th hour after seeding starts; in the dynamical model riginal maximum wind is eroded away and a second mum appears at a larger radius. After the seeding the original maximum reappears more weakly, and econd maximum tends to disappear. This leaves a 12 wind reduction from an original maximum of 86 ."

urricane Camille's circulation was still strong at upper as it moved off the mid-Atlantic coast on the 20th passed north of Debbie on the 21st and 22d. Without ille's presence, Debbie most likely would have passed to Bermuda and probably would have made landfall ewfoundland.

TROPICAL STORM EVE, AUGUST 24–27

is not uncommon during the hurricane season fo of polar air to cut off over the Tropics south of th westerly currents. Occasionally, surface Lows wil within these baroclinic zones and trigger convectiv esses resulting in systems that feed upon both baro and latent heat energy sources. Sometimes, the ective processes become sufficiently well organized concentrated that local warming dominates and stifles aroclinic contributions. When this occurs, the nature ie vortex changes from cold to warm core and may t in the formation of a tropical storm. It has been ated that nearly 15 percent of all Atlantic storms are ted in this way, and Eve is an excellent example of type of formation.

veral days prior to the appearance of Eve, cold air t over the eastern United States in the wake of ille and eventually covered the entire Southern es, leaving a quasi-stationary front across north ida. A center of positive vorticity drifted slowly heastward from the Great Lakes, reaching northern ida on the 24th. The influx of vorticity aloft activated weak baroclinic field associated with the old frontal gh and produced a low-level circulation east of tona Beach, Fla.

he next day, satellite pictures indicated widespread rective activity, suggesting that tropical processes becoming more important. Winds up to 50 kt and a imum sea-level pressure of 999 mb were reported by raft reconnaissance that afternoon.

ve drifted toward the northeast, struggling against environment, with no significant changes for the next hr. In the meantime, developments were occurring the eastern United States that ultimately determined final destiny of Eve. Pressure rises associated with a surge of cold air spread over New England and ibited the storm from accelerating eastward. The forward motion allowed cold air to penetrate the , thwarting the tropical processes, and brought a k death blow on the afternoon of the 27th.

HURRICANE FRANCELIA, AUGUST 19–SEPTEMBER 4

ancelia developed from a complex system that moved frica during August 19 and 20. The wave, which may contained a depression, moved westward. A significant enhancement of convection occurred on August 26 when the wave was located about 800 mi east of Barbados; but Navy reconnaissance east of the Windward Islands on the 28th found no evidence of a closed circulation. After the disturbance passed through the island chain, ship and land reports indicated that a depression with maximum winds of 30 kt had formed in the extreme eastern Caribbean. Air Force reconnaissance on the 29th showed that the depression was speeding toward the west-northwest at almost 20 kt with no intensification.

As the disturbance approached the Windward Islands, environmental conditions were becoming increasingly favorable for intensification. This trend continued in the large-scale flow patterns, but the historically unfavorable location seemed to allow no increase in intensity until the more favorable western Caribbean was reached. Reconnaissance reports on the morning of the 30th indicated winds up to 40 kt and a sea-level pressure of 1001 mb. A maturing Francelia was named about 250 mi south of Haiti.

The trend toward intensification, so far as central pressure was concerned, did not continue. As late as the morning of September 1, the central pressure had risen to 1006 mb. In spite of this rather minor trend in pressure, winds were increasing and were reported as high as 65 kt, mainly in squalls, during the 2 days. A careful examination of satellite photographs and reconnaissance data gave one possible explanation of this rather unusual occurrence. The surface wind and pressure center had outraced the supporting convective cloud system and associated sustaining physical and dynamical processes.

By early afternoon of September 1, the ESSA Research Flight Facility aircraft found winds of 70 kt and a sea-level pressure of 995 mb; further intensification proceeded as had been expected earlier. When it looked as if Francelia would pass just to the north of Swan Island, there was a gradual building of pressures north of the hurricane, which resulted in a turn toward the west, and the center passed over the island during the early evening.

Francelia turned to the west-southwest; and by early afternoon on the 2d, Air Force reconnaissance found winds to 100 kt and a sea-level pressure of 973 mb. This was just as the center passed to the north of the Bahia Islands located some 30 mi north of the coast of Honduras.

The hurricane was now moving at less than 8 kt. Reports from two ships, the *Aragon* and the *Elets*, indicated Francelia was maintaining intensity. Another ship, the *Rio Cobre*, and a commercial aircraft located the center some 30 mi east of the southern British Honduras coast, moving toward the west-southwest at a very slow speed of 3 kt. These reports were very important since the hurricane's center was so close to land and the adjoining coastal ranges that it was impossible to carry on conventional aerial reconnaissance during the final hours prior to landfall.

