SATELLITE

POLAR ORBITTER VIEWS OF THE MOST POWERFUL HURRICANE IN HISTORY, "GILBERT"

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Hurricane "Gilbert," the most powerful hurricane in the history of the Western Hemisphere, struck the Caribbean in early September 1988. It hit Jamaica on the 12th of September . . . Grand Cayman Island on the 13th and crashed into the Yucatan Peninsula on the 14th. Gilbert eventually ended up (weakened) in Mexico. Figure 1 shows historical track of Gilbert.

On the night of the 13th of September (2000 EDT/140000 GMT) hurricane Gilbert's center reached the lowest pressure ever recorded in a hurricane in the Western Hemisphere . . . a sea-level pressure of 26.13 in. of mercury or 885 mb. The satellite photographs shown in this article (Figs. 2–8) were recorded from polar orbiting weather satellites, which are far superior to geostationary ones for delineating cloud features inside and outside the eye.

NOAA or Defense Meteorological Satellite Program (DMSP) 900-km (450-mi) high polar orbiting sun-synchronous meteorological satellites provide resolutions of 1 km or less, day and night, visual and infrared. Nighttime visuals with or without moonlight are available from DMSP.

The satellite hurricane "eye" is not a point—airplanes fly in and give a "point" where they think the lowest pressure is. This point is a small circle that moves within the larger satellite eye and can give misleading and erratic positioning (Brandli (2), Willoughby (3)). The best way to track a hurricane using polar orbiting satellites is to position the eye as a circular area. Some of these satellite or center eyes in hurricanes and typhoons have been 80 mi across; most are a lot smaller.

In the accompanying figures of hurricane "Gilbert" (the most powerful in history), one can see the satellite eye 30 mi in diameter over Jamaica with near 150 mph winds reported. In the next 24 to 36 hr, the eye shrunk like a figure skater in a spin bringing her arms into her side. You can actually see the shrinking of the eye; as it got smaller, the storm intensified further (see Table 1). Winds gusted to over 200 mph as the storm went from Grand Cayman to Cozumel. Then dry air came in, forcing the storm to weaken and the winds to drop off.

SUMMARY

1. Polar orbiter gridded-enhanced images are superior to geostationary views in resolution, spectral intervals, and enchancement capabilities. Polar visual images have twice the resolution of GOES; infrared images have ten times the resolution of GOES infrared.
2. The "eyes" of tropical storms are not points, but circular areas with smaller vortices inside; polar expanded/enhanced images bring this out.
3. The eye diameter in "Gilbert" is inversely proportional to wind speed.

