Factual Report – Attachment 1

Meteorological analysis provided by the National Weather Service Weather Forecast Office in Houston/Galveston, Texas.

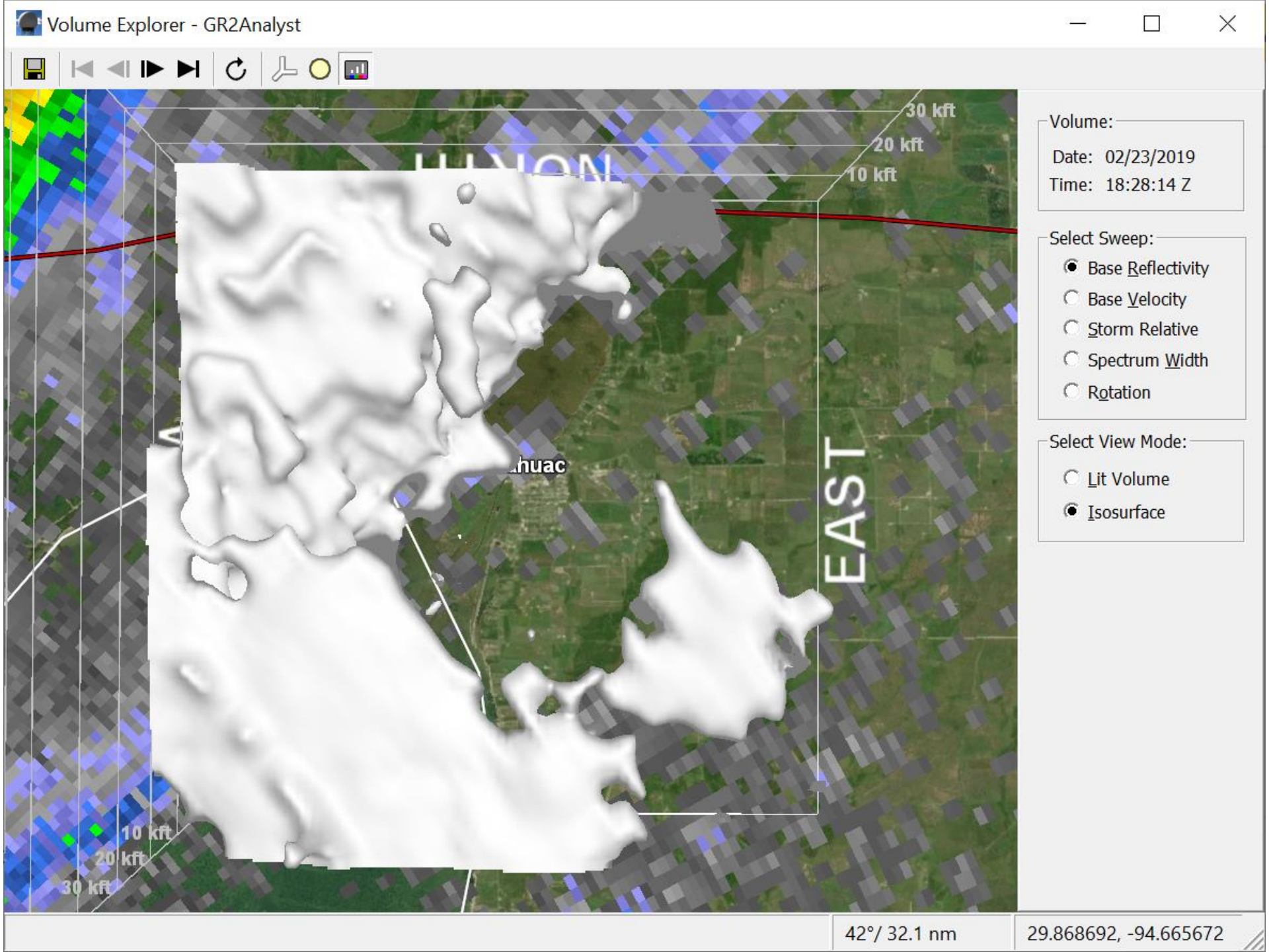
METEOROLOGY

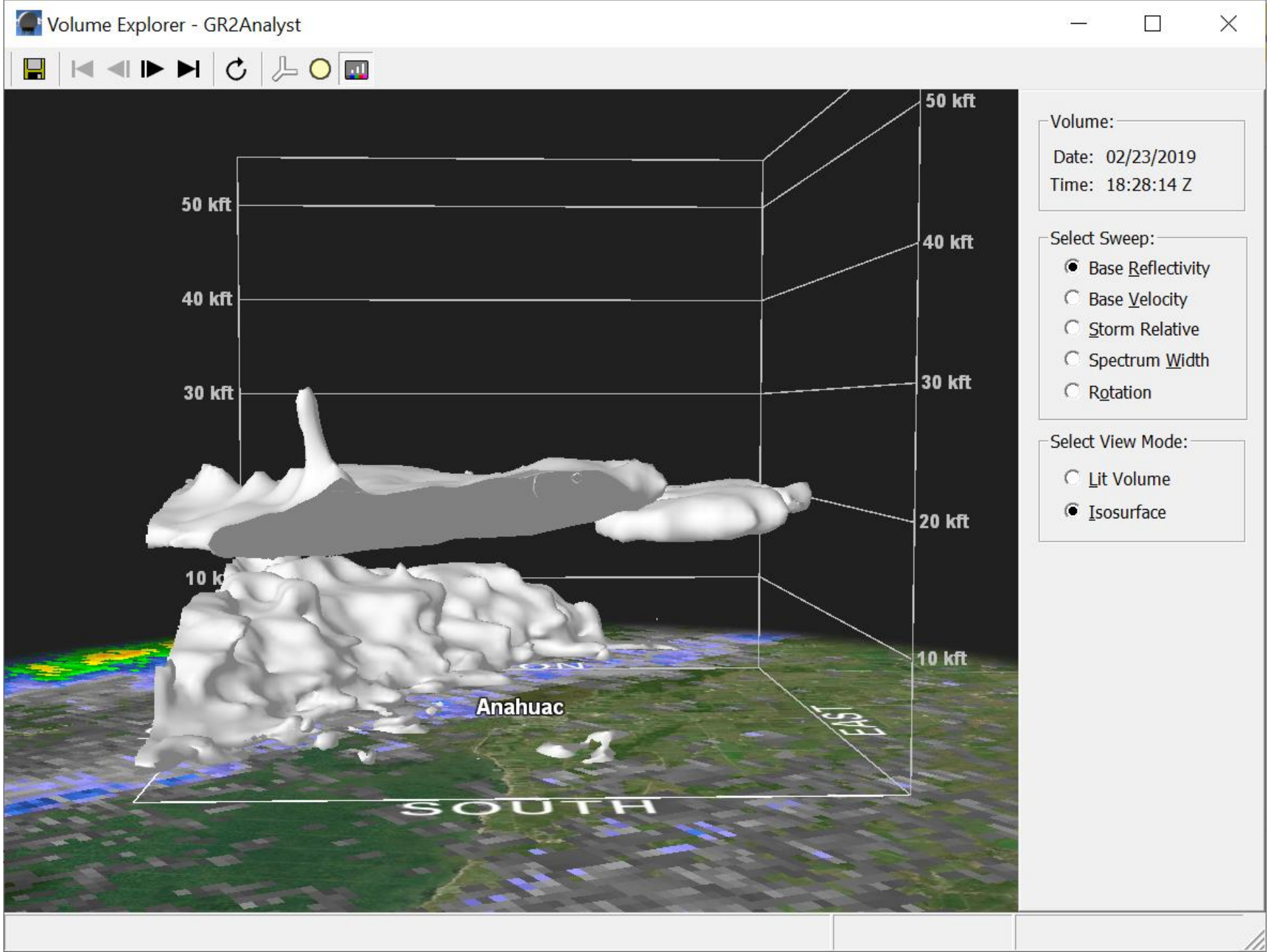
DCA19MA086

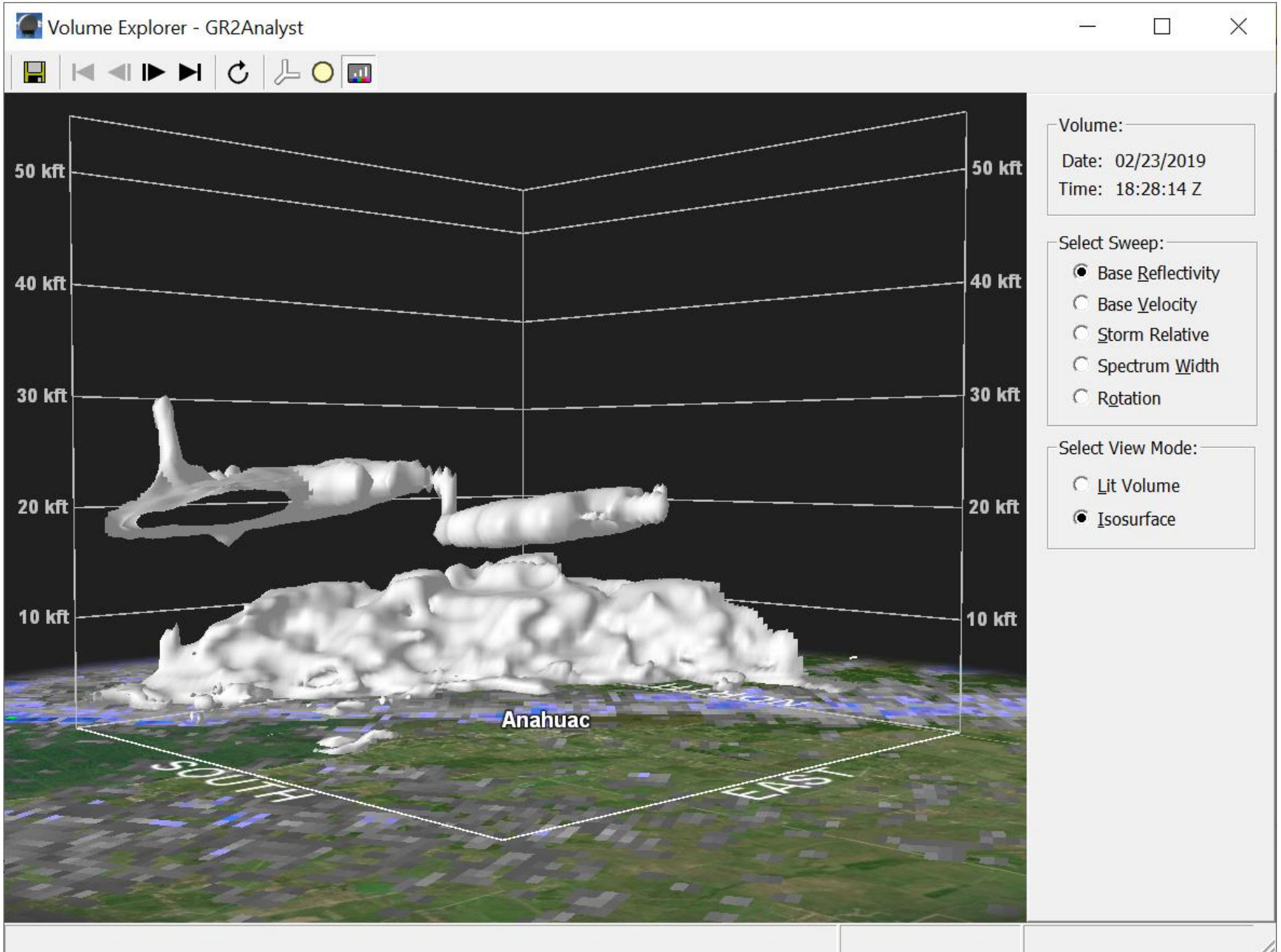
