

CRYSTAL FACE SYNOPSIS – FROM GRIDDED FIELDS + SATELLITE + LIGHTNING MOVIE

| | <u>LT Flow Regime</u> | <u>UT Flow Regime</u> | <u>Convection</u> |
|--------|---|---|---|
| July 1 | Variable; sfc trough across southern FL | N-S trough in westerlies over entire state | MCS over South Florida |
| July 2 | Variable; sfc low IVOF Ft. Myers | N-S trough in westerlies over entire state | Widespread South and Central Florida |
| July 3 | SW flow in confluence zone southern FL | N-S trough in westerlies over east coast | Short line over southeast coast |
| July 4 | SW flow in confluence zone western FL | NW flow | Widespread along east and west coasts |
| July 5 | Variable; sfc low IVOF Naples | NW flow | Widespread along east and west coasts |
| July 6 | S/SE flow | E-W trough across southern FL | Widespread over South Florida |
| July 7 | SE flow | N/NW flow | Widespread over South Florida |
| July 8 | SE flow | NW flow | Widespread along east coast |
| July 9 | SE flow | Fast 30 kt NW flow | MCS over Keys; widespread east coast |
| Jul 10 | S/SE flow | E-W trough across southern FL | Offshore MCSs; widespread South Florida |
| Jul 11 | SW flow | NE flow w/ E-W trough SW of Naples | Scattered over South Florida |
| Jul 12 | SW flow | NW-SE ridge transects state | MCS over southeast coast |
| Jul 13 | SW flow | Closed anticyclone over southern state | Widespread over central peninsula |
| Jul 14 | W/SW flow | E-W ridge across state | Very suppressed entire state |
| Jul 15 | Variable; col across southern FL | E/SE flow > 30 kts southern FL | Short line over southeast coast |
| Jul 16 | N flow w/ weak E-W ridge southern FL | E flow > 30 kts southern tip of FL | Widely scattered over South Florida |
| Jul 17 | N/NE flow w/ col over southern FL | E/NE flow > 30 kts southern tip of FL | MCSs along western coast |
| Jul 18 | Variable; sfc low IVOF Okeechobee | NE flow > 30 kts southern tip of FL | MCSs along western coast |
| Jul 19 | Variable; diffluent S flow entire state | NE flow > 35 kts southern tip of FL | MCS over central peninsula |
| Jul 20 | Variable; S/SW flow w/ col IVOF TBW | NE flow 45 kts southern tip of FL | MCS over central peninsula |
| Jul 21 | Variable; SE flow w/ col central FL | E-W ridge across entire state | MCSs over Gulf Stream, entire peninsula |
| Jul 22 | S flow w/ diffluence southern FL | N flow | MCSs over central peninsula |
| Jul 23 | SE flow | N/NE flow > 30 kts southern tip of FL | Widely scattered over central, southern peninsula |
| Jul 24 | E/SE flow | NE flow | Widespread over southern, central peninsula |
| Jul 25 | SE flow | L&V; weak anticyclone w/ col southern FL | MCSs along west coast |
| Jul 26 | SE flow | L&V; anticyclone over entire state | MCSs along west coast |
| Jul 27 | E/SE flow | NE flow | Widespread central peninsula |
| Jul 28 | E flow | Fast E flow 40 kts freshens to 60 kts late PM | Widely scattered entire peninsula |

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| Days with Low Level Easterly Flow: | 12 |
| Days with Low Level Westerly Flow: | 6 |
| Days with Low Level Variable/Unclassifiable Flow: | 10 |
| | 28 |
| Days with Upper Level Easterlies: | 11 |
| Days with Upper Level Westerlies: | 6 |
| Days with Variable/Unclassifiable Flow Aloft: | 11 |
| | 28 |
| Days with Trough/Vortex Present Aloft: | 6 |
| Days with Ridge/Anticyclone Present Aloft: | 6 |
| | 12/28 |

Principal Flow Regimes (Five):

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|-------------------|--|
| July 1 – July 5 | Low pressure located at surface, trough in the westerlies aloft, changing to NW flow aloft |
| July 6 - July 10 | SE flow at surface, NW aloft with several days of trough formation |
| July 11 – July 14 | SW flow at surface, ridging/anticyclone present aloft |
| July 15 – July 21 | No well-defined flow regime at surface, fast E/NE flow aloft |
| July 22 – July 28 | SE flow at surface, NE flow aloft weakening on two days in anticyclone |

One Paragraph Synopsis of Each Day:

July 1 Large MCS forms over South Florida with extensive trailing anvil canopy.

