

Technical Attachment

**A DIFFERENT LOOK AT HURRICANE ANDREW—
LIGHTNING AROUND THE EYEWALL**

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The track of Hurricane Andrew was followed closely by millions of people through satellite and radar observations. In fact, it was the first hurricane tracked by a WSR-88D operated by the National Weather Service. But is it possible that Andrew's track could have been followed through lightning detection equipment? This is precisely what the National Weather Service Office in Melbourne was able to do as Hurricane Andrew neared the southeast Florida coast. A circular pattern in the lightning became evident as Andrew moved across the warm Gulf Stream waters clearly defining the eye of the hurricane!

Lightning data available at Melbourne are supplied by Atmospheric Research Systems, Inc. (ARSI) through a dial-in port. Their data are obtained through the Lightning Position and Tracking System (LPATS). This system uses a time-of-arrival technique to position cloud-to-surface strokes. ARSI's software package, Video Information System (VIS), allows display and manipulation of the lightning data.

Fig. 1 shows the circular nature of the lightning pattern as the hurricane moved across the Gulf Stream just east of Miami. About 15 cloud-to-water strokes were detected around the eye in a ten-minute period ending at 0743 UTC. If we assume the lightning pattern is concentric around the eye, the approximate eye position determined from the lightning data is 25.5 N, 79.9 W.

The composite reflectivity (in gray scale) from the Melbourne WSR-88D at about the same time is shown in Fig. 2. Again, the eye position is approximately 25.5 N, 79.9 W. (This is easily determined with the WSR-88D by positioning a cursor in the center of the eye and reading the cursor location from the information display as shown in Fig. 2 (CUR. L/L].)

Fig. 3 is a composite of all cloud-to-surface lightning strokes for the period 0149 UTC to 0849 UTC. Lightning strokes associated with spiral bands were most numerous in Andrew's South quadrant, and in time lapse they can be seen rotating cyclonically inward toward the eyewall. Note that far more lightning strokes were measured in spiral bands away from the hurricane center as compared to the eyewall region. Another feature that persisted as Andrew was nearing Miami was that most of the cloud-to-surface lightning strokes occurred over the water. There was one band well to the north between Grand Bahama Island and West Palm Beach that produced lightning over interior sections of Palm Beach County.

Enhanced infrared satellite imagery indicated the convection around the center of Andrew increased

considerably just before landfall. According to *NWS Southern Region Forecaster Notes No. 3* (1992), if a tropical cyclone passes over warmer water while other environmental conditions remain the same, the warmer water may play a role in cyclone intensification. Therefore, it seems possible that the increase in convection around Andrew's center at landfall may have been aided by warm Gulf Stream water. This is supported by the extensive lightning associated with Andrew's spiral bands and especially by the fact that lightning increased around the eyewall as it moved over the Gulf Stream. On the other hand, surface friction asymmetries may also have played a role in thunderstorm (and lightning) generation as the storm felt the effects of landfall.

This brief analysis of Andrew's lightning activity illustrates a phenomena that much of the meteorological community has not yet seen. In conversations with NHC and WSFO personnel, I learned that extensive lightning in hurricanes has not often been documented. Given that Andrew is the most costly hurricane on record, I am sure that more in-depth studies of this and other aspects of the hurricane will be forthcoming.

Reference

NWS Southern Region Forecaster Notes No. 3, July 1992: Do The Strongest Tropical Cyclones Occur Over The Warmest Waters? Scientific Services Division, NWS Southern Region Headquarters, Fort Worth, Texas.