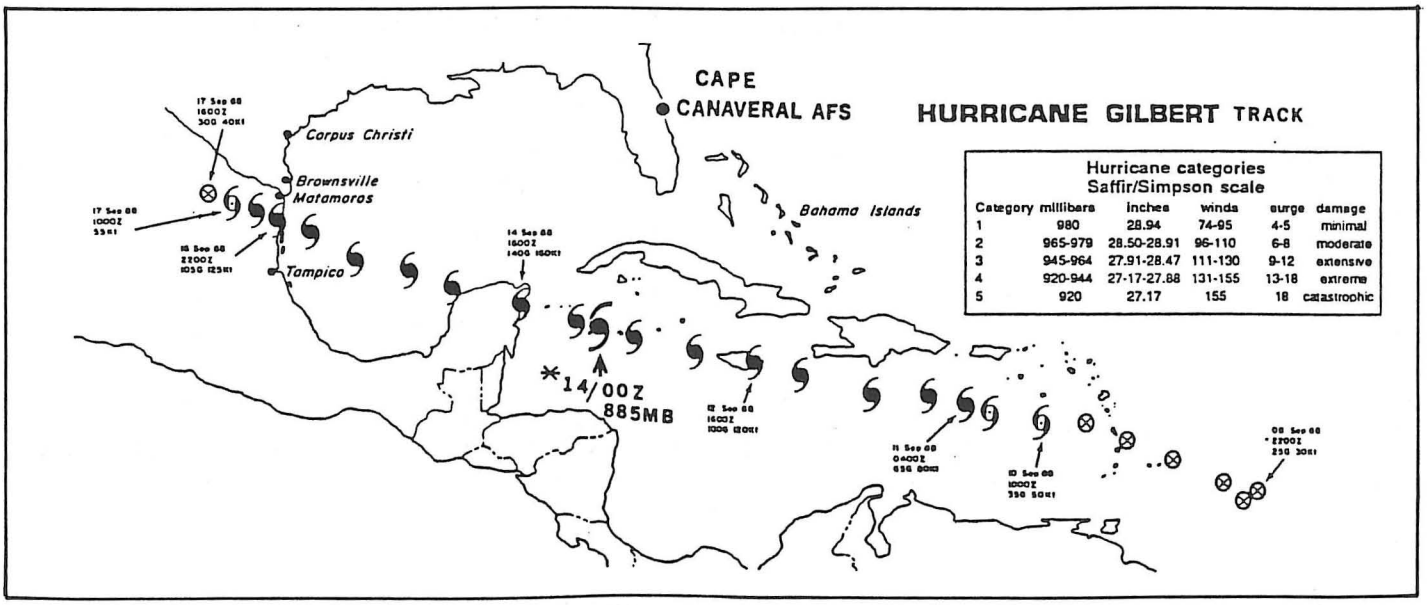


Fig. 1. Track of Hurricane "Gilbert"—the most powerful in history.

4. Aircraft reconnaissance in storms for eye location is: a. dangerous* b. fallible. Satellite data is generally sufficient for eye location and movement, especially on polar orbiting imagery. However, reconnaisance does provide much more quantative data at several levels and can be used for dropsonde delivery. The data are also important for research and analysis.

NOTES AND REFERENCES

1. Henry W. Brandli is Chairman, of the NWA Satellite Meteorology Committee.

2. Brandli, H.W. 1976: Satellite Meteorology, AWS-TR-76-264, Air Weather Service, Scott AFB, IL.

3. Willoughby, H., 1989: Insight On The News Magazine, Jan. 9, 1989, P. 18. Washington, D.C.

Table 1—Hurricane Gilbert eye diameter comparisons from polar orbiter imagery (NOAA/DMSP) with winds and surface pressure.

Date	Time (GMT)	Eye diameter (nmi)	Surface pressure (mb)	Surface wind (kt)
9/12/88	1300	30	960	110
9/13/88	1445	17	934	125
9/13/88	2331	8	885	160
9/14/88	1220	15	892	145

*During the Air Force's weather reconnaissance history, three weather planes and 26 men have been lost penetrating tropical cyclones. The last plane, a WC-130H, was lost Oct. 12, 1974, flying into Typhoon Bess in the South China Sea. In all, 23 weather planes and 144 weather flyers have been lost on various meteorological missions since World War II. (AWS Observer, Oct. 1988, TSgt. Dave Black).

