Overview

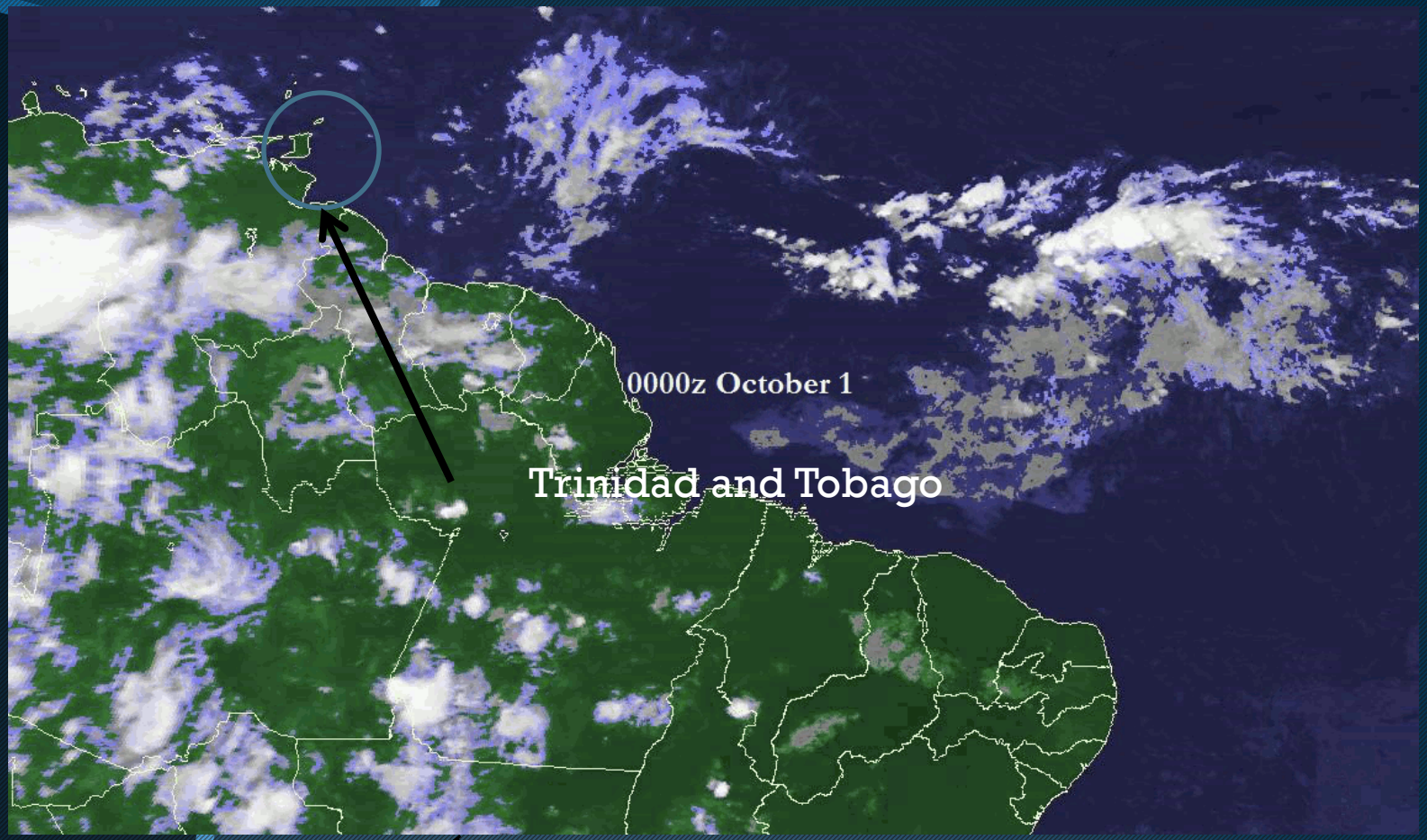
"During the period October 1- 4, 2014, Trinidad and Tobago was affected by:

- periods of sustained gale force winds (≥27kts) and;
- extended periods of rain, showers and thunderstorms.

Overview

"Though showery conditions were not uncommon for the time of year, it resulted in the **second highest daily** rainfall accumulation on record for the month of October at ANR International Airport, Crown Point Tobago.

October 1 – 4, 2014



Oct 1
00z

Oct 2
00z

07-08z TW
07z 040°/03kts
08z 110°/30G46kts
100°/16G29kts;
RR: 27.8mm

Oct 3
00z

01 - 07z
070°/16G39kts
(period avg)
RR: 15.2mm

19z
Rainfall event
Trof passage
RR:80.5mm

Oct 4
00z

Case Study: Extreme Rainfall Event – Trinidad and Tobago October 1- 4, 2014

Fellow: Simon Craig

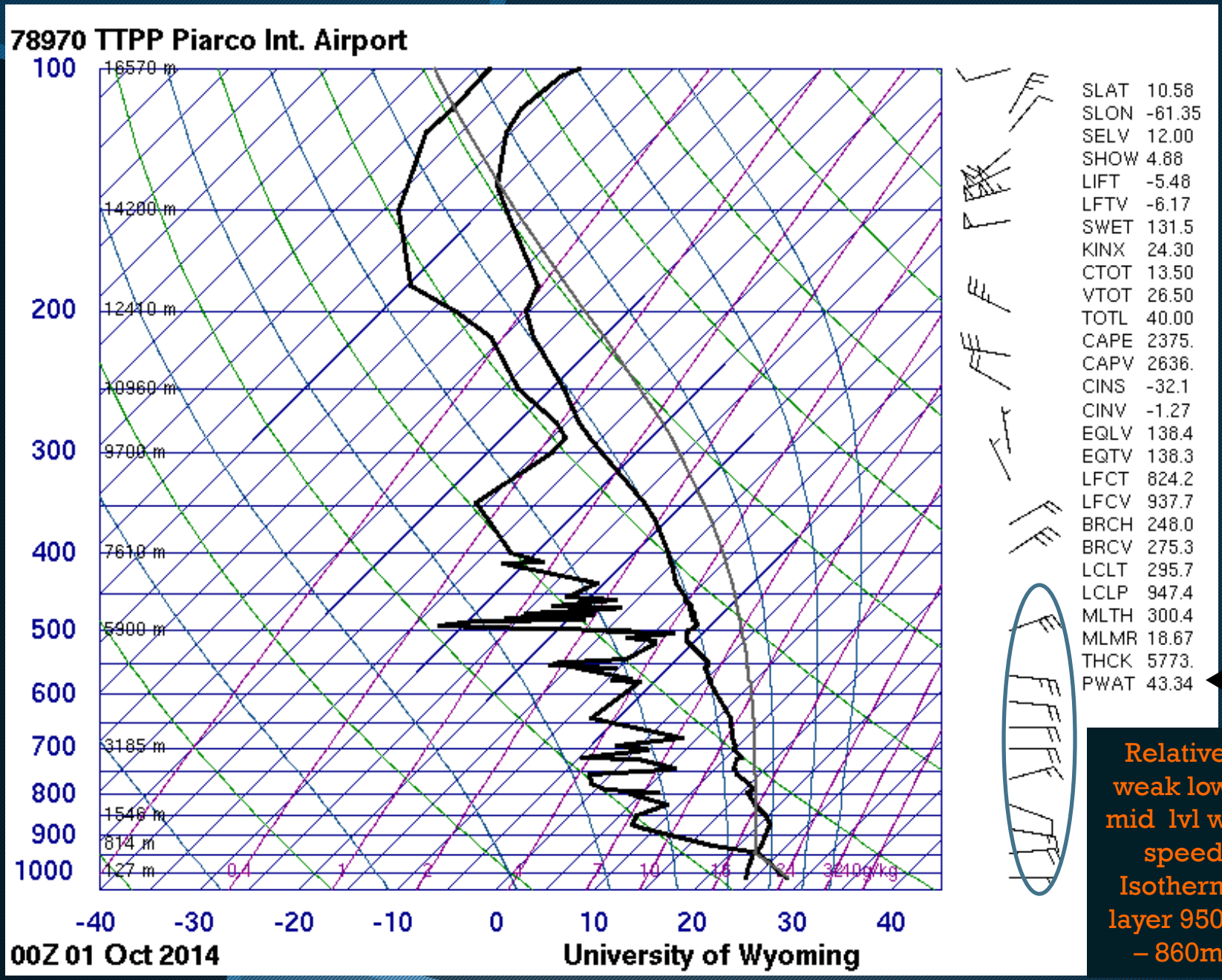
Instructors: Michel Davison & Jose Galvez

Presentation of Data

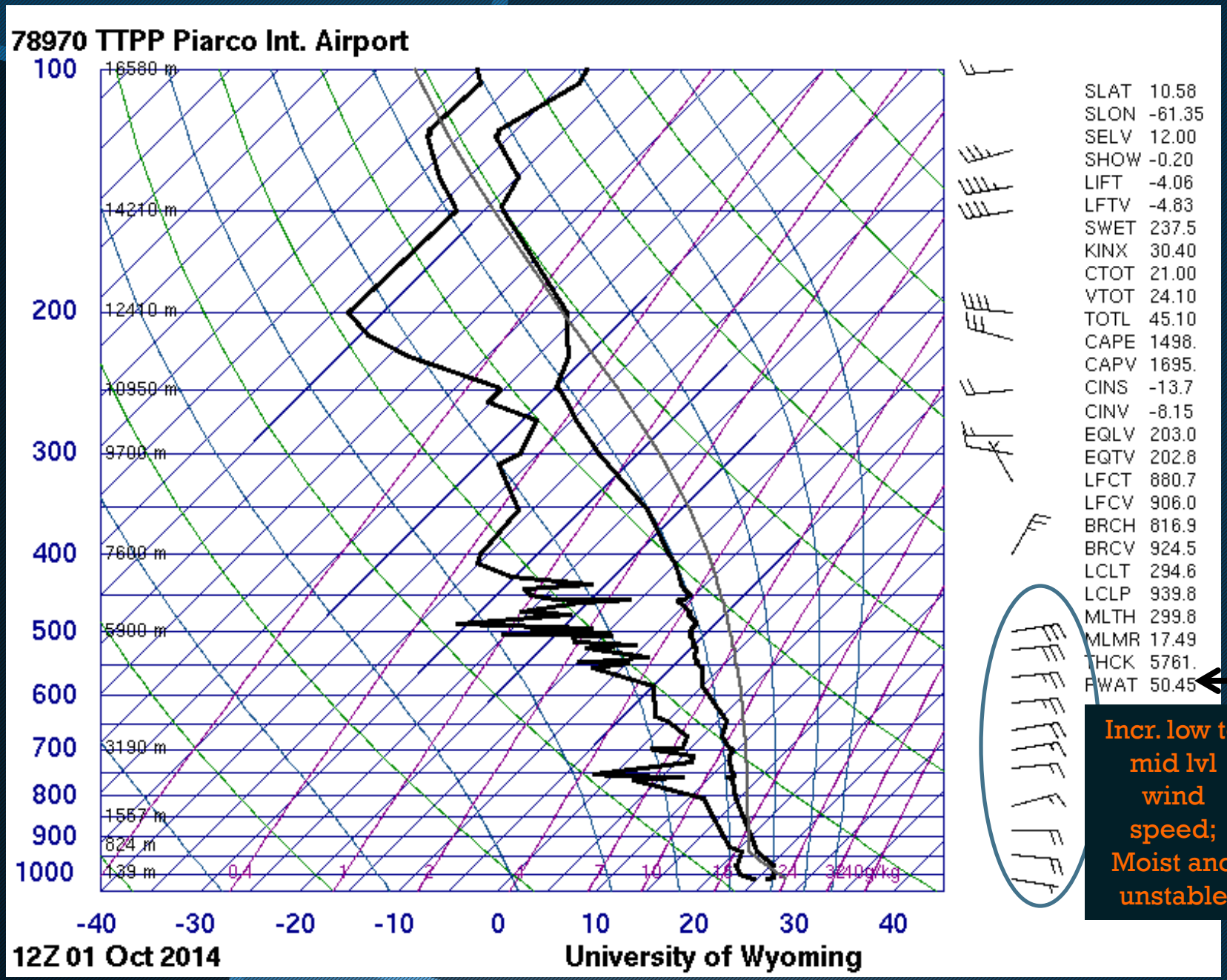
- 1. Soundings
- 2. Analysed Charts (T.T.M.S.) and forecasts (Tropical Desk)
- 3. Model Runs

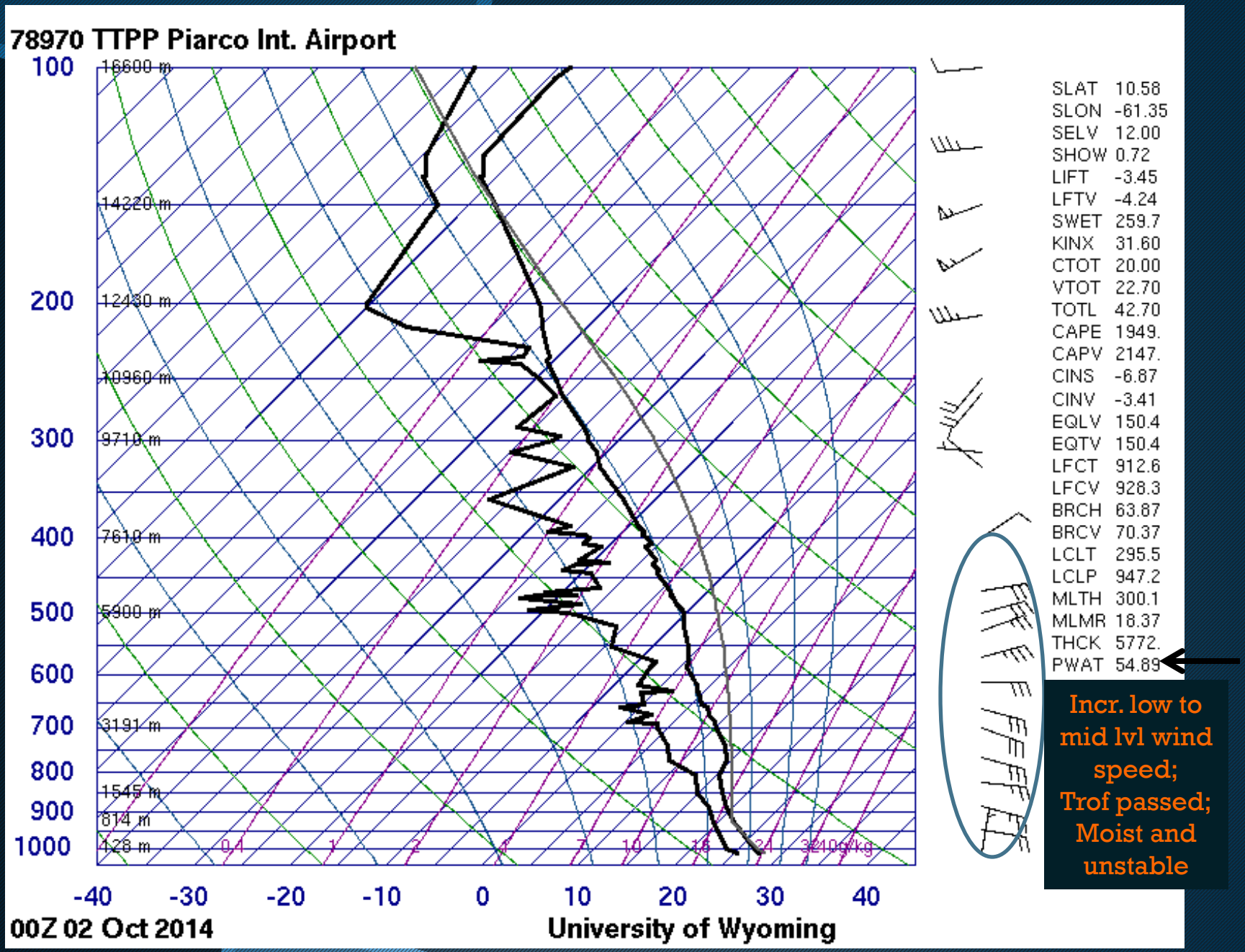
Soundings

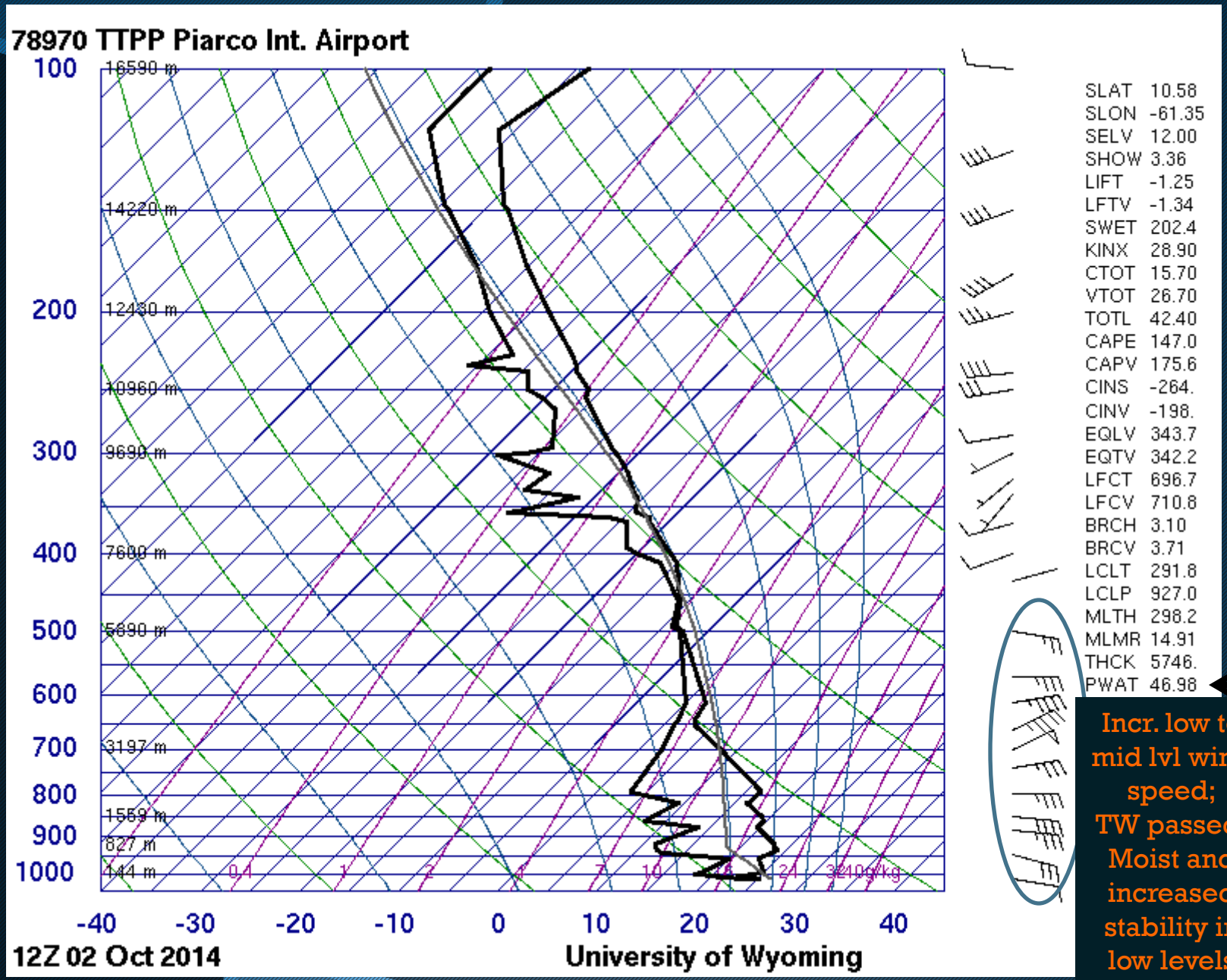
"TTPP – 0000z October 1
to
0000z October 4