Gale-force winds occurred over British Honduras from Belize southward, and hurricane-force winds were confined to a small area along the coast just north of the landfall. High tides probably occurred over a small area to the

north of the center. Torrential rains in the mountains of Guatemala, Honduras, and British Honduras produced flooding of many rivers, with the Belize River rising to over 36 ft above normal.

It took the remnants of Francelia 3 days to cross Central America and the southern states of Mexico, prolonging torrential rains which had been falling in those sections for weeks. After emerging into the Pacific Ocean, the disturbance regained a circulation, and was eventually named tropical storm Glenda on September 7.

HURRICANE GERDA, AUGUST 21–SEPTEMBER 10

Hurricane Gerda had a comparatively short life for an early September hurricane. However, prior to development into a depression, the disturbance that probably generated the tropical cyclone can be traced across the Atlantic from the interior of northwestern Africa. The track from Africa was developed by following cloud masses on daily satellite pictures. Some of the cloud masses were organized, others disorganized.

On September 3, the disturbance merged with a degenerating midtropospheric cyclone to the north of Hispaniola and Puerto Rico. A larger cloud mass developed and continued toward the west-northwest at 10 mi hr^{-1} until there were indications of a surface circulation forming in the western Bahamas on the 5th.

The weak tropical depression moved into southeastern Florida on the 6th, then drifted very slowly northward before emerging into the Atlantic near Cape Kennedy on the afternoon of the 7th. Thereafter, a northeasterly course with a steady fall in pressure began, and on the next morning a Navy reconnaissance aircraft found winds up to 50 kt and a sea-level pressure of 1000 mb.

The approach of a major trough in the westerlies produced rapid acceleration, and Gerda reached hurricane intensity on the afternoon of the 8th. The hurricane proceeded on a northeast to north-northeast course within 100 mi of the U.S. east coast, and eventually obtained a forward speed of 40 mi hr^{-1} as the center passed 50 mi off Cape Cod and moved inland over the extreme eastern tip of Maine by late afternoon and evening of September 9. The Nantucket lightship, about 75 mi southeast of Cape Cod, measured winds of 125 mi hr^{-1} and gusts to 140 mi hr^{-1}, as the center passed directly over the ship. Only gales were reported at Nantucket. The extremely high wind velocities, normally not produced by a hurricane with a central pressure of 979 mb, can be attributed, in part, to the rapid movement of the system and to the interaction with a strong trough in the westerlies.

Damage was minimal and confined mainly to marinas, downed trees, high powerlines, and to highways from the Cape Cod area to eastern Maine.

HURRICANE HOLLY, SEPTEMBER 9–21

The disturbance that became hurricane Holly could be identified as early as September 8, after it had moved off the African coast. Subsequently, it moved westward near 10° N. latitude until it reached 40° longitude, where it began a west-northwestward track.

By September 12, the disturbance had begun to show better organization on satellite pictures; it was a depression on the 13th, and Navy reconnaissance aircraft found a central pressure of 1000 mb on the following day. Steady but not rapid deepening occurred for the next 2 days. Hurricane intensity was obtained on the 15th, winds reached 75 kt, and the central pressure dropped to 984 mb (not shown in fig. 1) on the following day. Thereafter, the hurricane began to weaken steadily. On September 17, it was downgraded to a tropical storm, and to a depression on the 18th.

When Holly was downgraded to a depression, it was still 300 mi east of the Leeward Islands. It then moved west-southwestward and continued to weaken as it moved into the eastern Caribbean when it was barely perceptible from surface data. The last satellite pictures of an identifiable circulation showed weak but clear low-level banding with the cirrus canopy completely gone. By midday of the 21st, all traces of Holly had vanished.

When Holly was named, the environment seemed mildly favorable for development. The flow in the upper troposphere was anticyclonic, and there was little vertical shear. But from the beginning, analyses at high levels revealed no substantial outflow. As the system moved through the Lesser Antilles, an upper trough drifting eastward was becoming progressively better defined near 60° longitude. Holly moved under the cyclonic flow associated with the upper tropospheric trough and steadily deteriorated. It was then that the upper and lower level features drifted westward in tandem, inhibiting redevelopment of the storm.

HURRICANE INGA, SEPTEMBER 20–OCTOBER 14

Inga (longest lived Atlantic tropical cyclone of record) spent 25 days inside a relatively small circle (radius less than 700 mi) over the open Atlantic. It was born under adverse conditions, made a rather tight loop southeast of Bermuda, and then passed within 200 mi of Bermuda. It was along this northeastward track that the hurricane reached her greatest strength; winds were estimated to be 90 kt, and the sea-level pressure was reported to be 964 mb.