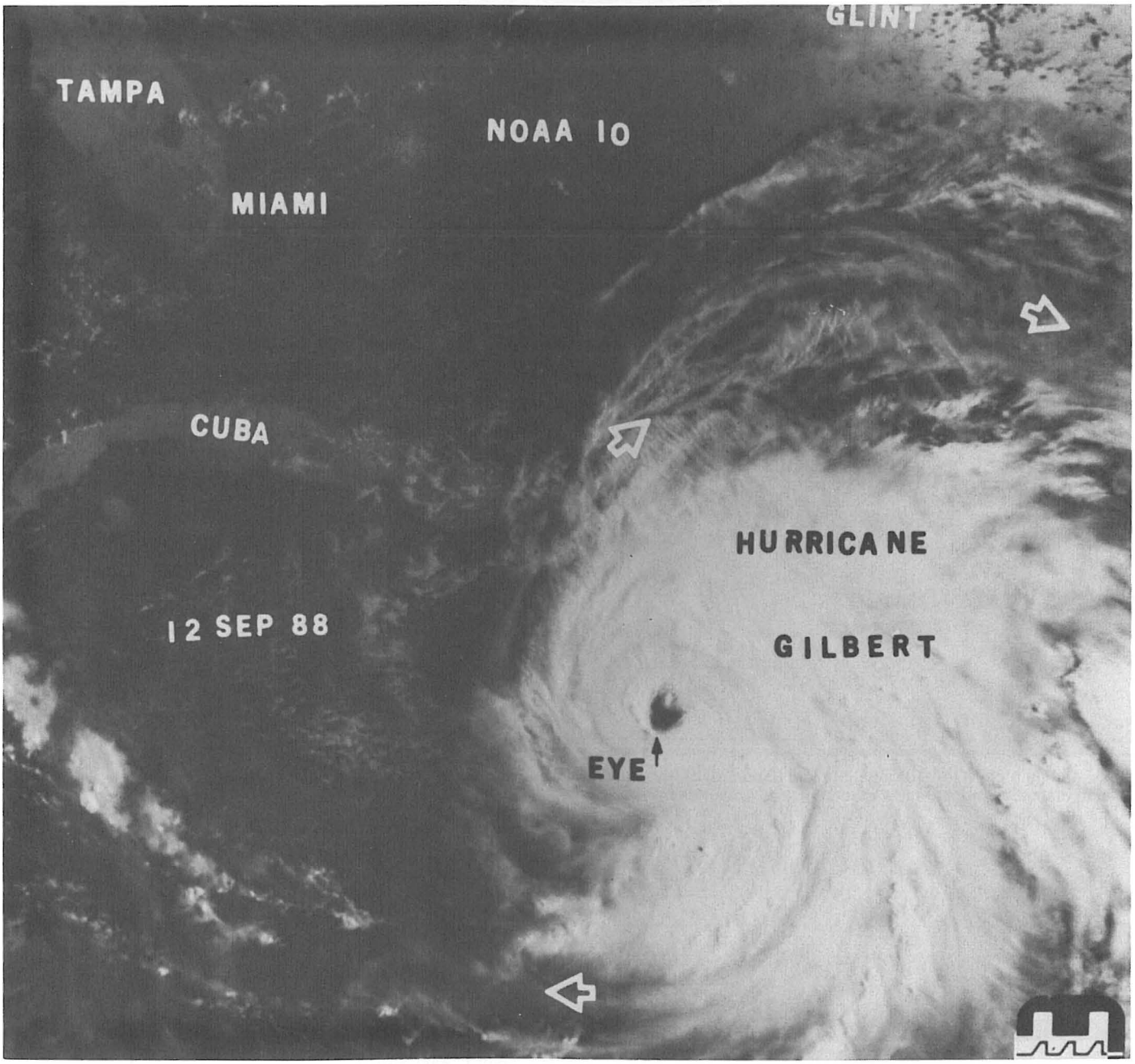


Fig. 2. 450-mi high NOAA-10 visual view of super hurricane "Gilbert" on Sept. 12, 1988, 1300 GMT.