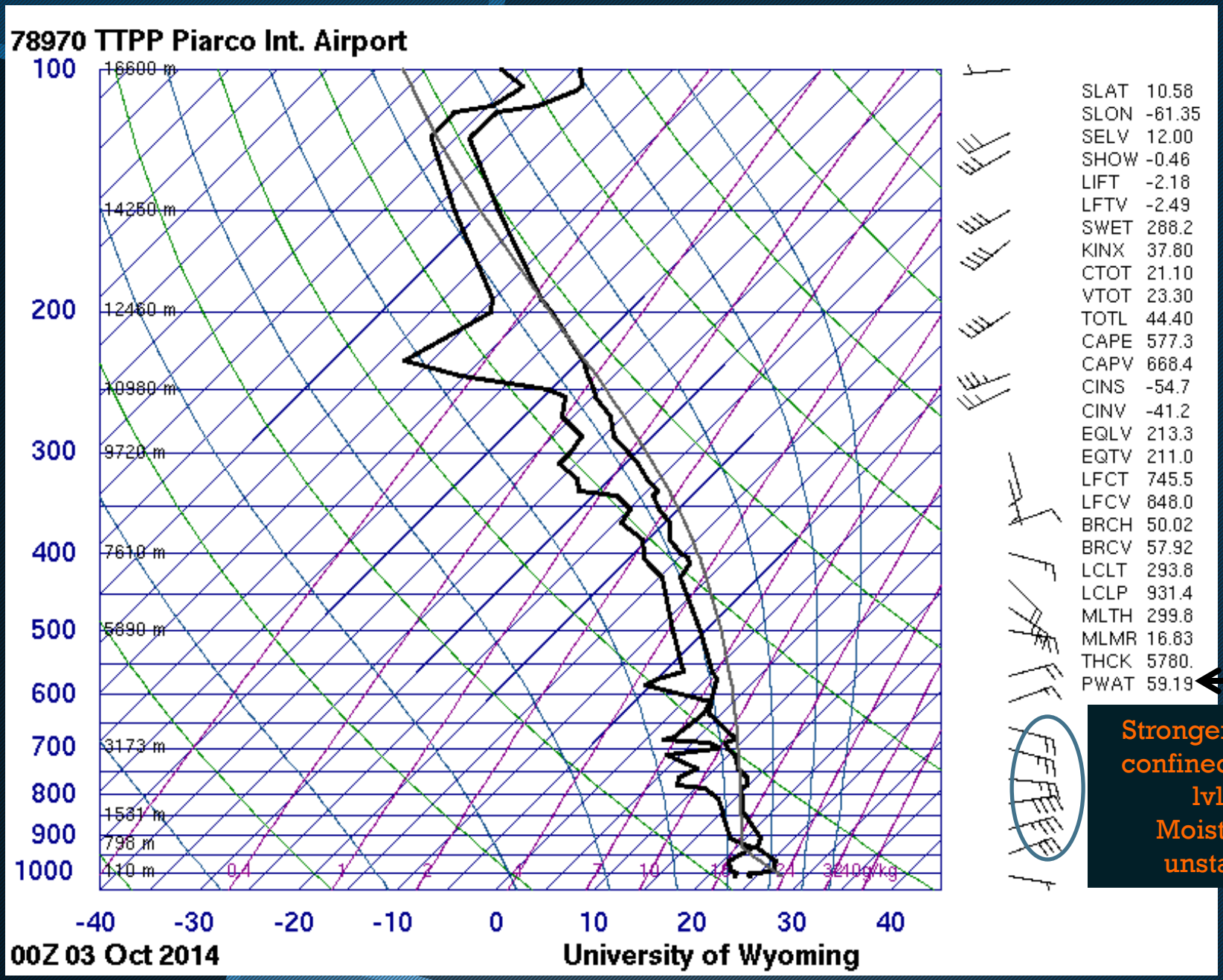


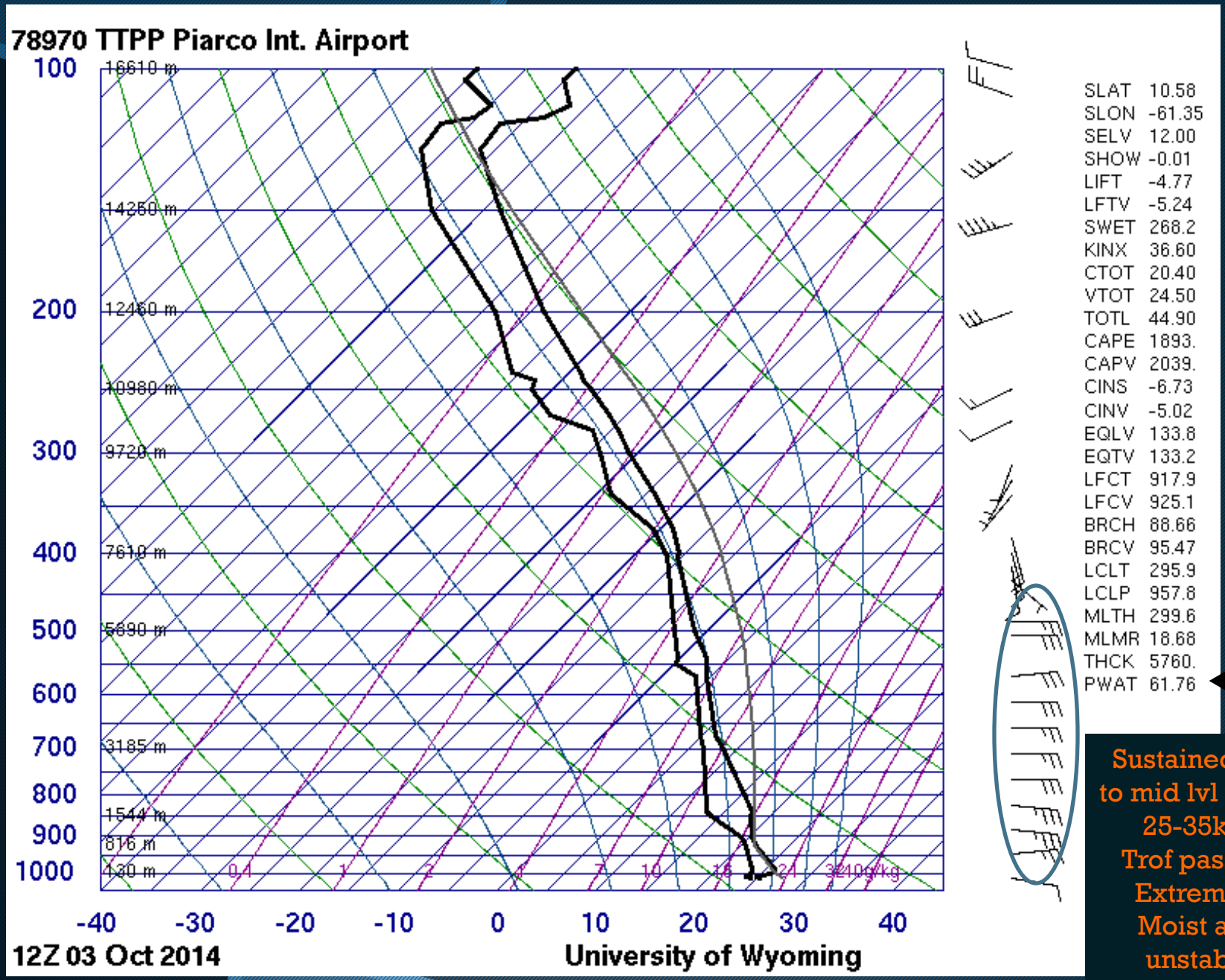
Relatively weak low to mid lvl wind speed; Isothermal layer 950mb – 860mb


78970 TTPP Piarco Int. Airport
100
200
300
400
500
600
700
800
900
1000
16580 m
14210 m
12410 m
10950 m
9700 m
7600 m
5900 m
3190 m
1567 m
824 m
439 m
0.4
1
2
4
7
10
16
24
32
40g/kg
-40
-30
-20
-10
0
10
20
30
40
12Z 01 Oct 2014
University of Wyoming
SLAT 10.58
SLON -61.35
SELV 12.00
SHOW -0.20
LIFT -4.06
LFTV -4.83
SWET 237.5
KINX 30.40
CTOT 21.00
VTOT 24.10
TOTL 45.10
CAPE 1498.
CAPV 1695.
CINS -13.7
CINV -8.15
EQLV 203.0
EQTV 202.8
LFCT 880.7
LFCV 906.0
BRCH 816.9
BRCV 924.5
LCLT 294.6
LCLP 939.8
MLTH 299.8
MLMR 17.49
THCK 5761.
PWAT 50.45
Incr. low to mid lvl wind speed; Moist and unstable

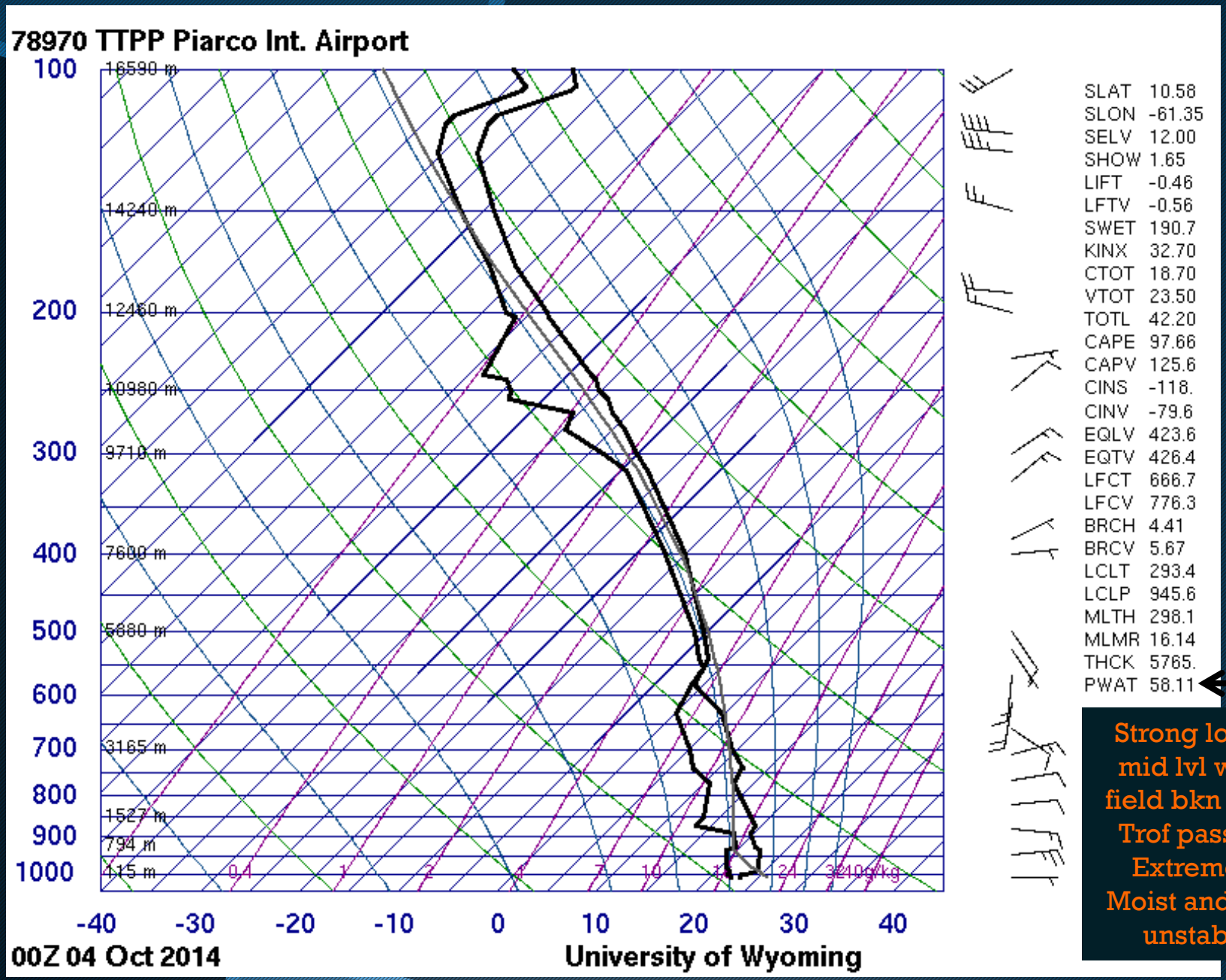

78970 TTPP Piarco Int. Airport
100
200
300
400
500
600
700
800
900
1000
16600 m
14220 m
12430 m
10960 m
9710 m
7610 m
5900 m
3191 m
1545 m
814 m
128 m
0.4
1
2
4
7
10
16
24
32
40g/kg
-40
-30
-20
-10
0
10
20
30
40
00Z 02 Oct 2014
University of Wyoming
SLAT 10.58
SLON -61.35
SELV 12.00
SHOW 0.72
LIFT -3.45
LFTV -4.24
SWET 259.7
KINX 31.60
CTOT 20.00
VTOT 22.70
TOTL 42.70
CAPE 1949.
CAPV 2147.
CINS -6.87
CINV -3.41
EQLV 150.4
EQTV 150.4
LFCT 912.6
LFCV 928.3
BRCH 63.87
BRCV 70.37
LCLT 295.5
LCLP 947.2
MLTH 300.1
MLMR 18.37
THCK 5772.
PWAT 54.89
Incr. low to mid lvl wind speed;
Trof passed;
Moist and unstable


78970 TTPP Piarco Int. Airport
100
200
300
400
500
600
700
800
900
1000
16590 m
14220 m
12430 m
10960 m
9690 m
7680 m
5690 m
3197 m
1569 m
827 m
444 m
-40
-30
-20
-10
0
10
20
30
40
12Z 02 Oct 2014
University of Wyoming
SLAT 10.58
SLON -61.35
SELV 12.00
SHOW 3.36
LIFT -1.25
LFTV -1.34
SWET 202.4
KINX 28.90
CTOT 15.70
VTOT 26.70
TOTL 42.40
CAPE 147.0
CAPV 175.6
CINS -264.
CINV -198.
EQLV 343.7
EQTV 342.2
LFCT 696.7
LFCV 710.8
BRCH 3.10
BRCV 3.71
LCLT 291.8
LCLP 927.0
MLTH 298.2
MLMR 14.91
THCK 5746.
PWAT 46.98
Incr. low to mid lvl wind speed; TW passed; Moist and increased stability in low levels


78970 TTPP Piarco Int. Airport
100
200
300
400
500
600
700
800
900
1000
16600 m
14250 m
12460 m
10980 m
9720 m
7610 m
5890 m
3173 m
1531 m
796 m
110 m
-40
-30
-20
-10
0
10
20
30
40
00Z 03 Oct 2014
University of Wyoming
SLAT 10.58
SLON -61.35
SELV 12.00
SHOW -0.46
LIFT -2.18
LFTV -2.49
SWET 288.2
KINX 37.80
CTOT 21.10
VTOT 23.30
TOTL 44.40
CAPE 577.3
CAPV 668.4
CINS -54.7
CINV -41.2
EQLV 213.3
EQTV 211.0
LFCT 745.5
LFCV 848.0
BRCH 50.02
BRCV 57.92
LCLT 293.8
LCLP 931.4
MLTH 299.8
MLMR 16.83
THCK 5780.
PWAT 59.19
Stronger winds confined to low lvls;
Moist and unstable



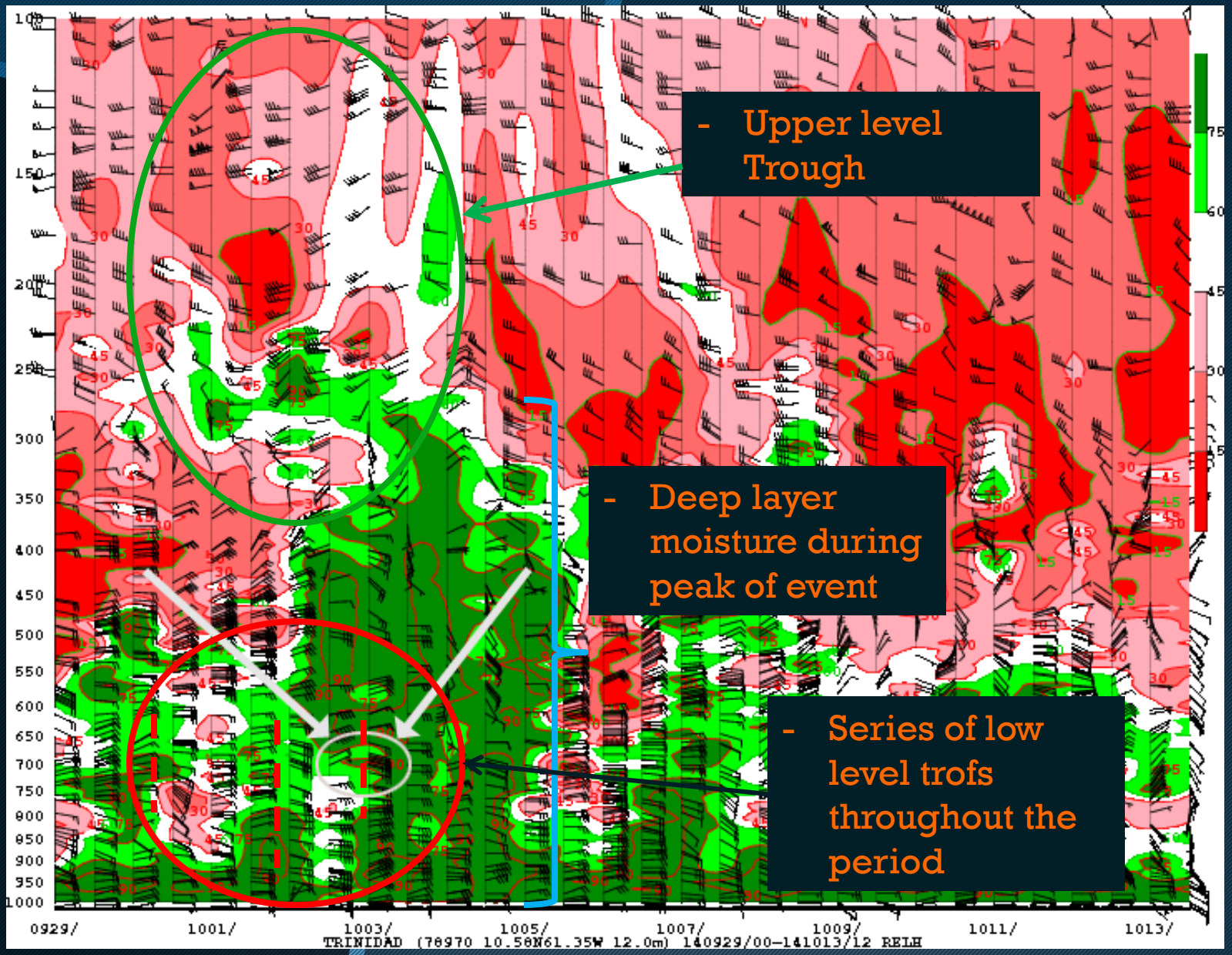
Sustained low to mid lvl winds 25-35kts; Trof passed; Extremely Moist and unstable



