30 September 2010 Tri-agency Weather Summary

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1. Synoptic overview/current conditions

The synoptic-scale flow pattern across the North Atlantic basin is illustrated using the CIMSS water vapor and upper-level wind analysis valid at 1015 UTC 30 Sep (**image 1**). Southerly flow on the eastern flank of a deep trough over the eastern U.S. continues to direct very moist air from the northern Caribbean poleward into the Mid Atlantic and the Northeast (**image 2**). The remnants of TS Nicole (ex-PGI50L) are embedded within this moisture plume just off the eastern coast of Florida (note the 700-hPa relative vorticity maximum in **image 3**). Downstream of the eastern U.S. trough, a narrow upper-level ridge is in place over the extreme western North Atlantic (**image 1**). A narrow plume of high precipitable water (**image 2**) associated with an eastward extension of this ridge stretches across the midlatitude North Atlantic toward Europe, terminating at about 10 W. South of this west-east oriented ridge, an elongated positively tilted upper-level trough with a broad cold low at its end has become established over the subtropical/midlatitude North Atlantic (**image 1**). In the lower troposphere, a strong ridge dominates much of the subtropical/midlatitude North Atlantic (**image 3**). On the southern periphery of this ridge, three tropical disturbances are moving westward over the central tropical Atlantic: PGI51L (a weak disturbance over the Lesser Antilles), PGI48L (the disturbance being targeted by the G-V flight today just east of PGI51L), and PGI49L (a tropical wave east of PGI48L) (**image 2**).

Dynamical models indicate that PGI51L will remain very weak before quickly dissipating or becoming absorbed within the circulation of PGI48L or PGI49L (not shown). Thus, PGI51L will not be discussed further here.

Discussion of the two pouches of interest, PGI48L and PGI49L, as well as a brief post-mortem of Nicole (PGI50L), follows below:

PGI48L: Based on a consensus of the GFS and ECMWF (a pouch could not be analyzed in the UKMET or NOGAPS) the pouch associated with PGI48L was located at 14.1 N, 56.6 W as of

2200 UTC. Relative to the GFS, the ECMWF initial position is displaced substantially to the south and a bit to the east (bottom panel in **image 4**). The pouch is collocated with disorganized convection and relatively weak 850-hPa cyclonic relative vorticity (top panel in **image 4**). This disturbance is in a very moist environment (TPW >55 mm, not shown) in an area of moderate (~10 kt) deep-layer vertical wind shear (bottom panel in **image 4**) and weak upper-level divergence (top panel in **image 4).**

A G-V flight into the disturbance earlier in the day revealed unexpectedly strong (30-40 kt) easterly winds on the north side of the system (**image 5**). These easterlies, combined with southwesterlies stradling 10N, reveal the presence of a well-defined wave axis. Consideration of the dropsonde data with an ASCAT pass from this morning suggests a elongated area of convergence and cyclonic curvature in the low-level winds extending from 12.5 N, 55 W to about 10 N, 48 W. The presence of a well-defined wave axis suggests that the ECMWF 12-h forecast from 0000 UTC 30 September, which indicated a more coherent pouch than the GFS (not shown), may have provided a more accurate depiction of this disturbance than the same forecast from the GFS.

PGI49L: As of 1700 UTC, the consensus pouch location for PGI49L is 14.2 N, 46.4 W. This is somewhat to the northeast of what the NHC is currently tracking as Invest 97L, located at 1200 UTC at 12.0 N, 48.5 W. PGI49L is characterized by modest, somewhat disorganized convection extending along a WNW-ESE axis to the east from the consensus pouch position (**image 6).** CIMSS satellite/model blended analyses suggest that PGI49L is centered along the northern edge of an east-west strip of higher 850 hPa relative vorticity values along 13 N between 40-50 W (**image 7**, top panel). An ASCAT overpass from 1306 UTC this morning missed PGI49L but did suggest the presence of a broad surface convergence zone to its southwest near the 1200 UTC NHC Invest 97L position (**image 7**, top panel). The environment surrounding PGI49L is characterized by relatively high moisture content (**image 2**), weak diffluence aloft, and moderate vertical wind shear of 20 kt (**image 7**, bottom panel). A strong north-south gradient in vertical wind shear is observed (**image 7**, bottom panel) and results from strong upper tropospheric flow between the tropical upper anticyclone to the south and a closed upper low along 30 N/58 W to the north.

Ex-PGI50L (former TS Nicole): As of 2100 UTC yesterday, the NHC declared Nicole post-tropical. Since then, the circulation associated with Nicole has become extratropical and further elongated in the midst of the NNW-to-SSE-oriented baroclinic zone along the east coast of the United States. What remains of Nicole was located at 1500 UTC to the east of Daytona Beach, FL near 29.5 N, 78.5 W with continued deep-layer heat and moisture from Nicole into the mid-latitudes, observed between 70-80 W (not shown). As Nicole has become extratropical, it is not discussed any further in this write-up.

2. 0-24 hr forecast

PGI48L: The ECMWF is the only global model to predict some development of this disturbance during the period (**image 8**). A signature of strengthening in the ECMWF is seen by the increase in OW and relative vorticity as the disturbance moves west or northwestward. The GFS, in contrast, shows near steady-state conditions, with Okubo-Weiss (OW) values remaining near zero or just slightly positive, and the UKMET shows dissipation of this disturbance near the start of the period.

PGI49L: PGI49L is expected to race westward between F000-F024 with little change in strength or environmental conditions forecast during this time (**image 9**).