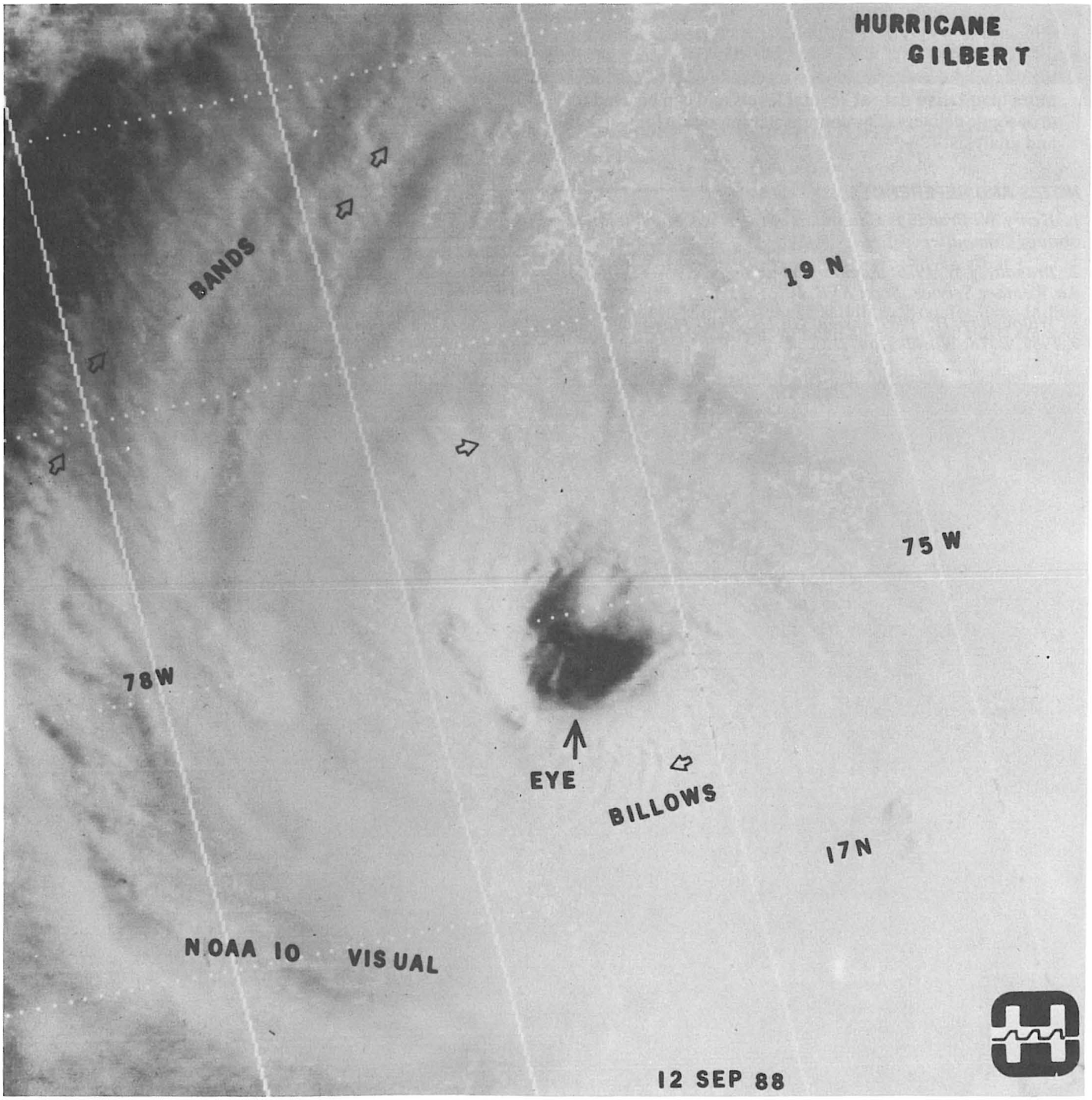


Fig. 3. 450-mi high NOAA-10 visual blowup (Gridded) of hurricane "Gilbert" on Sept. 12, 1988, 1300 GMT. Satellite eye approximately 30 mi in diameter; there are low-cloud vortices or eddies in eye.