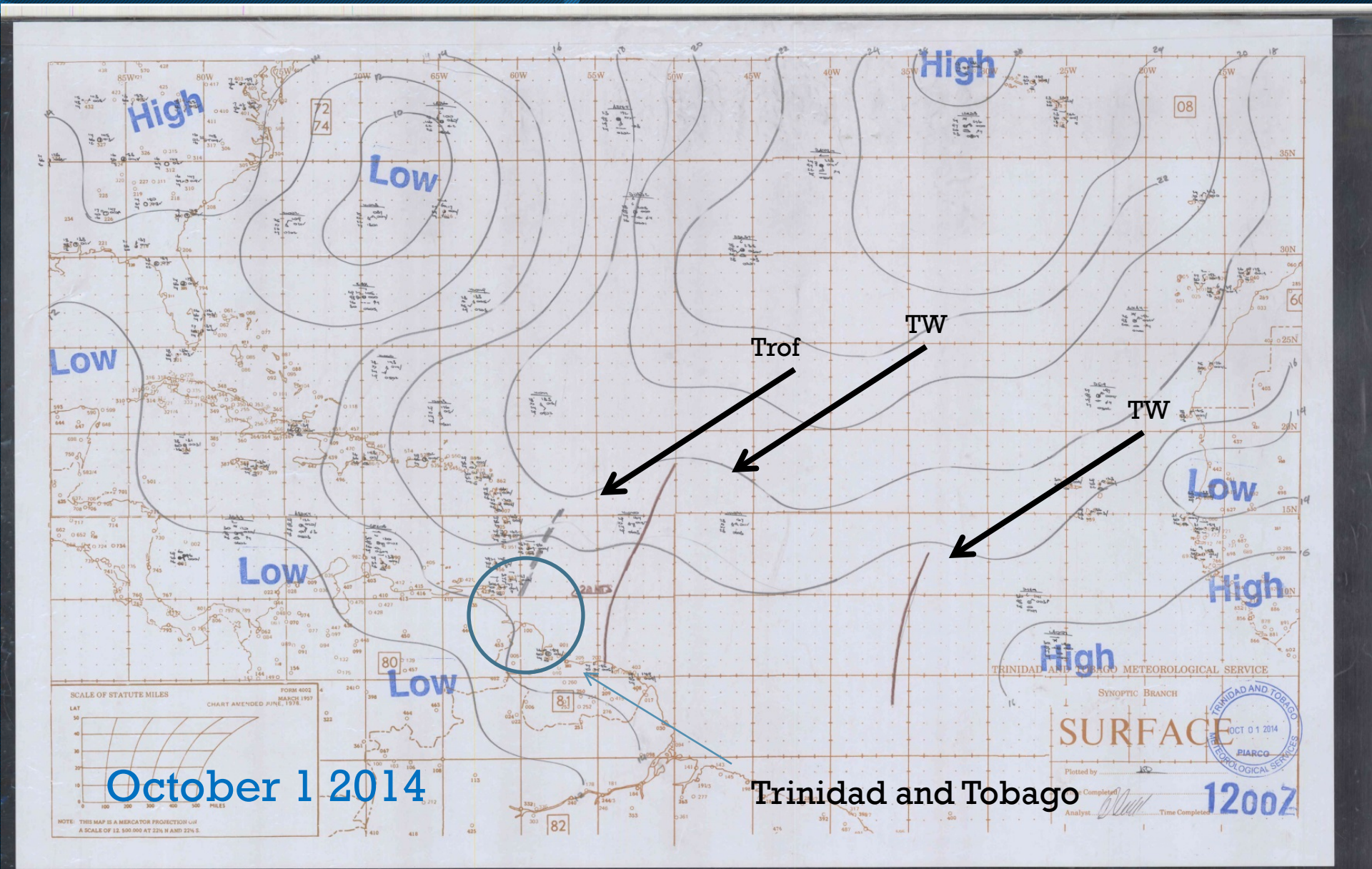
Strong low to mid lvl wind field bkn dwn; Trof passed; Extremely Moist and less unstable

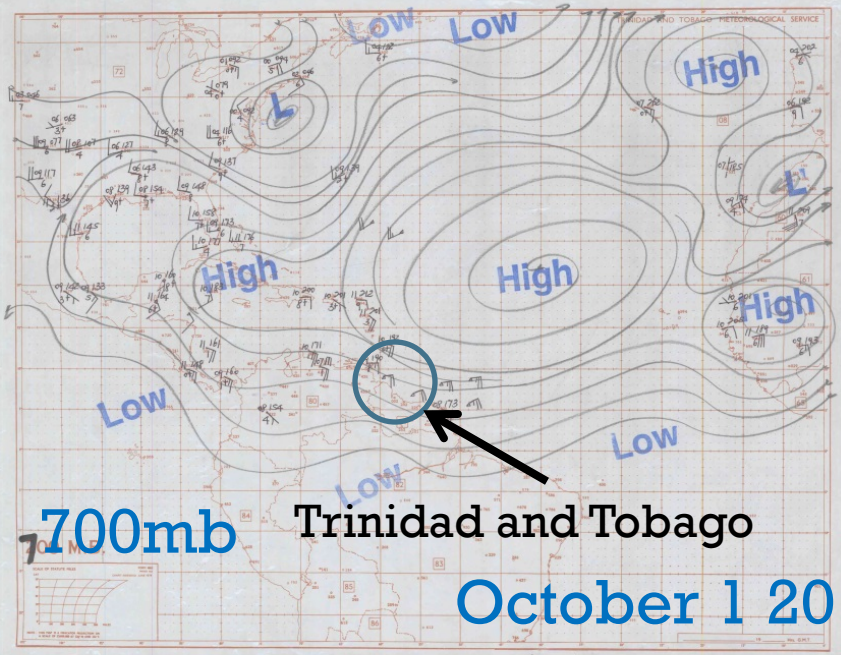
Charts

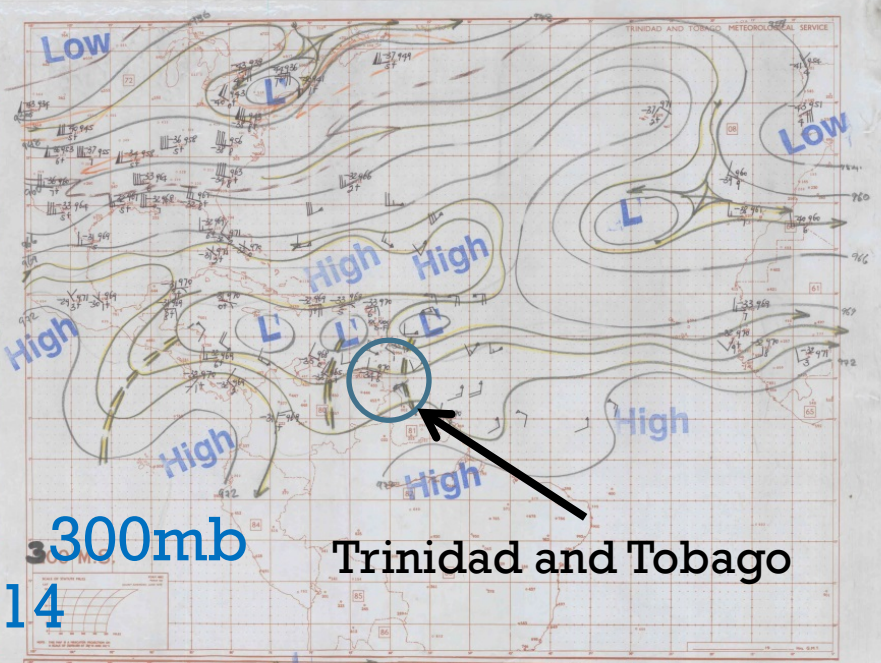
- Winds and Relative Humidity;
- - Analysed Surface;
- - Analysed mid – upper Levels (850mb, 700mb, 500mb, 300mb) and;
- Analysed 200mb



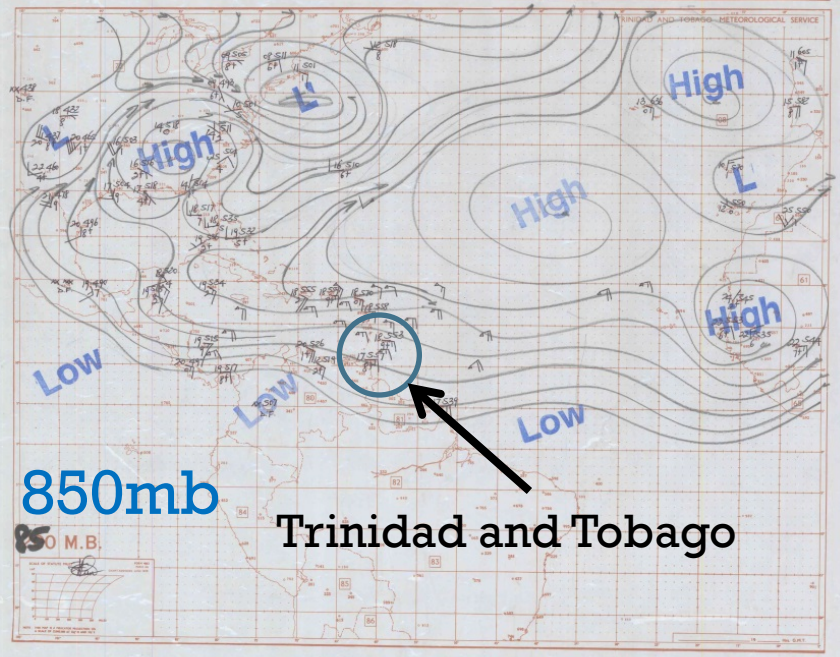
Relative Humidity and Wind Analysis– September 29 - October 13 2014

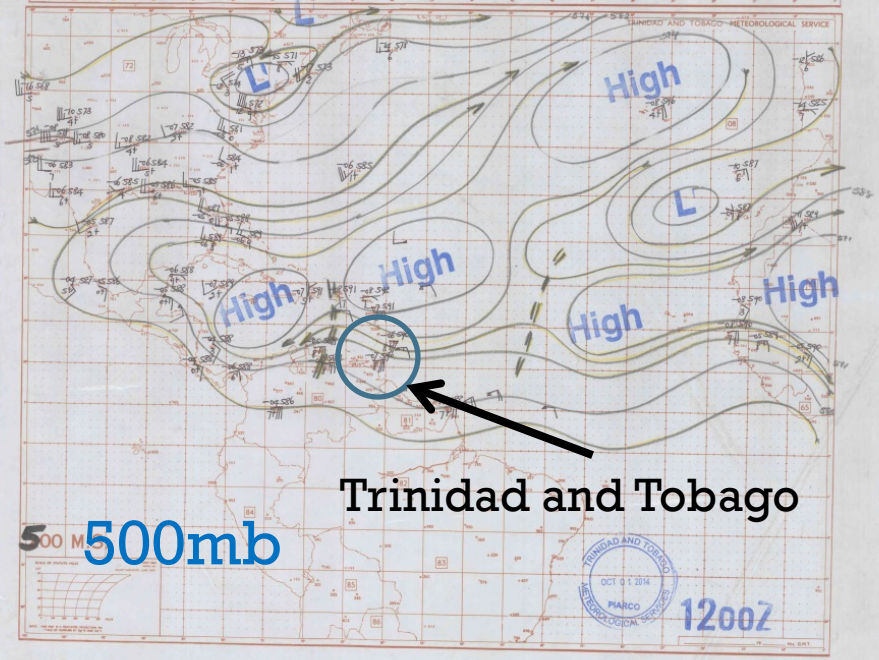

High
Low
High
Low
Low
Low
High
High
Trof
TW
TW
Trinidad and Tobago
October 1 2014
TRINIDAD AND TOBAGO METEOROLOGICAL SERVICE
SYNOPTIC BRANCH
SURFACE
OCT 01 2014
PIARCO
12002