3. 24-48 hr forecast

PGI48L: The GFS indicates that the pouch associated with PGI48L will dissipate as it moves north and encounters very strong vertical wind shear (**image 8**) associated with an upper-level trough (not shown). The ECMWF keeps PGI48L farther south, and thus does not show it experiencing as much vertical wind shear. Still, the ECMWF does indicate that PGI48L may weaken somewhat during the period (note the dip in OW in **image 8**).

PGI49L: There exists some minor disagreement on the evolution of PGI49L between F024-F048. During the 24-48 hr period, the ECMWF dissipates PGI49L (**image 9**) as races westward and becomes entrained into PGI48L (not shown). Both the UKMET and GFS suggest a steady-

state to somewhat weakened disturbance during this time as it traverses a relatively moist, high SST, but moderately high vertical wind shear environment (**image 9)** to the south of the upper low referenced in the current overview.

4. Extended forecast

PGI48L/49L: The GFS indicates that PGI49L will become absorbed by or will absorb PGI48L around F060-F072 (not shown). This is similar to but delayed by approx. 24 hr from the evolution shown by the ECMWF. Both models imply that the merged disturbance may undergo genesis after F072 with a track keeping it to the north of the Lesser Antilles and Virgin Islands/Puerto Rico. Ryan Torn's EnKF-based WRF ensemble also suggests that PGI49L may undergo genesis at or after F072 (**image 10**), though it does so independently of PGI48L (which it also develops to the west; not shown). The UKMET, however, simply dissipates the disturbance by F084 and shows no development of either PGI48L or PGI49L. No matter what occurs, the models do agree upon it continuing to race west-northwestward with some slowing of its forward motion with time. Agreement is also observed with the forecast environment surrounding PGI49L, characterized by high moisture content and high SSTs but also moderately high vertical wind shear (**image 9)** to the south of the upper low referenced in the current overview.

Other features of note: The long-range deterministic ECMWF and GFS indicate the possibility for two additional tropical developments at or beyond 48 hr. One such development is similar to Nicole and occurs on the eastern edge of the broad cyclonic gyre still in place across the northwestern Caribbean Sea. The 0000 UTC GFS very rapidly develops this feature by F048 to the west of Jamaica, taking it across Cuba as it becomes involved with the baroclinic zone across the western Atlantic. The ECMWF is both slower and weaker with this development. Neither the ECMWF nor the NCEP ensembles suggest any significant development across this region during the F048-F120 time frame.

The second such development occurs beyond 5 days between 40-50 W within both the ECMWF and GFS. The origins of this feature are unclear and may include remnant vorticity from PGI49L, an easterly wave currently located near 13 W, and/or an in situ roll-up along the

ITCZ in weakly convergent low-level flow. Both models develop this feature into a tropical cyclone by F144 with a track generally to the north across the central Atlantic. Note again, however, that both the ECMWF and NCEP ensembles are generally bearish with any development across this region.

5. Figures

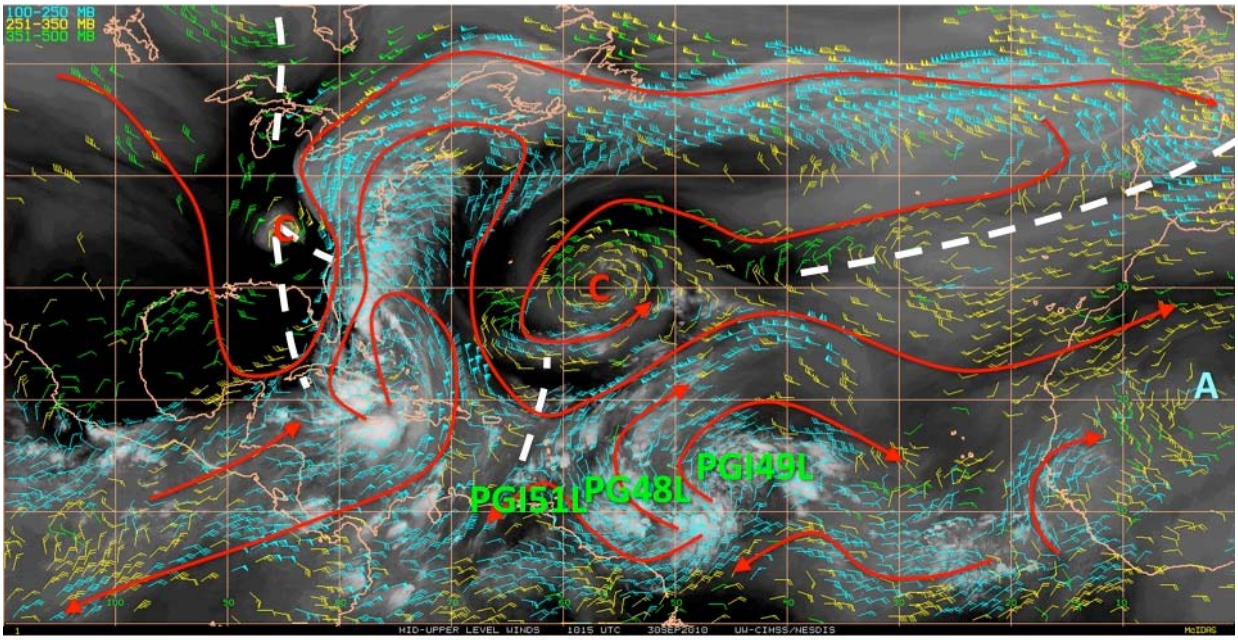

Image 1.