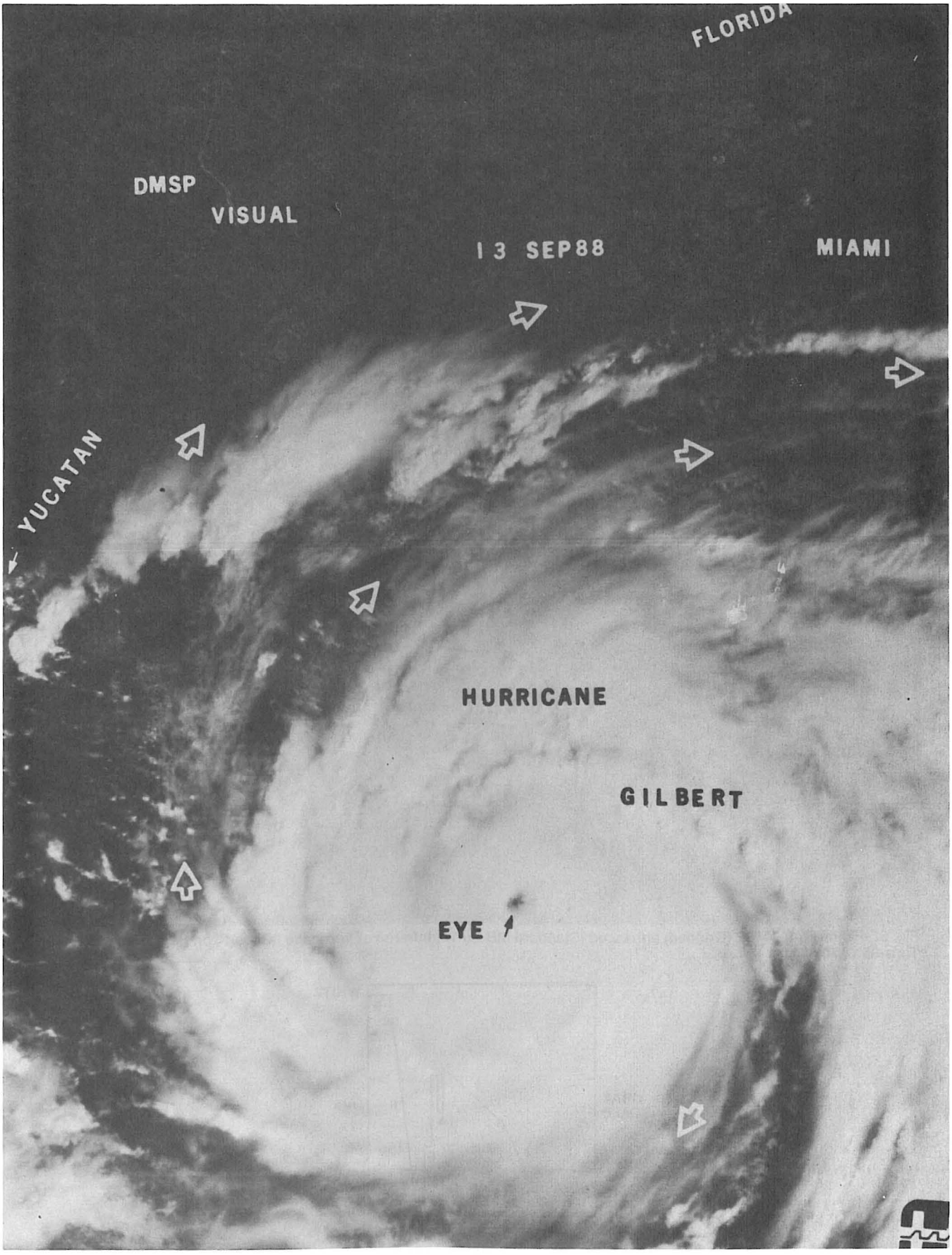


Fig. 4. 450-mi high DMSP visual view of hurricane "Gilbert" on Sept. 13, 1988, 1445 GMT.

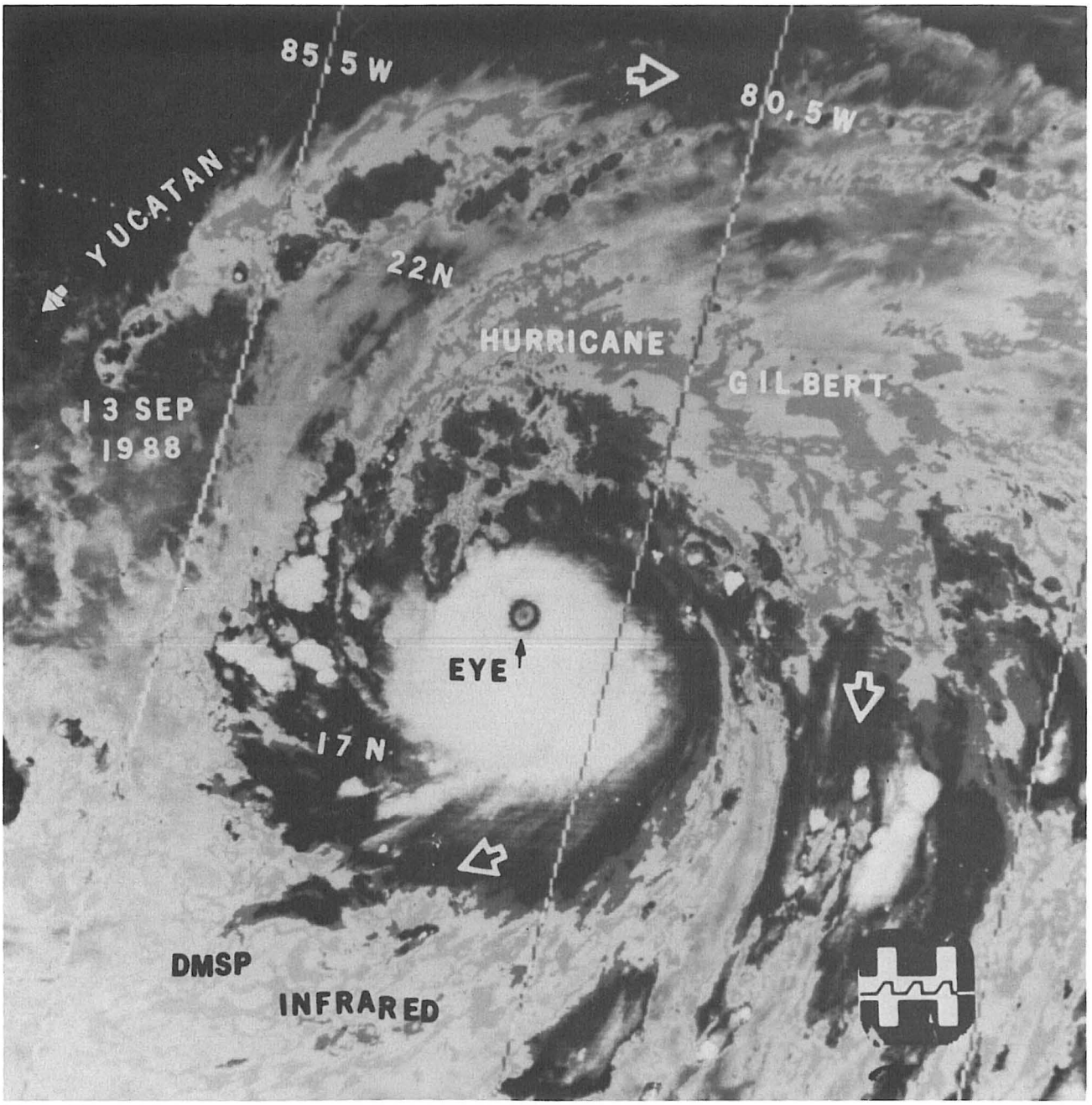
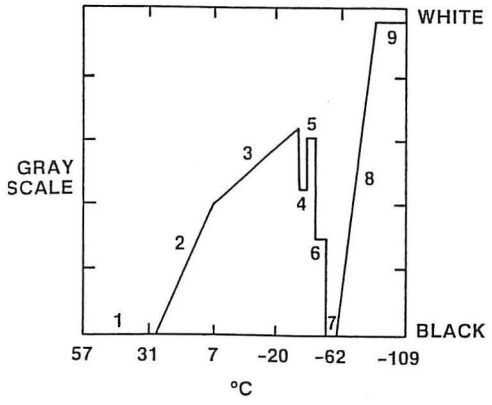