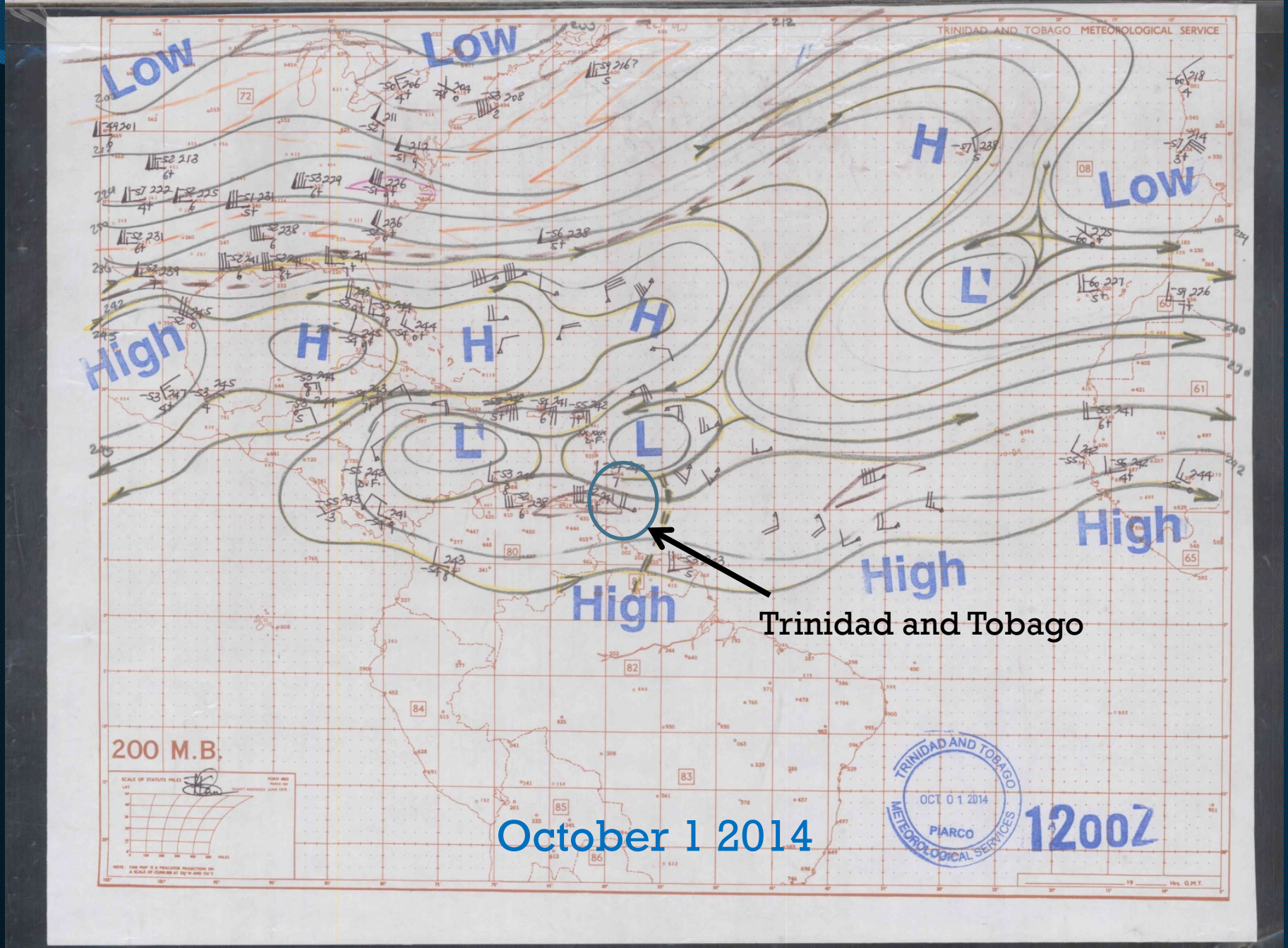


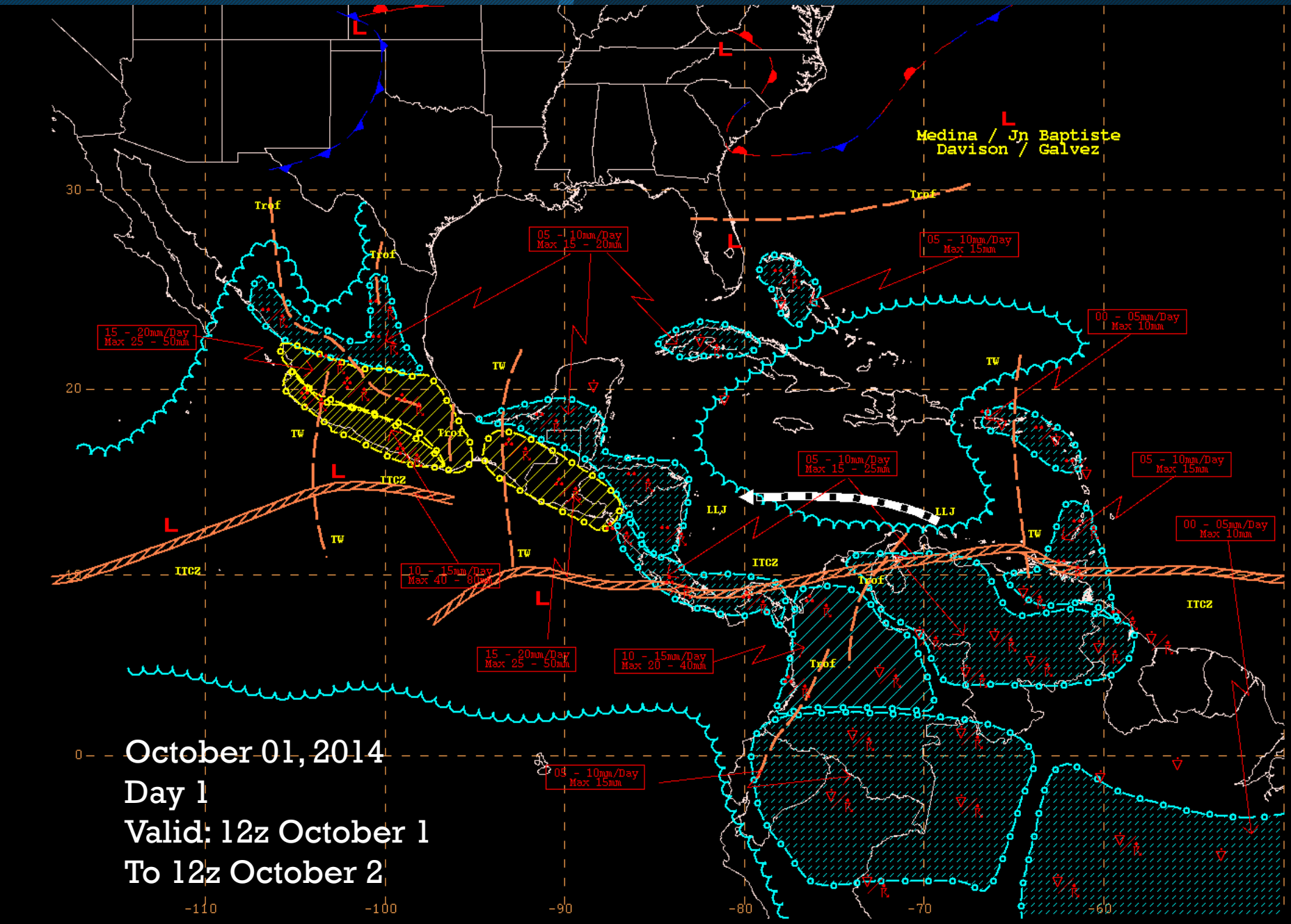


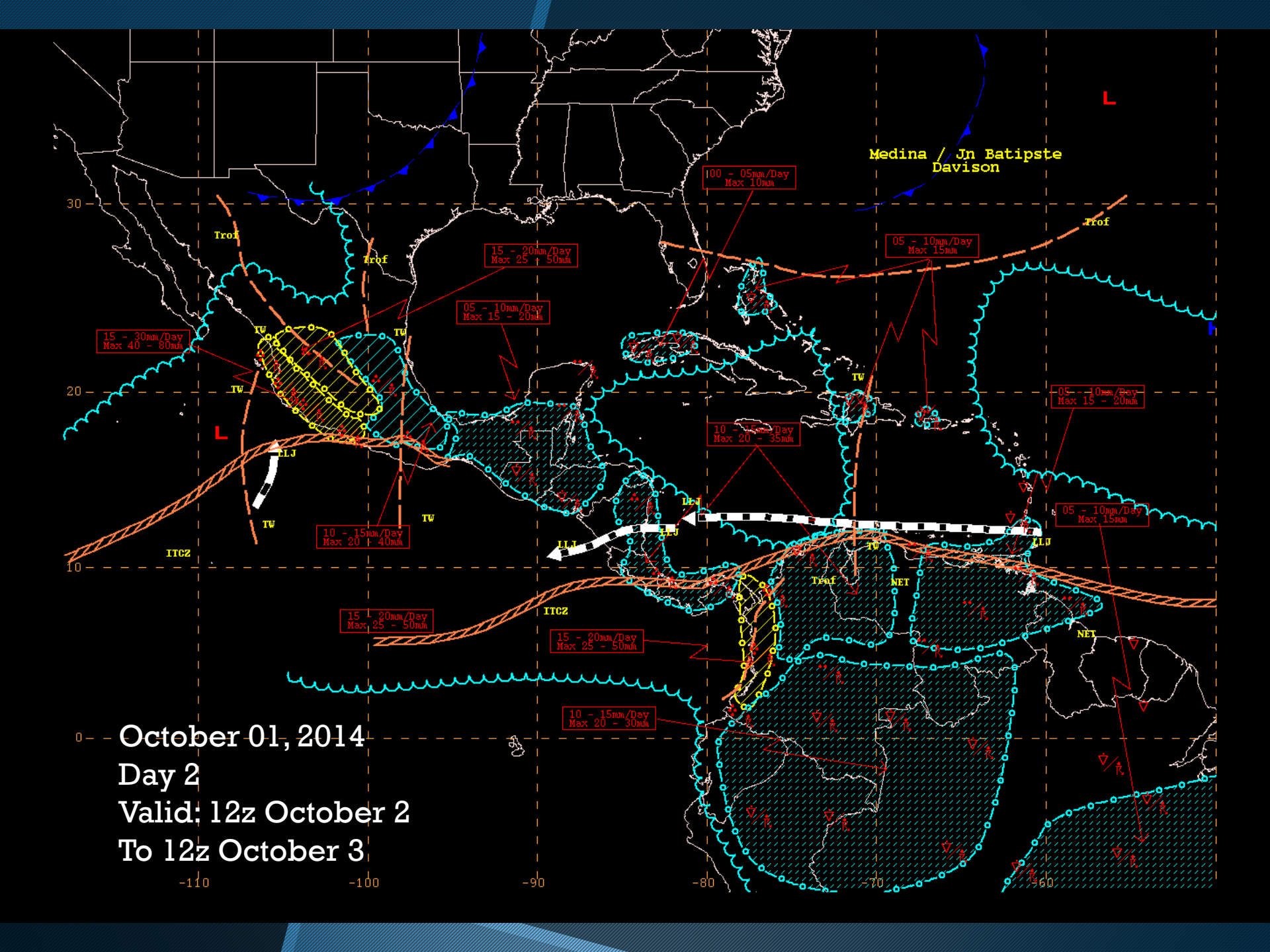
October 1 2014



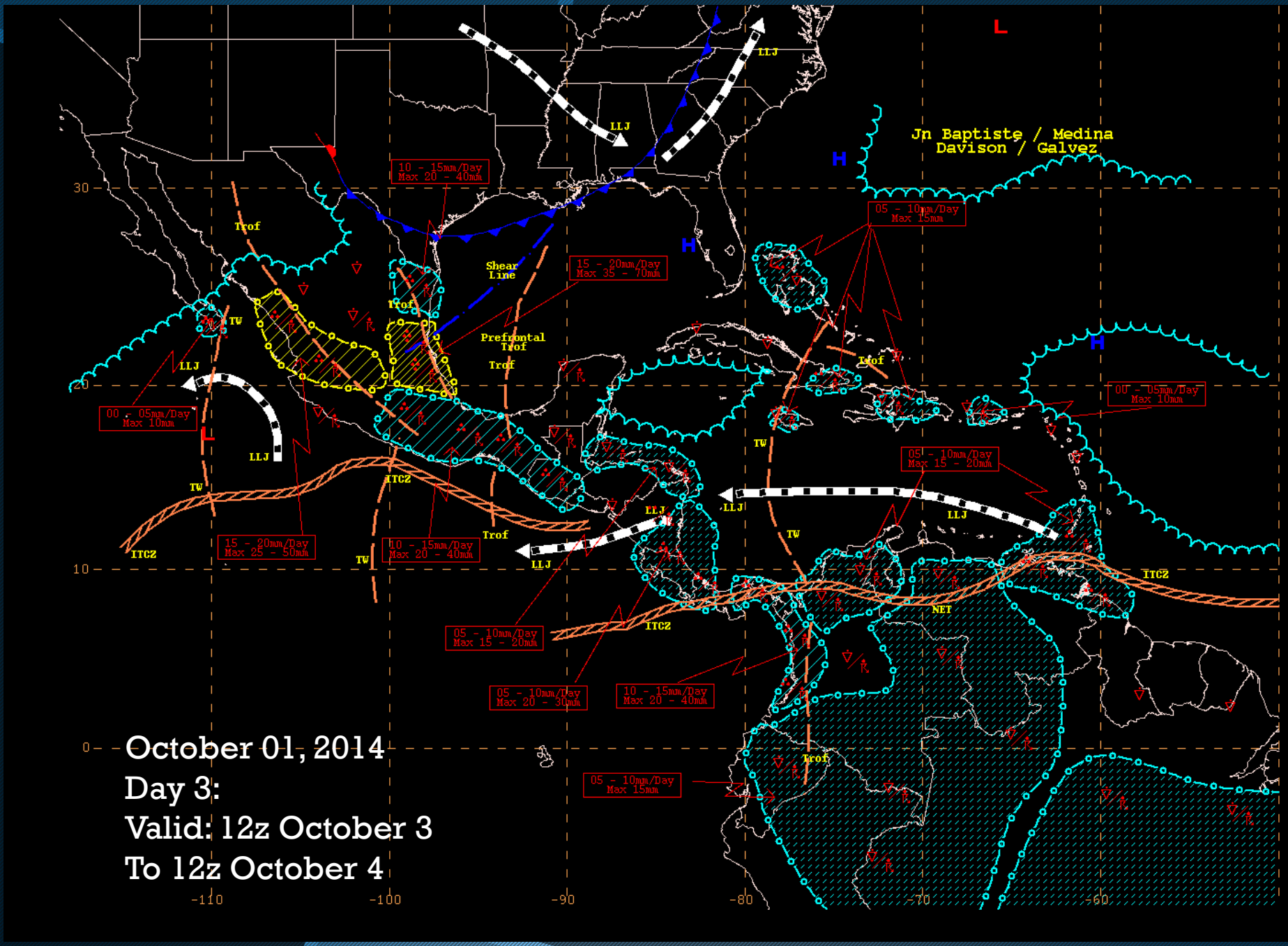



TRINIDAD AND TOBAGO METEOROLOGICAL SERVICE
LOW
LOW
LOW
High
High
High
High
H
H
H
H
L
L
L
Trinidad and Tobago
200 M.B.
October 1 2014
TRINIDAD AND TOBAGO METEOROLOGICAL SERVICES
OCT 01 2014
PIARCO
1200Z


Medina / Jn Baptiste
Davison / Galvez
Trof
Trof
Trof
Trof
Trof
05 - 10mm/Day
Max 15 - 20mm
05 - 10mm/Day
Max 15mm
15 - 20mm/Day
Max 25 - 50mm
00 - 05mm/Day
Max 10mm
TW
TW
TW
TW
TW
ITCZ
ITCZ
ITCZ
LLJ
LLJ
05 - 10mm/Day
Max 15 - 25mm
05 - 10mm/Day
Max 15mm
00 - 05mm/Day
Max 10mm
10 - 15mm/Day
Max 40 - 60mm
15 - 20mm/Day
Max 25 - 50mm
10 - 15mm/Day
Max 20 - 40mm
08 - 10mm/Day
Max 15mm
30
20
0
-110
-100
-90
-80
-70
-60
October 01, 2014
Day 1
Valid: 12z October 1
To 12z October 2



October 01, 2014
Day 2
Valid: 12z October 2
To 12z October 3


October 01, 2014
Day 3:
Valid: 12z October 3
To 12z October 4
Jn Baptiste / Medina
Davison / Galvez
Shear Line
Prefrontal Trof
Trof
LLJ
TW
ITCZ
NET
10 - 15mm/Day
Max 20 - 40mm
15 - 20mm/Day
Max 35 - 70mm
05 - 10mm/Day
Max 15mm
00 - 05mm/Day
Max 10mm
05 - 10mm/Day
Max 15 - 20mm
15 - 20mm/Day
Max 25 - 50mm
05 - 10mm/Day
Max 20 - 30mm
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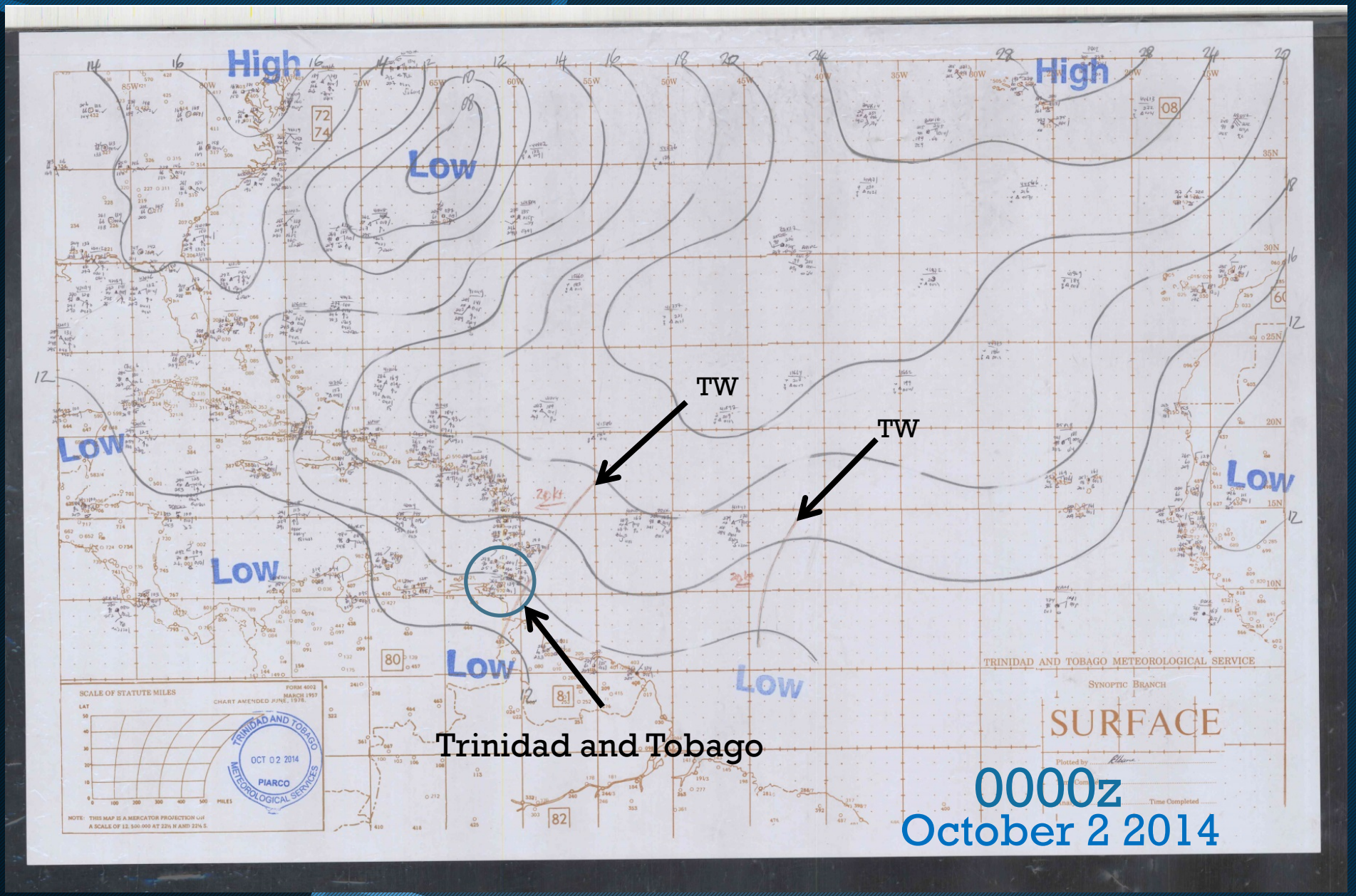
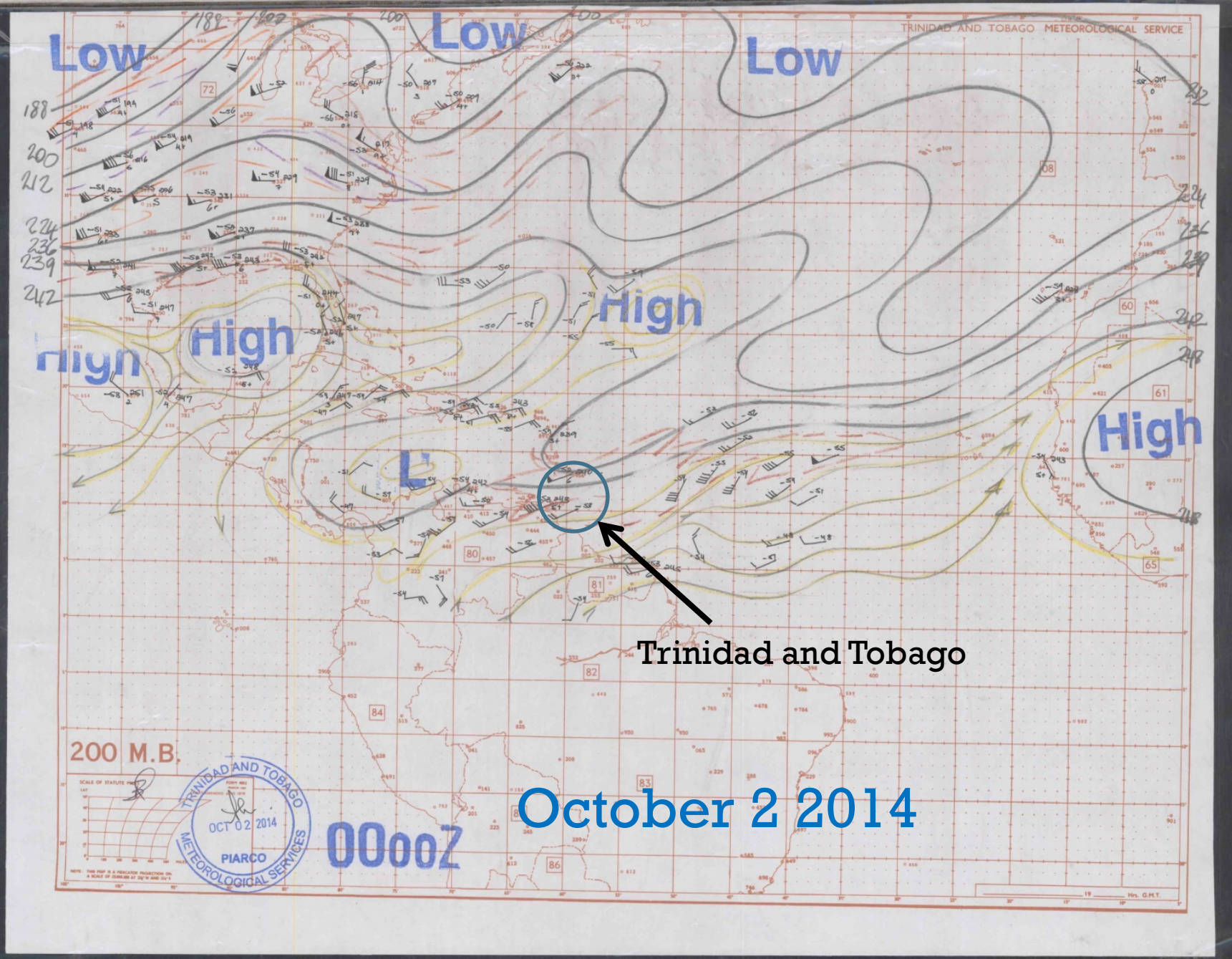
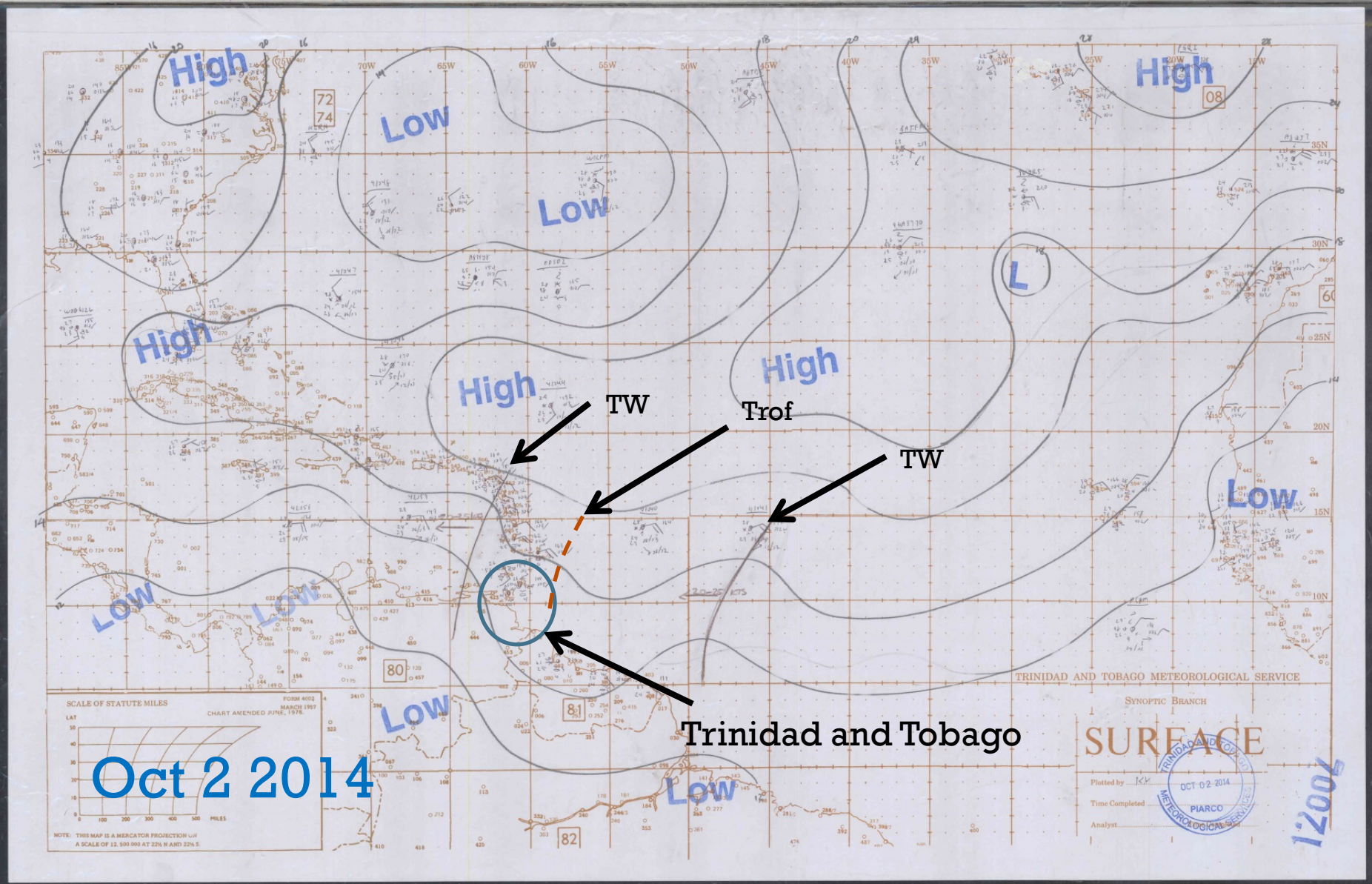
10
0
-110
-100
-90
-80
-70
-60


High
High
Low
Low
Low
Low
Low
Low
TW
TW
Trinidad and Tobago
TRINIDAD AND TOBAGO METEOROLOGICAL SERVICE
SYNOPTIC BRANCH
SURFACE
0000z
October 2 2014


TRINIDAD AND TOBAGO METEOROLOGICAL SERVICE
Low
Low
Low
High
High
High
L
Trinidad and Tobago
200 M.B.
TRINIDAD AND TOBAGO METEOROLOGICAL SERVICES
OCT 02 2014
PIARCO
00ooZ
October 2 2014


