</b> (12)	<b>211</b> ( 8)
GFDN	35 (13)	<b>58</b> (12)	<b>73</b> (11)	<b>74</b> (10)	<b>83</b> ( 8)	<b>105</b> ( 6)	<b>193</b> ( 4)
LBAR	<b>26</b> (25)	61 (23)	107 (21)	156 (19)	277 (16)	409 (12)	494 ( 8)
GFSI	57 (25)	97 (21)	144 (19)	212 (16)	341 ( 8)	415 ( 5)	665 ( 3)
GFSO	63 (26)	102 (21)	145 (19)	192 (16)	313 ( 9)	420 ( 5)	630 ( 3)
AEMI	35 (23)	63 (21)	<b>89</b> (19)	<b>105</b> (17)	175 (12)	284 ( 5)	316 ( 4)
BAMD	30 (26)	60 (24)	94 (22)	128 (20)	211 (16)	248 (12)	<b>268</b> ( 8)
BAMM	35 (25)	72 (23)	111 (21)	150 (19)	238 (16)	312 (12)	402 ( 8)
BAMS	42 (25)	85 (23)	136 (21)	189 (19)	314 (16)	446 (12)	543 ( 8)
NGPI	30 (25)	<b>54</b> (23)	<b>74</b> (21)	<b>86</b> (19)	<b>115</b> (15)	<b>125</b> (11)	<b>138</b> ( 7)
NGPS	30 (26)	<b>51</b> (24)	<b>75</b> (22)	<b>86</b> (20)	<b>114</b> (16)	<b>121</b> (12)	<b>154</b> ( 8)
UKMI	<b>29</b> (23)	<b>48</b> (21)	<b>67</b> (19)	<b>81</b> (17)	<b>96</b> (13)	<b>175</b> ( 8)	352 ( 5)
UKM	36 (12)	<b>53</b> (11)	<b>68</b> (10)	<b>84</b> ( 9)	<b>104</b> ( 7)	<b>169</b> ( 4)	310 ( 3)
GUNS	<b>29</b> (23)	<b>51</b> (21)	<b>67</b> (19)	<b>75</b> (17)	<b>92</b> (13)	<b>136</b> ( 8)	<b>173</b> ( 5)
GUNA	33 (23)	<b>56</b> (19)	<b>70</b> (17)	<b>81</b> (14)	<b>146</b> ( 6)	253 ( 2)	310 ( 1)
OFCL	30 (26)	60 (24)	91 (22)	117 (20)	164 (15)	208 (12)	284 ( 8)
NHC Official (1994-2003 mean)	38 (2746)	70 (2474)	100 (2196)	127 (1928)	180 (1476)	210 (283)	247 (179)