Submitted by: Mike Richards
NTSB, AS-30

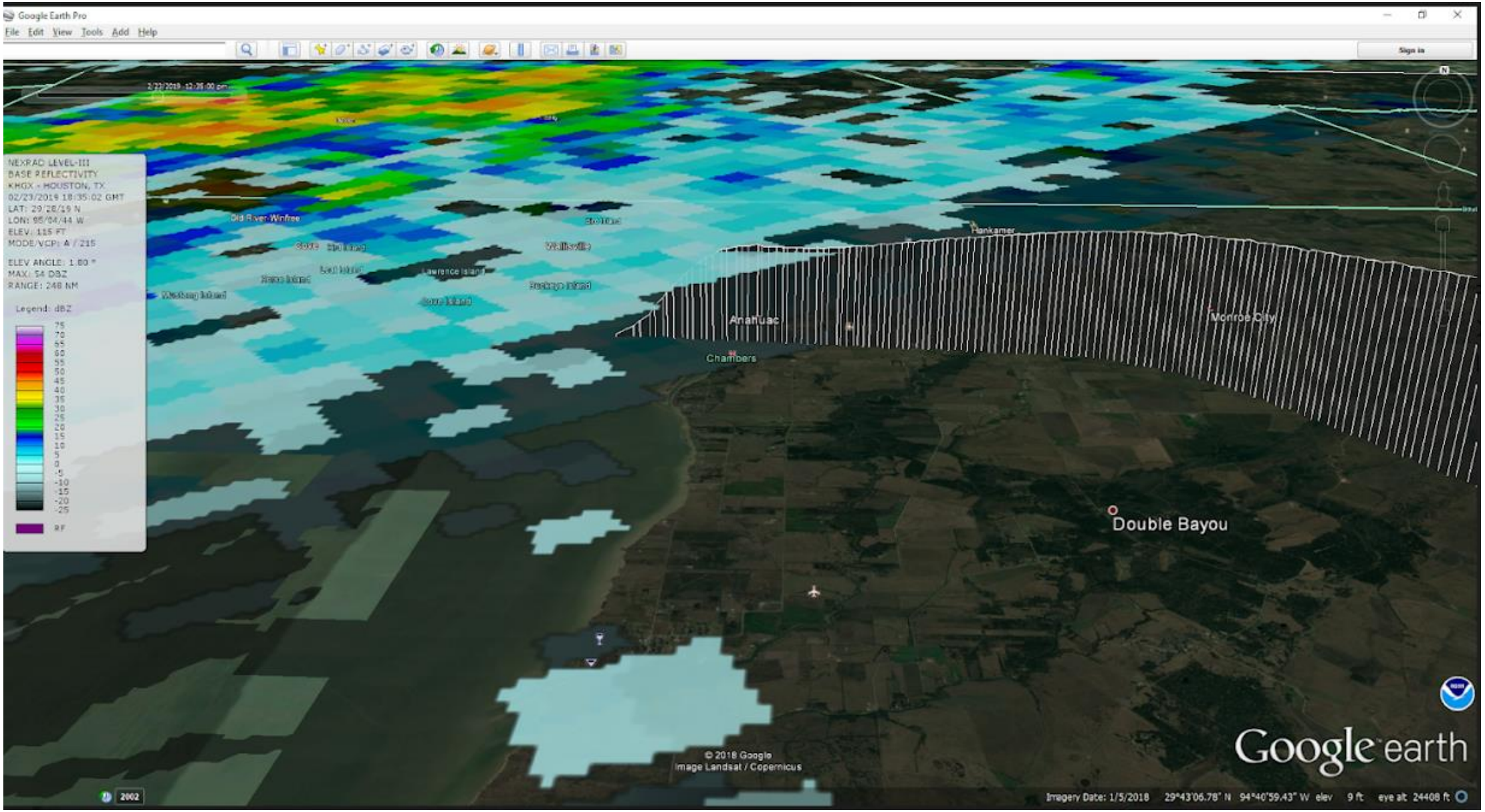
Using an isosurface of -10 dBZ reflectivity, which is as low as we can use. This should correspond fairly well to cloud cover.

This is the volume scan (1828Z) before the aircraft reaches the Anahuac area.

