UNITED STATES NAVY
LOCAL AREA FORECASTER'S HANDBOOK
FOR
NAVAL STATION MAYPORT, FLORIDA
1998

NAVAL ATLANTIC
METEOROLOGY AND OCEANOGRAPHY
DETACHMENT
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FOREWORD

This publication revises the 1995 edition of the Forecaster's Handbook for Naval Station, Mayport, Florida. Because of the current and past part-time status of observations at the Detachment, climatology data is complete from 1984 to 1998 only. Recent realignment and manning changes resulted in reducing the observer watch bill from 24 hours to one matching field operating hours. Every effort will made to continue climatology data support.

With the establishment of Naval Air Facility, Mayport on 01 October 1982, and the introduction of the LAMPS MK III community, this detachment assumed responsibility for providing weather and ASW support to both surface and aviation fleet units. Meteorology and Oceanography support continued as Naval Air Station and Naval Station consolidated on 01 Oct 1992, assuming the name Naval Station Mayport. Greater emphasis is being directed towards unified support to local commands, as exemplified by the local Hurricane Command Center establishment in 1985. In November 1993, Naval Oceanography Command Detachment Mayport's name was changed to Naval Atlantic Meteorology and Oceanography Detachment, Mayport in order to reflect our wide range of responsibilities.

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SECTION I - BASIC DESCRIPTION

A. INTRODUCTION

1. The forecaster reporting to Mayport will find this a challenging tour. Located at the boundaries of the westerlies and the easterlies, only two significant seasonal changes occur. In winter, there are days of cloudy skies with rain, drizzle, and chilly temperatures. Cold fronts moving south during this period often begin to stall, becoming stationary and occasionally meander north and south over the local area with the formation of waves along the stationary front. Summer brings a tropical climate with frequent afternoon thunderstorms, rainshowers, consistent temperatures, and plenty of sunshine. Consistently high humidity is experienced throughout the year. Many local mesoscale effects are important considerations for an accurate forecast at Mayport.

B. TOPOGRAPHY AND EXPOSURE

1. Naval Station, Mayport is located at latitude 30 23'34" North and longitude 81 24'06" West. It is situated on the East Coast of the United States on the southern shore of the mouth of the St. John's River in Duval County (Jacksonville), Florida. Urban Jacksonville is 14 air miles to the west. Within six miles to the south are the towns of Atlantic Beach, Neptune Beach, and Jacksonville Beach. The seaport village of Mayport is one mile to the west (Figure 1).

2. The surrounding terrain is salt marsh with wooded sections both to the south and northwest of the station. The runway is 8000 feet long, 200 feet wide and oriented 050-230 degrees true (Figure 2). The maximum field elevation is 14 feet above sea level.

3. Naval Atlantic Meteorology and Oceanography Detachment Mayport is located in the Air Operations Building (BLDG 90), at Naval Station, Mayport, Florida.

C. INSTRUMENT LOCATIONS

1. Meteorological instruments are located at the following field sites as indicated in (Figure 2).

(a) Automated Surface Observing System (ASOS), located in the meteorological communication space of Building 90, displays the following information:

(1) Sky condition
(2) Visibility

(3) Present weather

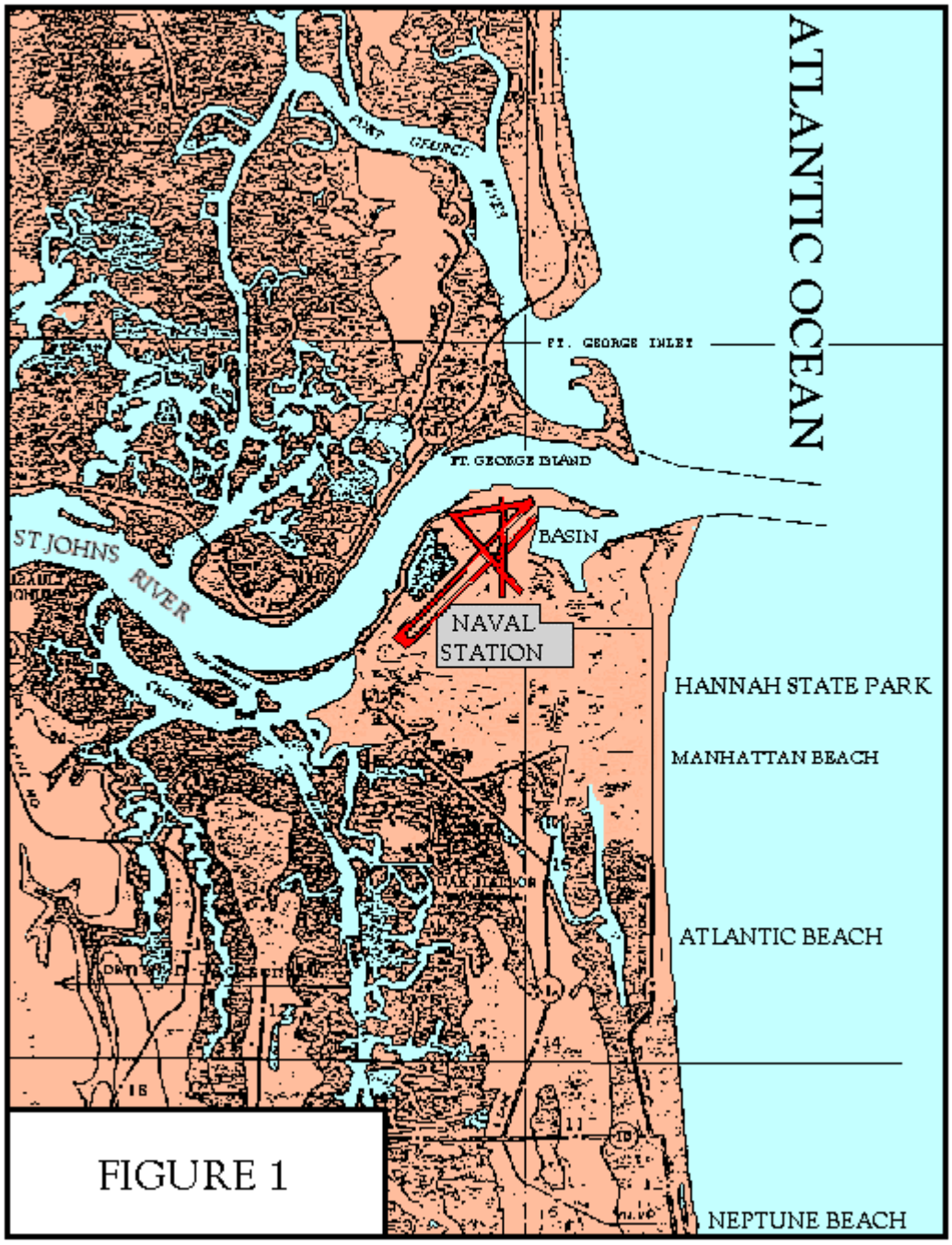
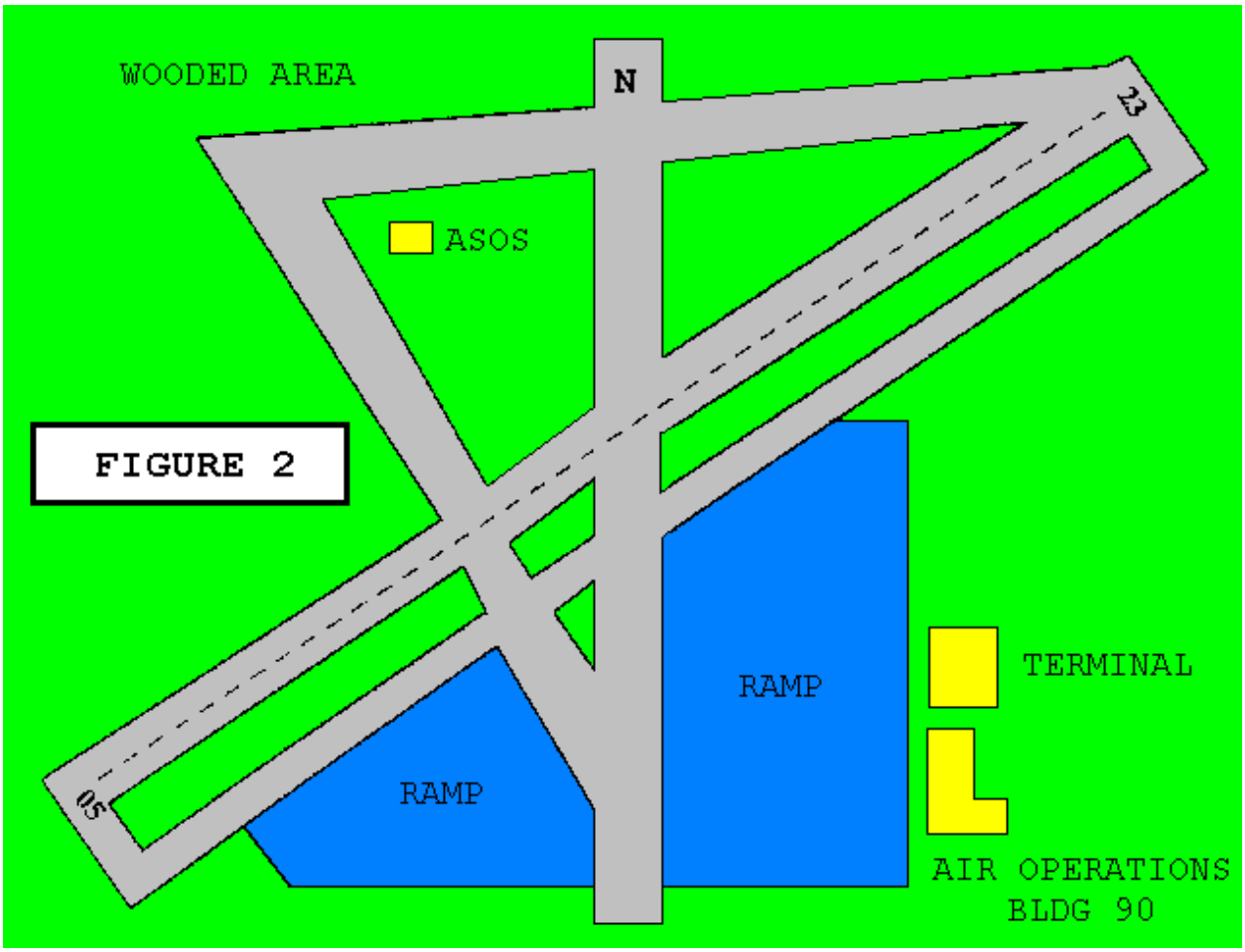


FIGURE 1



(4) Pressure
(5) Temp/dew pt
(6) Wind dir/spd
(7) Precip amounts

(b) The ASOS sensors are located 500' west of runway 05-23 between the 2500'-3000' marker of approach runway 23.