High
Low
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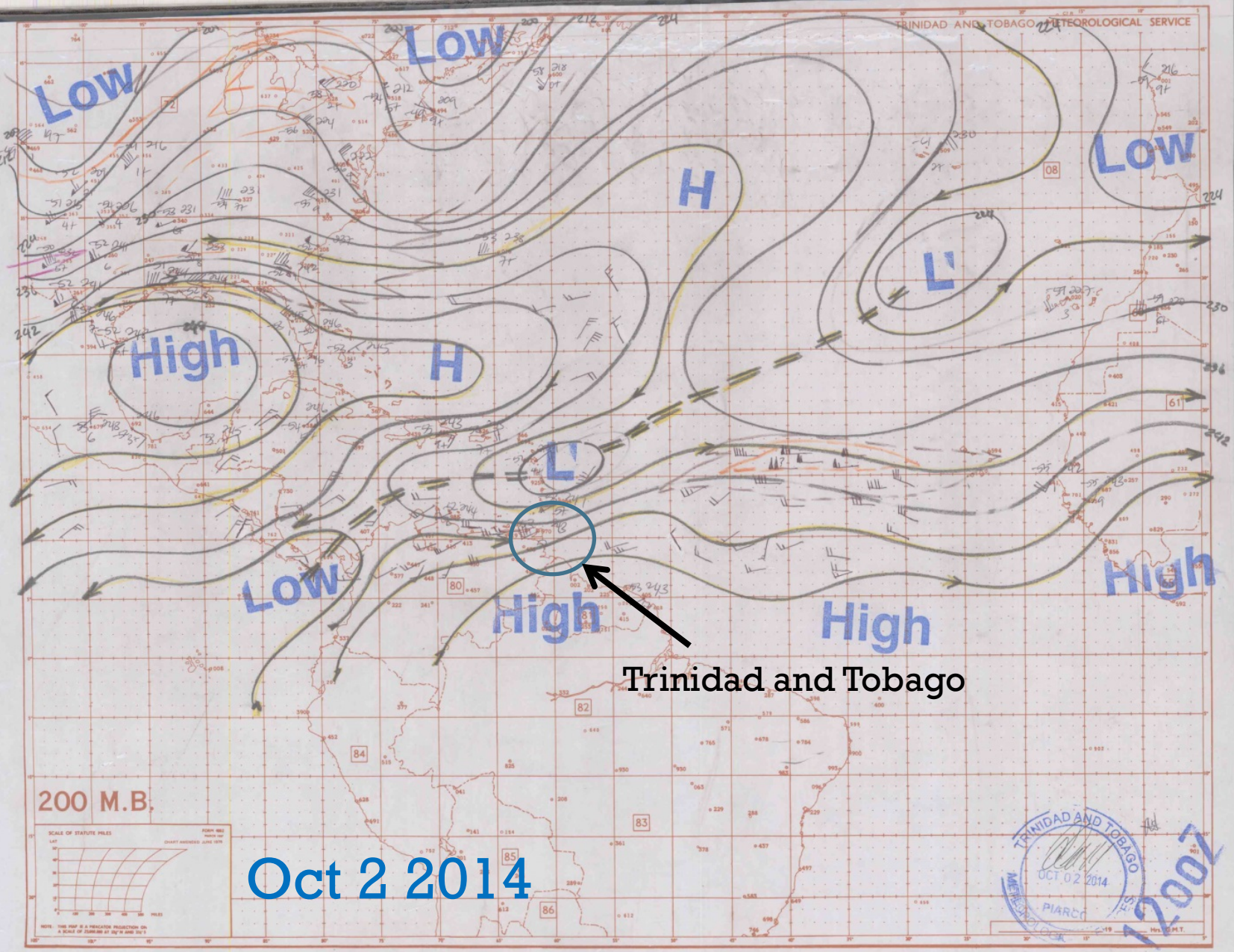
Low
Low
TW
Trof
TW
Trinidad and Tobago
TRINIDAD AND TOBAGO METEOROLOGICAL SERVICE
SYNOPTIC BRANCH
SURFACE
Plotted by KV
Time Completed
Analyst
OCT 02 2014
PIARCO
SCALE OF STATUTE MILES
CHART AMENDED JUNE, 1978.
Oct 2 2014


TRINIDAD AND TOBAGO METEOROLOGICAL SERVICE
Low
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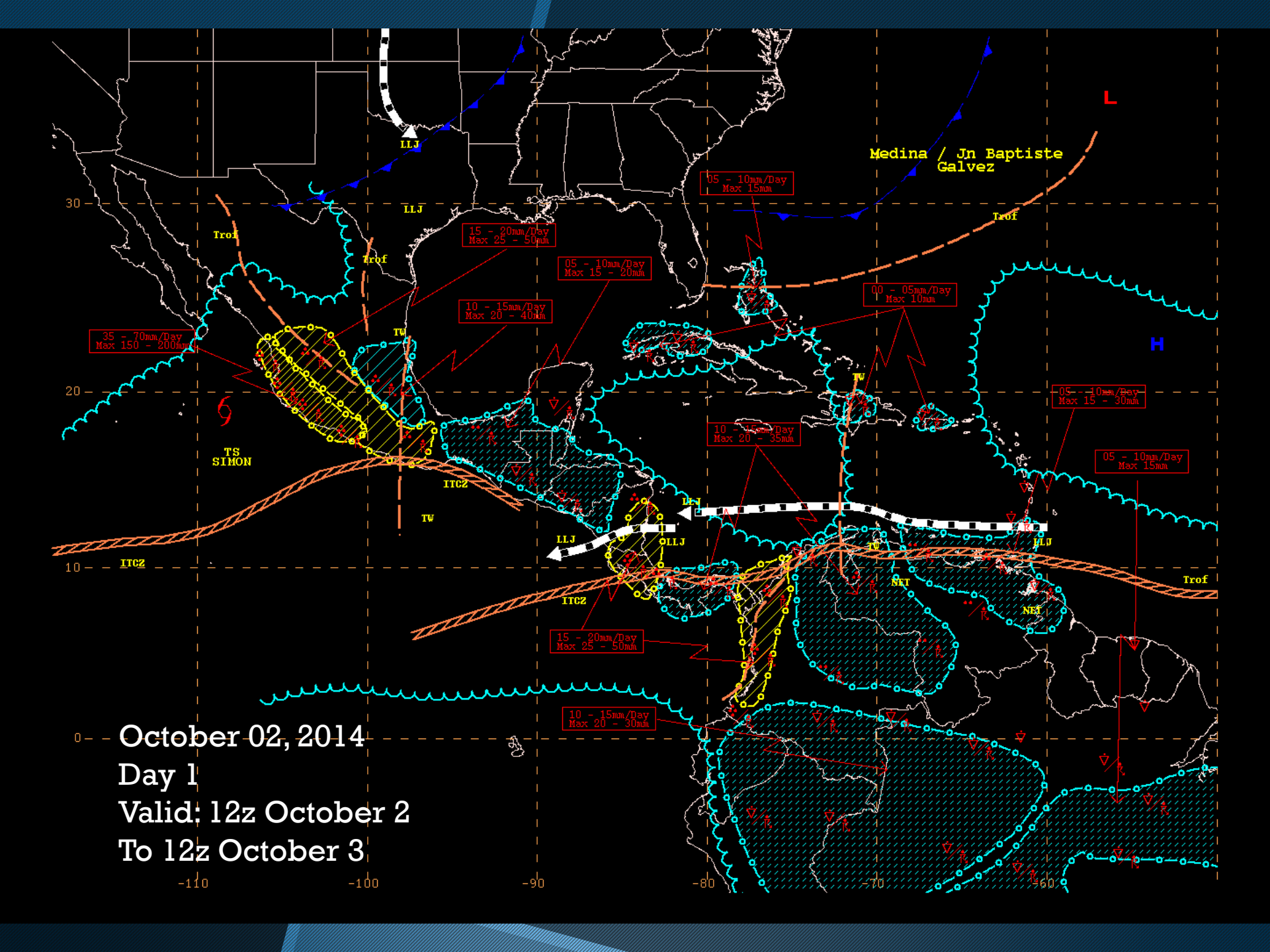
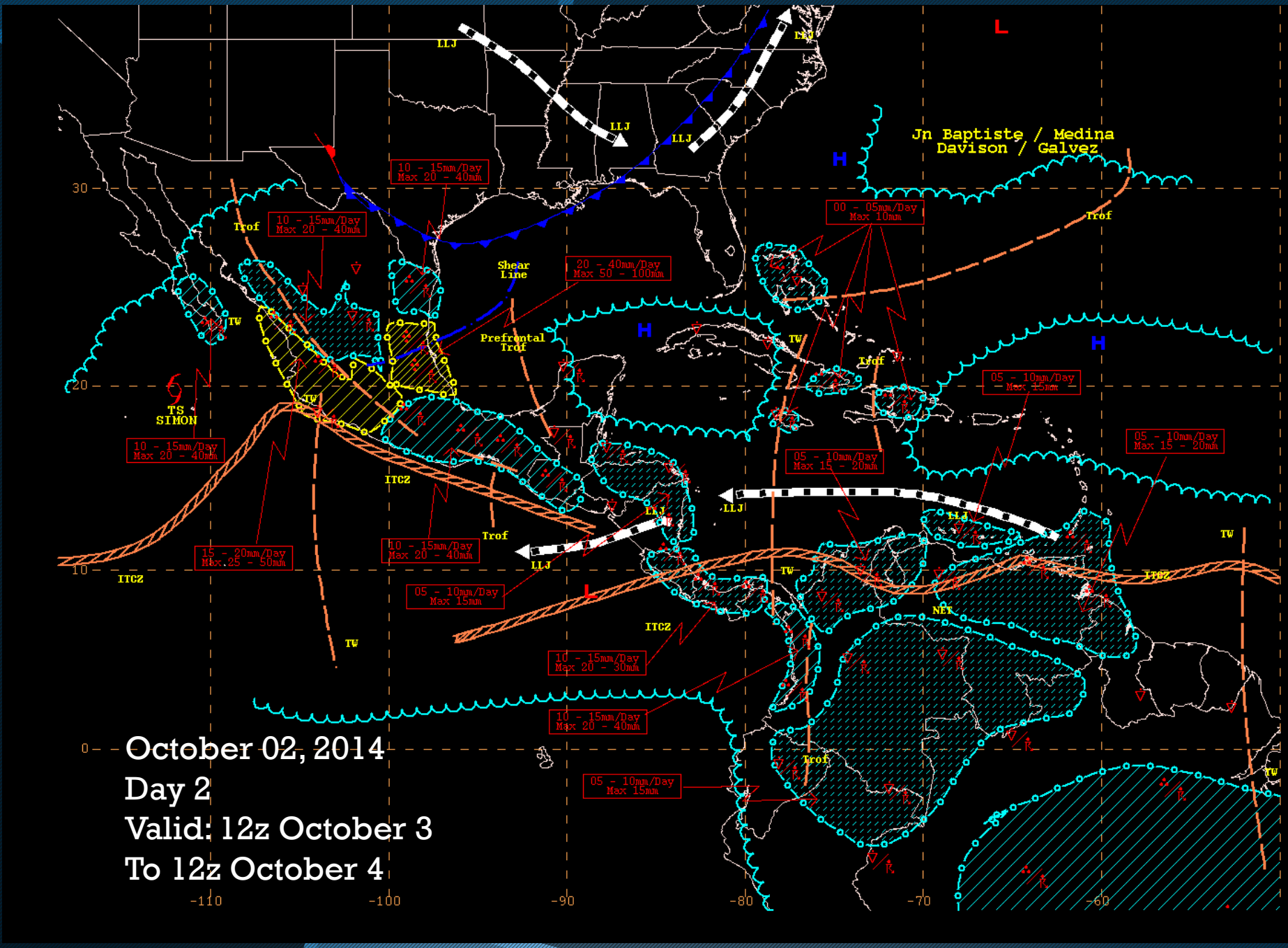
L
High
High
High
High
Low
Trinidad and Tobago
200 M.B.
Oct 2 2014
TRINIDAD AND TOBAGO
METEOROLOGICAL SERVICE
OCT 02 2014
PIARCO
2007