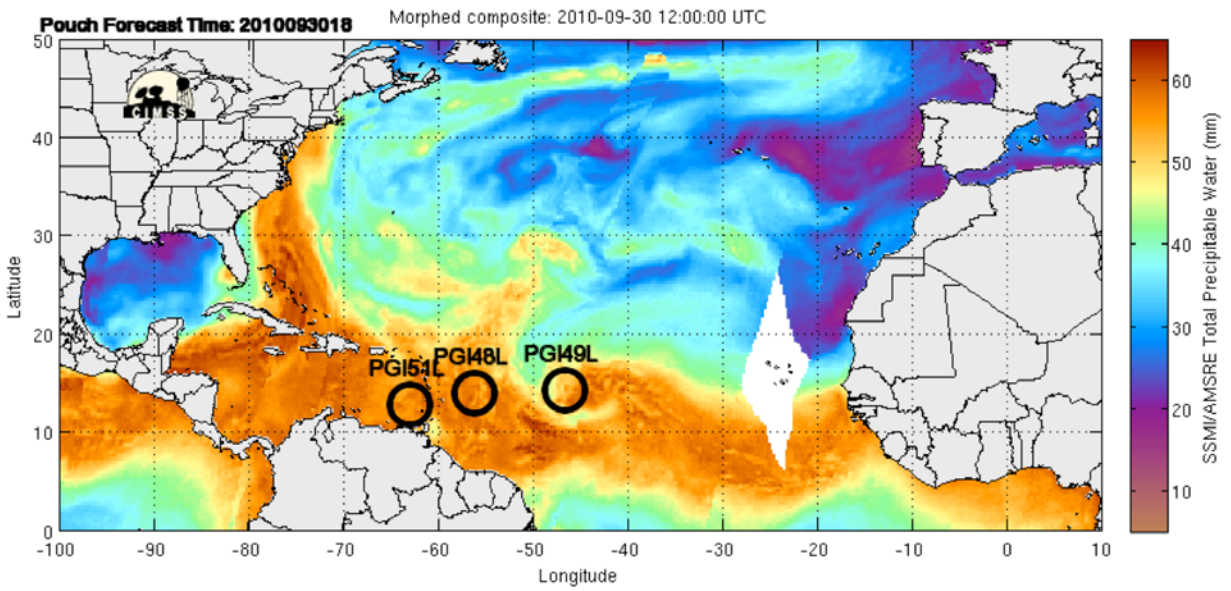

Image 2.

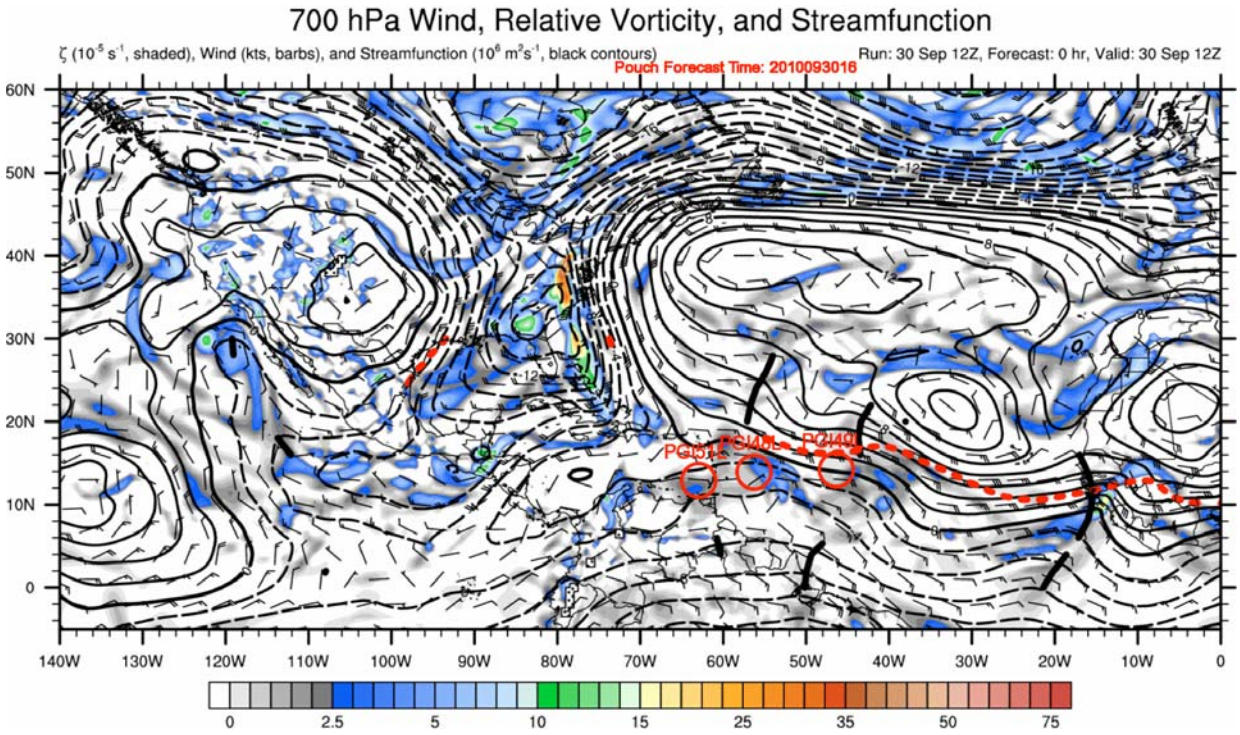

Image 3.