Fig. 5. 450-mi high DMSP (Gridded) enhanced (Standard MB Curve) infrared of hurricane "Gilbert" on Sept. 13, 1988, 1445 GMT. Tops-95°C, 70,000 ft.



*MB Enhancement Curve**

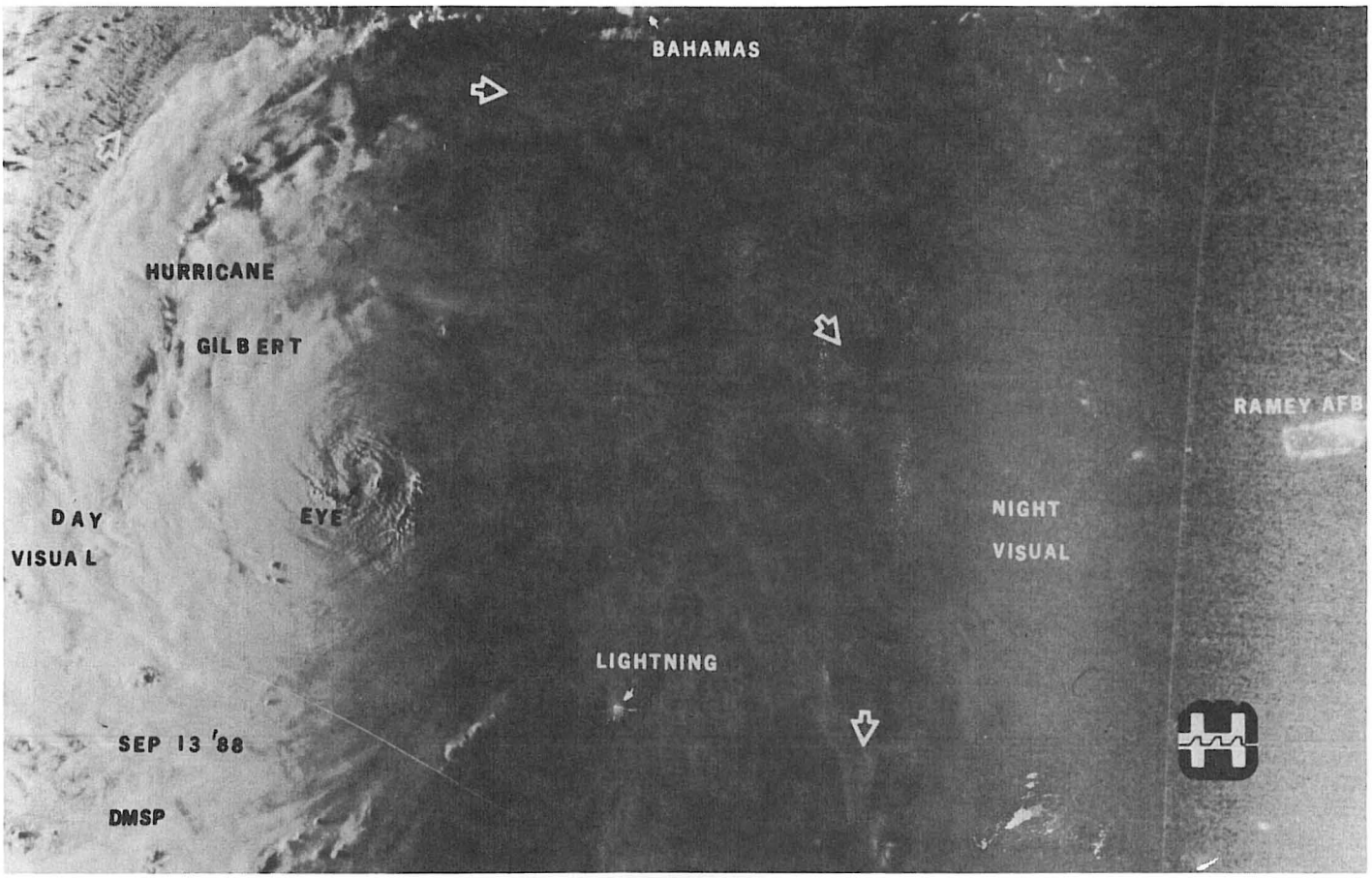


Fig. 6. 450-mi high DMSP day-visual/night-visual on Sept. 13, 1988, 2332 GMT. At this time hurricane "Gilbert" became