An upper level trough axis is located in westerly flow aloft, with the trough axis aligned north to south over the peninsula and upper level winds ranging from 10 kts (south) to 20 kts (north). A surface trough was oriented from W/SW to E/NE through the south central peninsula. Early morning S/SE flow at low levels converged with the land breeze front off the east coast, forcing numerous CBs with extensive, merging anvils over water by early afternoon. Land CBs fired off early in the afternoon south of Lake Okeechobee along the surface trough axis. Outflow from these storms flowed SE and merged with the SE coastal sea breeze front, reinforcing CB development along the SE coast. A large MCS developed with a leading convective line and extensive, elliptical shaped trailing anvil; the MCS propagated to the SE by virtue of its outflow boundary. The MCS dissipated offshore by midnight. By late afternoon, a line of CBs also fired along the west coast between Tampa Bay and Cedar Key. This line, anchored to the coast, developed in a convergence region between the west coast sea breeze front and prevailing easterly flow. Anvils from this activity formed narrow plumes that advected to the NE and then rapidly dissipated.

This day featured some of the most widespread, intense activity of the project.

July 2 Narrow east-west convective anvil mass coalesces from numerous cells across the southern half of Florida.

The synoptic situation is similar to July 1 – trough axis aligned north to south in the westerlies over the peninsula, and a closed surface low spinning over Venice, Florida and a trough of low pressure extending from the low across the state into the Melbourne area. Upper level flow is weaker than on July 1 (10 kts). During the early afternoon a ring of thunderstorms fire around the surface low/upper trough axis and coalesce into a W/NW-E/SE band across the center of the peninsula. Within the weak upper steering flow, the convective line fizzles and the anvil remnants decay in situ by early evening. Very early the next morning, an intense thunderstorm cluster fires over the waters east of Palm Beach as prevailing southwesterly current drives the land breeze front over the warm Gulf Stream.

July 3 Narrow north-south oriented convective anvil mass forms from merger of seabreeze cells along southeast coast.

On this day, the north-south trough axis in the upper level westerly flow has shifted to a location along the east coast. General westerly flow prevails at the surface, with a large confluence between northwesterlies (over the northern half of the peninsula) merging with southwesterlies over the southern half of the peninsula. Afternoon showers erupt along the SE coast as the east coast sea breeze front converges with southwesterly flow. Later in the afternoon, an east-west oriented band of thunderstorms fires between Ft. Myers and Ft. Lauderdale, along the axis of the surface confluence. The cells are short-lived and small anvil plumes advect to the SE under weak (10 kt) NW flow aloft.

July 4 Small anvils are generated by sea breeze cells along both coasts.

The synoptically disturbed regime continues with a large region of flow deformation (col) established at the surface along the west coast of Florida. Around this col, the prevailing low level flow is westerly. The northwesterly upper level current has freshened to 15-20 kts. The first group of afternoon CBs pop along the northwest coast, as the west coast sea breeze front is driven inland. Thunderstorms erupt along the east coast as the sea breeze front converges with westerly flow from Daytona Beach to Vero Beach. These storms quickly die and the anvil remnants from both coasts drift to the SE under 15-20 kt NW upper level flow. A solitary intense cell later forms east of Vero Beach over water, triggered either by outflow from the east coast seabreeze activity or land breeze; peak intensity occurs before midnight and anvil remnants linger until early morning.

July 5 Moderate sized anvils are generated by isolated groups of cells along both coasts.