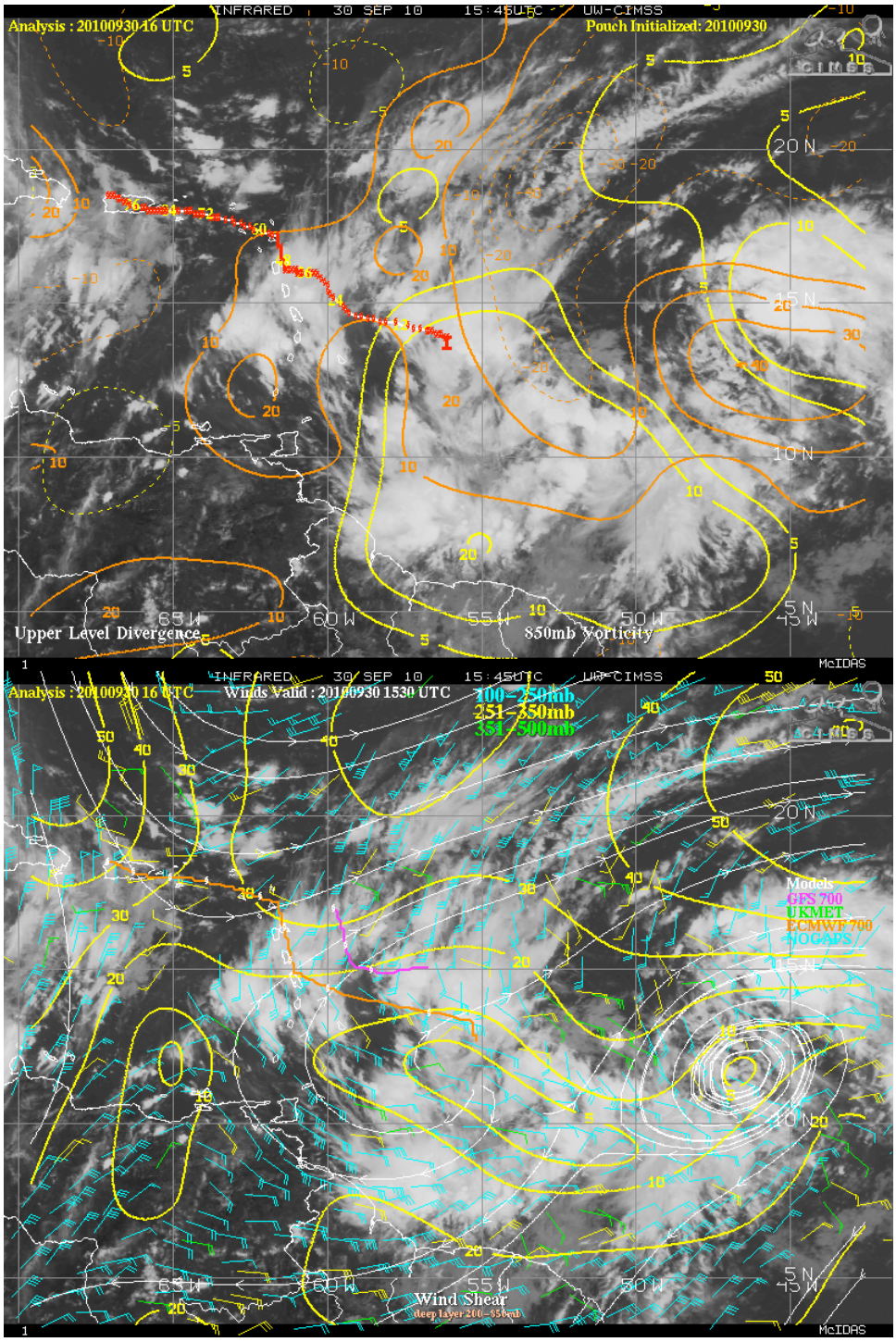
INFRARED 30 SEP 10 15:45UTC UW-CIMSS
Analysis : 20100930 16 UTC
Pouch Initialized: 20100930
Upper Level Divergence
850mb Vorticity
McIDAS
INFRARED 30 SEP 10 15:45UTC UW-CIMSS
Analysis : 20100930 16 UTC
Winds Valid : 20100930 1530 UTC
100-250mb
251-350mb
351-500mb
Models
GFS 700
UKMET
ECMWF 700
NOGAPS
Wind Shear
deep layer 200-850mb
McIDAS

Image 4.