(c) Instrument Back-ups. A standard four inch rain gauge is located on the roof of Building 90. A portable wind measuring set (AN/PMQ-3) and electric psychrometer are stored in a standby status and are used when necessary. The wind transmitter (AN/UMQ-5C) is mounted on a 15' mast near the ASOS sensors.

D. EFFECTS OF SURROUNDING TERRAIN AND WATER AREAS ON LOCAL WEATHER

1. The most significant local effect is the maritime influence generated by the water that extends almost three

fourths of the way around the base. High humidity, moderated temperature extremes, and a Northeast Stratus after cold frontal passage in winter are the manifestations. In summer, sea-land breezes result. The low level terrain in the area fails to slow or stop any advancing storms or fronts, but the influence on maritime tropical air surrounding the Florida peninsula often has a profound effect. The southern part of the Appalachian Mountains, located about 250 miles northwest of the station, do impede cold fronts moving down from Canada, but they also produce leeside troughing which may bring partly cloudy skies to our local area.

E. WEATHER COMMUNICATION

1. The primary communication sources available within the detachment are:

a. Contel Meteorological Workstation (CMW). One transmit/receive computer terminal links the detachment to the USAF Automated Weather Network (AWN) in Tinker, Oklahoma. Selected weather observations, forecasts, bulletins and warnings are booked for routine receipt. Local observations, forecasts and NOTAMS are transmitted to the AWN for worldwide distribution. Worldwide weather data is available upon request through the use of the Automatic Response to Query (ARQ) feature.

b. Airport Weather Information System (AWIS). Mayport's local observation is transmitted directly to TRACON at Jacksonville International Airport via the AWIS terminal.

c. Meteorology & Oceanography Integrated Data Display System (MIDDS). Receives, stores, and prints weather charts prepared by the National Weather Service on a continuous 24 hour basis by way of a small satellite dish located on the roof of building 90. It also receives GOES satellite pictures via a direct slave line from the Satellite Field Service Facility at Coral Gables, Florida through the Naval Atlantic Meteorology and Oceanography Facility, Jacksonville and NODDS products, OPARS and Internet products on the WWW via Jax Internet.

d. Lightning Positioning and Tracking System (LPATS). Provides a visual display of all cloud to ground lightning strikes within the displayed geographical area.

e. Facsimile Machine. A Telefax Machine is available to send/receive printed documents.

f. NEXRAD. NEXRAD Doppler Radar was installed in March 1995, greatly enhancing short-range forecast and warning capabilities.

g. PMSV. Pilot to Metro Service provides direct voice communications between aircraft and forecaster on a freq of UHF 301.3 Mhz.

h. Gateguard. Provides a direct link for transmitting and receiving naval message traffic via the AUTODIN system. Gateguard will be replaced by the Message Conversion System (MCS) in the near future.

i. NLMOD Homepage. Located on NIPRNET, provides our customers another avenue for receiving many products via the WWW that we link our pages to. Our internet address is: 205.67.238.10 (there is no DNS at this time).

F. METEOROLOGICAL AND OCEANOGRAPHIC SUPPORT

1. Commands and Staffs Supported. NLMOD Mayport is primarily responsible for the environmental support to the Naval Station Commanding Officer. In addition, the detachment provides meteorological and oceanographic support to the following commands and staffs located in the Mayport area:

a. Commander, Western Hemisphere Group
b. Commander, Carrier Group Six
c. Commander, Cruiser-Destroyer Group Twelve
d. Commander, Regional Support Group
e. Commander, Destroyer Squadron Fourteen
f. Commander, Destroyer Squadron Two Four
g. Commander, Helicopter Squadron Light Wing Atlantic
h. Helicopter Anti-Submarine Squadron Light Four Zero
i. Helicopter Anti-Submarine Squadron Light Four Two
j. Helicopter Anti-Submarine Squadron Light Four Four
k. Helicopter Anti-Submarine Squadron Light Four Six
l. Helicopter Anti-Submarine Squadron Light Four Eight
m. All ships home ported Mayport including CV's
n. All tenant commands, transient ships/aircraft

2. Types of Support.

a. Forecasts

1. Terminal Aerodrome Forecasts
2. Staff Briefings
3. Destructive weather warnings and forecasts
4. Environmental summaries (quarterly)
5. Hurricane briefings

b. Aviation Services

1. Pilot briefings
2. Flight forecast folders
3. Local area briefings for CDO's and HSL SDO's
4. OPARS

c. Oceanographic Services

1. Source USW Acoustic Data and Predictions
2. Oceanographic Climatological Studies
3. ASW packages
4. Platform characteristic and capabilities briefs

d. Electromagnetic/Electro-optical Services

1. Refractive effects support products in the form of IREPS (Integrated Refractive Effects Prediction System) and AREPS (Advanced Refractive Effects Prediction System) data
2. Platform and sensor briefings
3. Electro-optics support in the form of EOTDA (Electro-Optical Tactical Decision Aid) data

e. Training

1. Quartermaster Weather Observation School
2. Basic Oceanography/ASW products Interpretation Course/Platforms and sensors
3. Aviation Ground School for Meteorological Conditions (HITS)
4. Ship Visitation for Surface and Expendable Bathythermograph (XBT) Observations
5. HSLWINGLANT Tactical Information Course

3. Intra-service Support Agreement (ISA)

a. NLMOD supports local DOD assets with forecasts, weather warnings and hurricane updates. Special operations are supported with advanced notice.

b. Local DOD ISA's are held with:

1. Naval Station Mayport
2. Army National Guard, Craig Field
3. Army National Guard, St. Augustine
4. Blount Island Command Jacksonville (Marines)
5. Coast Guard Station, Mayport

SECTION II

CLIMATOLOGY

A. SYNOPTIC CLIMATOLOGY

1. Controlling Features

a. Atlantic Ocean. The water surrounding Florida is an important influence on local air temperature. During winter, air masses passing over the relatively warm Gulf Steam and Florida Current pick up thermal energy, resulting in local temperatures that are 10 to 20 degrees warmer than those at the same latitude to the west. Conversely, summer temperatures are subject to a cooling effect from adjacent waters, usually holding the maximum temperature below 90 degrees at Mayport.

b. Gulf of Mexico. This body of water helps to maintain a maritime influence on the local weather when the flow is from the southwest. This is also an area of intense sea temperature differential. During polar outbreaks, multiple cyclones can be expected along a quasi-stationary front. Due to the cyclogenic influence of cold air temperatures and underlying warm water.

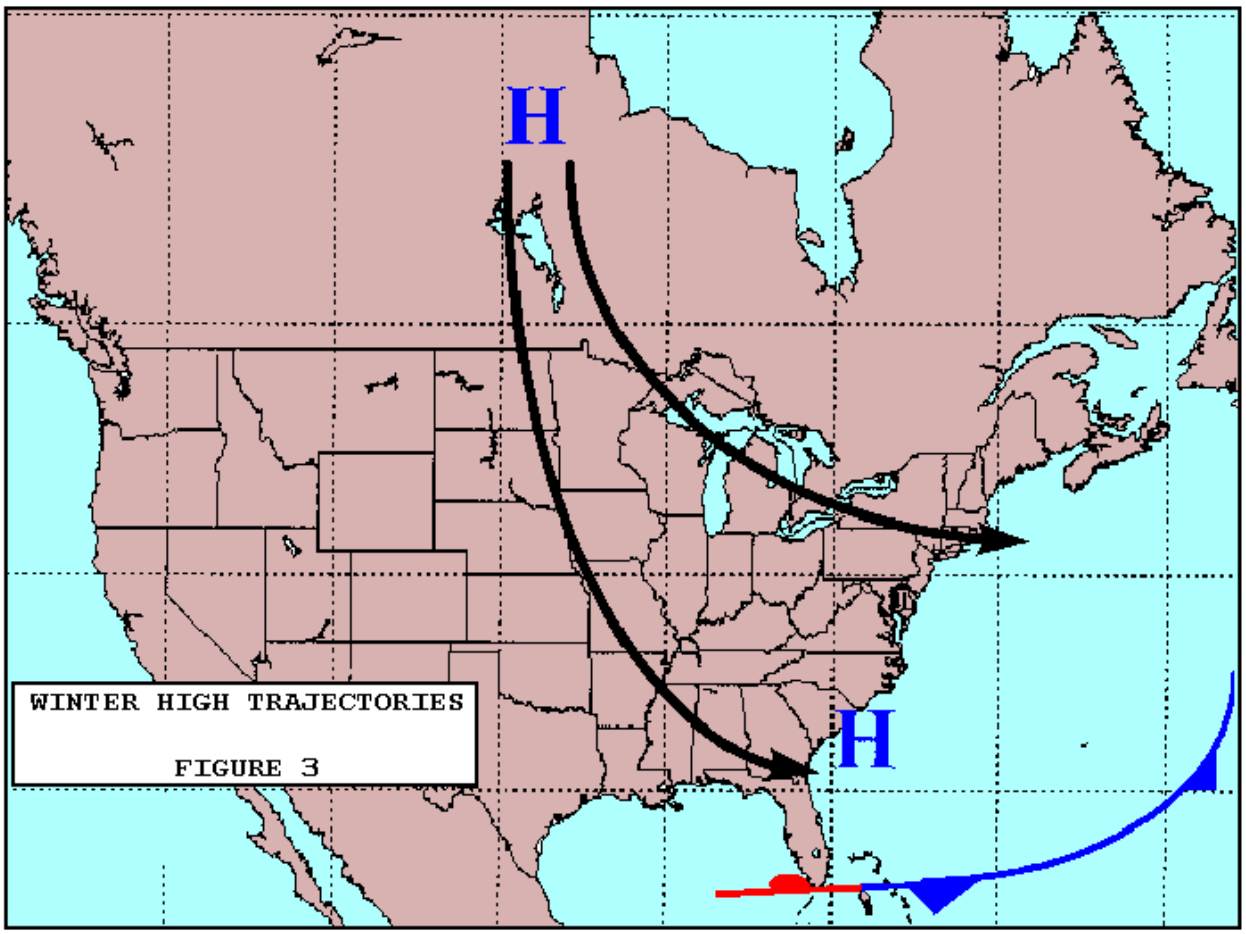
c. Latitude. Mayport is located near the boundary of the tropics so that two weather regimes prevail. In winter it has a temperate climate while in summer the climate is tropical.