Another synoptically disturbed day begins with a closed surface low located over Ft. Myers. Upper level flow blow from the NW across the state but is weak (10 kts). Cell development on this day is scattered and not very organized. Two groups of scattered cells develop: One group initiates along the west coast sea breeze front, driven onshore by westerlies, in the vicinity of Waccassassa Bay and these cells expand in coverage over the central peninsula. One group of these cells propagates SE into the Cape Canaveral/Melbourne area. The second group of cells initiates along the SE coast north of Miami along the east coast breeze front (where southerly surface flow parallels the coastline). All of these cells generally drift from NW to SE across the state, and coalesce into moderate sized anvils, which fizzle by sunset.

July 6 Isolated small cells form over the southern peninsula, and coalesce into a moderate sized EW oriented anvil band.

On this day, the surface flow is from the SE-E across the state but the upper level flow has developed an east-west oriented trough axis across the southern peninsula. As a result, upper level flow is light and variable. Afternoon CBs fire along the southeast coast sea breeze front, driven onshore in prevailing SE flow. Then a narrow line of new cells rapidly form across the center of the southern peninsula bridging both coasts south of Okeechobee. It appears that these cells are aligning with the upper level trough axis. Anvil debris from cells coalesces into a moderate sized EW oriented band across the southern peninsula and then decays in situ by sunset. Vigorous isolated thunderstorm cells continue over Tampa Bay until early evening.

July 7 Modest sized anvils erupt from sea breeze interactions over southern Florida.

Residual upper level troughiness remains over the Gulf of Mexico, along the SW peninsula, while low level flow remains from the E/SE. Upper tropospheric winds are light from the NW (10 kts). A CB band initiates during the afternoon along the SE coast, forced by onshore propagating sea breeze front. This storm band moves with the SE flow across the southern peninsula. The band later collides with a stationary west coast sea breeze front and this triggers enhanced convective activity along the SW coast from Tampa Bay south. Modest sized anvils evolve from these cells and cover mainly the western half of the state, but decay largely in situ.

July 8 Parallel SW-NE oriented anvil cloud bands form in strong reversing shear across the state.

Lower level SE flow has increased to 15 kts while upper troposphere winds oppose this flow from the NW at 10-15 kts, establishing a reversing shear across the state. A trough axis oriented SW to NE remains embedded in the upper flow over the Keys and southern peninsula. Early morning showers and CBs developed over the waters south and east of the peninsula – probably from offshore convergence between the land breeze and SE basic state flow. Weak CBs and showers developed along the SE coast during the morning, propagating further inland and along the east coast during the early afternoon. Isolated west coast CBs erupt near Tampa Bay and northward along the west coast during the late afternoon. The distinguishing feature this day is the generation of long parallel anvil bands stretched out in the NW to SE oriented shearing flow.

July 9 Heavy early AM convective activity over southern waters IVOF Keys leads to massive anvil coverage over southern peninsula; in the afternoon the southern peninsula clears while a significant MCS anvil develops over the Gulf of Mexico SW of Florida.

After midnight on the 8th, extensive CBs fire over the Gulf Stream east of the peninsula as the land breeze front flows offshore and converges with 15 kt onshore SE flow. Anvils from these cells are ripped into narrow ribbons by the strong NW to SE shearing flow. An intense NW to SE oriented convective line also fires over the Keys during the early morning hours, again probably due to landbreeze induced convergence. CBs erupt up and down the southeast coast around sunrise. The basic state flow features strong SE onshore flow (15 kts) capped by vigorous NW flow aloft (35-40 kts). The coastally-generated cells move rapidly toward the NW. Anvils are deformed into narrow ribbons behind these cells and merge into larger anvil bands by mid-afternoon. The southern peninsula remains free of convection. There are also extensive anvils that form SW of the peninsula over the eastern Gulf of Mexico. Around sunset, isolated CBs form over Naples and Ft. Lauderdale.

July 10 Extensive early AM anvil mass offshore of the east coast dissipates, while extensive anvil cover develops over the eastern GOMEX, far southern Florida and Keys.