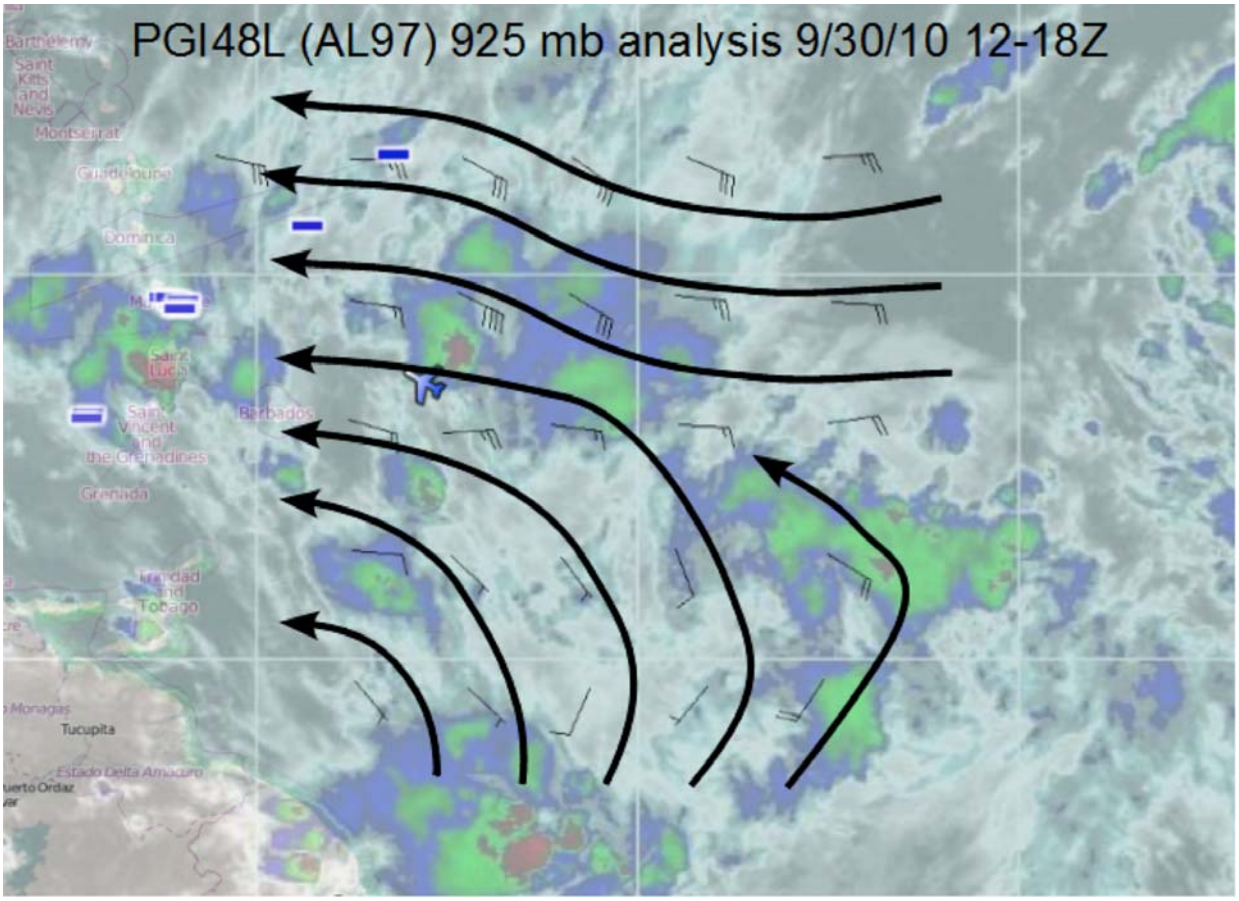
PGI48L (AL97) 925 mb analysis 9/30/10 12-18Z
Saint Kitts and Nevis
Montserrat
Guadeloupe
Dominica
Saint Lucia
Barbados
Saint Vincent and the Grenadines
Grenada
Trinidad and Tobago
Tucupita
Estado Delta Amacuro

Image 5.

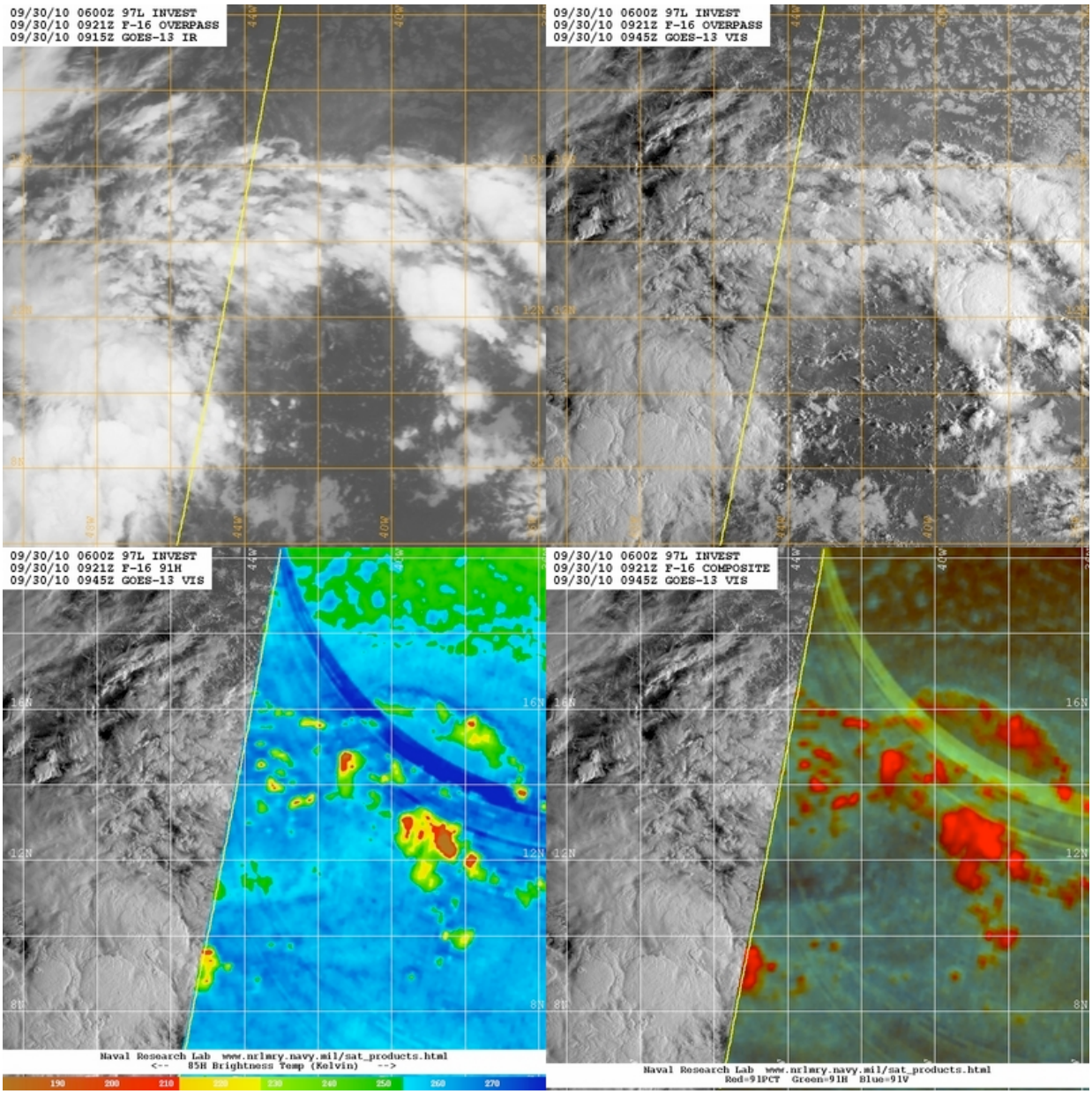
09/30/10 0600Z 97L INVEST
09/30/10 0921Z F-16 OVERPASS
09/30/10 0915Z GOES-13 IR
09/30/10 0600Z 97L INVEST
09/30/10 0921Z F-16 OVERPASS
09/30/10 0945Z GOES-13 VIS
09/30/10 0600Z 97L INVEST
09/30/10 0921Z F-16 91H
09/30/10 0945Z GOES-13 VIS
09/30/10 0600Z 97L INVEST
09/30/10 0921Z F-16 COMPOSITE
09/30/10 0945Z GOES-13 VIS
Naval Research Lab www.nrlmry.navy.mil/sat_products.html
<-- 85H Brightness Temp (Kelvin) -->
190 200 210 220 230 240 250 260 270
Naval Research Lab www.nrlmry.navy.mil/sat_products.html
Red=91PCT Green=91H Blue=91V