2. Predominant Synoptic Patterns

a. Winter Synoptic Patterns (November through March). The Continental Polar (CP) air mass moves southeastward from Canada across the United States. This forms an intense, shallow, cold high, which usually follows one of two main tracks (Figure 3). The high moves along the first track southeast to the Great Lakes and then eastward over the Atlantic. It is this track that causes cold fronts to become east-west oriented and become quasi-stationary near or to the south of the Mayport area. Along the second track, the high moves southeast near Texas before turning east and across the local area. The track is normally associated with fast moving cold fronts. Most Florida freezes are associated with this system movement.

(1) Fronts. Frontal passages produce varied weather conditions depending upon their intensity, forward momentum, and direction of movement. The forecaster must classify the front as one of the following:

(a) Fast Moving - This is the most common at Mayport and the easiest to forecast. As the high moves rapidly



WINTER HIGH TRAJECTORIES

FIGURE 3

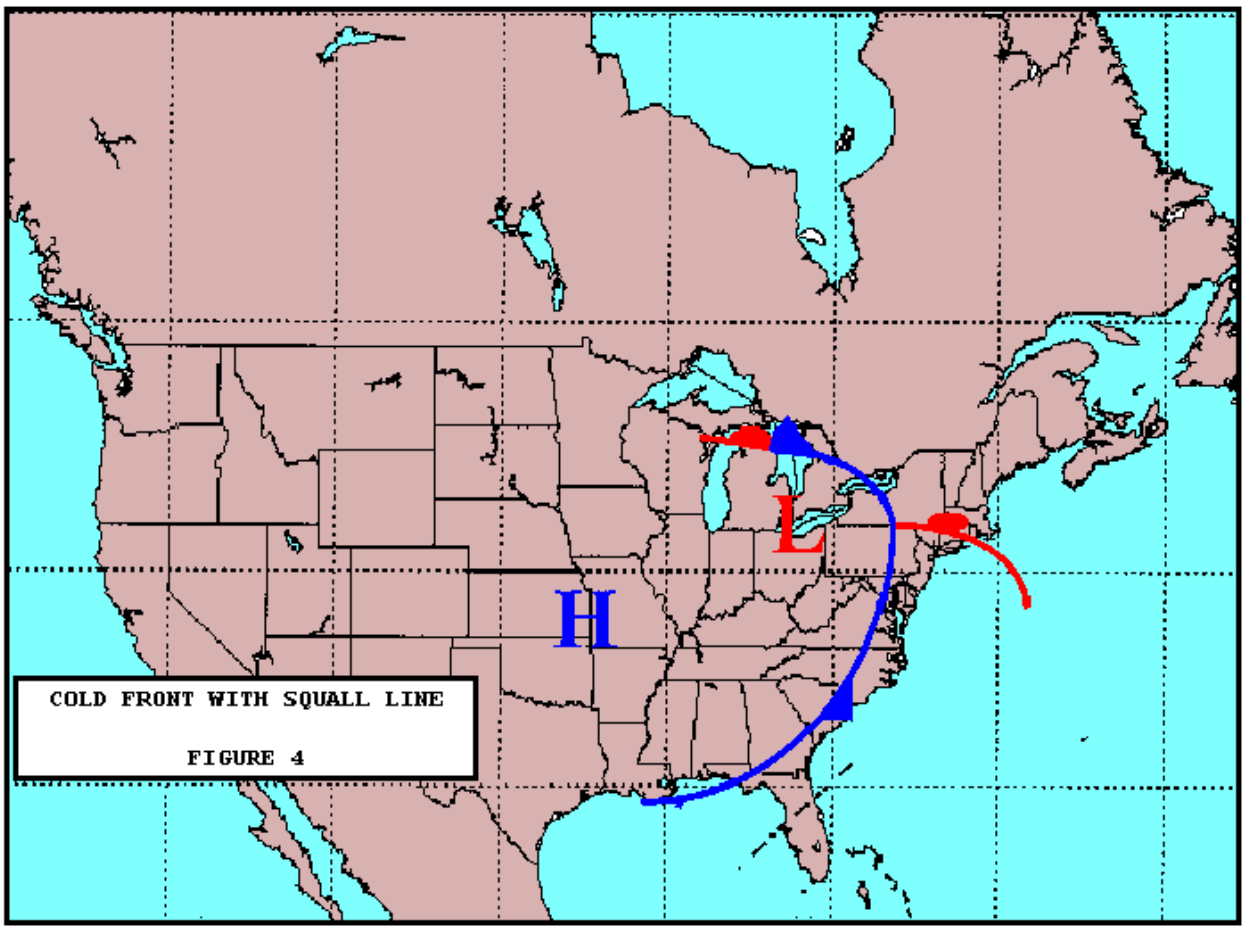
over the Southeastern United States, the front is pushed eastward past Mayport at an average speed of 20 knots. Under normal conditions, the faster the front moves the more violent and narrow the band of weather. Weather associated with this type of front is usually increasing low, middle and high cloudiness. Increasing southerly surface winds and falling pressure ahead of the front. Rain usually occurs with the mid-clouds. Rainshowers or thunderstorms commence an hour or two before frontal passage. IFR conditions are usually brief. After frontal passage,

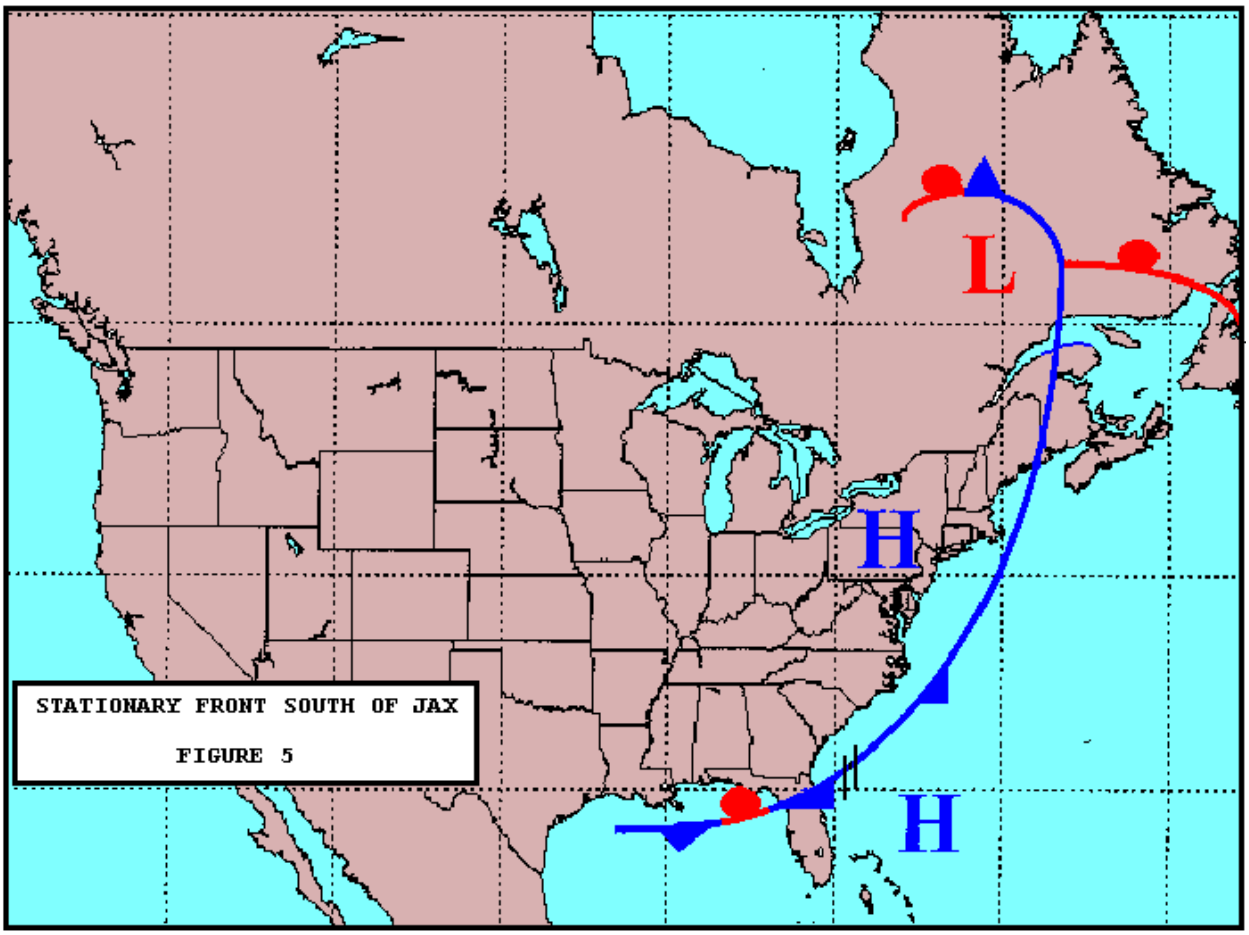
cloudiness decreases rapidly, surface winds shift to a more westerly direction and increase in velocity, and pressure rises rapidly. Surface winds will veer to a more northwesterly direction 10-12 hours after passage of the front. The best indication of weather to expect and speed of movement of the front is to observe the hourly reports from stations along the Central Gulf Coast and Appalachicola.

(b) Accompanied by a Squall Line - The squall line usually forms about 50-100 miles ahead of the front and moves out as far as 200 miles ahead of the front. The formation of the squall line weakens the front considerably. With a severe squall line in advance, the front may be void of precipitation, and will slow noticeably (Figure 4). If formation of the squall line occurs in the Kansas-Arkansas-Louisiana area, it will not usually reach the Mayport area. Formations, which later reach Mayport, usually develop along a line from Eastern Alabama to Panama City, Florida, during the late morning or early afternoon. With an approaching cold front, the forecaster should maintain a close watch on the weather radar and hourly observations from the stations at Panama City, Tallahassee, Albany, Valdosta, Alma, and Gainesville for any severe weather formation. Dialing up the Appalachicola weather radar can provide advance warning of severe weather.