October 02, 2014
Day 1
Valid: 12z October 2
To 12z October 3


October 02, 2014
Day 2
Valid: 12z October 3
To 12z October 4
Jn Baptiste / Medina
Davison / Galvez
Shear Line
Prefrontal Trof
TS SIMON
ITCZ
Trof
LLJ
TW
10 - 15mm/Day Max 20 - 40mm
20 - 40mm/Day Max 50 - 100mm
00 - 05mm/Day Max 10mm
05 - 10mm/Day Max 15mm
05 - 10mm/Day Max 15 - 20mm
15 - 20mm/Day Max 25 - 50mm
10 - 15mm/Day Max 20 - 30mm
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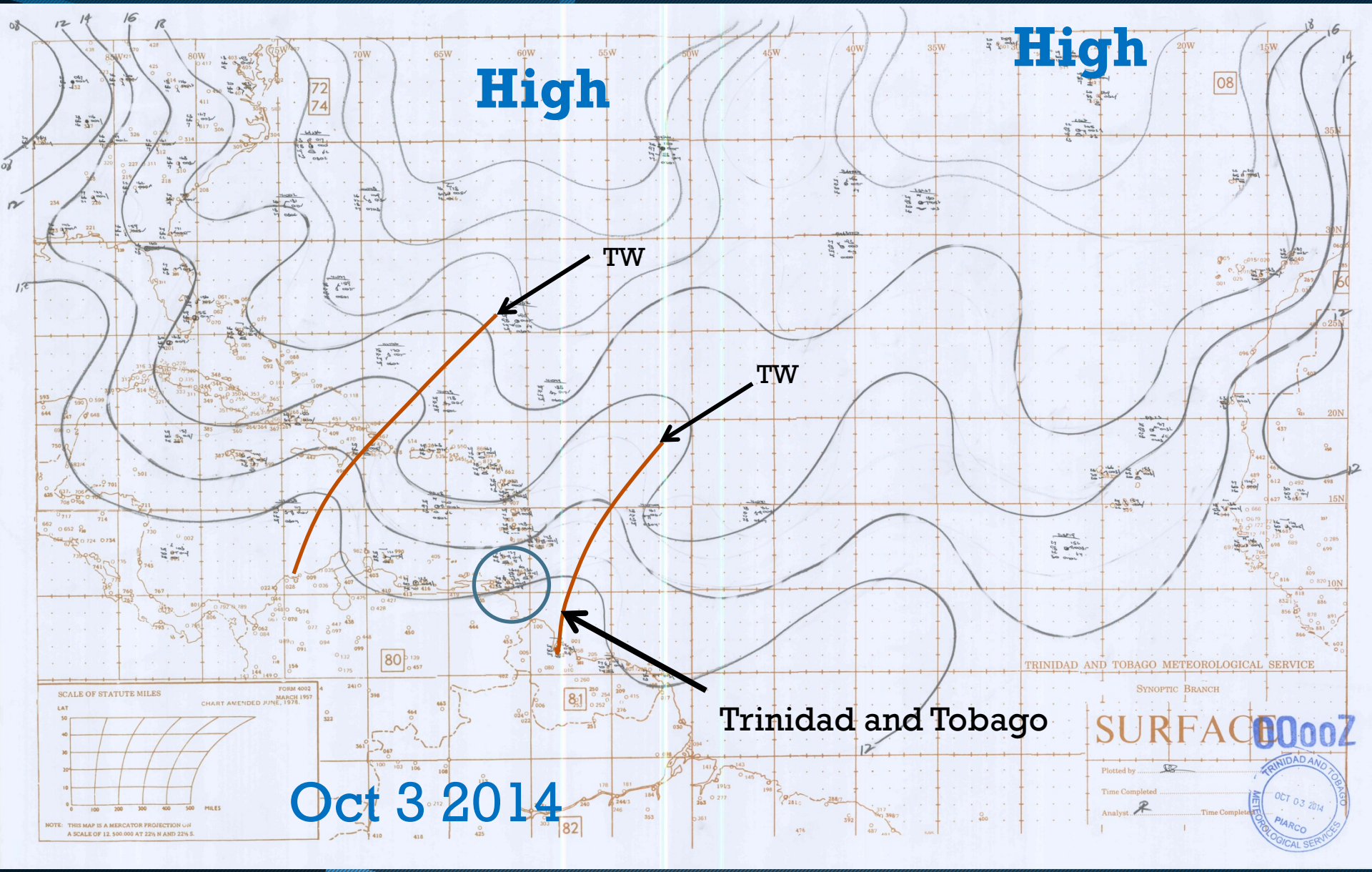
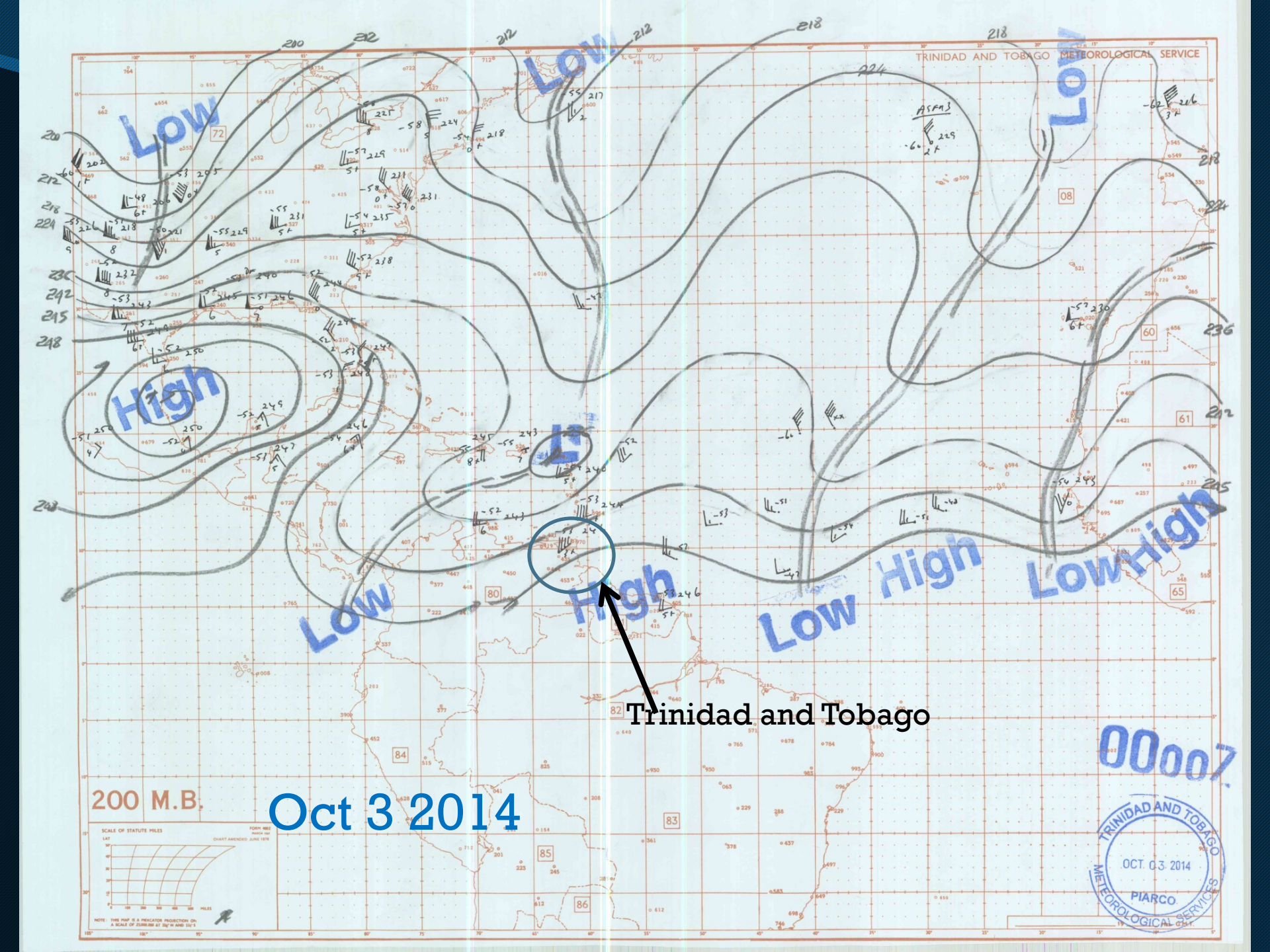
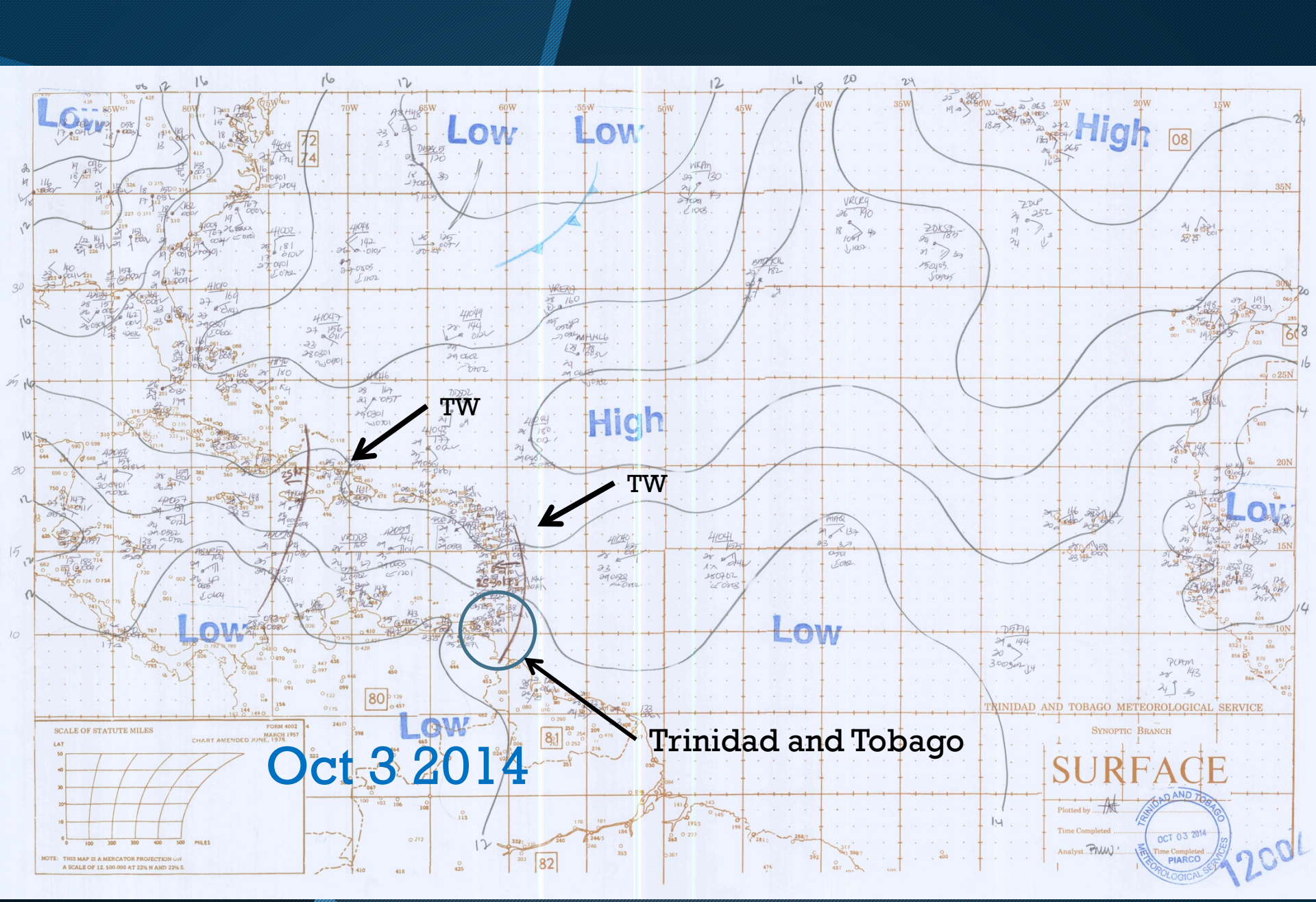
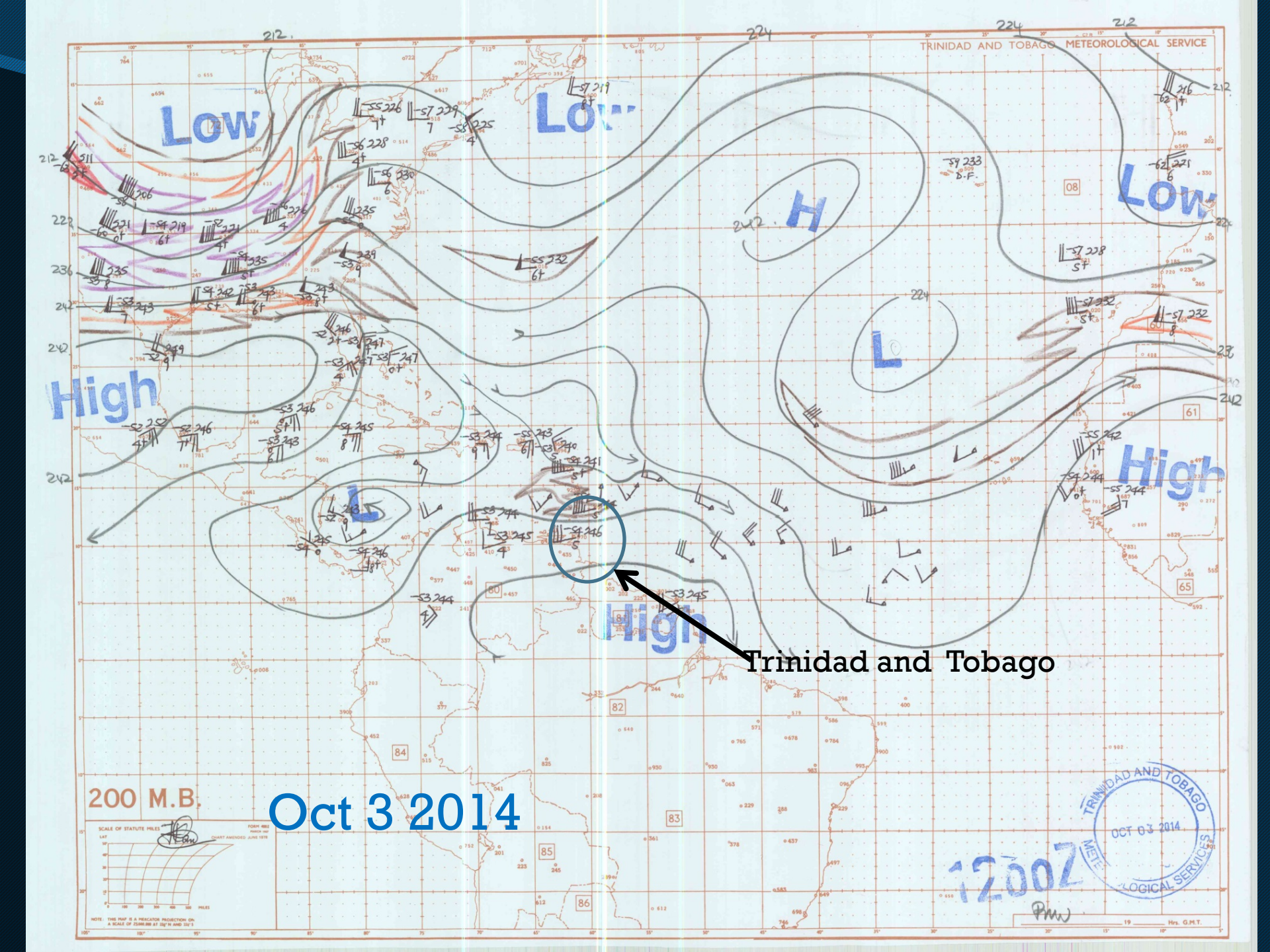
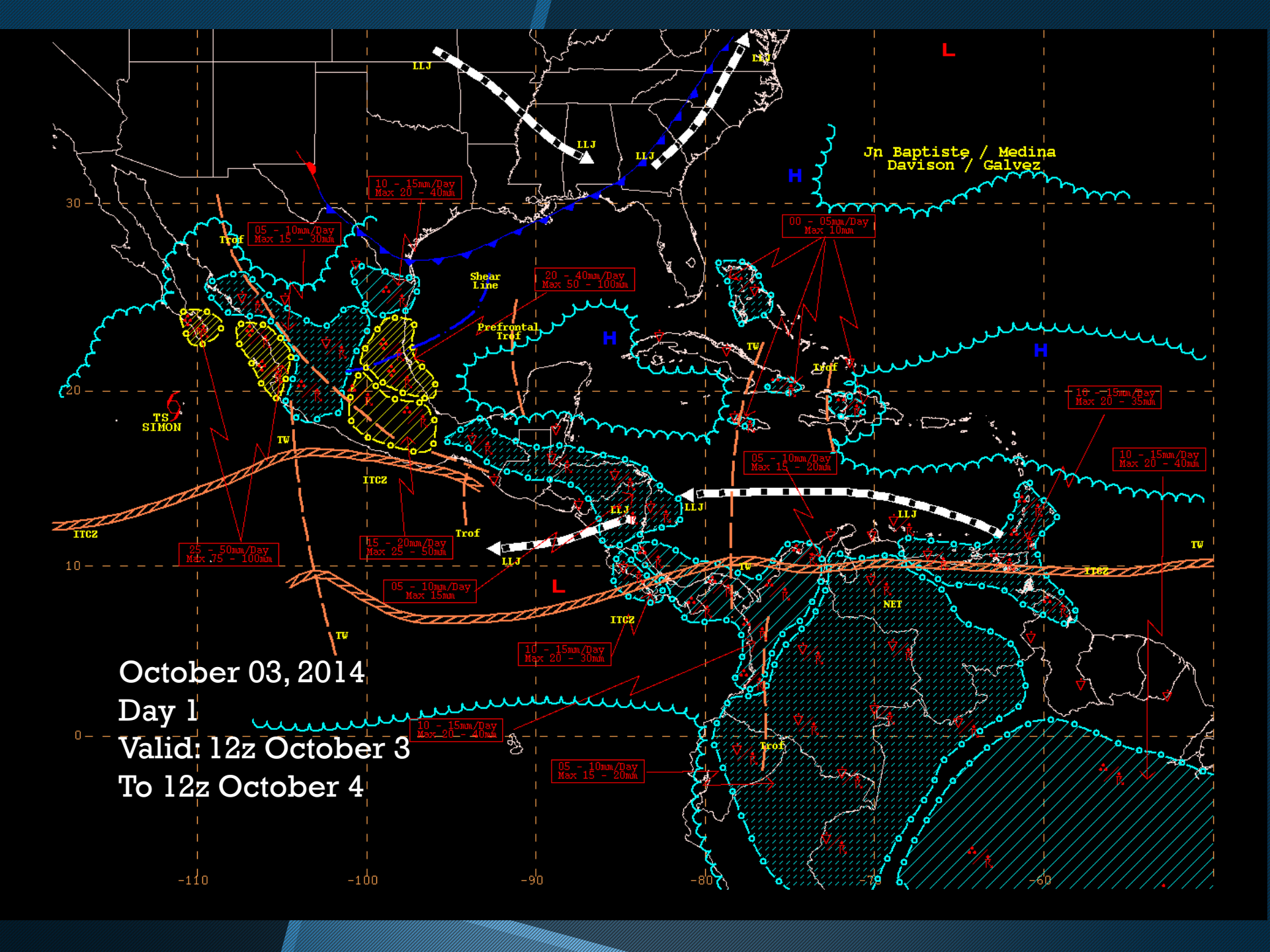
10
0
-110
-100
-90
-80
-70
-60

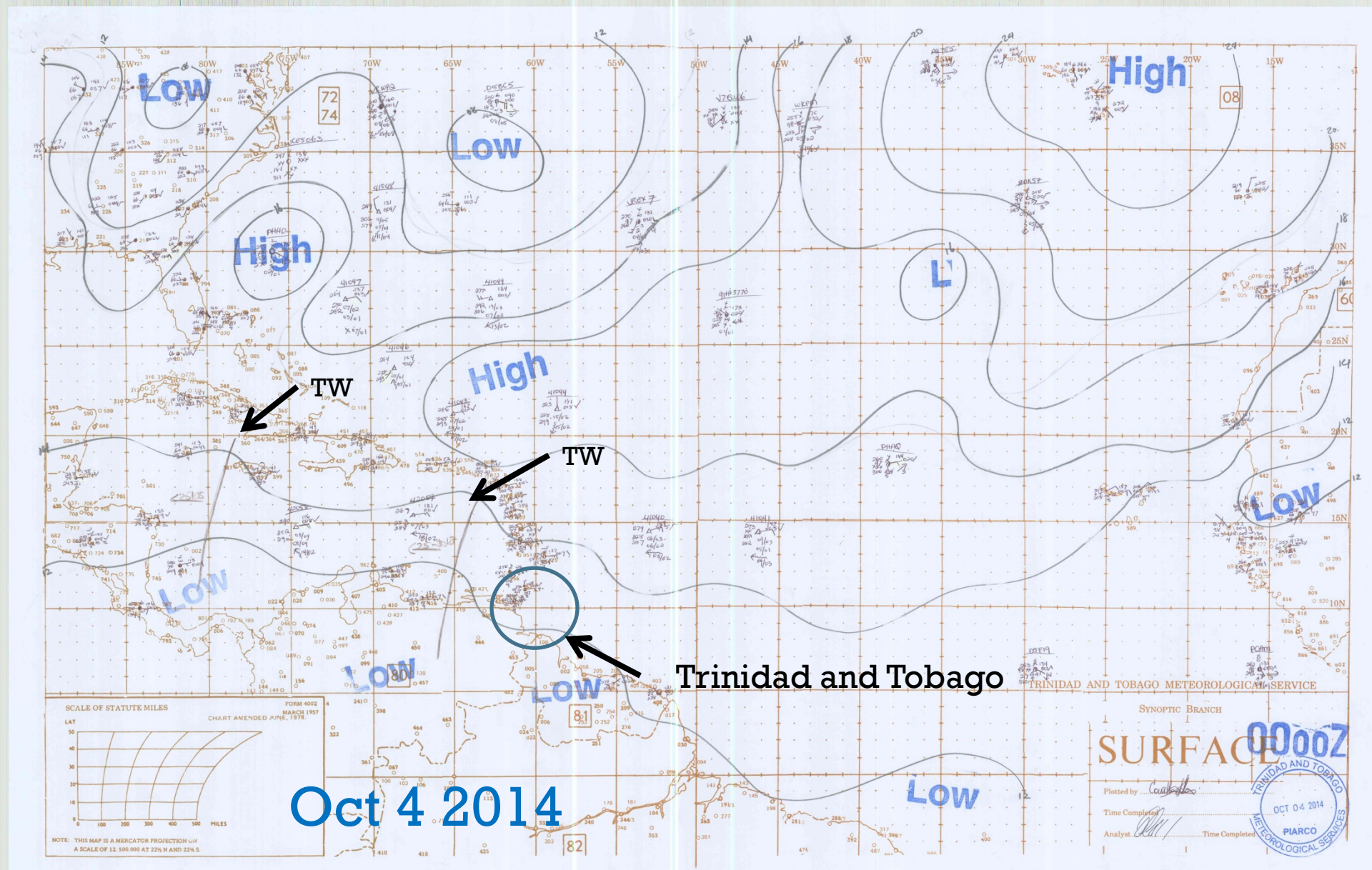

High
High
TW
TW
Trinidad and Tobago
Oct 3 2014
TRINIDAD AND TOBAGO METEOROLOGICAL SERVICE
SYNOPTIC BRANCH
SURFACE
00ooZ
SCALE OF STATUTE MILES
CHART AMENDED JUNE, 1978.
FORM 4002
MARCH 1957
Plotted by
Time Completed
Analyst
TRINIDAD AND TOBAGO METEOROLOGICAL SERVICES
OCT 03 2014
PIARCO

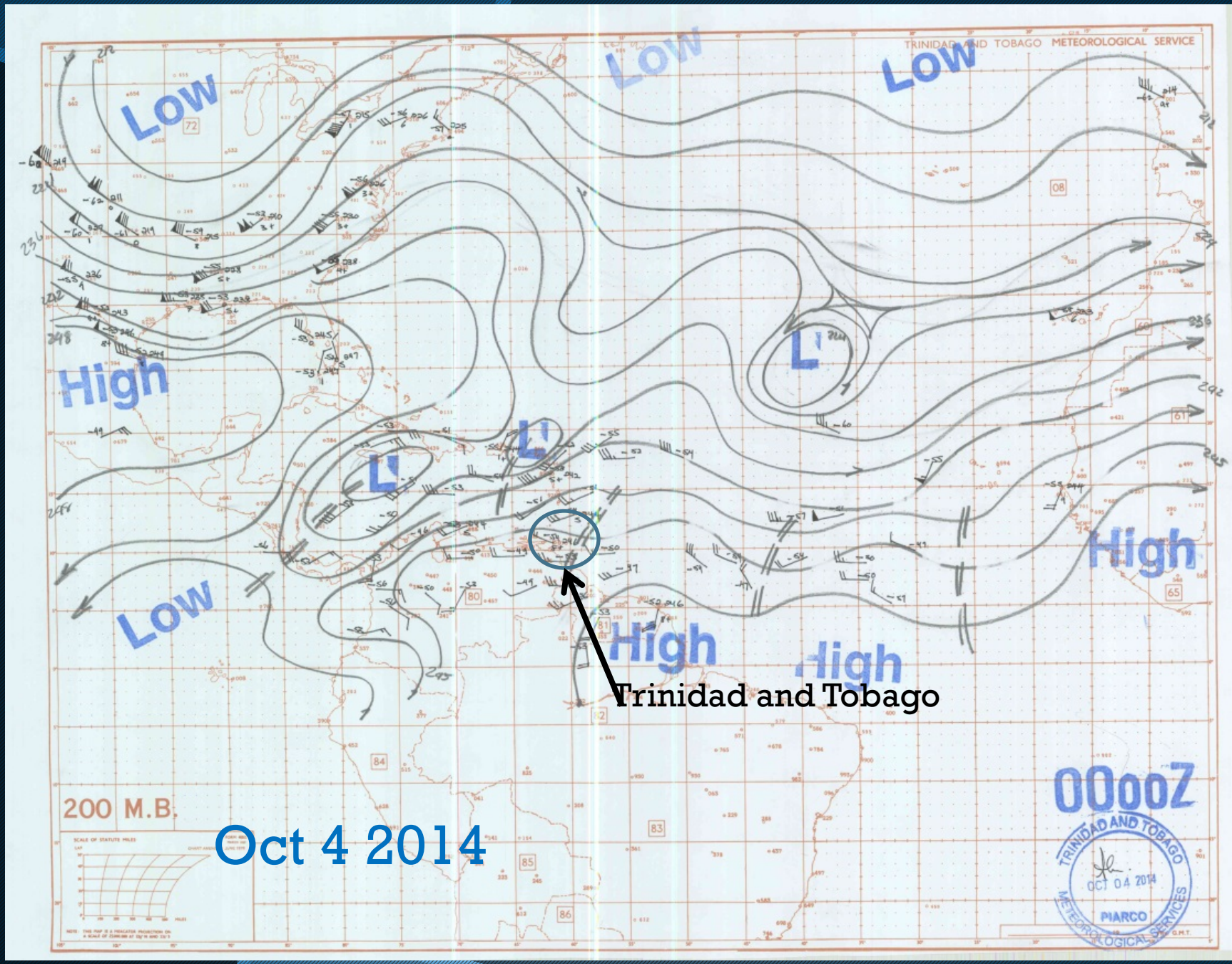

TRINIDAD AND TOBAGO METEOROLOGICAL SERVICE
Low
High
Low
High
Low
High
Low
High
Trinidad and Tobago
200 M.B.
Oct 3 2014
00007
TRINIDAD AND TOBAGO
OCT 03 2014
PIARCO
METEOROLOGICAL SERVICES


Low
Low
Low
High
High
TW
TW
Low
Low
Low
Trinidad and Tobago
Oct 3 2014
TRINIDAD AND TOBAGO METEOROLOGICAL SERVICE
SYNOPTIC BRANCH
SURFACE
SCALE OF STATUTE MILES
CHART AMENDED JUNE, 1978.
Plotted by
Time Completed
Analyst
OCT 03 2014
PIARCO
METEOROLOGICAL SERVICES
1200L


TRINIDAD AND TOBAGO METEOROLOGICAL SERVICE
Low
Low
Low
H
L
High
High
High
L
Trinidad and Tobago
200 M.B.
Oct 3 2014
1200Z
TRINIDAD AND TOBAGO
OCT 03 2014
METEOROLOGICAL SERVICES


October 03, 2014
Day 1
Valid: 12z October 3
To 12z October 4
Jn Baptiste / Medina
Davison / Galvez
Shear Line
Prefrontal Trof
TS SIMON
ITCZ
TW
Trof
LLJ
NET
00 - 05mm/Day Max 10mm
05 - 10mm/Day Max 15 - 30mm
10 - 15mm/Day Max 20 - 40mm
20 - 40mm/Day Max 50 - 100mm
25 - 50mm/Day Max 75 - 100mm
15 - 20mm/Day Max 25 - 50mm
05 - 10mm/Day Max 15mm
10 - 15mm/Day Max 20 - 30mm
05 - 10mm/Day Max 15 - 20mm
10 - 15mm/Day Max 20 - 35mm
30
20
10
0
-110
-100
-90
-80
-70
-60