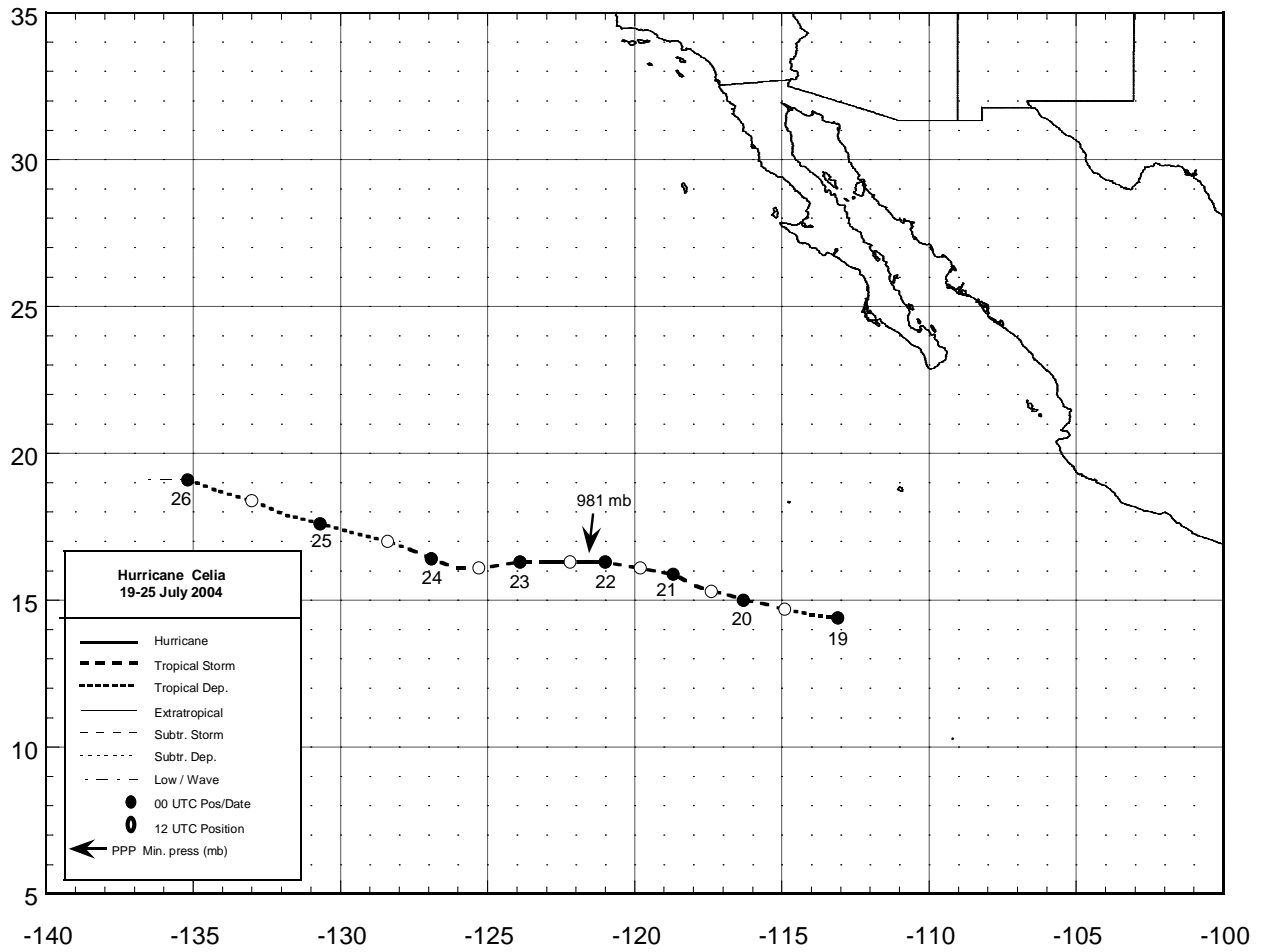


Figure 1. Best track positions for Hurricane Celia, 19-25 July 2004.