Image 6.

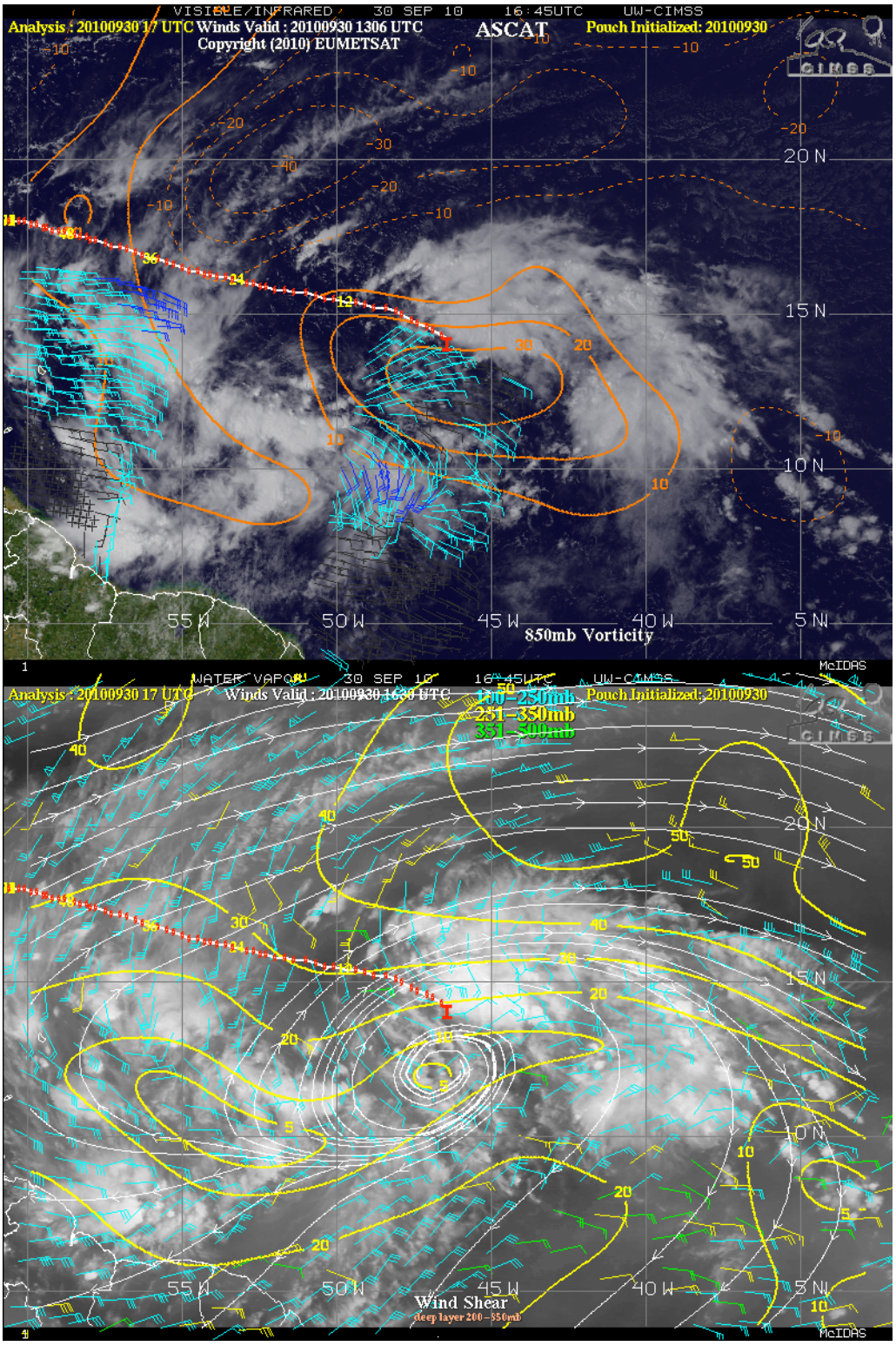
VISIBLE/INFRARED 30 SEP 10 16:45UTC UW-CIMSS
Analysis : 20100930 17 UTC Winds Valid : 20100930 1306 UTC
Copyright (2010) EUMETSAT
ASCAT
Pouch Initialized: 20100930
20 N
15 N
10 N
55 W
50 W
45 W
40 W
5 N
850mb Vorticity
WATER VAPOR 30 SEP 10 16:45UTC UW-CIMSS
Analysis : 20100930 17 UTC
Winds Valid : 20100930 1630 UTC
Pouch Initialized: 20100930
200-250mb
251-350mb
351-500mb
Wind Shear
deep layer 200-850mb
McIDAS

Image 7.