Flow this morning is SE/E at lower levels with an east-west trough in the upper levels. The trough sets up curving flow aloft from NE to NW across the state. Upper level winds are weak in the region of the trough. Extensive CBs fired during the early morning off the east coast where prevailing SE flow converged with the land breeze front offshore. Moderate amounts of anvil debris from the Gulf Stream activity drifted toward the W-NW on the northern side of the upper trough. Meanwhile, massive MCS activity fired once again over the eastern GOMEX, the keys and far southern Florida with cell merger producing an extensive anvil canopy. This canopy drifted E on the southern side of the upper trough.

July 11 Suppressed day with small widespread anvils generated by westward moving sea breeze front.

Low level flow today is from the SW while upper level flow is from the N/NE at 5-15 kts. On this day the west coast sea breeze penetrated far inland before kicking off a weak N to S line of showers down the interior peninsula. By late afternoon, showers formed over parts of the east coast IVOF Melbourne. All activity was weak and the small anvils dissipated completely by sunset. However, there was enough reversing shear present (although weak) such that the anvils that did form became elongated in short plumes oriented from NE to SW.

July 12 Classic sea breeze line of storms pushed from west to east coast during afternoon, trailing long narrow anvils; late afternoon MCS over MIA formed a moderate-sized intense elliptical anvil shield.

The low level flow continues to stream out of the SW and upper level flow is deformed by a NW to SE oriented ridge which weakens the flow considerably (5 kts). Today saw classic Florida sea breeze evolution. An early afternoon line of CBs developed along the west coast in the central peninsula and rapidly pushed eastward across the state. Weak upper winds from the NE, combined with fast E motion of cells, caused anvils to stretch into narrow, parallel plumes along NW coast. The collision of outflows from this line converged with the east coast breeze later in the afternoon and triggered CBs up and down most of the eastern coast. An intense cluster of CBs developed over Daytona Beach and propagated south (along outflow), forming a small but intense MCS with leading convective arc and trailing stratiform anvil region over the southern peninsula. However, given the weak upper level steering flow, the elliptical anvil plume rapidly dissipated in situ during the early evening.

July 13 Moderate anvil cover generated by west coast sea breeze activity over the central peninsula.

On this day, an anticyclone was parked at upper levels over the entire peninsula, while at low levels the prevailing flow was from the SW. Winds aloft were very weak. A weak line of cells formed along the west coast in the central peninsula during the morning, as the sea breeze front was driven onshore. The anvils merged into a moderate sized mass that moved mainly through the central peninsula. The southern half of the peninsula remained suppressed.

July 14 Very suppressed day with one small anvil plume generated over Cape Canaveral and one over the southern peninsula.

An east to west oriented ridge axis persists at upper levels with 15-20 kts S/SW flow over most of the peninsula, but this flow increased to 30-35 kt easterly breeze south of the Keys. Low level flow today is from the W/SW. The entire peninsula remained suppressed this day with the exception of a lone afternoon cell that fired along Alligator Alley and an isolated Merrit Island Thunderstorm.

July 15 Moderate sized anvils generated only along southwestern coast.

Straight southeasterly upper level flow exceeding 30 kts is established over the southern half of the peninsula, and a surface col (deformation zone) is located over southern Florida. Small but intense CBs fired during the mid-afternoon along the southeast coast of Florida, where the east coast seabreeze front was driven onshore. The cells generated moderate-sized isolated anvils which advected rapidly downstream in the fast upper flow, then dissipated.

July 16 Widely scattered afternoon and evening CBs across the southern peninsula generated small to moderate sized, isolated anvils.

An east-west surface ridge axis is draped across the peninsula, with a col located along the southeast coast. Upper level flow is a straight easterly current that exceeds 30 kts across the southern tip of the peninsula. The east coast sea breeze moved inland in the middle afternoon, propelled on weak easterly surface flow, and this produced a congestus line along the interior peninsula. Isolated cells fired along the southwest coast convergence between the sea breeze and weak low level flow. Isolated cells continued to fire within the peninsula during the evening hours and early morning. Anvils remained small to moderate-sized, were isolated, and drifted rapidly to the west. One fairly extensive plume erupted from a cell located north of Ft. Myers.