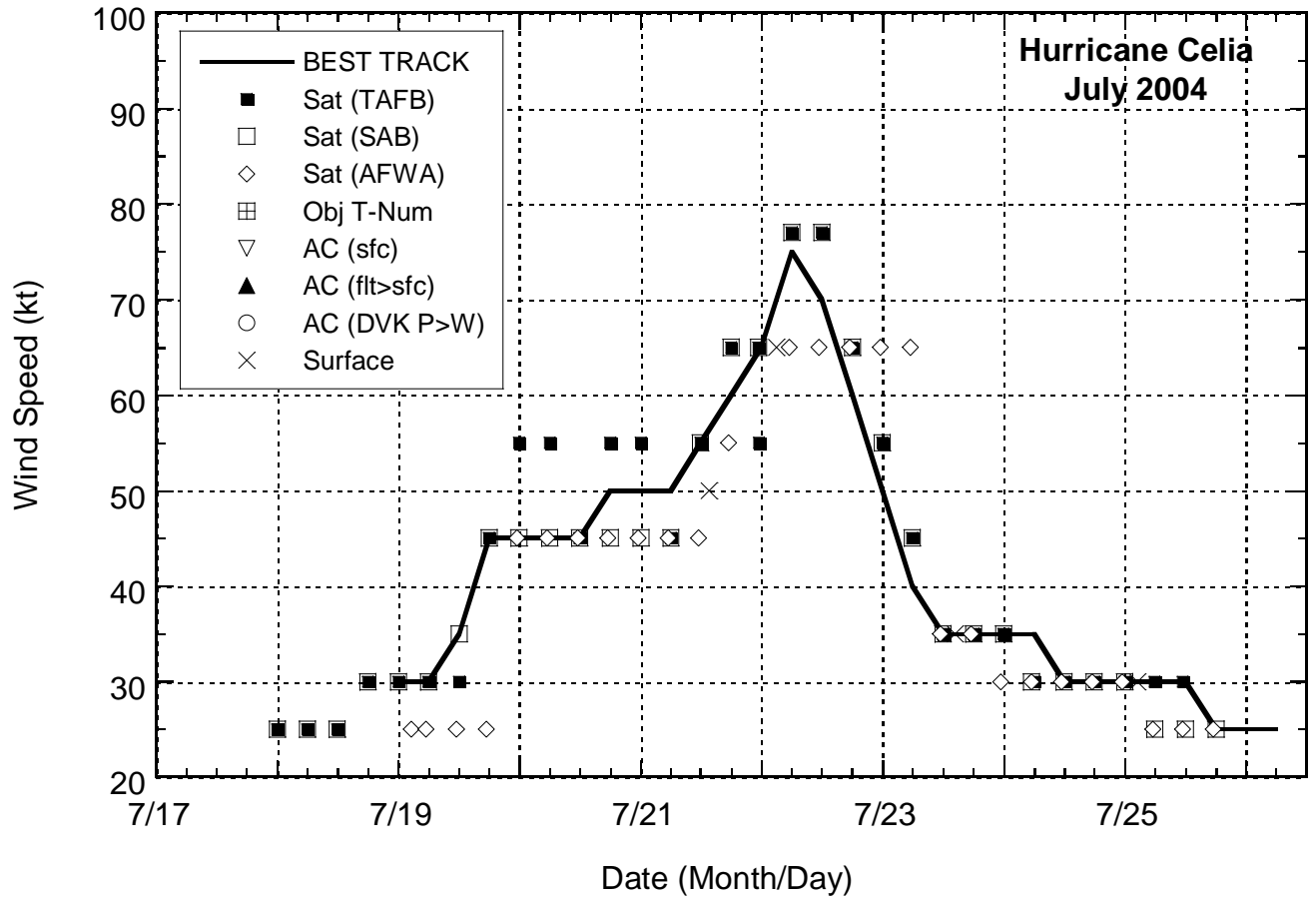


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Celia, 19-25 July 2004.

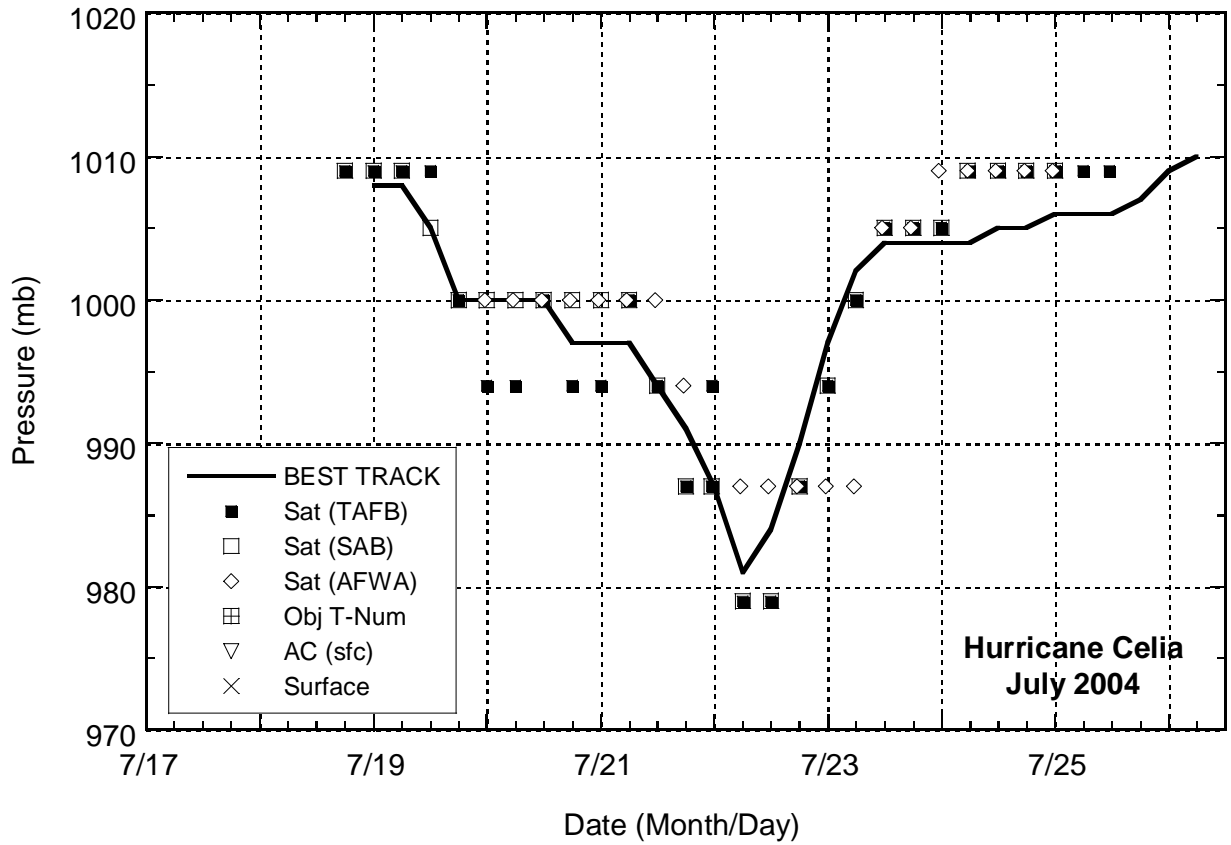


Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Celia, 19-25 July 2004.