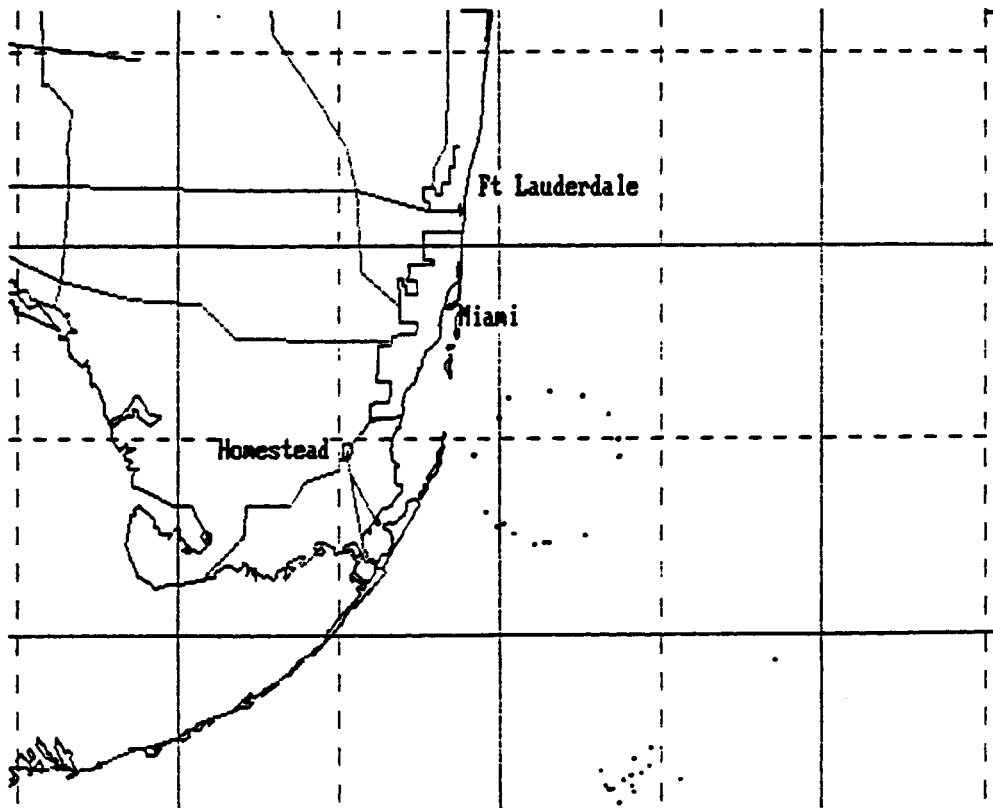


Figure 1. 10 minute composite of cloud-to-water lightning strokes ending at 0743 UCT 24 AUG 1992.