(c) Stationary South of Mayport - Concerning frontal and post-frontal weather, no system can equal the prolonged low ceilings and poor visibility of fronts which pass Mayport and become stationary over Northern or Central Florida, accompanied by northeasterly surface winds northward of the front (Figure 5).

(d) Stationary North of Mayport - This occurs when a high pressure cell moves southeastward over the central United States, and then moves eastward through the mid-Atlantic states and into the Atlantic Ocean. With insufficient push behind the cold front to carry it past the local area, it becomes stationary through southern Georgia. Often fronts will rapidly lose momentum as they approach Mayport, increasing the difficulty of forecasting frontal passage.


L
H
COLD FRONT WITH SQUALL LINE
FIGURE 4



(e) Warm Front - Warm frontal passages occur most frequently during the winter and transitional months. There are two distinct types of warm fronts.

(1) The first type forms in the Gulf of Mexico. After a cold front passes Mayport and becomes stationary across Florida or over the Gulf of Mexico, a warm front potential is present. If the warm front passage occurs during the daytime, cumulus clouds with scattered shower activity and cirrus clouds are observed in the warm sector. If frontal passage is during the night, low stratus overcast usually follows the front. Stations west and southwest of Mayport will realize first indications of this synoptic development. As the high pressure cell moves eastward, increasing cloudiness and intermittent rain at Key West, Fort Myers, Tampa, Gainesville, Panama City or Tallahassee warns the forecaster of possible Warm Frontogenesis. Frontal thickening on the satellite photos can serve as corroborating evidence.

(2) The second type of warm front forms off the East Coast of Florida. Warm Frontogenesis in the Atlantic east of Mayport can occur several times annually during the winter months. It can produce extremely adverse and persistent weather conditions for the local area. When a cold polar high moves rapidly across the Eastern United States and then decelerates or stagnates along the coastline north of the Carolinas, a ridge occasionally builds southwestward along the Eastern Seaboard. Due to the orientation of the isobars seaward, an east to northeast flow is produced across the warm Gulf Stream. Within 18-24 hours, warm frontogenesis occurs at the junction of this warm easterly flow along the coastline. Normally, this type of front moves very little the first 18-24 hours after formation. During this period, it is not uncommon for a wave to form on the front and then move northeastward and deepen. If however, the high pressure ridge weakens and the wind becomes more easterly, the front will move westward. The front will become stationary for a short period of time over Eastern or Central Georgia, extending into the Gulf of Mexico, before commencing a northeast movement towards the Carolina coast. As the southern portion of the front passes Mayport, it will resemble a slow moving front.

(2) Cyclogenesis and Wave Formation. Cyclogenesis and wave formation over the Gulf of Mexico and the Atlantic off the Florida coast are difficult to pinpoint due to the lack of information from these areas. The forecaster should continuously be alert for their formation whenever a stationary or slow moving front is oriented east-west across Florida. Satellite photos are often the best indication over open water areas, but must be used with caution.

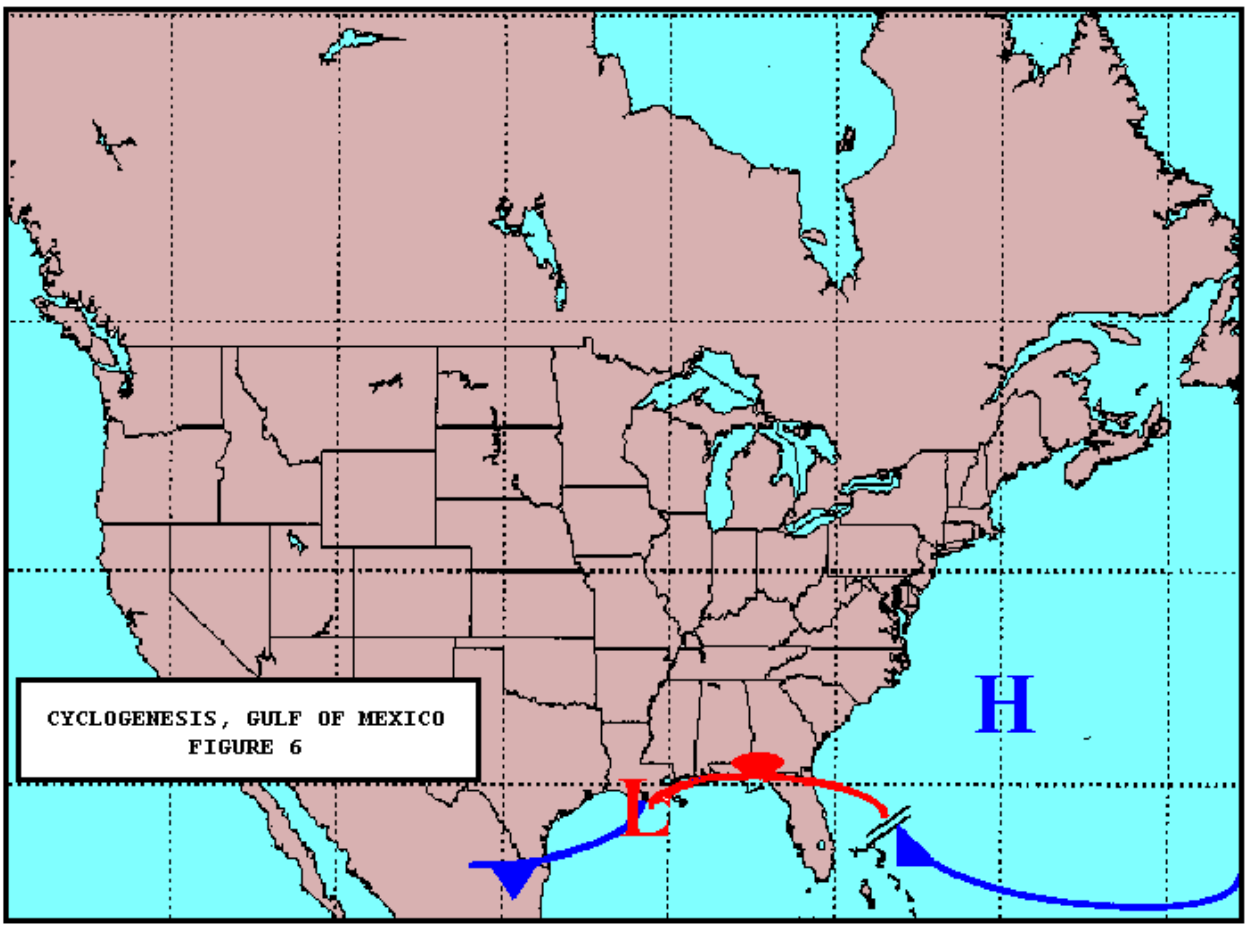
(a) Over the Gulf of Mexico. Although detection is difficult, the first indication is usually the isotherm "tongue" at 850 millibars (Figure 6). Unexplained cloudiness and precipitation at gulf coast stations from Galveston, Texas to Pensacola, Florida are also a good indication. Because of the distance from Mayport to the most likely spawning area, the Western Gulf, local weather is usually not affected for the first 48-72 hours after formation. Local weather varies greatly with approach of the wave. Although it is not uncommon for the wave to remain stationary for several days, movement is usually initiated after a strong jet maximum approaches the trough axis. The wave will usually move northeastward at 12-18 knots and the center will pass north of the local area. As the wave moves to the north, the station experiences a warm frontal passage, warm sector weather and finally, cold frontal passage. Occasionally, the wave will pass to the south of Mayport causing widespread inclement weather and prolonged IFR conditions in the local area.

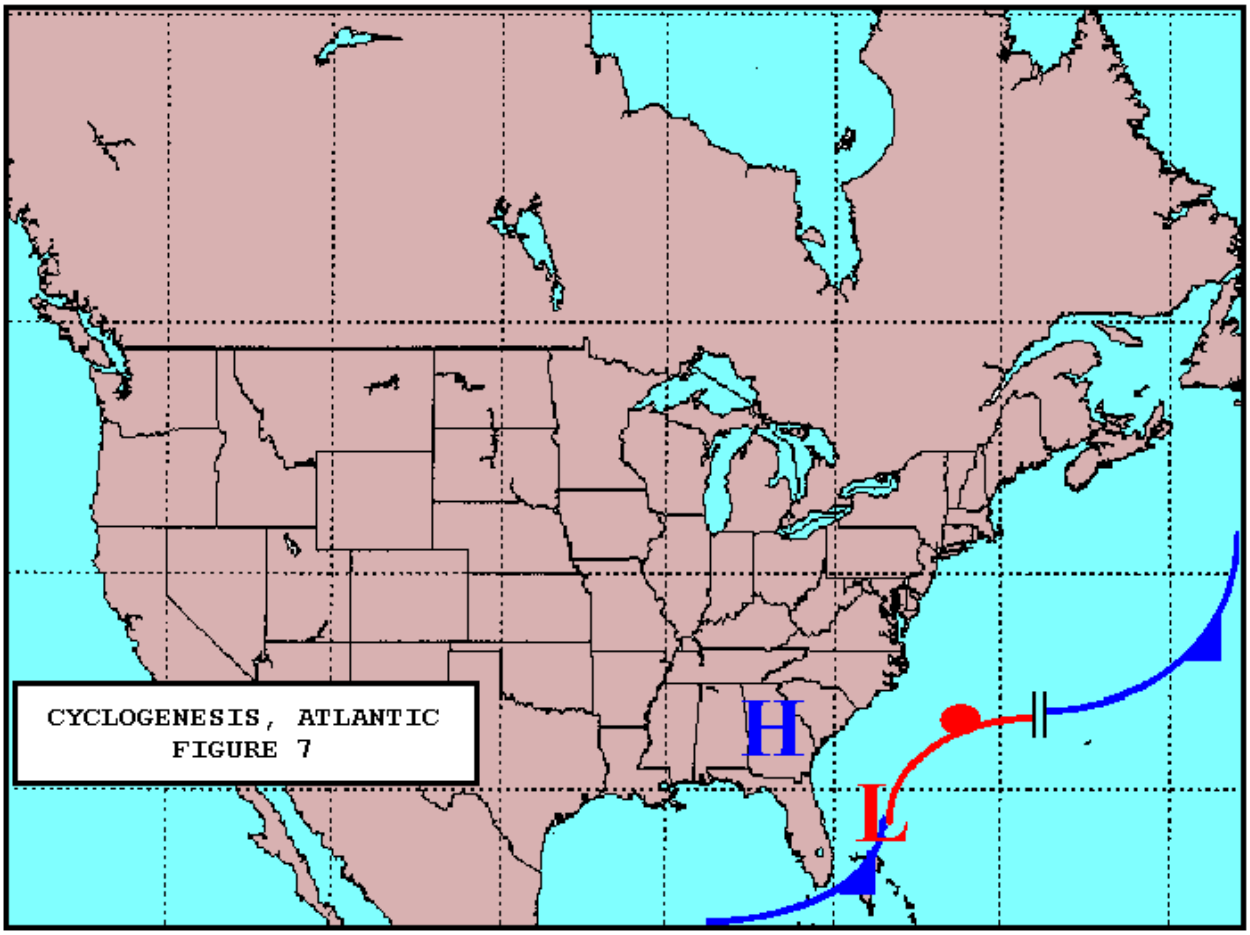
(b) Over the Atlantic. Formation of a wave over the Atlantic is an infrequent occurrence (Figure 7). The waves form on a quasi-stationary front that is oriented east-west across Florida. The Atlantic wave generally forms during mid-winter. Adverse weather associated with the Atlantic wave is not as widespread as that with the Gulf wave. The usual movement of the wave in the Atlantic is north to northeast at 10-15 knots. Wave development is most easily detected by satellite, ship reports off the East Coast of Florida, and the radar summary. The forecaster should check East Coast stations' hourly reports for low stratus layers, falling pressure and rain or drizzle.

b. Summer Synoptic Patterns (April - October).