July 17 Very active sea breezes day along both coasts; cell merger produced extensive anvil canopy covering southern peninsula, with several moderate-sized, isolated anvils forming along the west coast after sunset.

The low level flow continues to produce a weak ridge axis across the peninsula, with a col located over extreme southern Florida. Northeasterlies prevail aloft with 30 kt flow over the southern tip of Florida. This was a day of widespread, classic sea breeze generated activity. Tstorms erupted along both coasts by mid afternoon. The west coast breeze storms are anchored along the southwest coast, but the east coast sea breeze front moved inland in response to the weak easterly low-level flow. The east coast line triggered a second generation of storms in the middle of the southern peninsula, and merger with southwest coast storms created an intense but short-lived NW to SE oriented convective line close to the southwest coast. Anvil plumes merged into an extensive cold canopy oriented from NE to SW along the fast upper flow. In the central peninsula, the east coast front propagated storms across the state during the late afternoon. In the evening, the anvil complex over the south rapidly dissipated – but strongly electrified cells continued over Ft. Myers and Tampa Bay. These two cells produced very cold, circular anvils that persisted until midnight.

July 18 Very active seabreeze day along both coasts; large anvil complex formed from merger along southwest coast.

Synoptically very similar to July 17 with northeasterlies aloft and a surface based trough oriented from SW to NE across the southern peninsula. The upper level flow is very fast, in the range of 40-45 kts over the Keys. On this day, seabreeze tstorms fired along both coasts in the afternoon. Cells initiating over Ft. Myers set up a long, narrow anvil plume that trailed to the SW over the Keys. The east coast sea breeze front impulse travelled across the peninsula on weak northeasterly flow late in the afternoon and merged with southwest coast activity late in the afternoon. Anvil merges created a massive cold cloud shield along the southwest coast and offshore waters. This shield dissipated by midnight.

July 19 Large anvils form over the central peninsula, with an isolated small – moderate sized anvil over the south.

Fast upper northeasterly flow (35 kts over the Keys) continued on this day, with diffluent southerly flow established at the surface. On this day, the southern peninsula was generally suppressed, while the central peninsula become active. Afternoon CBs fired along the coast north of Tampa Bay and inland. An enormous anvil complex developed from CB mergers, covering the central peninsula. Only a few isolated CBs formed west of Okeechobee during the late afternoon; the anvil mass was isolated and drifted southwest as it dissipated during the evening.

July 20 An intense MCS with extensive cold anvil erupted over the central peninsula and lingered there until midnight.

Fast northeasterly flow again was found aloft over the peninsula, exceeding 35 kts over the Keys. Low level flow features a col pattern over Tampa Bay and surface ridging across the southern tip of Florida. In the mid-afternoon, an east-west line of tstorms fired along the axis of deformation between Tampa Bay and Cape Canaveral. Cell coverage across the central peninsula expanded in the afternoon between sea breezes, creating an intense north to south convective line. In the mid-central state Anvils from these cells merged into a massive cold shield that lingered over the central peninsula, drifted slowly SW, then dissipated by midnight.

July 21 Large MCS with extensive cold anvil tracks southward down the peninsula through the afternoon and evening.

The surface wind field is weakly defined due to a deformation or col flow pattern which straddles the peninsula. There is ridging in the flow aloft with 30 kt northerly flow located just off the eastern coast. In the early morning, the offshore flowing landbreeze triggered an intense thunderstorm cluster over the Gulf Stream southeast of Cape Canaveral. This system developed a massive circular anvil that persisted offshore until early afternoon. In the afternoon, a short squall line moved onshore north of Tampa Bay containing greatly electrified thunderstorms. The system propagated S-SE down along the axis of the peninsula under upper tropospheric northeasterly flow. The massive anvil shield from this system merged with the large, circular anvil left behind by the morning Gulf Stream system. The combined anvil canopy continued to drift south into the southern peninsula by evening.