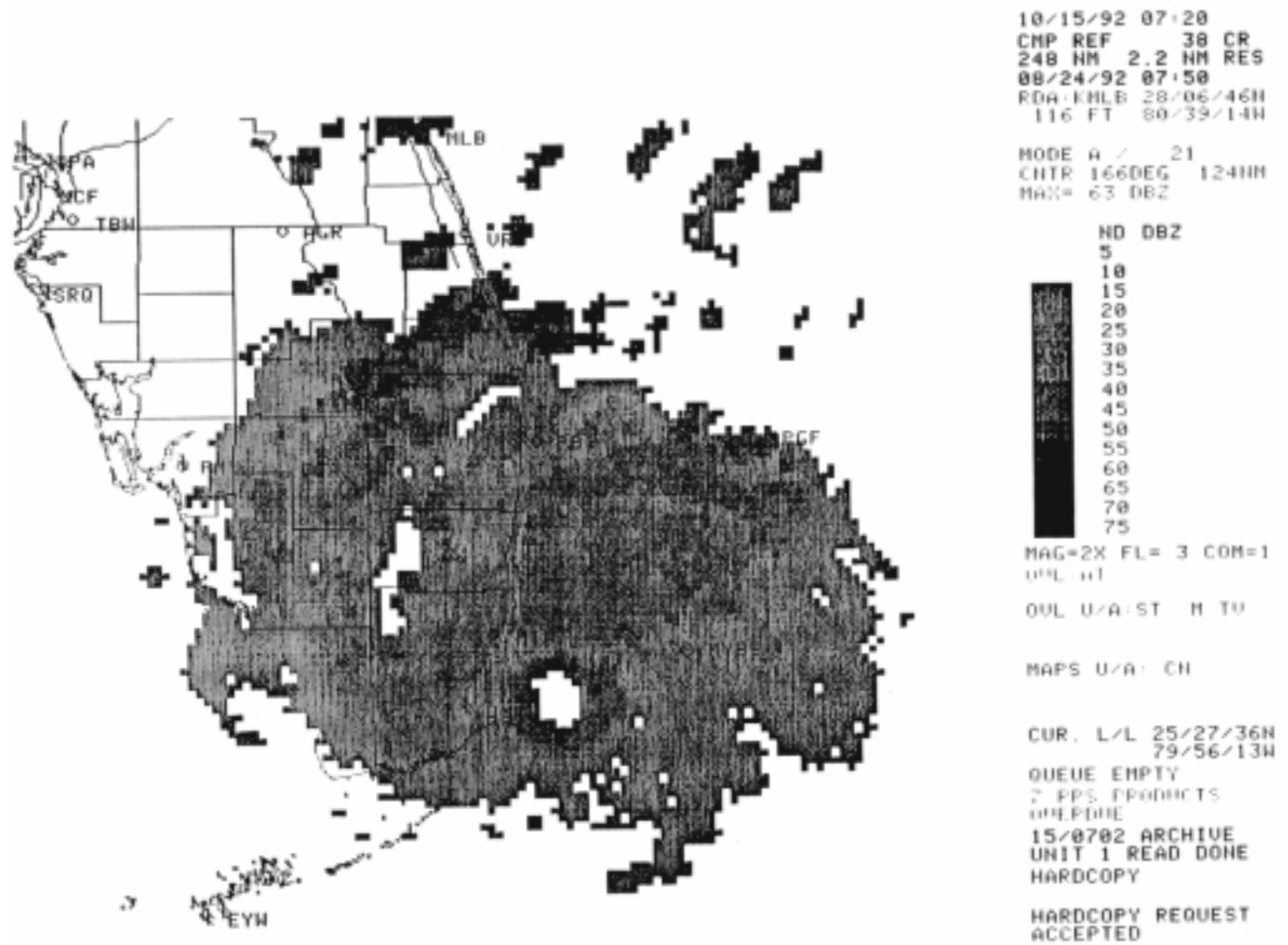


Figure 2 Composite reflectivity from Melbourne WSR 88D, 0750 UCT, 24 AUG 1992.

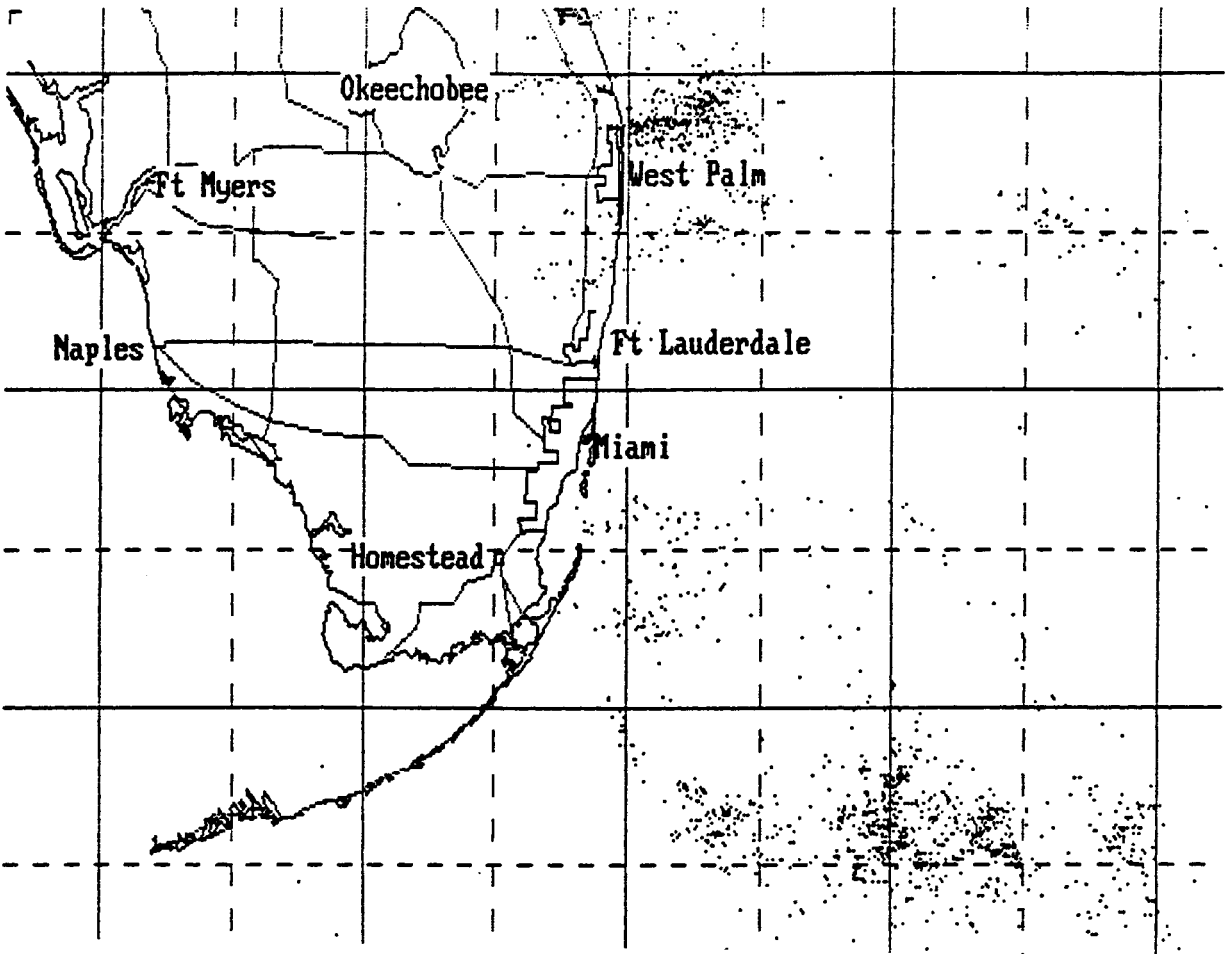


Figure 3. Composite of cloud-to-surface lightning strokes for period 0149 to 0849 UCT, 24 AUG 1992.