the most powerful in history—885 mb central pressure of 26.13 in., wind gusts over 200 mph; lights of Puerto Rico on right.

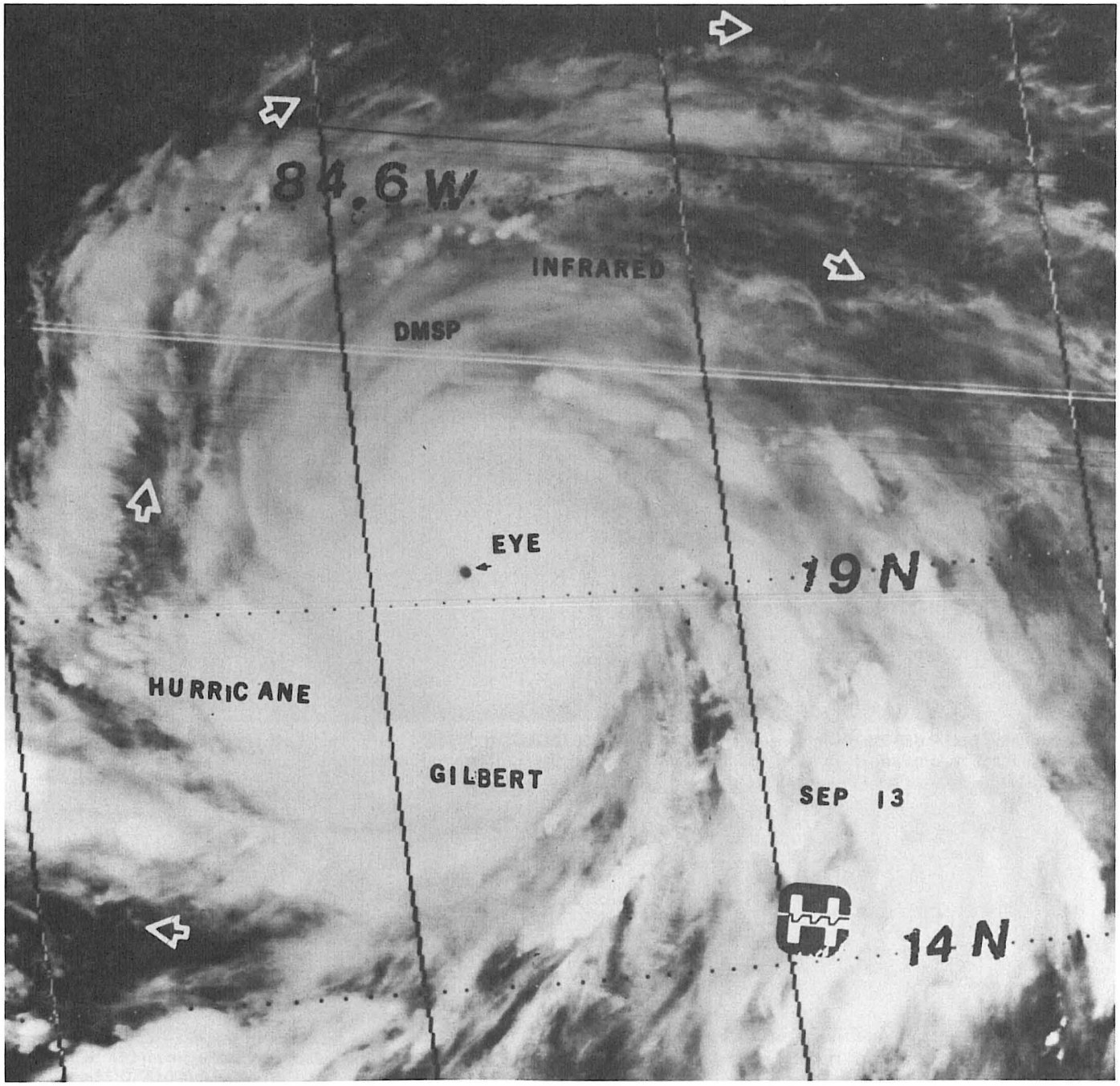


Fig. 7. DMSP 450-mi high infrared (Gridded) imagery on Sept. 13, 1988, 2331 GMT. Central pressure of 885 MB, 26.13 in., wind gusts of over 200 MPH—category "5" hurricane.