PGI48L

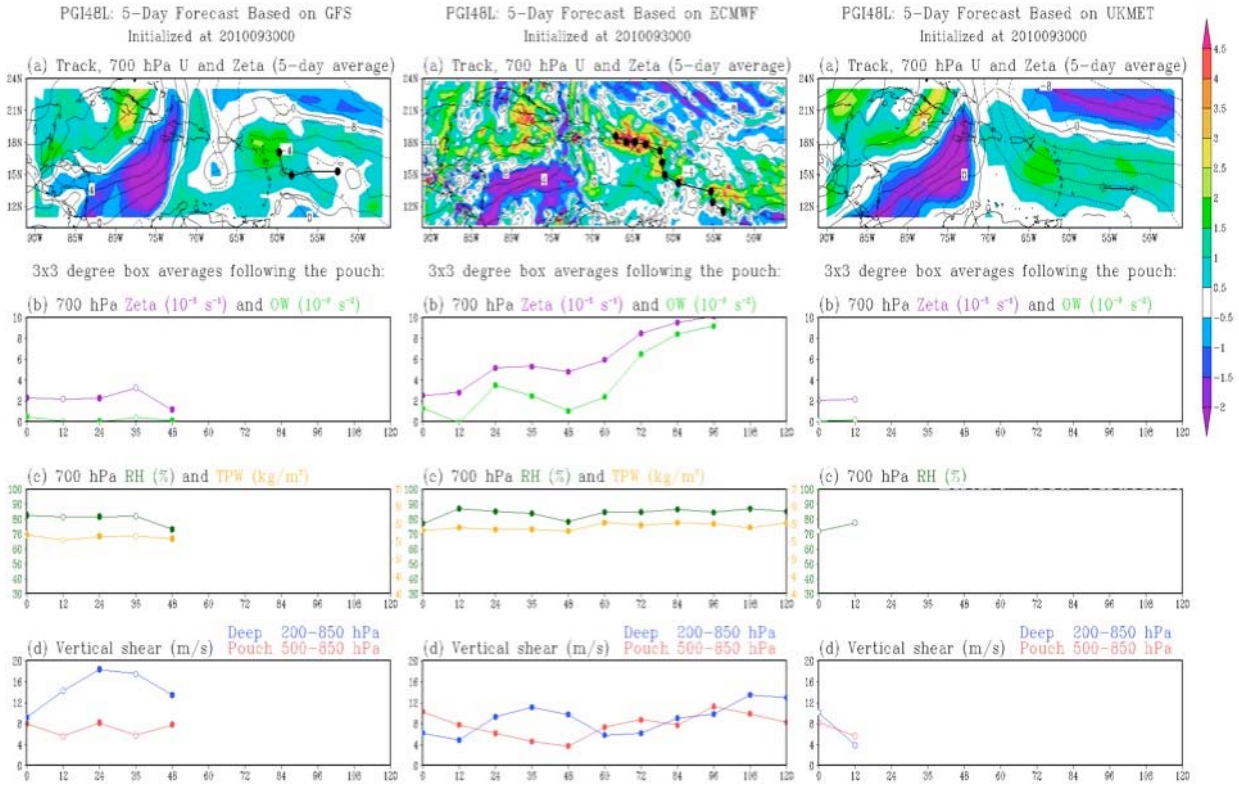

Image 8.

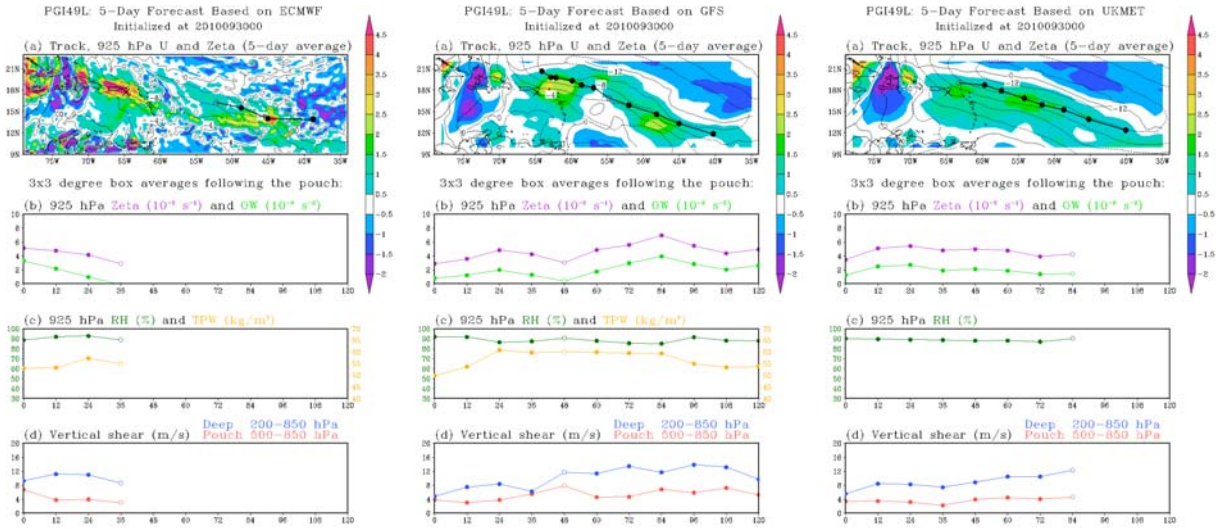
PGI49L: 5-Day Forecast Based on ECMWF
Initialized at 2010093000
(a) Track, 925 hPa U and Zeta (5-day average)
3x3 degree box averages following the pouch:
(b) 925 hPa Zeta (10⁻⁶ s⁻¹) and OW (10⁻⁶ s⁻²)
(c) 925 hPa RH (%) and TPW (kg/m²)
(d) Vertical shear (m/s)
Deep 200-850 hPa
Pouch 500-850 hPa
PGI49L: 5-Day Forecast Based on GFS
Initialized at 2010093000
(a) Track, 925 hPa U and Zeta (5-day average)
3x3 degree box averages following the pouch:
(b) 925 hPa Zeta (10⁻⁶ s⁻¹) and OW (10⁻⁶ s⁻²)
(c) 925 hPa RH (%) and TPW (kg/m²)
(d) Vertical shear (m/s)
Deep 200-850 hPa
Pouch 500-850 hPa
PGI49L: 5-Day Forecast Based on UKMET
Initialized at 2010093000
(a) Track, 925 hPa U and Zeta (5-day average)
3x3 degree box averages following the pouch:
(b) 925 hPa Zeta (10⁻⁶ s⁻¹) and OW (10⁻⁶ s⁻²)
(c) 925 hPa RH (%)
(d) Vertical shear (m/s)
Deep 200-850 hPa
Pouch 500-850 hPa