July 22 East and west coast convective lines produced moderate sized anvil canopies along both coasts.

Classic sea breeze evolution on this day under a surface south-southeasterly flow regime that was diffluent, and upper level flow from the north overlying the peninsula. Upper level windspeeds approached 30 kts offshore of Miami. Intense thunderstorms initiated along Tampa Bay and developed a moderate sized anvil that dissipated by late afternoon. A second sea breeze convergence line of thunderstorms erupted along the northeast coast, just inland of Cape This system generated a moderated sized linear anvil that drifted S-SE and dissipated by midnight.

July 23 Generally suppressed with a few small cells producing small anvil plumes near Okeechobee and at points along the southeast and southwest coasts.

Southeasterly flow was found at low levels with fast N-NE upper level flow (30 kts S of Okeechobee). A storm cluster erupted over Tampa Bay during the early afternoon and dissipated. A few small cells erupted south and east of Okeechobee producing small but narrow anvil plumes spread downstream in fast 30-35 kt upper level N-NE flow. As sunset a small cell erupted over Punta Gorda and produced a small anvil that blew downstream over the Gulf in a narrow ribbon.

July 24 Widespread cells occurred throughout most of peninsula producing several moderate-sized, individual anvils.

Southeasterly flow was established at the surface as part of an east-west ridge that extended throughout the central peninsula. Northeasterly flow again occurred aloft. Isolated afternoon cells developed in several locations: Tampa Bay, Melbourne, Miami areas. A loose line of small cells formed along the east coast where the sea breeze front moving inland under southeasterly flow. A large storm complex also erupted near Naples, producing a large, round anvil. Outflow from this cell triggered several generations of storms along the southwest coast and then offshore over the eastern Gulf. Each pulse of activity produced a moderate-sized anvil. A small cluster of thunderstorms also erupted late in the afternoon between the Cape and Tampa producing a short-lived anvil plume that dissipated while moving west-southwest.

July 25 Classic sea breeze storms erupted along both coasts, with line mergers producing large anvil complexes over western and central Florida.

The pattern of surface SE flow continued with stagnation of upper level flow in the form of a weak anticyclone/col couplet located over most of the peninsula. This day featured classic sea breeze thunderstorm evolution with intense cells firing along the entire west coast. The east coast sea breeze front moved inland, with enhancement of cell formation IVOF Lake Okeechobee. By late afternoon, the Okeechobee cells merged with the west coast activity and formed a massive anvil shield that covered most of the western and central peninsula. Anvil remnants decayed in situ by midnight.

July 26 Intense convection along the west coast and central peninsula created merging anvils and a large cirrostratus cloud mass over much of the western peninsula.

Upper level flow remained stagnant as an anticyclone builds over the peninsula. Low level flow continues to stream from the southeast. Another classic sea breeze day occurs with storms erupting inland of the east coast and also the along the west coast. Storm clusters were most pronounced NE of Naples and along the central peninsula. Massive anvils again merged along the west coast and dissipated in situ by midnight.

July 27. Scattered thunderstorms occurred throughout the peninsula that produced small anvils that quickly dissipated.

Low level E-SE flow continued to prevail but upper level flow has become more uniformly established from the NE. Scattered small cells initiated with afternoon heating over much of the central peninsula. Only small to moderate-sized anvils were generated, without much merging, and these drifted SW in the 15-20 upper level flow and rapidly dissipated. The southern peninsula remained largely inactive.

July 28 Widely scattered, weak cells were generated along the east coast producing a few short-lived, narrow anvil plumes.

The flow is uniformly easterly at all levels and fast, blowing 40-50 kts over the south-central peninsula. An early afternoon thunderstorm initiated over Tampa and rapidly dissipated. The east coast sea breeze front migrated across the state during the afternoon but produced only widely scattered, weak cells that formed small to moderate-sized, rapidly decaying anvils.