(1) Cold Fronts. During the summer these fronts decelerate and weaken when they reach the local area. Usually, the front is void of clouds or has a very narrow band of clouds, and the winds will shift to the west or west-northwest.

(2) Easterly Waves. Due to the flow around the subtropical high at this latitude, easterly waves do not usually reach this far north. When the high cell is well defined (pronounced easterly flow) at this latitude, the wave affects the local weather. Easterly waves move westward at 10-15 knots and usually dissipate after reaching Northwest Florida. As an intense wave approaches, Mayport experiences increasing low, middle, and high clouds, rainshowers and thunderstorms. As the wave passes, rainshowers and thunderstorms continue for one or two hours. After the shower activity ends, rain and light rain usually continues for three or four hours. The easterly wave is


CYCLOGENESIS, GULF OF MEXICO
FIGURE 6
H
L



easy to find on the satellite photo and surface chart as it moves into the Caribbean/Gulf of Mexico (Figure 8).

B. SPECIAL FEATURES

1. Tropical Cyclones. June 01 through November 30 is considered hurricane season. From July to September, the greatest danger will be posed by westward moving storms from the Atlantic. Nearing the states, their movement generally changes to a northwest direction with final recurvature to the north and northeast. (Figures 9 & 10) During June, October and November, the greatest threat of a tropical storm comes from the Western Caribbean and Gulf of Mexico. These storms will follow a northerly course before finally recurving to the northeast. While crossing the Florida Peninsula, surface friction and lack of an energy source will usually weaken the storm, although it may re-intensify upon reaching the Atlantic Ocean. The threat of hurricane-strength winds at Mayport is lessened by this frictional degradation. The average year finds 8-10 named

tropical cyclones forming in the Northern Atlantic, Caribbean Sea, and Gulf of Mexico. Five to six of these tropical storms normally become fully developed hurricanes.

(a) The classifications of tropical storms are:

(1) Tropical Disturbance - Circulation slight or absent on the surface, possibly more circulation aloft, lacking any closed isobars.

(2) Tropical Depression - One or more closed isobars at the surface, sustained wind force equal to or less than 33 knots.

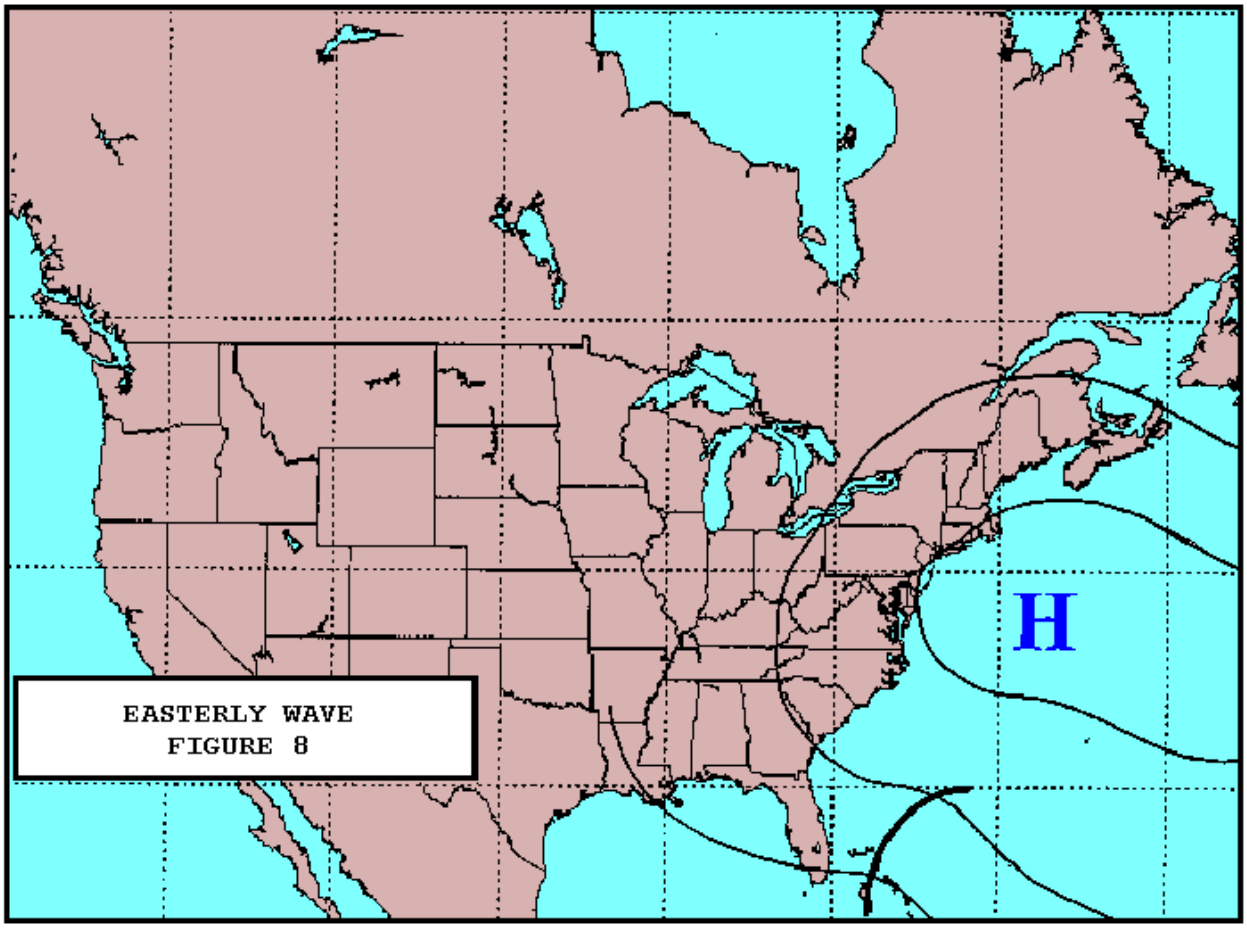
(3) Tropical Storm - Closed surface isobars, sustained wind force greater than 33 knots, but less than 64 knots.

(4) Hurricane - Sustained wind force of 64 knots or greater.

(5) Super Hurricane - Sustained wind force of 120 knots or greater.

(b) The life history of tropical cyclones may be divided into four stages:

(1) Formative Stage - The formative stage begins when the circulation develops along the equatorial front as an easterly wave and ends when the circulation reaches hurricane intensity.