Low
High
Low
High
L
High
Low
Low
Low
Low
Low
TW
TW
Trinidad and Tobago
TRINIDAD AND TOBAGO METEOROLOGICAL SERVICE
SYNOPTIC BRANCH
SURFACE 00UZ
SCALE OF STATUTE MILES
CHART AMENDED JUNE, 1978.
Plotted by
Time Completed
Analyst
Time Completed
OCT 04 2014
PIARCO
METEOROLOGICAL SERVICES
Oct 4 2014


TRINIDAD AND TOBAGO METEOROLOGICAL SERVICE
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TRINIDAD AND TOBAGO
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METEOROLOGICAL SERVICES

Model Runs

WINGRIDDS:

- 0000z September 30;
- 0000z October 1;
- 0000z October 2 and;
- 0000z October 3

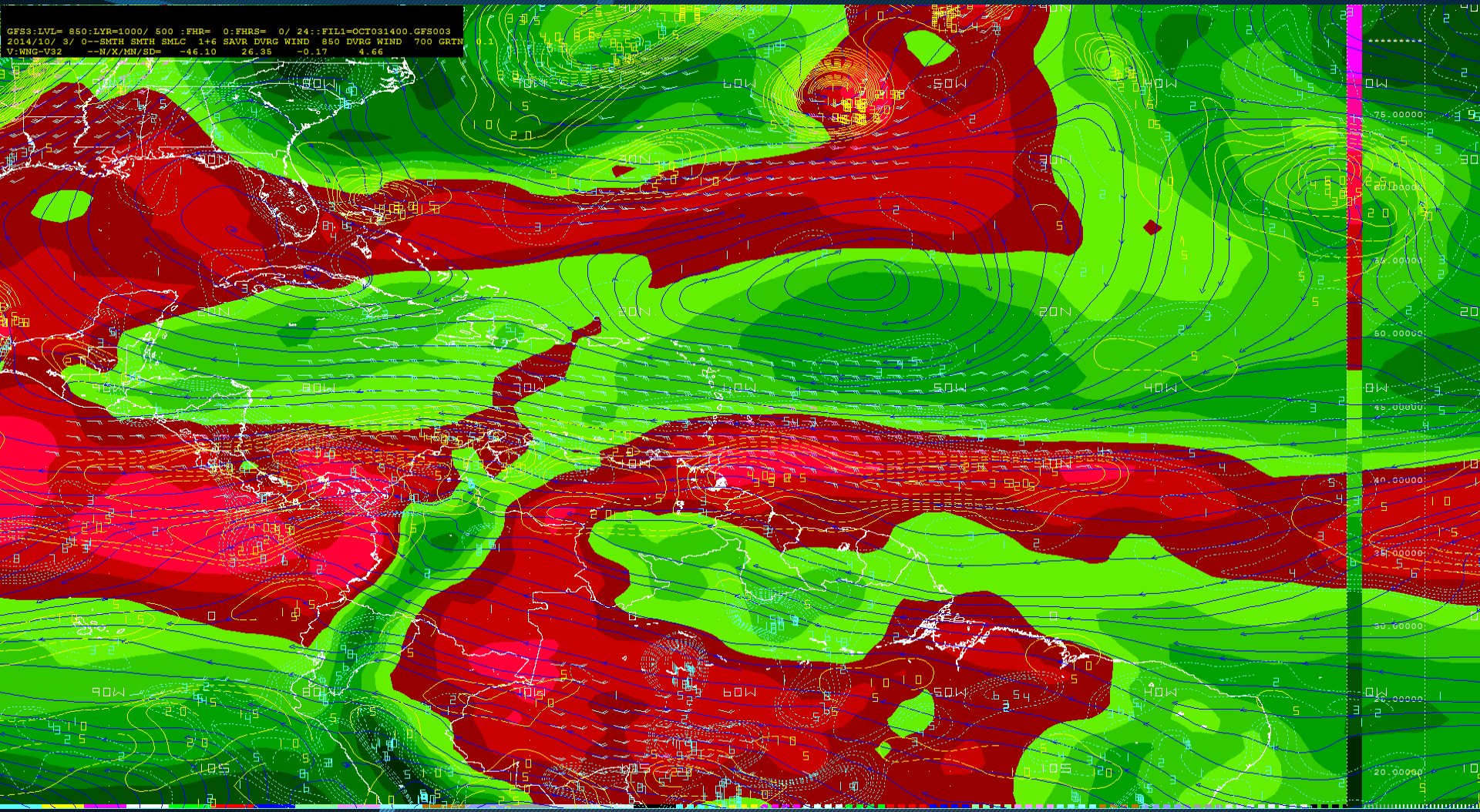
Navy Model Run –

- 0900z September 29

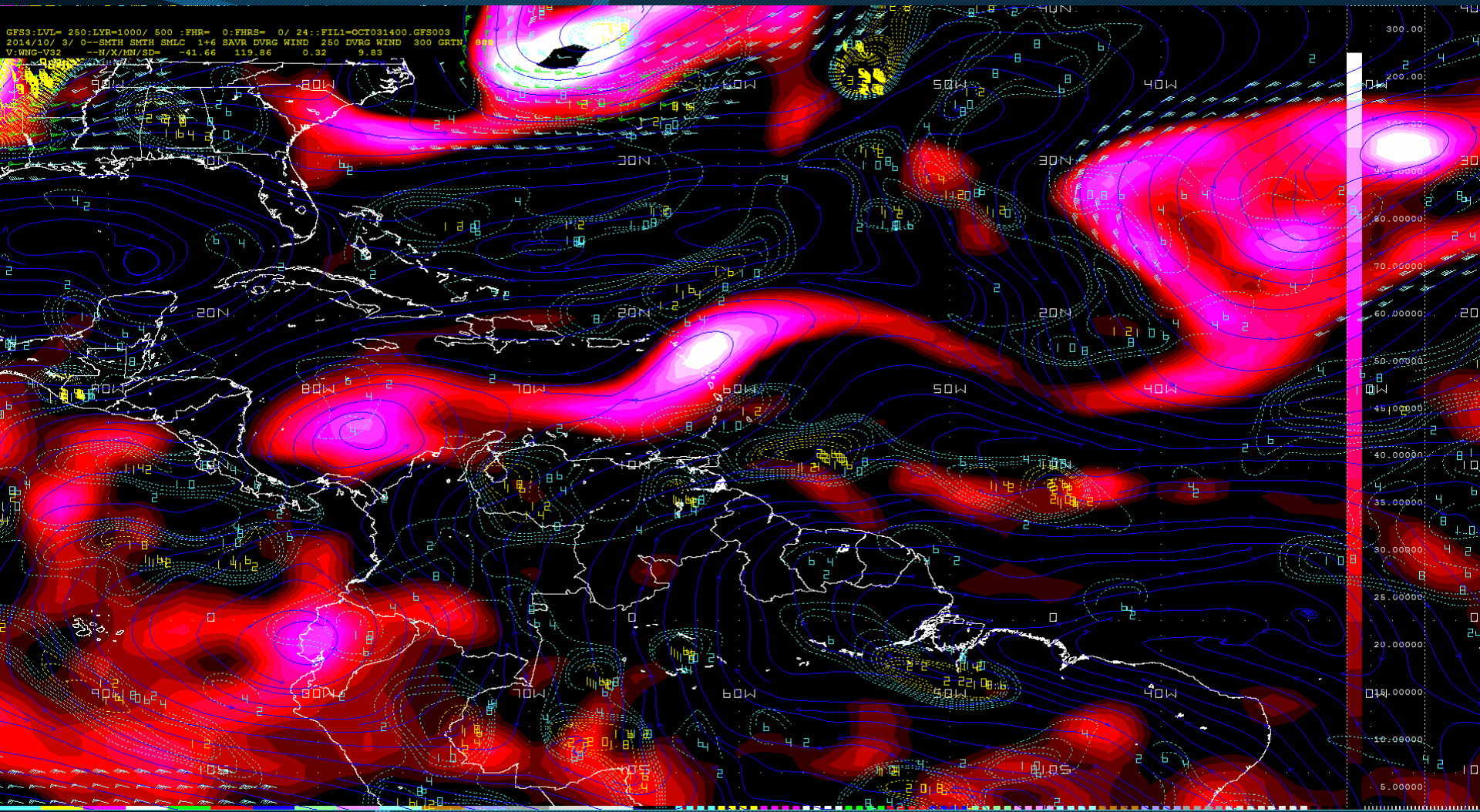
September 30, 2014

"WINGRIDDS Macros

- Tropical Wave
- Upper Level



0000z Tropical/Easterly Wave Model Run – September 30 2014
Parameters displayed: PWAT (shaded green/red); Relative Vorticity (≥0.1 - yellow dots); 850 – 700mb layer streamlines (blue) and divergence (≥ 0.1 - blue dots)



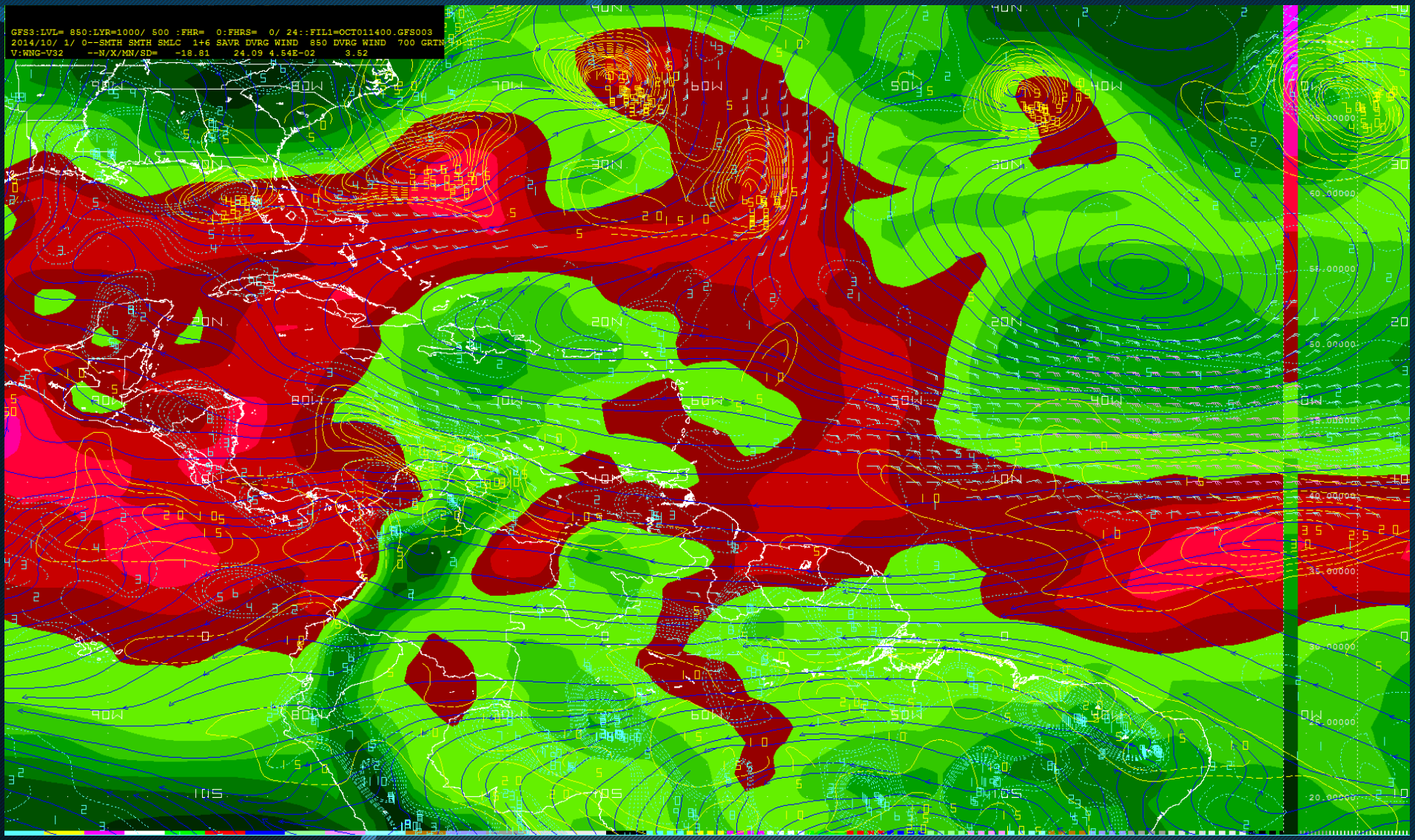
0000z Upper Level Model Run – September 30, 2014

Parameters displayed: Relative Vorticity (shaded red); 250 – 300mb layer streamlines (blue) and divergence (yellow and blue dots)

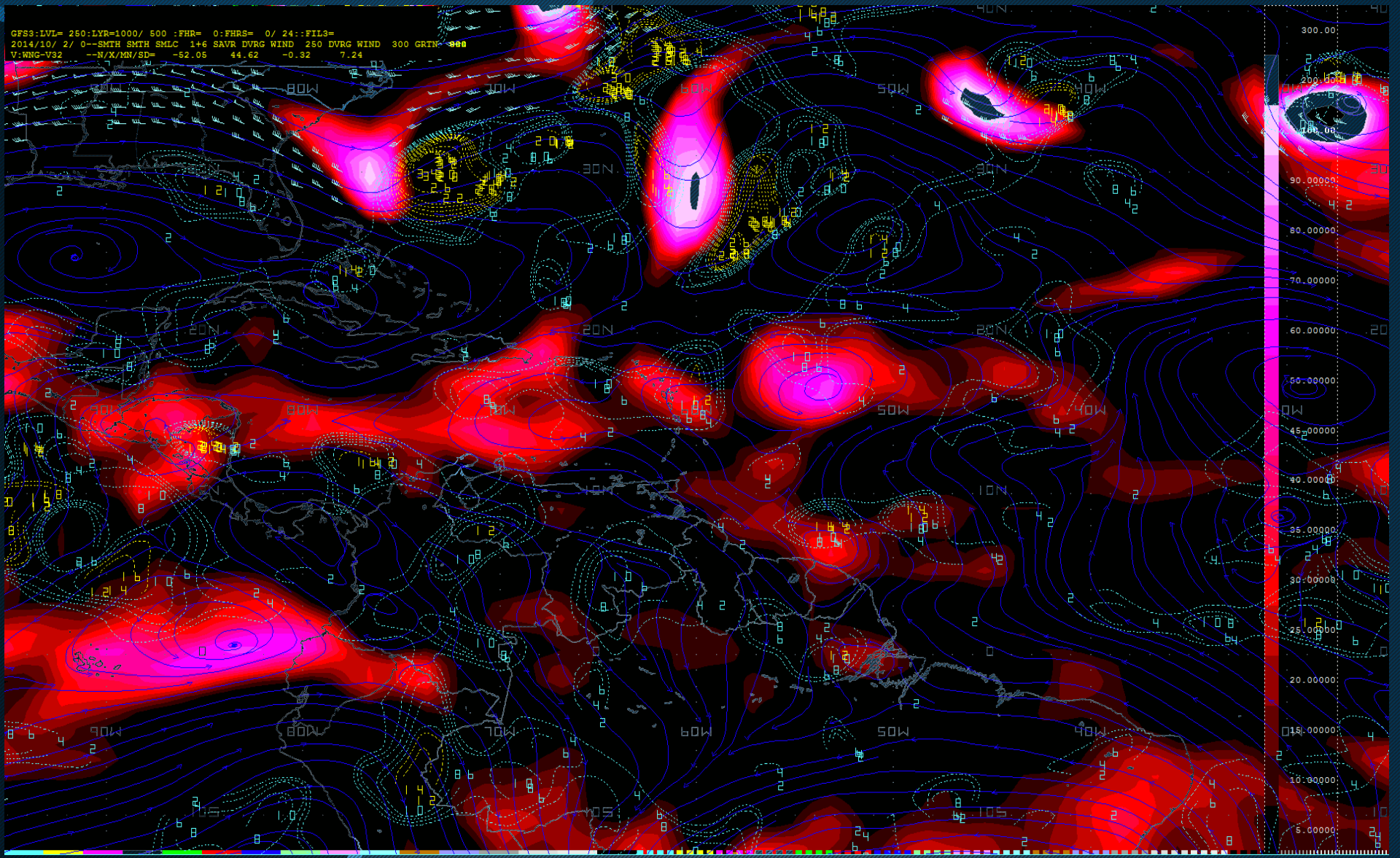
October 1, 2014

"WINGRIDDS Macros

- Tropical Wave
- Upper Level



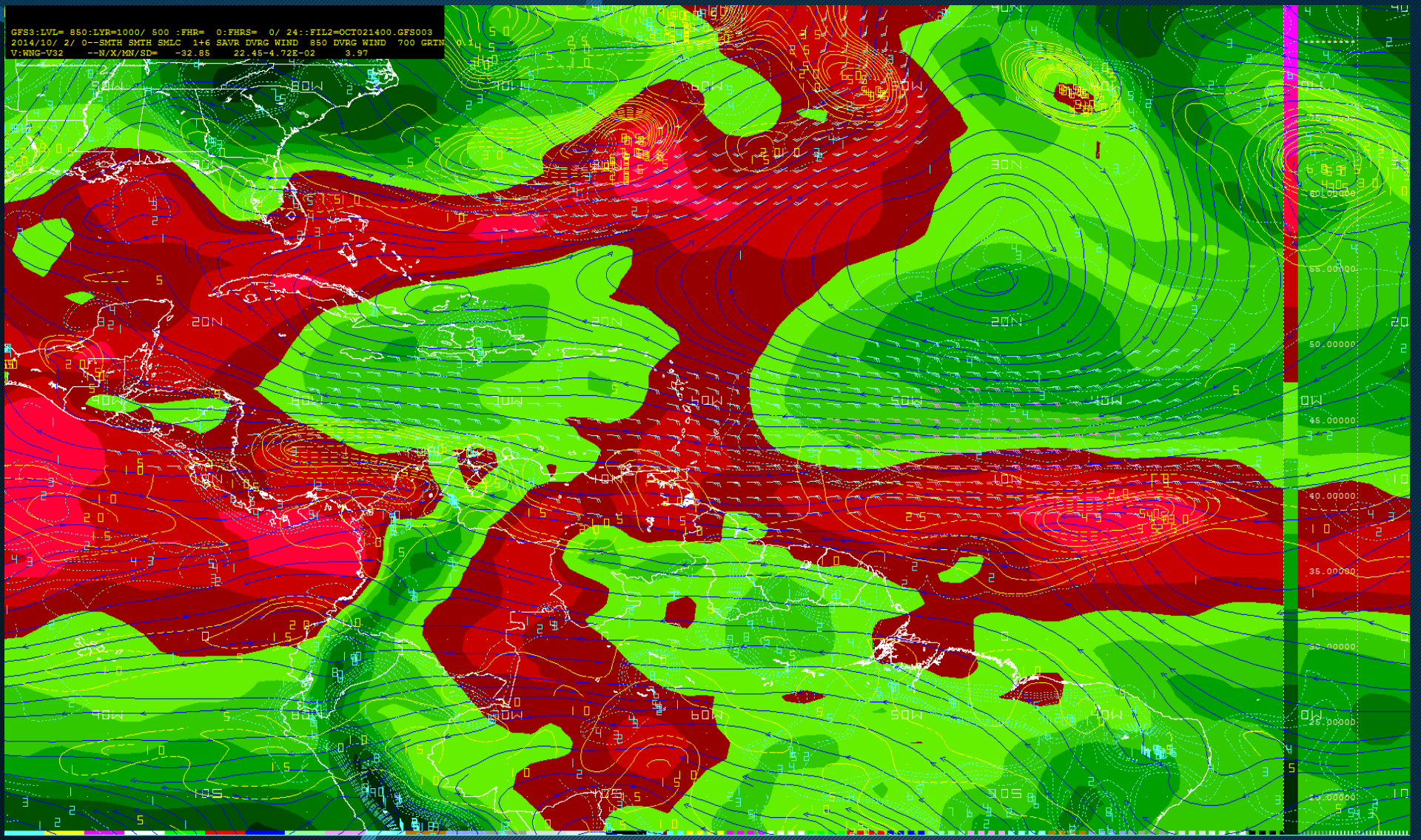
0000z Tropical/Easterly Wave Model Run – October 1, 2014
Parameters displayed: PWAT (shaded green/red); Relative Vorticity (≥0.1 - yellow dots); 850 – 700mb layer streamlines (blue) and divergence (≥ 0.1 - blue dots)