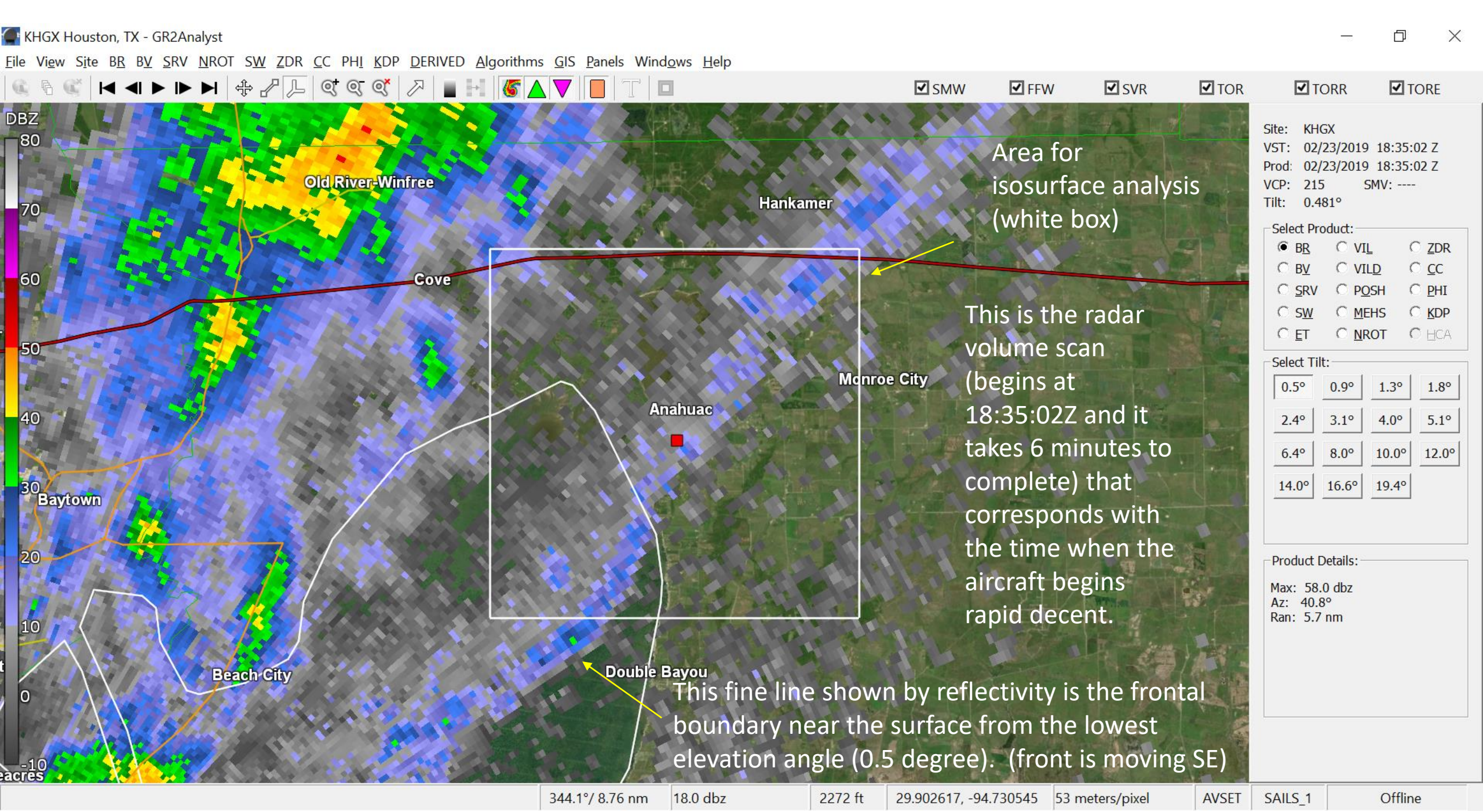


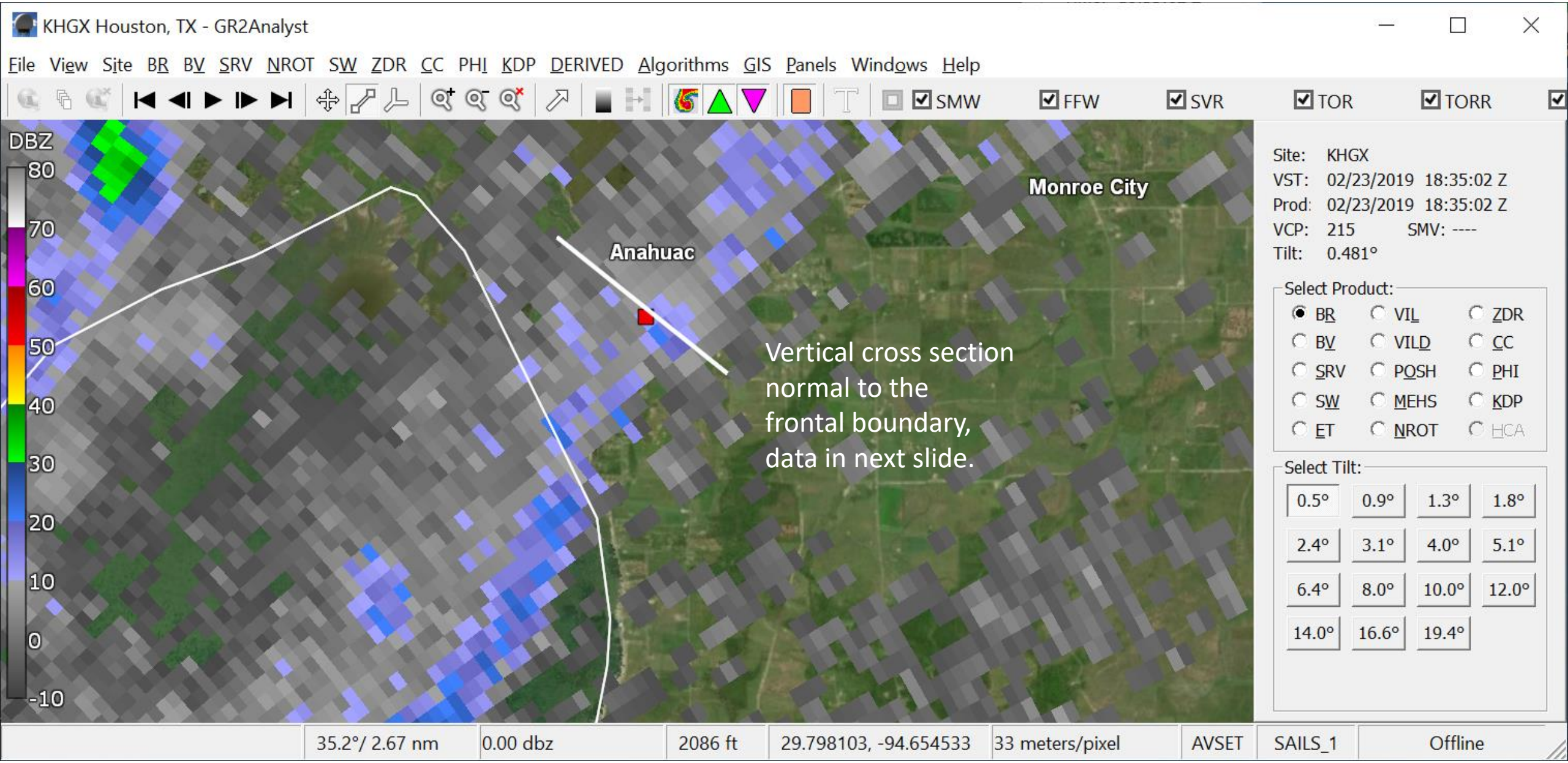

Volume Explorer - GR2Analyst
50 kft
40 kft
30 kft
20 kft
10 kft
Anahuac
SOUTH
EAST
Volume:
Date: 02/23/2019
Time: 18:28:14 Z
Select Sweep:
Base Reflectivity
Base Velocity
Storm Relative
Spectrum Width
Rotation
Select View Mode:
Lit Volume
Isosurface