Image 9.

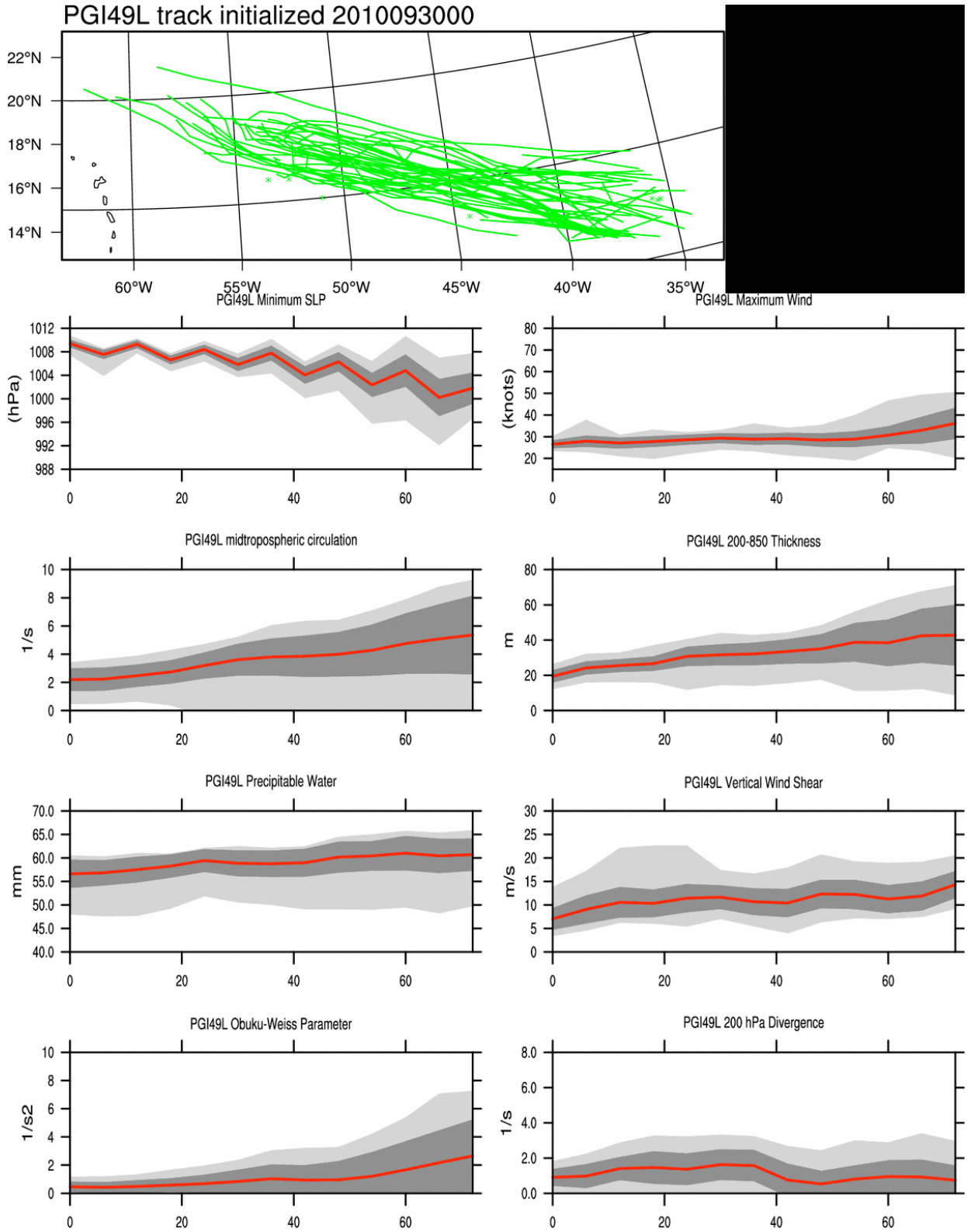
PGI49L track initialized 2010093000
22°N
20°N
18°N
16°N
14°N
60°W
55°W
50°W
45°W
40°W
35°W
PGI49L Minimum SLP
(hPa)
PGI49L Maximum Wind
(knots)
PGI49L midtropospheric circulation
1/s
PGI49L 200-850 Thickness
m
PGI49L Precipitable Water
mm
PGI49L Vertical Wind Shear
m/s
PGI49L Obuku-Weiss Parameter
1/s2
PGI49L 200 hPa Divergence
1/s

Image 10.