A cold Low to the east turned the hurricane toward the south; later, under the influence of a cold High to the north, Inga drifted westward and dissipated some 250 mi from where she first reached hurricane force.

TROPICAL STORM JENNY, OCTOBER 1–6

Jenny culminated a prolonged period of disturbed weather in the Gulf of Mexico that persisted for nearly a week. A cut-off Low in the upper troposphere triggered widespread showers and spawned two depressions prior to the formation of Jenny. The second depression moved into the Florida Panhandle on the same day that Jenny de-

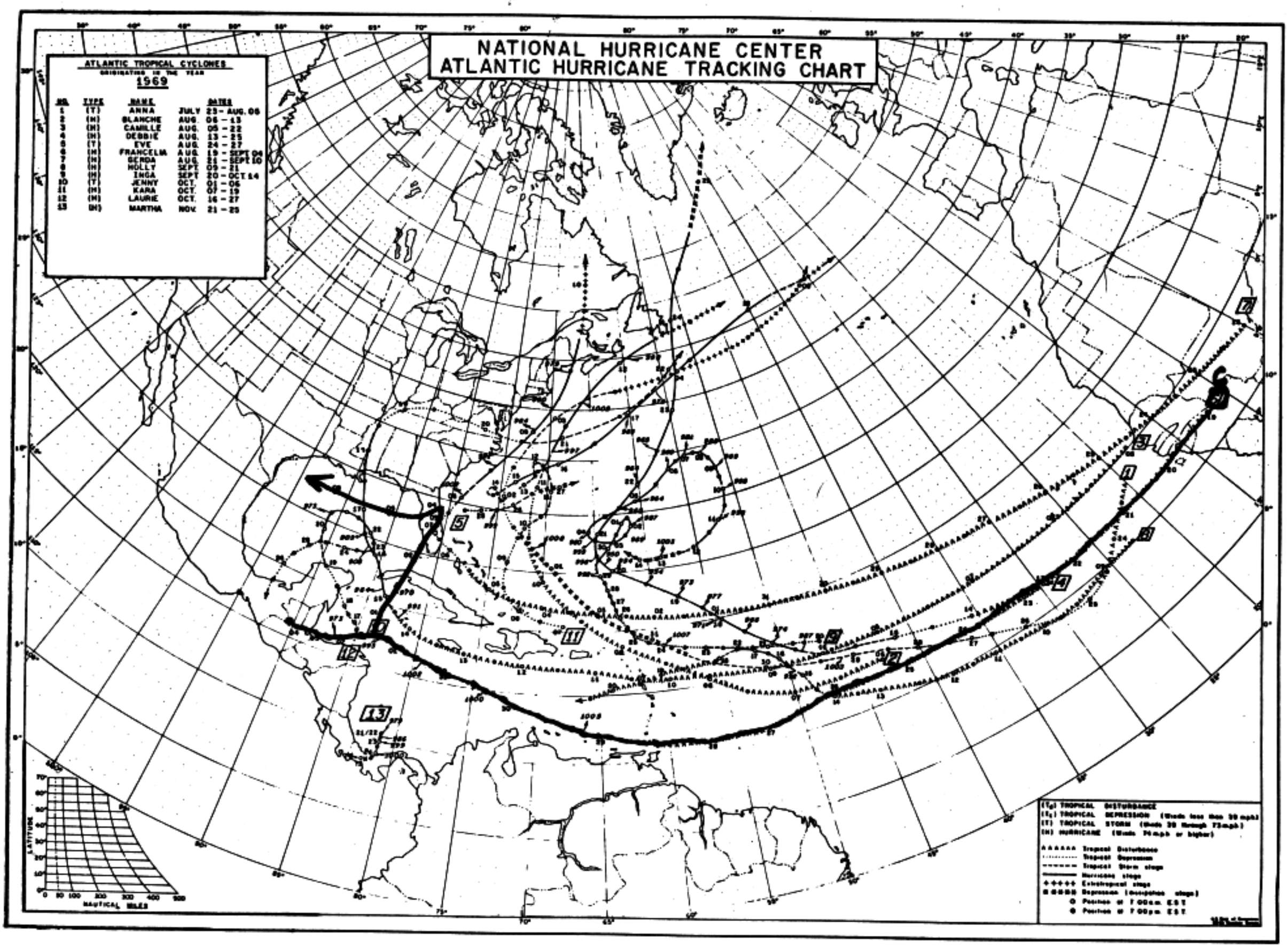

FIGURE 1.—Tracks of hurricanes and tropical storms in the North Atlantic in 1969.