H
EASTERLY WAVE
FIGURE 8

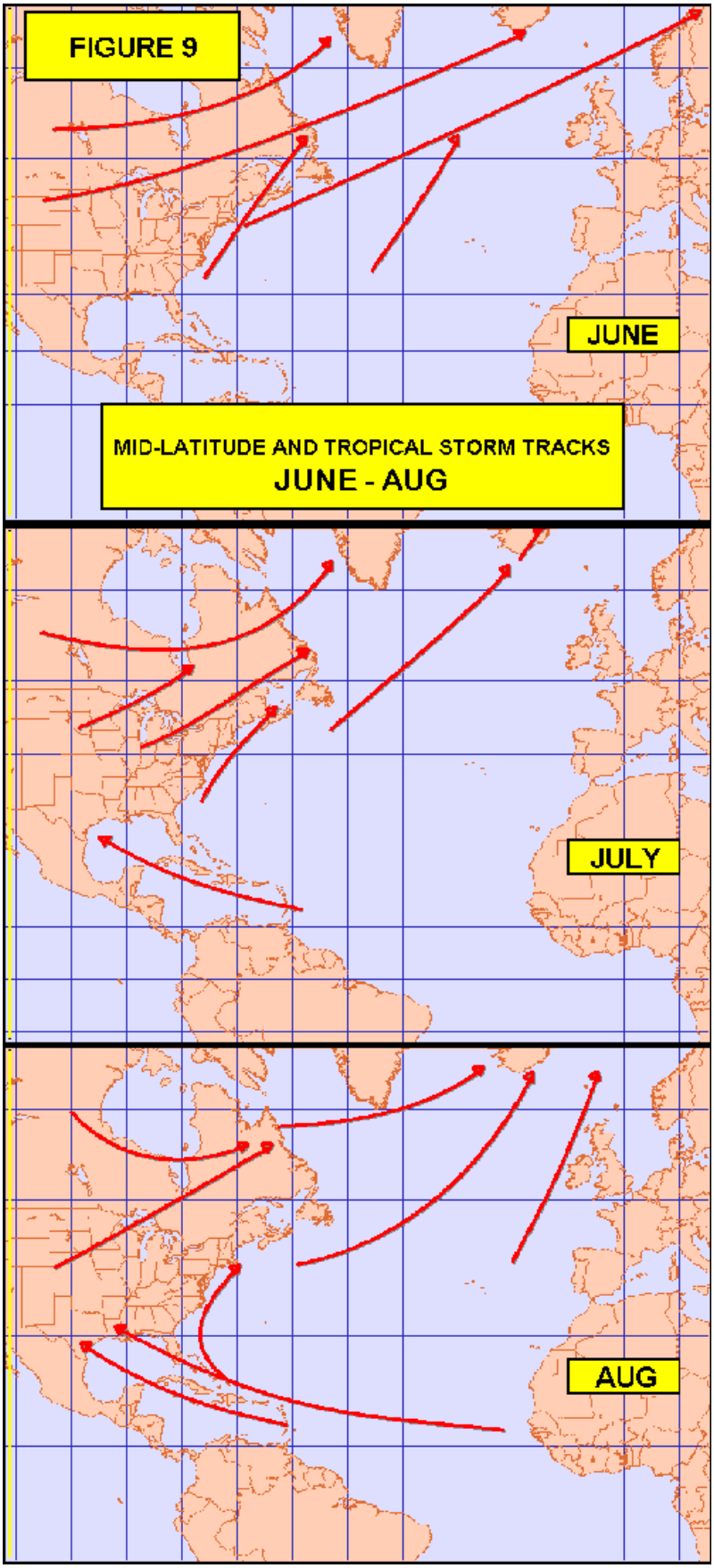


FIGURE 9
JUNE
MID-LATITUDE AND TROPICAL STORM TRACKS
JUNE - AUG
JULY
AUG

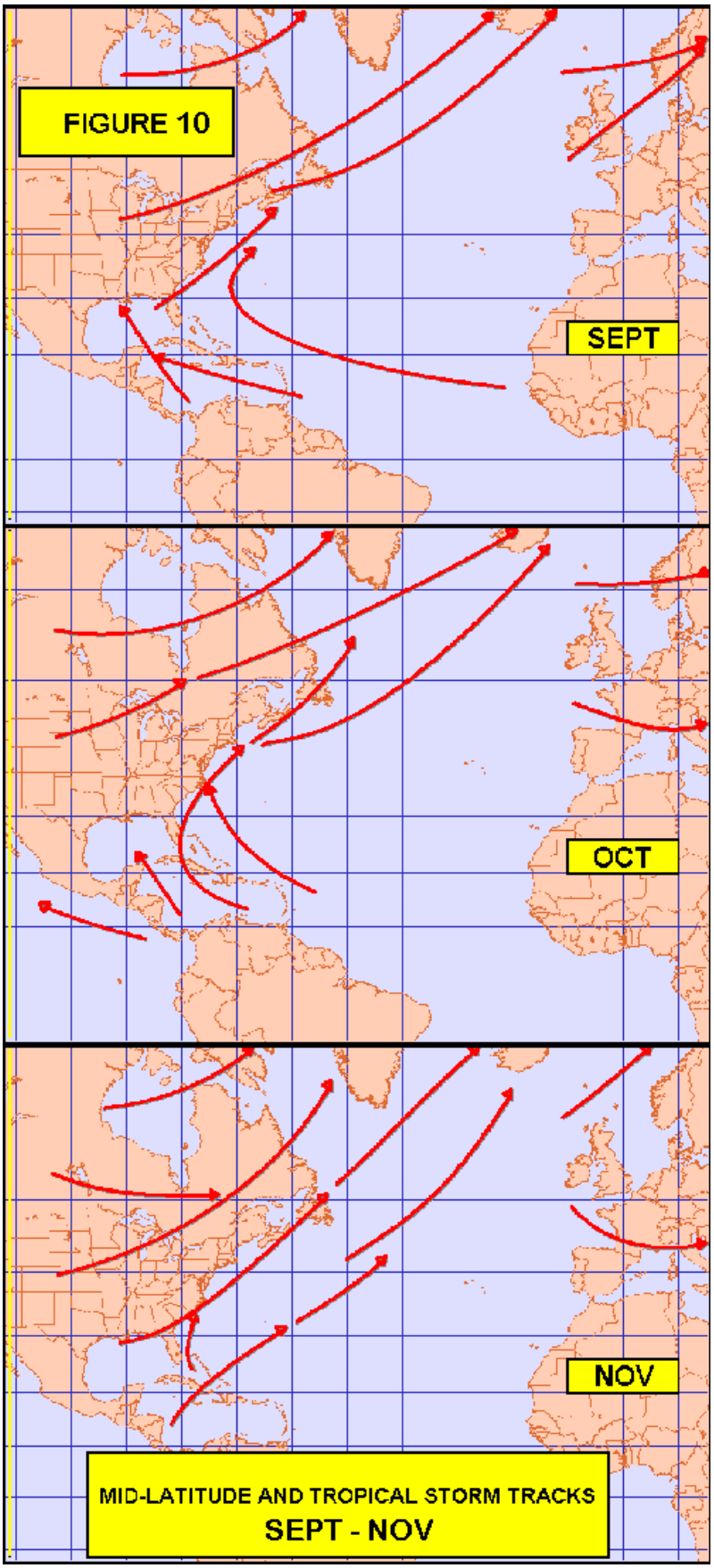


FIGURE 10
SEPT
OCT
NOV
MID-LATITUDE AND TROPICAL STORM TRACKS
SEPT - NOV

(2) Immature Stage - During the immature stage, circulation reaches its maximum intensity. Circulation is more symmetrical and covers a relatively small area.

(3) Mature Stage - The isobars associated with the storm are gradually spreading out over a wide area and there is no further deepening of the central pressure.

(4) Decaying Stage - During the stage of decay, the circulation either assumes extra-tropical characteristics or dissipates.

(c) Although Mayport is in the "Hurricane Belt", it very rarely receives the full force of passing hurricanes. During the past 100 years, only one fully developed hurricane approached Mayport from the Atlantic. This was HURRICANE DORA in 1964. A study of hurricane history reveals the following:

(1) During June, the majority of tropical cyclones that affect Mayport originate in the Caribbean Sea. They move northward over Cuba or through the Yucatan Straits over the Gulf of Mexico and across the Florida Panhandle.

(2) A tropical cyclone will decrease in intensity when deprived of warm water, which is its primary source of energy. Cyclones originating in the Gulf of Mexico must travel over land prior to reaching Mayport and are generally weakened significantly. However, rapid growth is again possible over the Gulf Stream. Consequently, a real threat exists after passage.

(3) During the months of July and August, the principle tropical cyclone paths originate in the vicinity of the Leeward Islands, move through the Bahamas and follow the Gulf Stream northward along the Florida Coast.

(4) Many of the tropical cyclones that pass to the east of Mayport follow the warmer waters of the Gulf Stream, normally keeping them offshore, particularly when the upper level westerlies are well developed. Tropical storms that come ashore seldom do so at Mayport due to the cusp of the coast. However, cyclones approaching from the southeast still pose the greatest threat to Mayport.

(5) During the month of September, tropical cyclones that can affect Mayport are apt to originate almost anywhere due to the high sea surface temperatures which exist over most of the adjacent ocean areas.

(6) During October and November, the tropical cyclones affecting Mayport normally originate in the Caribbean.

They move north to the Gulf of Mexico and northeast across Florida during recurvature. Due to the upper level westerly flow, late season storms rarely approach Mayport directly from the open Atlantic without recurving.

2. Tornadoes. The greatest threat of tornadoes comes from a mature hurricane as it makes landfall. Nearly all tropical cyclones that strike Florida have tornadoes associated with them. In every case, they have occurred in the outer edge of the hurricane circulation. Some exist near the central vortex and have a tendency to be on the advancing edge of hurricanes moving northward and on the right edge of those moving westward. Tornadoes associated with thunderstorms are discussed in the thunderstorm section of the handbook. Tornadoes are a real threat to the Mayport area even though no record of damage exists. Typically one or more funnel clouds, tornadoes, or waterspouts are sighted at Mayport during August and September.

3. Sea Breeze. Surface temperature difference of the land and sea areas from daytime solar heating produces a diurnal low pressure area. This especially occurs during the summer period during relatively clear and calm conditions. A resultant on-shore wind from the east, gradually veering southeast, occurs during the late morning and early afternoon. Arrival time and strength of the sea breeze will depend on sky conditions and any gradient wind that may exist.

(a) Ideal conditions for early occurrences will be clear skies and calm winds or a gradient wind from the southeast quadrant. Under these conditions, the sea breeze may progress as much as 30-40 miles inland and extend vertically to 2500 feet. The sea breeze may be established as early as 1100 local. Strongest effects will be found nearest the coast and within the first 500 feet of the surface. Gradient winds from other directions will modify the sea breeze. Westerly winds slow or eliminate any sea breeze effect. Average sea breeze winds locally range from 10-15 knots. Occasionally they may require a small craft warning. Record high temperatures at Mayport occur with west-southwest gradient winds which prevent the cooling sea breeze effect.

(b) With the arrival of the sea breeze, two effects in the local weather may be noted. The first will be a decided drop in temperature or a slowing of the diurnal rise that otherwise might be expected. Total effects on the local maximum temperatures due to the sea breeze, or lack of it, may amount to 10-12 degrees Fahrenheit. The second effect is initiation of thunderstorm activity along the coastline. The cooler, stable air from the ocean acts as a lifting wedge. If the air mass is sufficiently moist and unstable, the lifting action due to the

sea breeze will initiate thunderstorms. Weak westerly winds may hold off the sea breeze and increase local heating, then dramatically enhance thunderstorm development with the onset of the sea breeze.

4. Fog. The occurrence of fog in the local area extends principally over a six month period from October through March. During the remainder of the year, fog is usually light and the frequency is decidedly less. Although fog or stratus may accompany frontal systems moving through Mayport, the main cause of local fog is a combination of advected moist air and radiative cooling. An air mass circulation, which brings moist air to Mayport from the northeast through southeast, is the main fog producing situation. Clear skies and light surface winds, together with radiative cooling of the moist air mass, are the main factors in fog formation.

(a) Under favorable conditions, fog in the local area will generally form between midnight and 0600 local time, occasionally forming as early as 2100. Dissipation in the morning will occur between 0700 and 1100, depending on the thickness of the fog layer, cloud layers, and wind conditions. Visibility will range from zero to six miles.

5. Northeast Stratus. Advection fog and stratus at Mayport is referred to as northeast stratus since it forms almost entirely with surface winds from a north to northeast direction. The processes producing this stratus are dependent upon a strong offshore water temperature gradient, hence it forms during the months of November through March.

(a) During a typical winter month such as February, the mean sea surface temperature at Mayport is 69F-71F, whereas Norfolk's mean sea surface temperature is 47F. Therefore, any air arriving from the northeast after a one to four day water history would pick up heat and moisture over water. This would be cooled and stratified as it moved inland, producing low stratus.