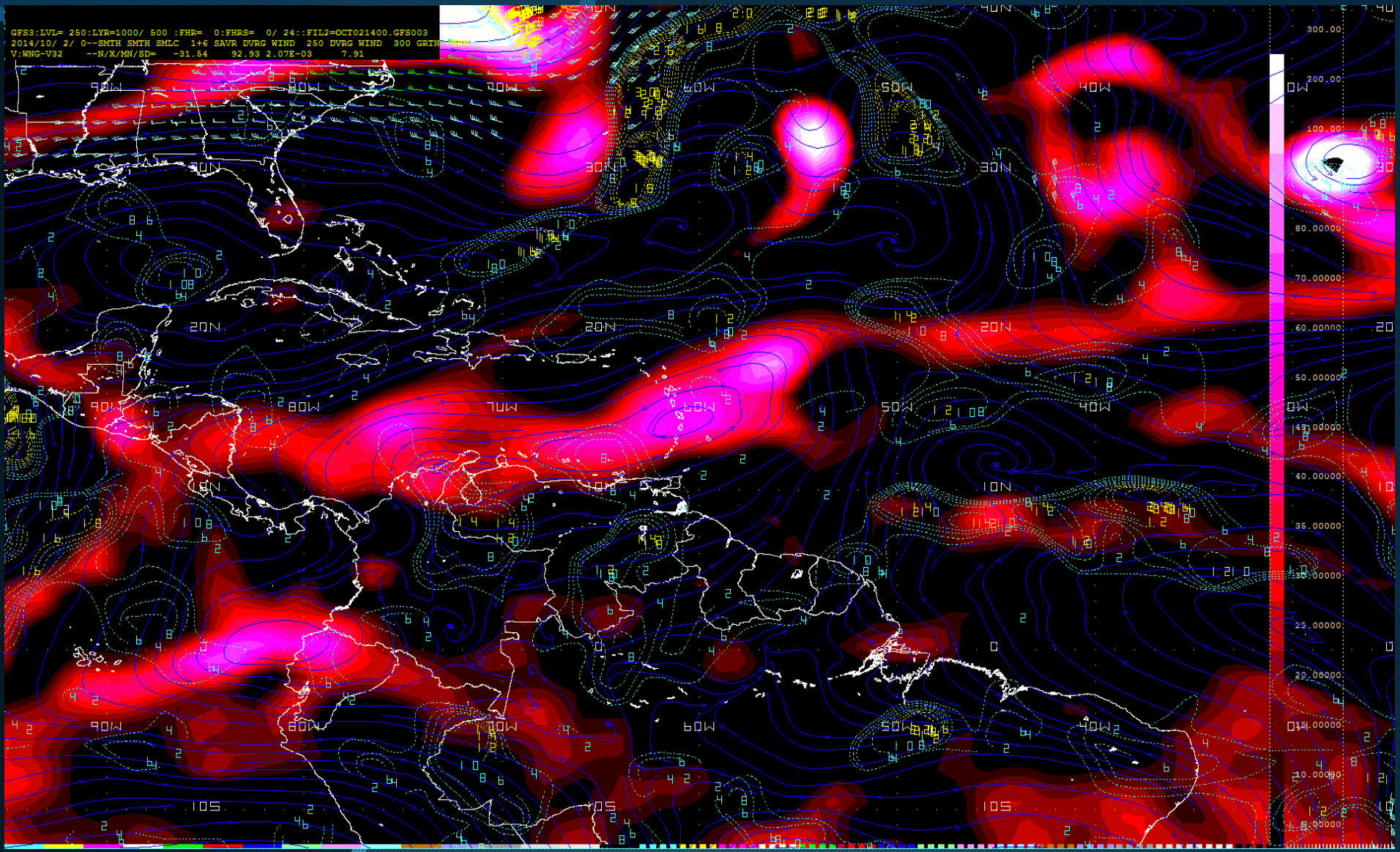
0000z Upper Level Model Run – October 1, 2014

Parameters displayed: Relative Vorticity (shaded red); 250 – 300mb layer streamlines (blue) and divergence (yellow and blue dots)

October 2, 2014



0000z Tropical/Easterly Wave Model Run – October 2, 2014
Parameters displayed: PWAT (shaded green/red); Relative Vorticity (≥0.1 - yellow dots); 850 – 700mb layer streamlines (blue) and divergence (≥ 0.1 - blue dots)



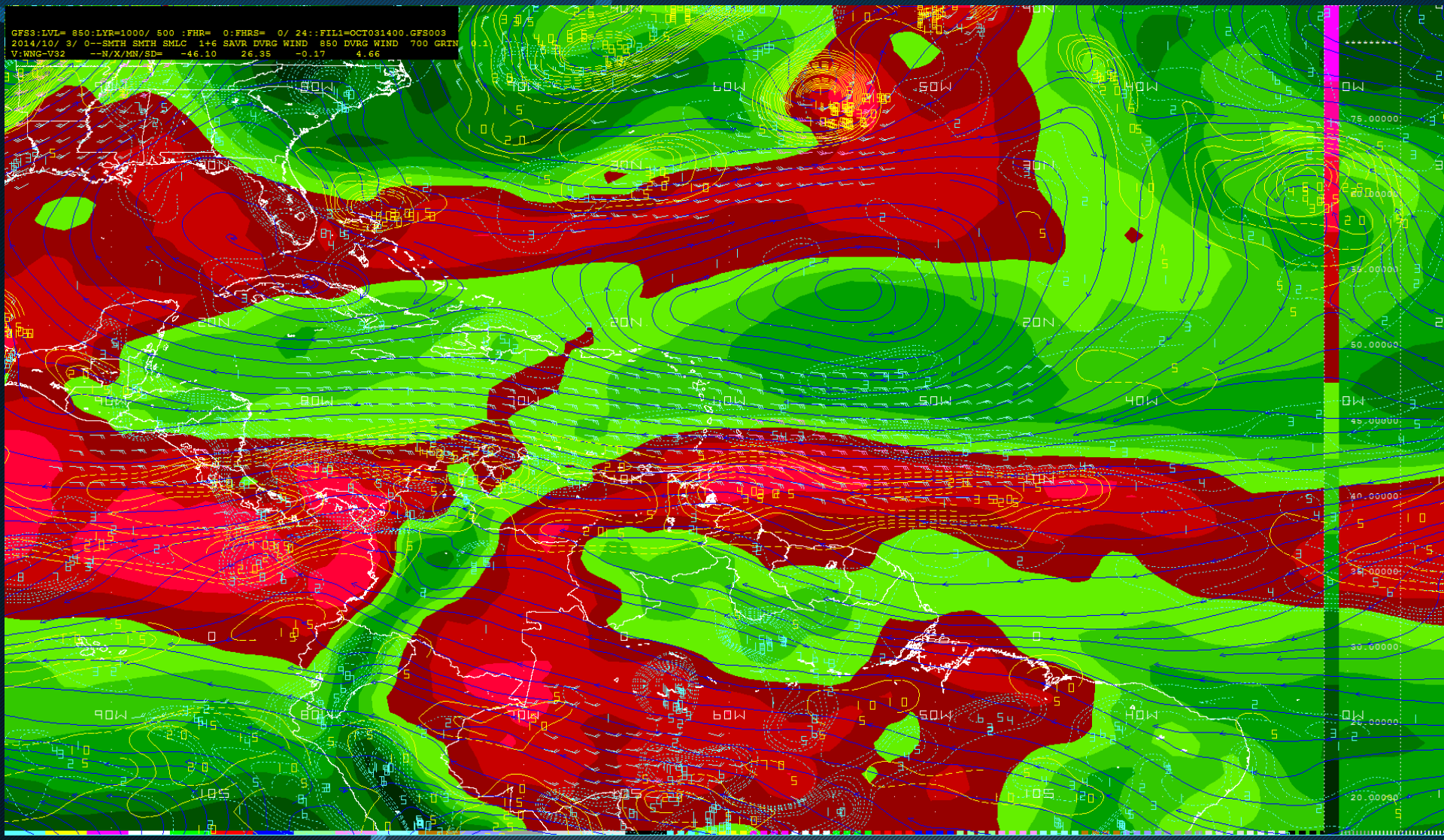
0000z Upper Level Model Run – October 2, 2014

Parameters displayed: Relative Vorticity (shaded red); 250 – 300mb layer streamlines (blue) and divergence (yellow and blue dots)

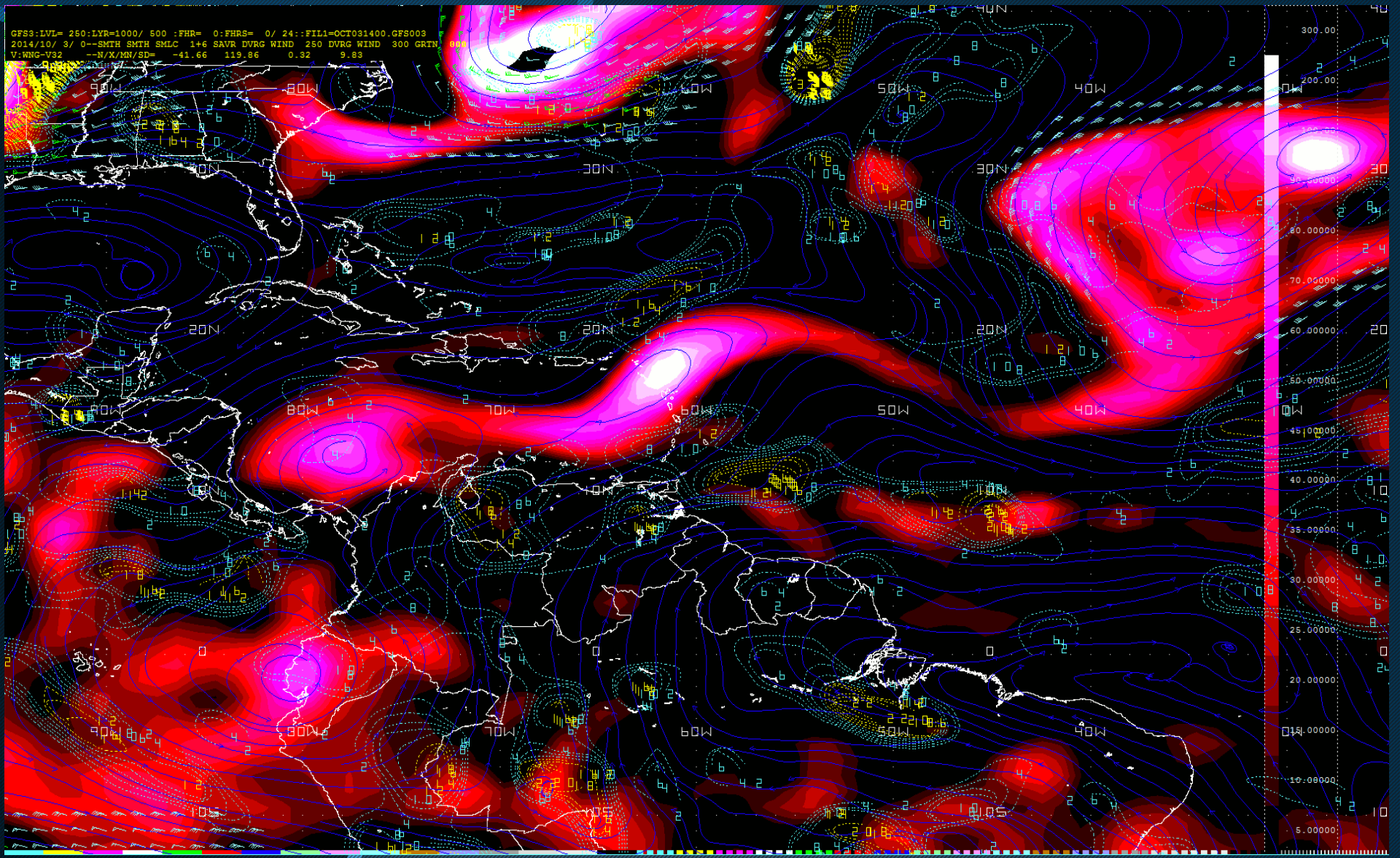
October 3, 2014

"WINGRIDDS Macros

- Tropical Wave
- Upper Level

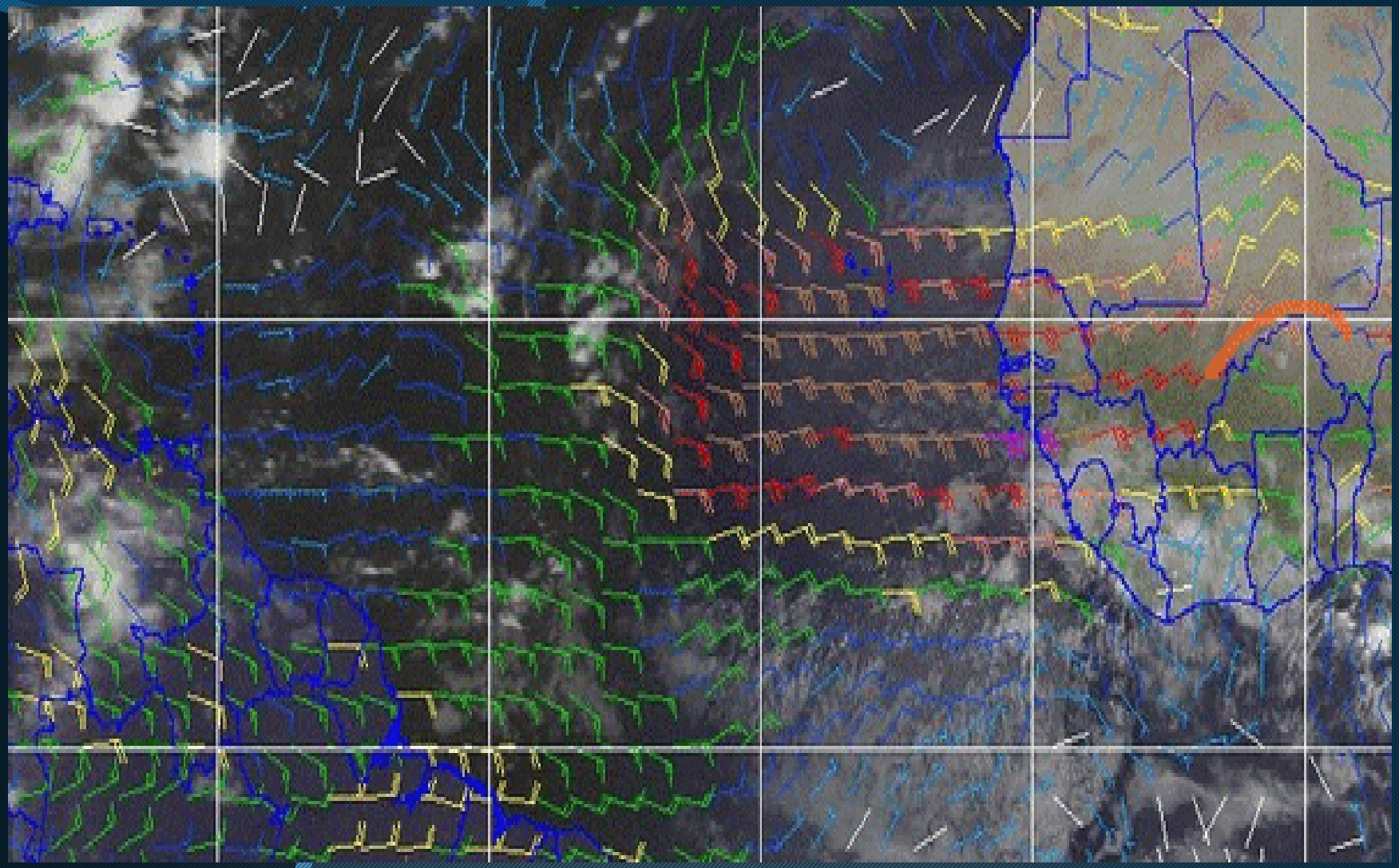


0000z Tropical/Easterly Wave Model Run – October 3, 2014
Parameters displayed: PWAT (shaded green/red); Relative Vorticity (≥0.1 - yellow dots); 850 – 700mb layer streamlines (blue) and divergence (≥ 0.1 - blue dots)



0000z Upper Level Model Run – October 1, 2014

Parameters displayed: Relative Vorticity (shaded red); 250 – 300mb layer streamlines (blue) and divergence (yellow and blue dots)



Satellite and overlay of winds estimated by a navy model– 0900z
September 29, 2014

Findings

- Passage of negatively tilted Tropical Wave – October 2nd, 2014;
- Passage of trough – October 3rd, 2014;
- Trade-wind Surge which assisted in the generation of other perturbations;
- ITCZ modulated by Tropical wave and displaced North and;
- Activity enhanced by meandering/organisation of TUTT

Timeline of Events

0700z – 0800z October 2

- **Passage of Tropical Wave;**
- Wx: Showers and thunderstorms into next hour
- Hourly wind and rainfall:
  - 0600z calm; 0.0mm
  - 0700z 040˚/03kts; 0.7mm
  - **0800z 110˚/30G46kts; 23.8mm**
  - **0900z 100˚/16G29kts; 3.3mm**

0100z – 0700z October 3

- SigWx: Initially vicinity showers becoming moderate thunderstorms at station.
- Hourly wind and rainfall:
  - 0100z 070˚/18G34kts; 1.6mm
  - 0200z 070˚/14G23kts; 0.0mm
  - 0300z 070˚/14G25kts; 0.0mm
  - 0400z 070˚/16G31kts; 0.0mm
  - 0500z 070˚/16G30kts; 1.5mm

0100z – 0700z October 3 (cont'd)

Hourly wind and rainfall:

- 0600z 070˚/16G24kts; 1.5mm
- 0700z 060˚/10G22kts; 7.4mm
- Rainfall: 15.2mm

1900z October 3 – 0000z October 4

- **Wx: Heavy showers and isolated thunderstorms to continuous rain**
- **Hourly wind and rainfall:**
  - **1900z 090˚/14kts; 0.4mm**
  - **2000z 180˚/14G25kts; 49.5mm**
  - **2100z 130˚/08G21kts; 17.4mm**
  - **2200z 090˚/10kts; 3.5mm**
  - **2300z 090˚/10kts; 3.8mm**

1900z October 3 – 0000z October 4

- **Hourly wind and rainfall**
  - **0000z 080˚/11kts; 5.9mm**
- **6hr Rainfall: 80.5mm**
- **24hr total: 100.5mm**

Impacts

- Aviation
  - Suspension of flights between 1900Z Oct 3 – 0000z October 4 and;
  - 7 domestic flights delayed; no cancellations.

Impacts cont'd

"Public

20z October 3 – 22z October 4

- 4 cases of flooding (commercial and residential);
- 9 cases of landslides (roads blockages and fallen trees) and;
- 4 cases of roofs being blown off

End

- Thank you for paying attention.
- If your questions are hard and/or convoluted, you can save your questions for after the break. (That's a serious joke…haha)

End

“Questions?

“(You can really ask them now)

Glossary

- Tropical Wave Definition: Perturbation in the easterlies which originate over Africa as a result of interactions of convective activity in Ethiopia and the African Easterly Jet.
- Tropical Upper Tropospheric Trough (T.U.T.T): An upper atmospheric trough that enhances convection in the tropics. They tend to separate the subtropical ridge from the sub-equatorial ridge.

Glossary (cont'd)

- Easterly Wave: perturbation in the easterlies. Does not originate over the African continent.
- Trade-wind Surge: a marked increase in the speed of the trade winds

Glossary (cont'd)

- Inter-Tropical Convergence Zone (ITCZ):

  An area of convergence extending from west Africa, where the northeast and southeast trades converge.