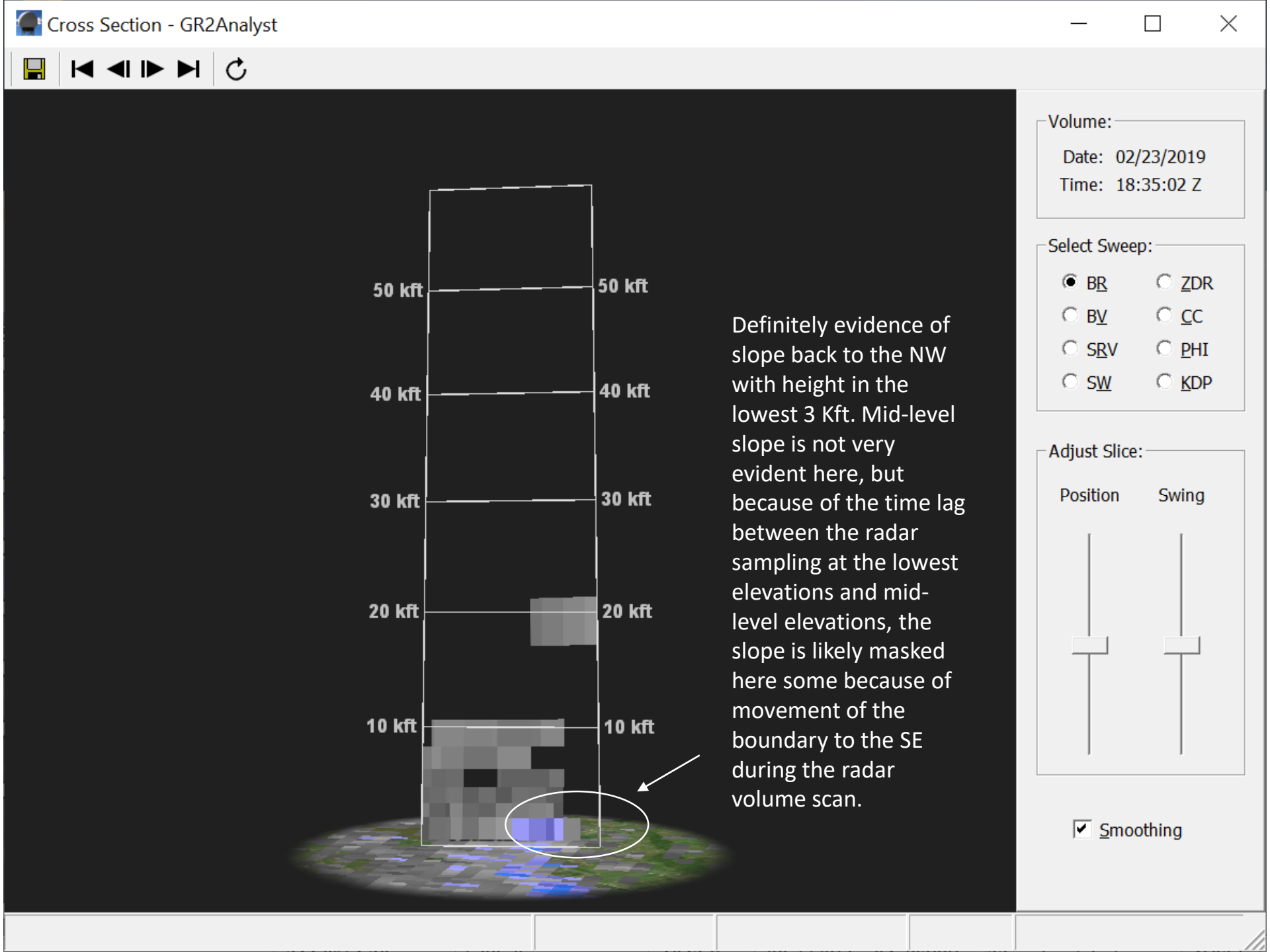

Volume Explorer - GR2Analyst
50 kft
40 kft
30 kft
20 kft
10 kft
Anahuac
SOUTH
EAST
Volume:
Date: 02/23/2019
Time: 18:28:14 Z
Select Sweep:
Base Reflectivity
Base Velocity
Storm Relative
Spectrum Width
Rotation
Select View Mode:
Lit Volume
Isosurface

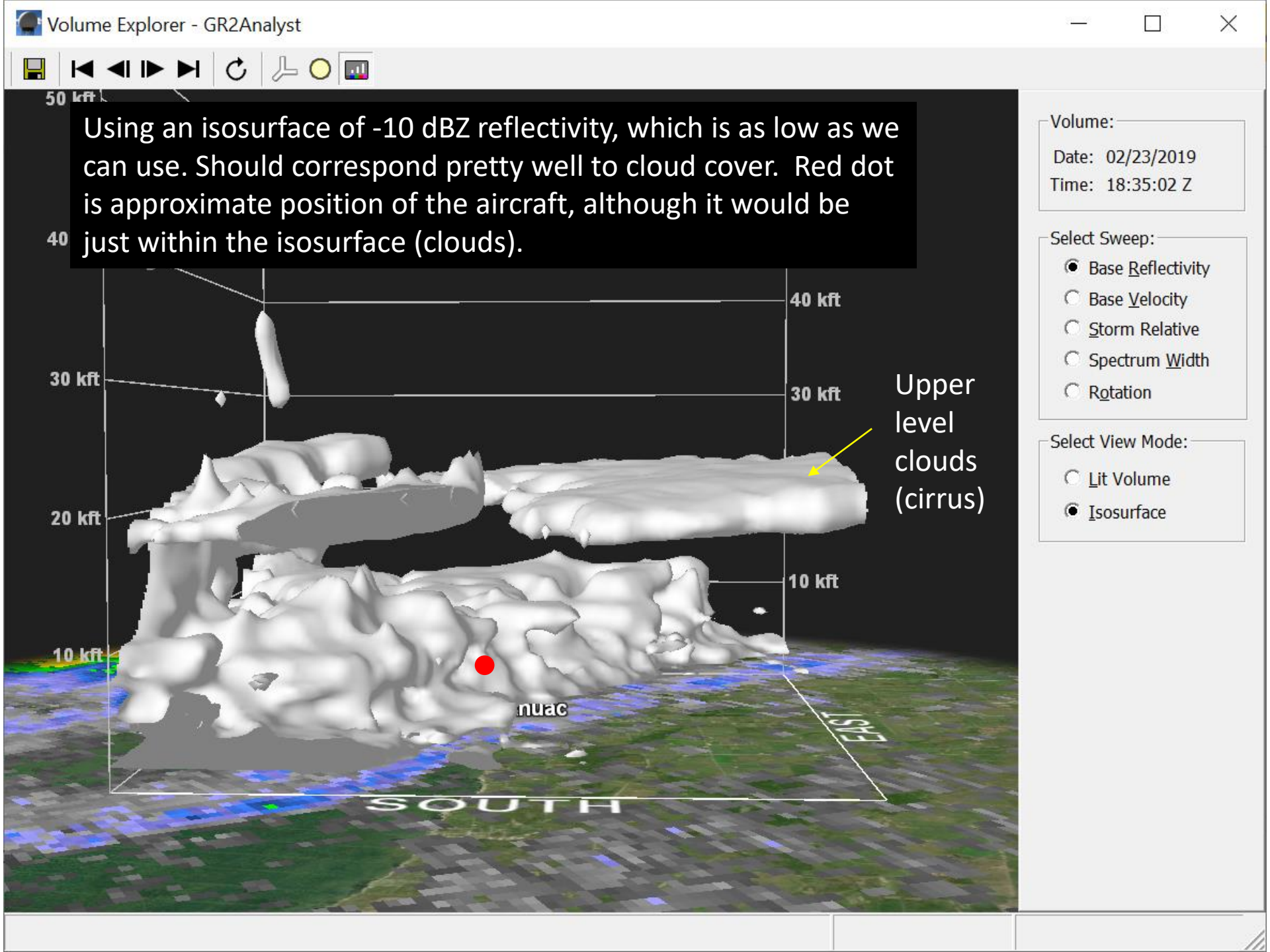


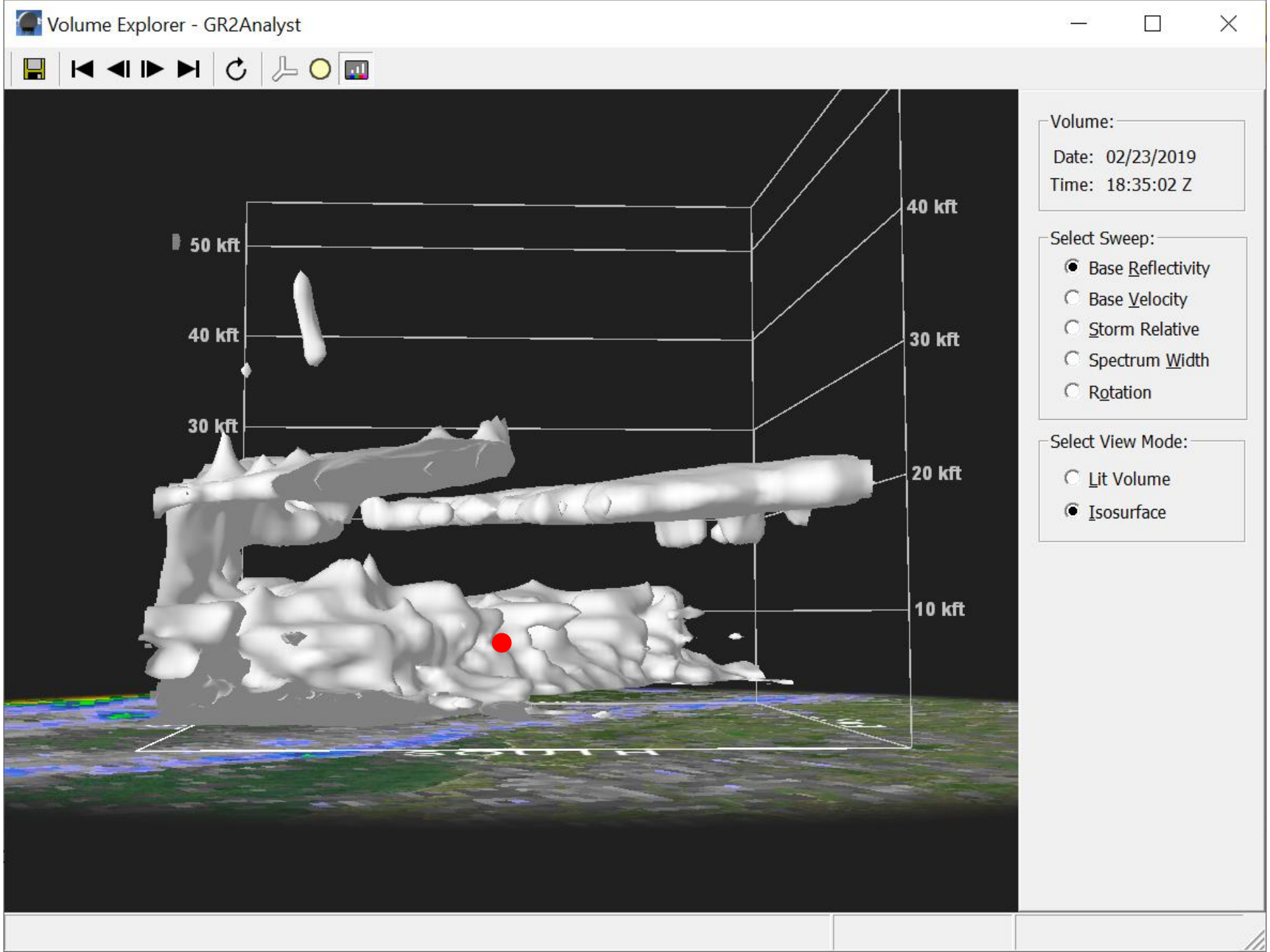
This is the 1.8 degree KHGX reflectivity from the 1835 UTC volume scan (the next volume scan) image in Google Earth with your flight path.
The product time for this reflectivity product within the 1835 UTC volume scan is 18:38:07.
It looks like the rapid decent that began around 6 KFT is very close to the onset of the 0-5 dBZ reflectivity edge, which is likely near the edge of the shelf cloud at about 6 KFT.