(b) Northeast stratus will usually occur a day or so following cold frontal passage. It will form when the following continental high is oriented so that the flow is from the north to northeast. The center of the high is usually north of Norfolk and east of Pittsburgh with Mayport in the southeast quadrant. With this situation, an air flow will arrive at Mayport in the form of stratus clouds. Ceilings will vary from 600 feet to 1200 feet in the mid-afternoon, but may be expected to lower to 0 to 300 feet after midnight, depending on the wind, temperature and dewpoint relationship. Cloud tops will range from 2000 to 3000

feet. Visibility under the stratus is usually good during the day. Breaking of the northeast stratus may occur through movement of the high, weakening of the pressure gradient, or shifting winds. The northeast stratus occurs on an average of 8 times per year and usually persists from one to three days, but four to five days are possible.

6. Transitional Northeast Stratus. The term "Transitional Northeast Stratus" applies to a unique condition of low ceilings that occurs locally. This stratus is likely to occur and may be forecast when cold stable air moves inland near Charleston, South Carolina and remains inland over the Mayport area. This produces a shallow inversion near the surface with low ceilings forming in early evening. This condition rarely lasts more than a few hours. As the trajectory increases, gradual warming in the lower layers destroys the inversion and rapid dissipation of the stratus occurs.

7. Smoke and Haze. During the fall of the year, smoke and haze are hazards to local flying. Forest fires which occur during the dry period, common in the latter part of October through November, are the prime factor. The forest fires may be in Florida, Georgia, Alabama, Tennessee, the Carolinas, or even farther to the north and west. Prevailing winds may carry smoke hundreds of miles to the Mayport area. This usually occurs with a high-pressure cell over the eastern states creating an inversion which traps the smoke in the lower levels. The smoke hazard may be ended by a wind shift, or by increased mixing and turbulence in the atmosphere which destroys the inversion.

8. Thunderstorms.

a. Air Mass Thunderstorms. A tropical maritime air mass predominates in the summer and a fair portion of the winter. Factors necessary for atmospheric instability and the resultant phenomena are usually present. Under these conditions, showers and thunderstorms are commonplace and an occasional tornado is formed. The most common cause of thunderstorms in Florida is convection from surface heating in conjunction with convergence caused by the sea breeze from either coast. Thunderstorms that form to the west of the station over the St. John's River will affect NAVSTA Mayport if mid-level winds are from 260-280 at 15 knots or greater.

b. Frontal Thunderstorms. Frontal thunderstorms are classed according to the type of front with which they are associated. In each case, the characteristics of the warm air mass will determine whether thunderstorms will or will not

accompany the front. In this connection, the speed of advance of the front is also a contributing factor.

(1) Cold Front - During the winter, polar fronts will normally pass through Mayport, generally every 5 to 6 days. If the warm air mass is sufficiently unstable and moist thunderstorms will occur. Most common is the pre-frontal variety.

(2) Pre-Frontal - Thunderstorms occur in the warm air mass preceding a cold front. They may be scattered or organized along a squall line or instability line.

(3) Warm Frontal - Thunderstorms are fairly common in this area as the polar front moves back and forth across Mayport while it is quasi-stationary between major outbreaks of cold air. The crucial factor is that the warm air must be sufficiently unstable so that the gentle lifting over a warm frontal surface is sufficient to cause cumulonimbus clouds to develop.

(4) Stationary Frontal - Thunderstorms along a stationary front are uncommon in the Mayport area.

c. Life Cycle of Thunderstorms

(1) Cumulus - Clouds building, updrafts throughout, light to moderate turbulence, electric discharge, precipitation (not falling) in the form of water, ice or snow mostly above the freezing level. The average duration is from 10 to 15 minutes for each cell. Light surface winds flow inward toward the cell.

(2) Mature Stage - No longer building, downdraft begins, strong turbulence, increasing electric discharge, heavy rain begins. There are strong gusty surface winds outward from the cell with a marked temperature drop at the surface. The average duration is from 15 to 30 minutes. This is the most severe stage.

(3) Dissipating Stage - Clouds flattening out, downdraft throughout, little turbulence, decreasing electrical discharge, precipitation steady and decreasing, surface winds light to moderate and no longer gusty, but still outward from the cell. Duration is about 30 minutes.

d. Phenomenon of Thunderstorms (Surface).

(1) Precipitation - A single thunderstorm may produce as much as three or more inches of rain in an hour.

(2) Hail - Associated with thunderstorms and may cause a great deal of damage. Any hailstone greater than one-fourth inch is a serious threat to aircraft, property and lives. Adequate warning to customers is crucial to minimizing damage.

(3) Surface Winds - Thunderstorm surface winds will usually peak at 28-30 knots. However, they may run higher. Florida has a maximum thunderstorm occurrence between 1500 and 1600 LST.

(4) Turbulence - Severe turbulence should be expected in a thunderstorm, particularly in the mature stage. Microbursts and strong wind shear must always be considered serious threats to aircraft safety. Aircraft with low velocity or low altitude are especially vulnerable. Flying under mature thunderstorms further enhances the risk of equipment, life, and limb.

(5) Thunder and Lightning - Thunder is merely frightening to hear at times while lightning is a major fire and electrical hazard. Many lives are lost each year as a result of lightning strikes.

(6) Icing - Icing may be a threat in a thunderstorm well above the freezing level in the cumulus stage. However, transit time through a thunderstorm normally would not permit a great accumulation of ice. Icing changes airfoil shape, greatly reducing available lift.

(7) Low Ceiling and Visibility - Can occur with any thunderstorm with these values decreasing to near zero in heavier thunderstorms.

(8) Tornadoes - Tornadoes are a real threat from severe thunderstorms in the spring and summer. Florida's extensive coastline offers excellent opportunities for waterspouts to come ashore and be classified as tornadoes. However, waterspouts usually dissipate soon after reaching shore. Florida has an average of 35 tornadoes a year, with the greatest occurrence from July to September.

CLIMATOLOGICAL SUMMARY FOR THE MONTH OF JANUARY

Winter is evident during January, with frequent passage of the polar front and wave cyclones. During January, the polar front reaches its extreme southern limits and begins its transition northward. With frequent frontal passages, continental polar air (modified) remains over the southeastern states most of the time. The lowest mean temperature of the year occurs in January. Low temperatures rarely reach the freezing point because

of Mayport's close proximity to the relatively warm water of the Atlantic and Gulf Stream.

Cyclogenesis frequently occurs throughout the Northern Gulf of Mexico and off the North Florida Atlantic Coast. Close monitoring of jet stream max is necessary to forecast this phenomenon.

Aloft, the westerlies continue their southward migration. The pattern is one of strong low index (meridional) flow with frequent passage of long and short waves over the local area.

Rain and drizzle are the predominant forms of precipitation with a rare risk of freezing rain during the passage of wave cyclones.

Fog is the main restriction to visibility.

Cold gradient outflow winds from the northwest frequently occur during polar outbreaks, nearly perpendicular to the NE/SW axis of the isobars.

CLIMATOLOGY SUMMARY FOR THE MONTH OF FEBRUARY

The polar front continues its northward migration during February. However, cold frontal passages and invasions of modified polar air are quite frequent. Cyclogenesis continues even more frequently than the previous winter months due to the greater contrast in temperature between water and land.

Aloft, the westerlies continue to drift southward with strong low index flow persisting as the main pattern.

With the retreating polar front and the ridging of the subtropical high, surface winds are from a westerly direction in February. Speeds increase slightly. There is less fog, better visibility and higher ceilings than in the previous month. February is the month of greatest diurnal temperature range.

CLIMATOLOGICAL SUMMARY FOR THE MONTH OF MARCH

The polar front continues its northward migration with its mean position through the Northern Gulf States, North Carolina and Virginia. Frontal passages over the local area occur slightly less frequently than the previous month.

Aloft, the westerlies reach their southernmost limits and begin to drift slowly northward.

As a result of less cyclogenesis and less frequent frontal passage, there is less fog, higher ceilings, and generally better weather. March has slightly greater sky coverage than the previous month due to the retreating polar high.

Surface winds remain westerly but increase in speed.

Rain is the predominant form of precipitation.

Mist, haze, and smoke are the main restrictions to visibility.

CLIMATOLOGICAL SUMMARY FOR THE MONTH OF APRIL

April continues the transition from winter to summer. Polar front passages are about as frequent as they are in March, but they are much weaker. Many fronts become stationary just north of Mayport and may slowly dissipate in the local area. The sub-tropical high begins to move northward and ridge westward. Prevailing surface winds shift from southwest to southeast. Also, the warming land mass gives rise to more frequent sea breeze effects.

Aloft, the westerlies continue to move northward. Skies become mostly clear.

Rain and rainshowers are about equal as the predominant forms of precipitation.

CLIMATOLOGICAL SUMMARY FOR THE MONTH OF MAY

Transition from winter to summer is complete during the first half of the month. Rainshowers become the predominant form of precipitation, due to an increase in convective activity associated with the warming land. Surface winds become southeasterly and decrease slightly in speed. Mist and haze are the main restrictions to visibility. The two typical synoptic patterns in May are a stationary front to the north through the Central Gulf Coast states or a strong ridge of high pressure over the local area.

CLIMATOLOGICAL SUMMARY FOR THE MONTH OF JUNE

The predominant air mass over the local area is maritime tropical. However, surface winds become more southerly as the gradient becomes weaker, and more of a flat pressure field prevails. This is due to the local area coming under the influence of the westward extension of the sub-tropical high.

With increased insolation and dominance of maritime tropical air, the frequency of showers and thunderstorm activity increases sharply. The main restrictions to visibility remain mist and haze, but precipitation becomes a close third. Sky coverage increases with cloudy skies prevailing.

Aloft, the westerlies make a strong surge farther north, displacing the polar jet near the U.S./Canada border. A weak flow pattern occurs over the southern portion of the country. Easterly waves and troughs in the easterlies occasionally affect local area weather.

CLIMATOLOGICAL SUMMARY FOR THE MONTH OF JULY

The westward extension of the sub-tropical high that persists through the summer months generally produce a weak pressure gradient over the local area. This system tends to keep the polar front north of the Mayport area where it dissipates. July has the highest max mean temperature of the year, and is the cloudiest month of the year with a high number of thunderstorms. The surface winds become south-southeast due to increased sea breeze activity caused by the warm land and light pressure gradient. The westerlies reach their northernmost limits by the end of the month. Easterly waves occasionally reach as far north as Mayport with troughing in the easterlies continuing in the tropics and sub-tropics.