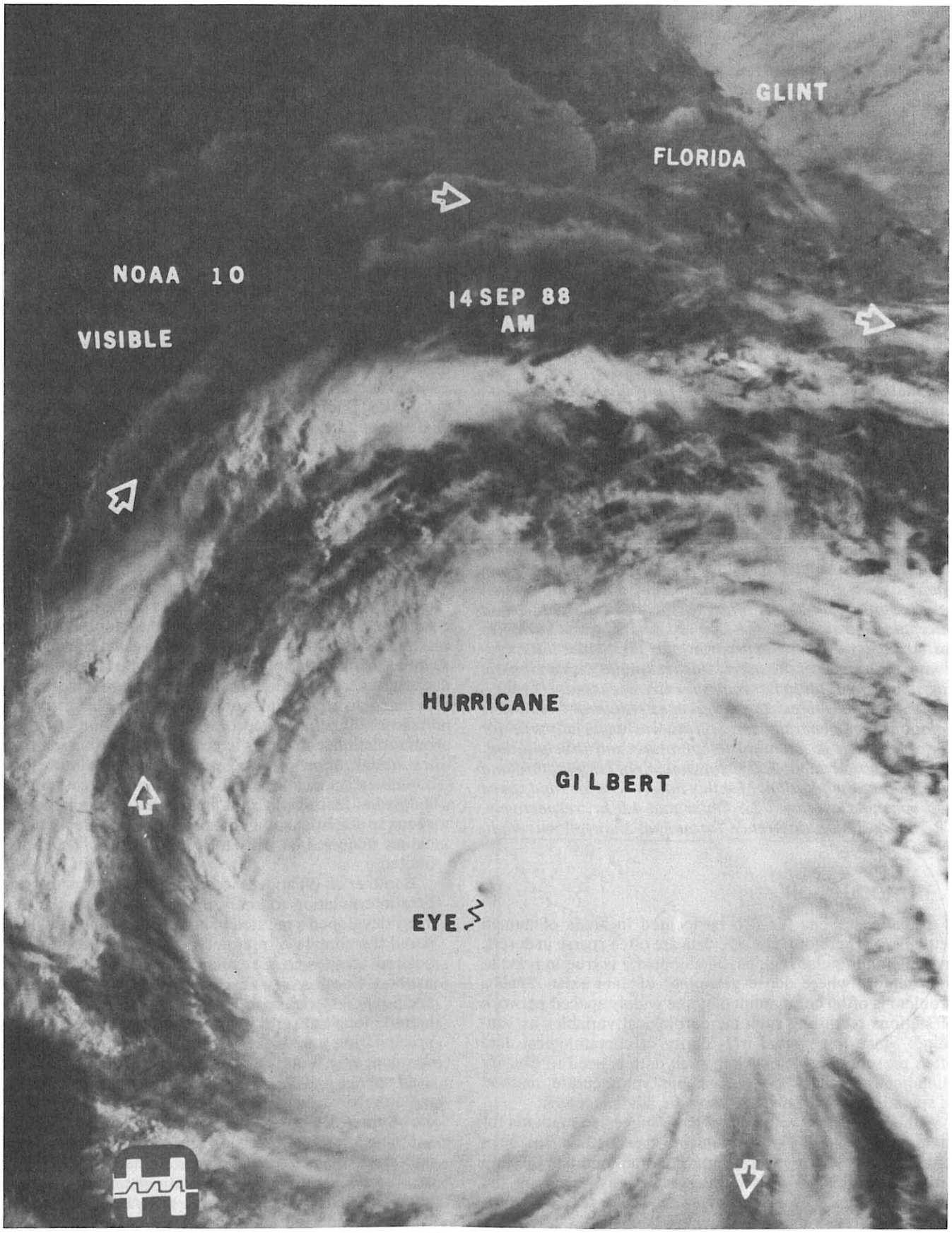


Fig. 8. 450-mi high NOAA-10 visual of hurricane "Gilbert" on Sept. 14, 1988, 1230 GMT, the morning after it became the strongest hurricane in history.