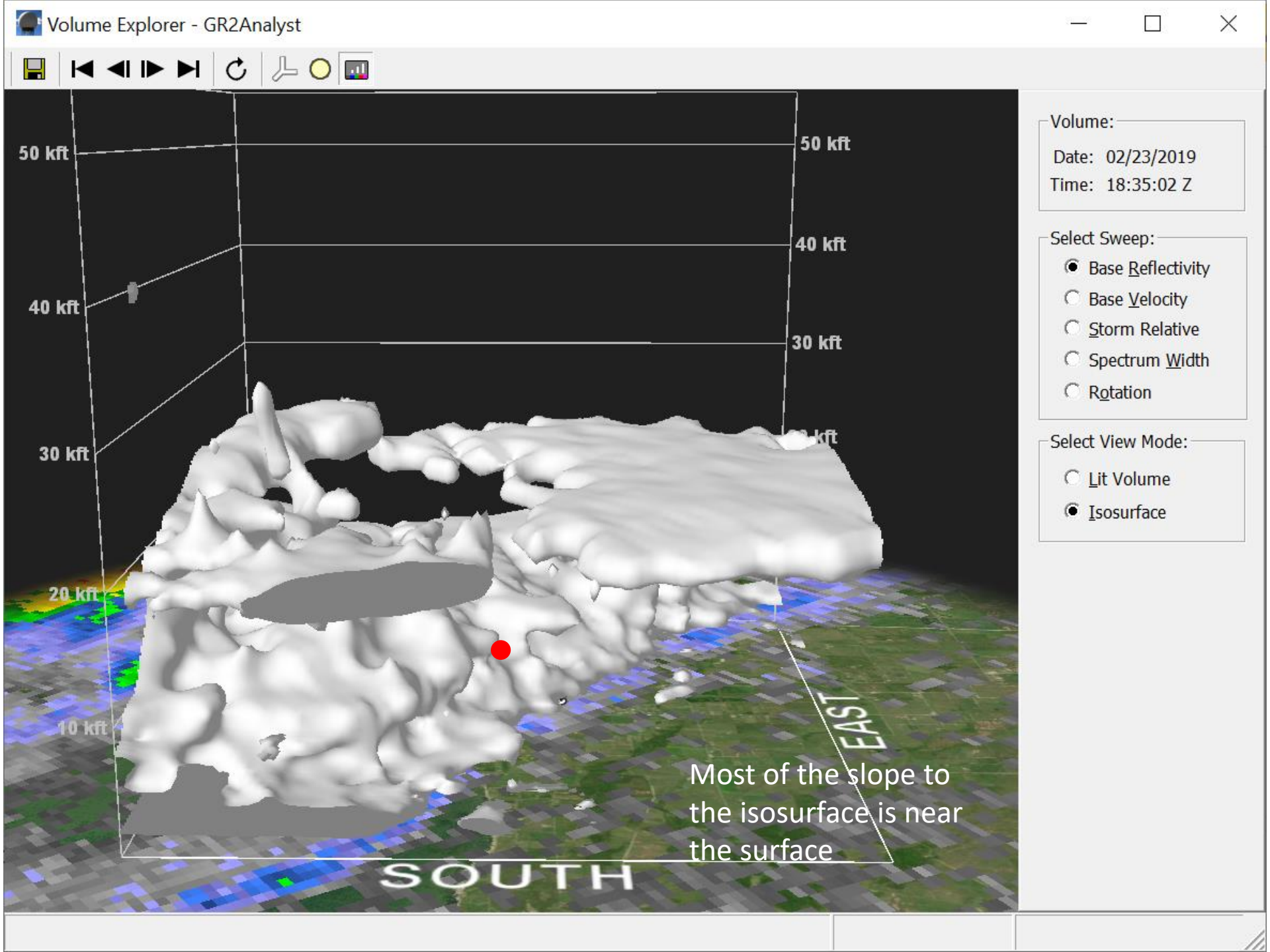

KHGX Houston, TX - GR2Analyst
File View Site BR BV SRV NROT SW ZDR CC PHI KDP DERIVED Algorithms GIS Panels Windows Help
SMW FFW SVR TOR TORR TORE
DBZ
80
70
60
50
40
30
20
10
0
-10
Old River-Winfree
Hankamer
Cove
Monroe City
Anahuac
Baytown
Beach City
Double Bayou
Area for isosurface analysis (white box)
This is the radar volume scan (begins at 18:35:02Z and it takes 6 minutes to complete) that corresponds with the time when the aircraft begins rapid decent.
This fine line shown by reflectivity is the frontal boundary near the surface from the lowest elevation angle (0.5 degree). (front is moving SE)
Site: KHGX
VST: 02/23/2019 18:35:02 Z
Prod: 02/23/2019 18:35:02 Z
VCP: 215 SMV: ----
Tilt: 0.481°
Select Product:
BR VIL ZDR
BV VILD CC
SRV POSH PHI
SW MEHS KDP
ET NROT HCA
Select Tilt:
0.5° 0.9° 1.3° 1.8°
2.4° 3.1° 4.0° 5.1°
6.4° 8.0° 10.0° 12.0°
14.0° 16.6° 19.4°
Product Details:
Max: 58.0 dbz
Az: 40.8°
Ran: 5.7 nm
344.1°/ 8.76 nm
18.0 dbz
2272 ft
29.902617, -94.730545
53 meters/pixel
AVSET
SAILS_1
Offline