CLIMATOLOGICAL SUMMARY FOR THE MONTH OF AUGUST

A flat pressure gradient continues throughout the month, resulting in August having a low average wind speed. Due to the slight change in orientation of the subtropical high, the prevailing winds shift to the southeast. Although the tropical storm and hurricane season begins in June, the storms usually will not affect the local area until August. The tropical cyclone threat has a strong axis from the southeast that is the most dangerous threat direction for Mayport.

Aloft, the westerlies begin to drift slowly southward by the end of the month. Easterly waves usually reach as far north as Mayport. Typically, August will have one or more funnel clouds sighted from Mayport.

CLIMATOLOGICAL SUMMARY FOR THE MONTH OF SEPTEMBER

The sub-tropical high reaches its northernmost limits during the month of September. Rain is the predominant form of precipitation, but showers occur almost as frequently. There is a marked decrease in thunderstorm activity as more easterly winds

prevail and solar heating decreases. The dominant tropical storm and hurricane tracks lie from the Gulf of Mexico northeastward across Northern Florida in the vicinity of Mayport into the Atlantic.

Aloft, the westerlies remain at high latitudes and continue to drift slowly southward.

CLIMATOLOGICAL SUMMARY FOR THE MONTH OF OCTOBER

Mid-October begins the transition from summer to winter. The polar front begins to drift southward and frontal passages begin again. An occasional wave cyclone will form to the west and influence local area weather. Tropical storm and hurricane tracks are nearly limited to a northeast-southeast orientation across southern Florida, recurving early. Prevailing surface winds from the north to northeast continue to carry moist air over the local area. Ceilings and visibility become lower than the previous months and the frequency of fog increases. Sky coverage decreases due to the modified continental high pressure cell centered over the Southern Appalachians that pushes down over the local area and provides periods of clear conditions.

CLIMATOLOGICAL SUMMARY FOR THE MONTH OF NOVEMBER

November continues as a month of transition. However, by the end of the month, winter is evident with increased frequency of frontal passages and wave cyclones that affect the local area. Due to the modified high pressure cell centered over southern Georgia, November is the month with the least sky cover. Rain is the predominant form of precipitation with occasional drizzle. Showers are seldom observed.

Aloft, there is a strong southward surge of the westerlies and frequent low index flow is the rule.

CLIMATOLOGICAL SUMMARY FOR THE MONTH OF DECEMBER

Winter is quite evident by mid-month with frequent frontal passage and the return of gulf wave cyclones and cyclogenesis off Florida's east coast. December has the poorest visibility of any month of the year. Rain is the predominant form of precipitation with drizzle occurring frequently. The minimum temperature approaches the freezing point a couple of times during the month. Thunderstorms are very rare and occur with a frontal passage.

Aloft, the westerlies become fairly strong over the southern United States.

SECTION III

LOCAL FORECASTING RULES

A. SUBJECTIVE RULES

1. Thunderstorms. Convective type thunderstorms at Mayport are generally formed in two regions. One is south to southwest of NAS Cecil Field and the other is south of Mayport. Those forming southwest of Cecil Field follow a northeast track and appear at Mayport one to two hours after they are observed at Cecil Field. These storms usually go north of the station and follow the St John's River. Rainshowers are not usually observed at the station with these storms, however thunder may be heard as the CBs move northeast. Those thunderstorms forming to the south of Mayport generally follow a northerly course and travel parallel to the beach. This track allows additional feeding in the lower levels of the cell and often produces heavy precipitation at the station.

2. Fog. During late summer and early autumn, high relative humidity along with advected moist air and radiative cooling are the primary factors in fog formation. Expect fog to form when high pressure extends through 500 millibars over North Florida. Occasionally, fog will form after an air mass thunderstorm due to the increased moisture in the air and the rapid cooling of the surface. Mayport generally experiences its densest fog when light southwest to westerly winds advect fog over Mayport from the west side of the St. Johns River. Time of most frequent occurrence is between 0600-0900L.

3. Frontal Passage. When northwest winds are forecast after a cold frontal passage, clear skies can be forecast to begin four to six hours after the passage of the front.

4. Haze. Persistent haze, reducing visibility to four to six miles, will occur with a subsidence inversion. Light to moderate turbulence can be expected below the inversion with smooth conditions above. Forecast four to six miles of visibility if all of the following occur:

(a) Mayport is below the eastern edge of a high pressure ridge at upper levels.

(b) A surface high pressure cell dominates the weather over the area. (North Florida and South Georgia)

(c) A strong inversion exists between the 850 Mb and 500 Mb levels.

5. Northeast Stratus. From October through March, a cold frontal passage can reduce ceilings and visibility due to northeast stratus. Forecast ceilings of 500 to 1200 feet and visibility three to six miles due to drizzle and fog if the following synoptic conditions exist:

(a) A high pressure cell is centered north of Norfolk and east of Pittsburgh with Mayport within the southeast portion of the high cell.

(b) A front or trough line lies between Jacksonville and Miami.

(c) Surface winds are from the north-northeast through the east-northeast so that the streamline reaching Mayport has passed over the Gulf Stream.

B. OBJECTIVE RULES AND TECHNIQUES.

1. When tropical lows pass the east of and relatively close to Mayport, forecast clearing as the winds back from north to west.

2. Forecast early morning showers and an early onset of a sea breeze with light easterly gradient winds. This combined effect will carry nocturnal showers forming over the Gulf Stream inland over Mayport.

3. Following the passage of a cold front, which has become stationary in the vicinity of Jacksonville, be alert for the passage of a short wave in the upper atmosphere which may cause a wave to form along the front.

4. Stationary fronts in the vicinity of Jacksonville will begin to move when the upper atmosphere pattern changes from a high to a low index or when a wave cyclone forms in the vicinity of Cape Hatteras.

5. During the summer, fronts in the Great Lakes Region will pass through Mayport if there is a major trough over the East Coast, and intensifying ridge over the Rockies and meridional flow over the frontal area.

6. During both summer and winter, forecast nocturnal land breeze with northwest winds less than 5 knots when a high pressure in the vicinity of Jacksonville and a very weak pressure gradient exists in the local area.

7. The wind direction is important for many forecasts at Mayport. Don't depend on the wind blowing parallel to the isobars as friction and local effects will often preclude this. There is one case where this is particularly true:

(a) When a wintertime cold front approaches Mayport from the west, the closer its orientation to north-south, the greater the likelihood of rapid clearing following frontal passage. The high pressure cell following the front will generally result in northwesterly winds over North Florida, even when surface isobars indicated that the winds should be from the north to northeast. The surface winds may cross the isobars by as much as 90 degrees. If there is only one high pressure cell associated with the system, and it is located south of 35 degrees north latitude, the wind direction will be along a line direct from the high center to Jacksonville. Should the front arrive with a nearly east-west orientation, there is a danger that the front will stall and become stationary part way down the Florida peninsula, thereby resulting in a northeasterly flow of low stratiform clouds with intermittent rain or drizzle over North Florida. These conditions may persist for three days or more.

SECTION IV

SPECIALIZED FORECASTS

A. There are special manuals available in the office which contain procedures for producing forecasts for the following:

1. Sound Focus Forecasting

2. Search and Rescue

3. Ballistics Forecasting

4. Radiological Fallout Forecasting

5. Atmospheric Refraction

   (a) IREPS

   (b) FLIR

6. Basic and Tactical Oceanography

7. Optimum Path Aircraft Routing System (OPARS)

8. Navigational Briefs

B. Additionally, the FDO has various SOP's which detail the actions required for issuing severe weather warnings, freeze warnings, destructive weather warnings, and when WW's, SIGMETS, AIRMETS, and tropical cyclone warnings are received.

SECTION V

ENVIRONMENTAL EFFECTS

A. When certain environmental conditions exist, the forecaster must be particularly alert to provide timely warnings/updates to supported activities that require unique consideration at NAVSTA Mayport.

1. Thunderstorm Condition 1 - Lightning, imminent or already occurring within 5 miles of NAVSTA Mayport is a paramount safety consideration during aircraft refueling and weapons handling evolutions. The MWR Department is also concerned due to the safety of the patrons using the outdoor swimming pool and golf course.

2. Small Craft Warning - Sustained winds in excess of 15 knots adversely affect the small boat operations in the Mayport basin. Winds from the Northeast at 12 knots or greater will also require a Small Craft Warning, Due to the wind blowing unobstructed into the basin from the Ocean.

3. Freeze Warning - Public Works requires advance warning to maintain proper heating capacity and drain all effected pipes.

4. Northeasters - Northeast stratus conditions can last 5 days or longer. Ceilings below 1000 feet and visibility below 3 miles may persist for prolonged periods, significantly impacting local flight operations.

5. Special VFR - (authorized by control tower only) Criteria is 500 - 1000 ft ceiling and/or 1 - 3 mi VSBY.

6. Runway Minimums -

(a) PAR:

(1) RNWY 05: 100 ft and/or 1/2 mi VSBY

(2) RNWY 23: 200 ft and/or 1 mi VSBY (helos, 100 ft and/or 1/2 mi VSBY

(b) ASR:

(1) RNWY 05: 400 ft and/or 1 mi VSBY

(2) RNWY 23: 500 ft and/or 1 mi VSBY

7. PA/DA Forecast - Included on DD175-1 briefs due to its impact on lift with helo operations.

SECTION VI

REFERENCES

The following publications are available to the forecaster and contain additional information about the local area.

a. - Naval Atlantic Meteorology and Oceanography Facility Jacksonville, Local Area Forecaster's Handbook

b. - Naval Atlantic Meteorology and Oceanography Detachment Cecil Field, Local Area Forecaster's Handbook

c. - U.S. Navy Regional Climatic Study of the United States Atlantic Coast and Associated Waters (NAVAIR 50-1C-555)

d. - U.S. Navy Regional Climatic Study of the Caribbean Sea and Gulf of Mexico, Volumes 1-4 (NAVAIR 50-1C-543 through 546)

e. - Hurricane Havens Handbook for the North Atlantic Ocean (NAVENVPREDRSCHFAC Technical Report TR 82-03)

f. - Tropical Cyclone Evasion Handbook (COMNAVSURFPAC/COMNAVSURFLANT INSTRUCTION 3140.2)