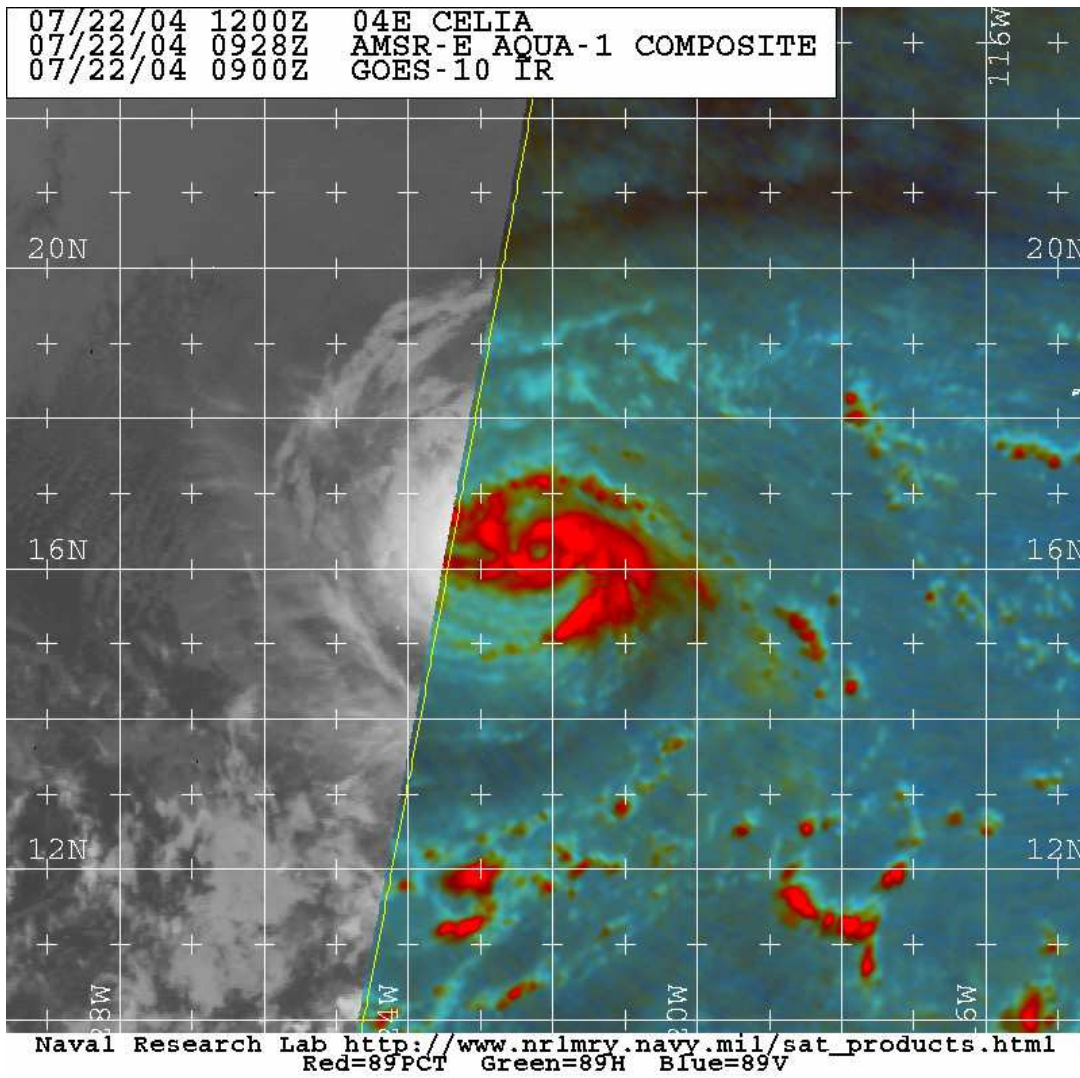


Figure 4. 0928 UTC 22 July 2004 AMSR-E AQUA-1 overpass showing the small but distinct eye of Hurricane Celia near its peak intensity of 75 kt.