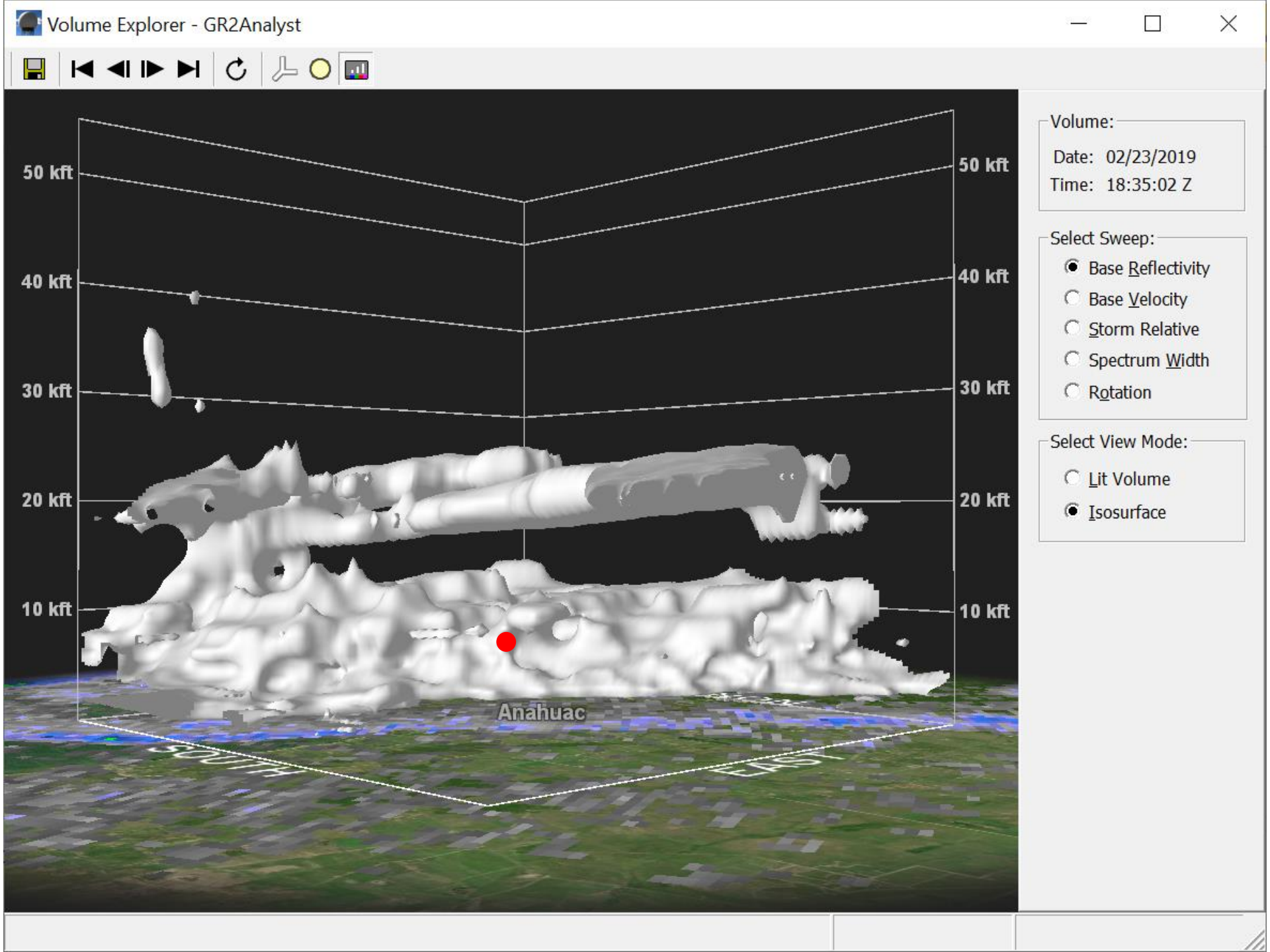

KHGX Houston, TX - GR2Analyst
File View Site BR BV SRV NROT SW ZDR CC PHI KDP DERIVED Algorithms GIS Panels Windows Help
SMW FFW SVR TOR TORR
DBZ
80
70
60
50
40
30
20
10
0
-10
Monroe City
Anahuac
Vertical cross section normal to the frontal boundary, data in next slide.
Site: KHGX
VST: 02/23/2019 18:35:02 Z
Prod: 02/23/2019 18:35:02 Z
VCP: 215 SMV: ----
Tilt: 0.481°
Select Product:
BR VIL ZDR
BV VILD CC
SRV POSH PHI
SW MEHS KDP
ET NROT HCA
Select Tilt:
0.5° 0.9° 1.3° 1.8°
2.4° 3.1° 4.0° 5.1°
6.4° 8.0° 10.0° 12.0°
14.0° 16.6° 19.4°
35.2°/ 2.67 nm
0.00 dbz
2086 ft
29.798103, -94.654533
33 meters/pixel
AVSET
SAILS_1
Offline

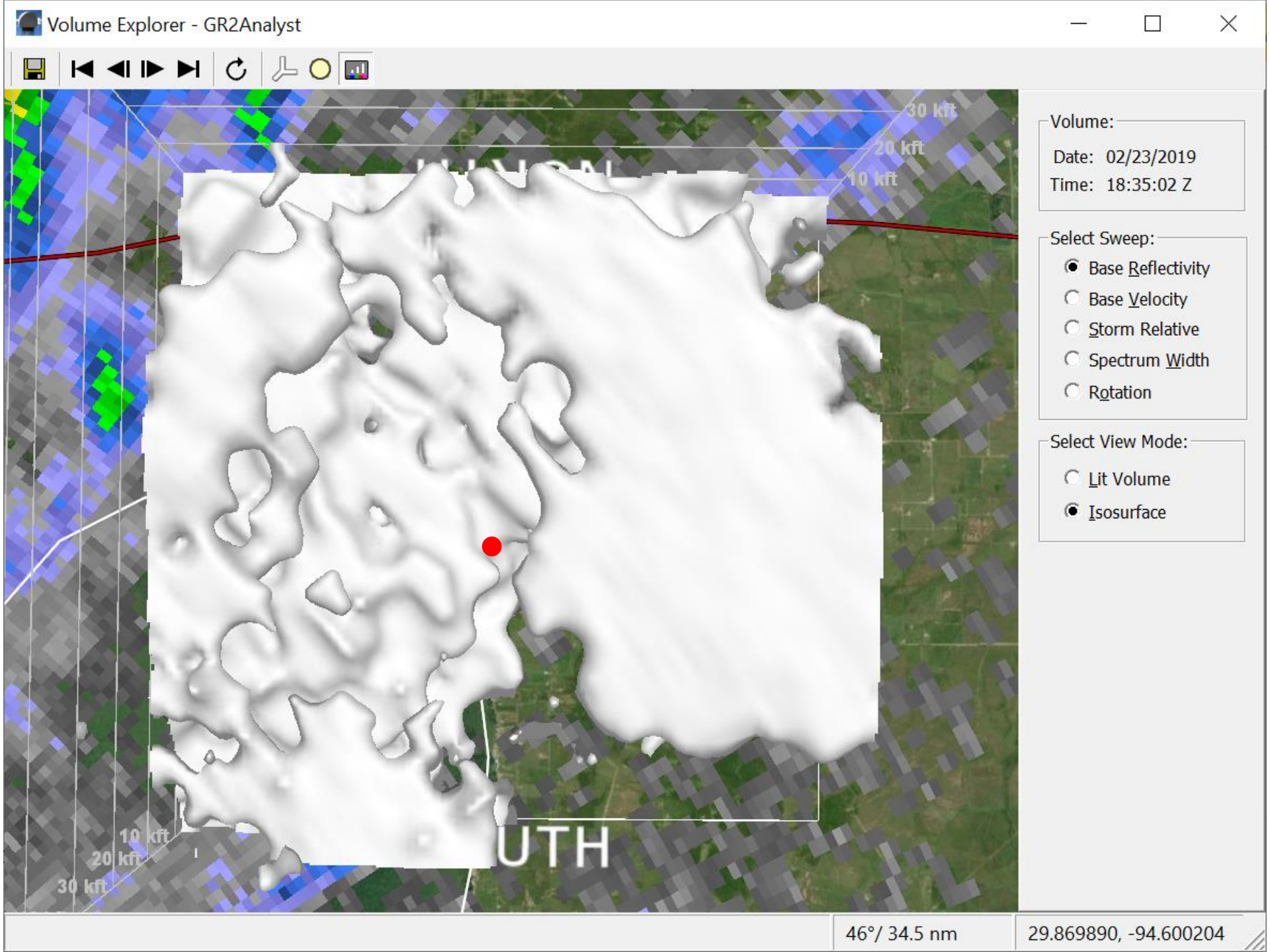

Cross Section - GR2Analyst
50 kft
50 kft
40 kft
40 kft
30 kft
30 kft
20 kft
20 kft
10 kft
10 kft
Definitely evidence of slope back to the NW with height in the lowest 3 Kft. Mid-level slope is not very evident here, but because of the time lag between the radar sampling at the lowest elevations and mid-level elevations, the slope is likely masked here some because of movement of the boundary to the SE during the radar volume scan.
Volume:
Date: 02/23/2019
Time: 18:35:02 Z
Select Sweep:
BR
ZDR
BV
CC
SRV
PHI
SW
KDP
Adjust Slice:
Position
Swing
Smoothing

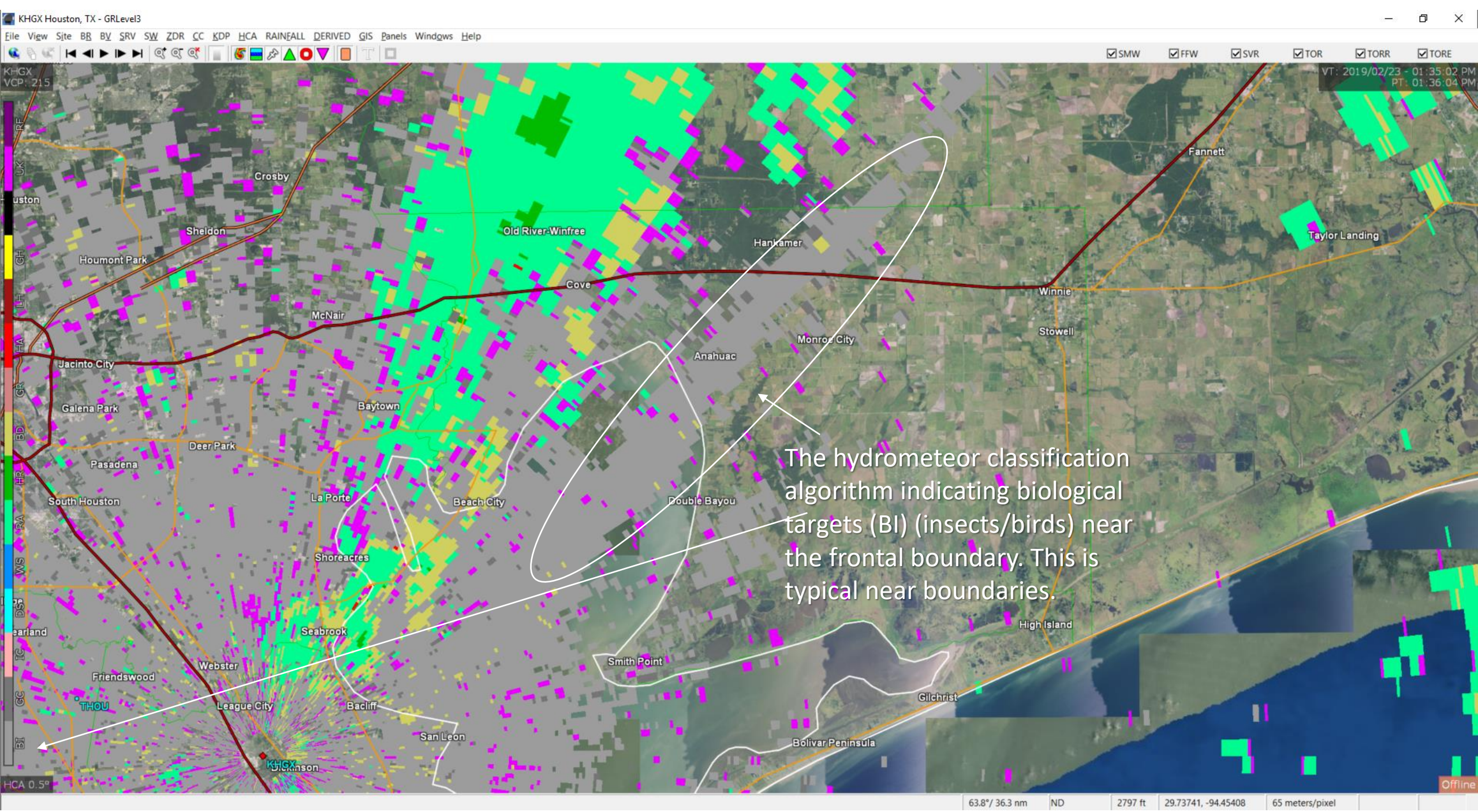

Volume Explorer - GR2Analyst
Using an isosurface of -10 dBZ reflectivity, which is as low as we can use. Should correspond pretty well to cloud cover. Red dot is approximate position of the aircraft, although it would be just within the isosurface (clouds).
50 kft
40
40 kft
30 kft
30 kft
20 kft
10 kft
10 kft
Upper level clouds (cirrus)
nuac
SOUTH
EAST
Volume:
Date: 02/23/2019
Time: 18:35:02 Z
Select Sweep:
Base Reflectivity
Base Velocity
Storm Relative
Spectrum Width
Rotation
Select View Mode:
Lit Volume
Isosurface

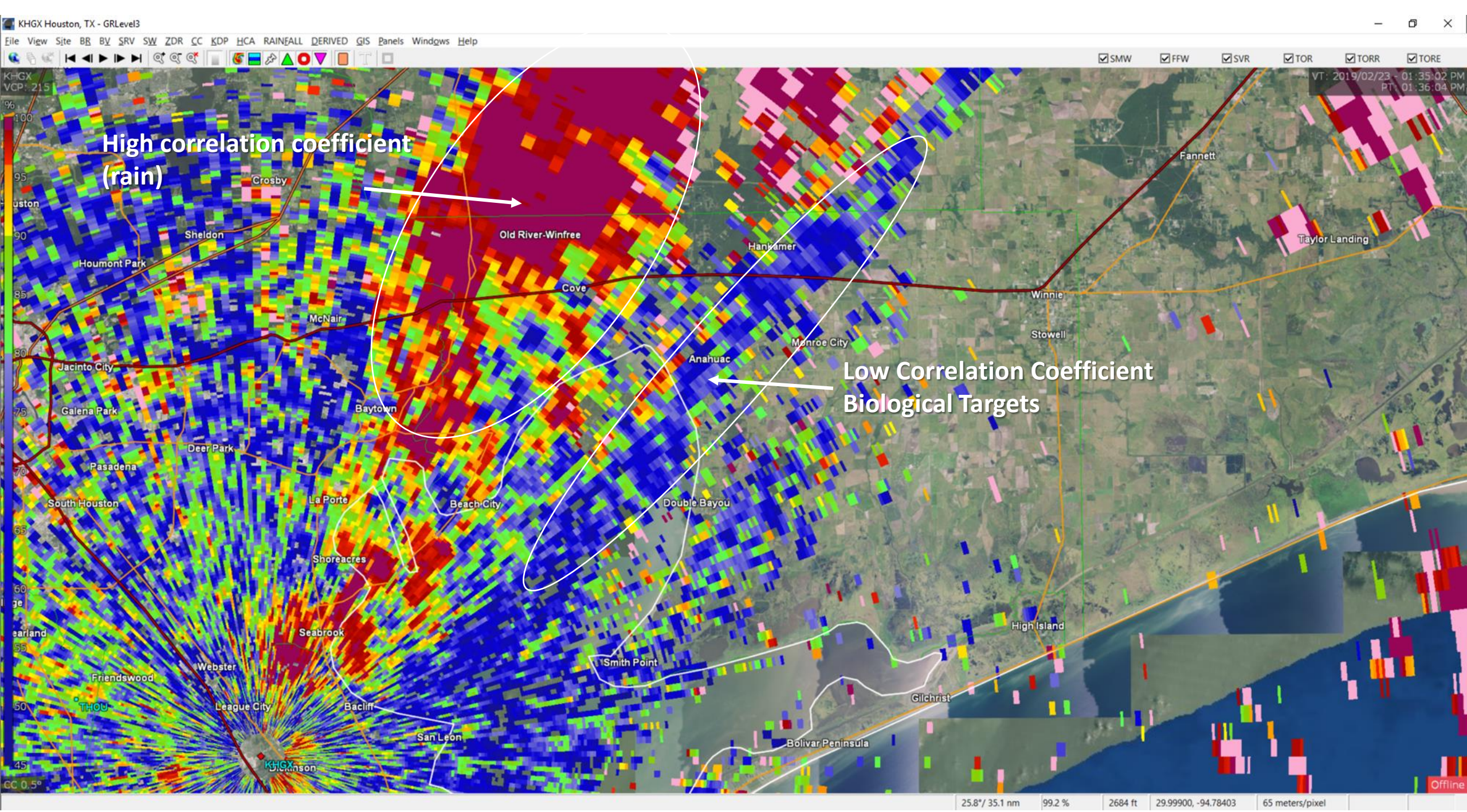

Volume Explorer - GR2Analyst
50 kft
40 kft
30 kft
40 kft
30 kft
20 kft
10 kft
Volume:
Date: 02/23/2019
Time: 18:35:02 Z
Select Sweep:
Base Reflectivity
Base Velocity
Storm Relative
Spectrum Width
Rotation
Select View Mode:
Lit Volume
Isosurface


Volume Explorer - GR2Analyst
50 kft
40 kft
30 kft
20 kft
10 kft
50 kft
40 kft
30 kft
SOUTH
EAST
Volume:
Date: 02/23/2019
Time: 18:35:02 Z
Select Sweep:
Base Reflectivity
Base Velocity
Storm Relative
Spectrum Width
Rotation
Select View Mode:
Lit Volume
Isosurface
Most of the slope to the isosurface is near the surface

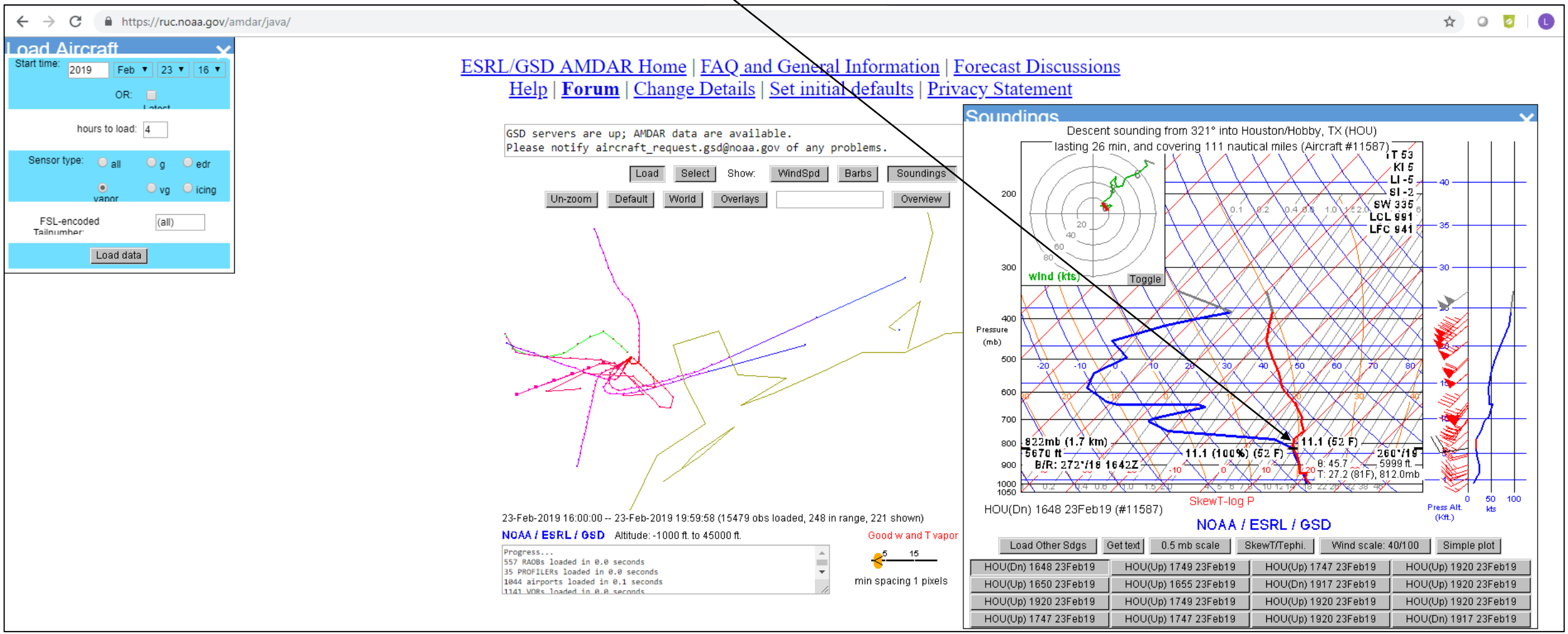

Volume Explorer - GR2Analyst
50 kft
40 kft
30 kft
20 kft
10 kft
Anahuac
SOUTH
EAST
Volume:
Date: 02/23/2019
Time: 18:35:02 Z
Select Sweep:
Base Reflectivity
Base Velocity
Storm Relative
Spectrum Width
Rotation
Select View Mode:
Lit Volume
Isosurface


Volume Explorer - GR2Analyst
30 kft
20 kft
10 kft
Volume:
Date: 02/23/2019
Time: 18:35:02 Z
Select Sweep:
Base Reflectivity
Base Velocity
Storm Relative
Spectrum Width
Rotation
Select View Mode:
Lit Volume
Isosurface
10 kft
20 kft
30 kft
46°/ 34.5 nm
29.869890, -94.600204

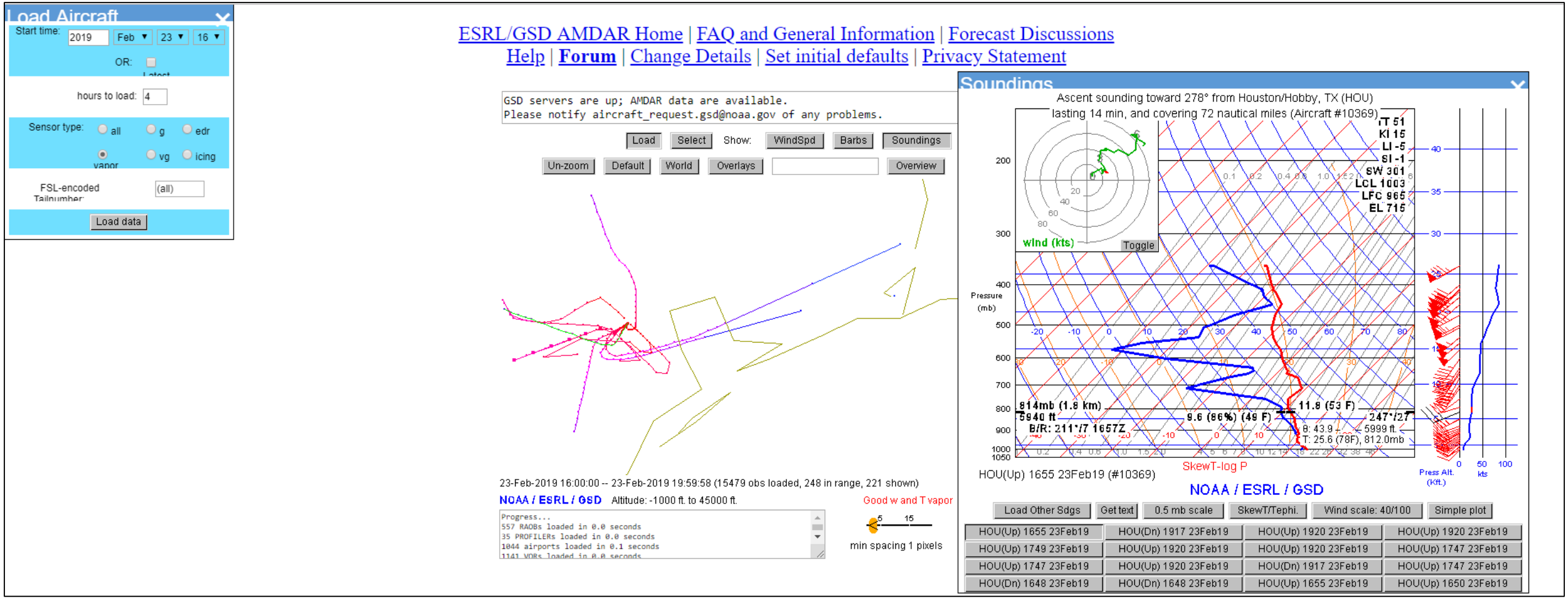

KHGX Houston, TX - GRLevel3
File View Site BR BV SRV SW ZDR CC KDP HCA RAINFALL DERIVED GIS Panels Windows Help
SMW FFW SVR TOR TORR TORE
KHGX
VCP: 215
VT: 2019/02/23 - 01:35:02 PM
PT: 01:36:04 PM
Crosby
Sheldon
Houmont Park
Old River-Winfree
Hankamer
Fannett
Taylor Landing
Cove
Winnie
McNair
Stowell
Monroe City
Anahuac
Jacinto City
Galena Park
Baytown
Deer Park
Pasadena
South Houston
La Porte
Beach City
Double Bayou
Shoreacres
Seabrook
High Island
Smith Point
Webster
Friendswood
THOU
League City
Bacliff
Gilchrist
San Leon
Bolivar Peninsula
KHGX
HCA 0.5°
Offline
63.8°/ 36.3 nm
ND
2797 ft
29.73741, -94.45408
65 meters/pixel
The hydrometeor classification algorithm indicating biological targets (BI) (insects/birds) near the frontal boundary. This is typical near boundaries.


KHGX Houston, TX - GRLevel3
File View Site BR BV SRV SW ZDR CC KDP HCA RAINFALL DERIVED GIS Panels Windows Help
SMW FFW SVR TOR TORR TORE
KHGX
VCP: 215
VT: 2019/02/23 - 01:35:02 PM
PT: 01:36:04 PM
High correlation coefficient
(rain)
Low Correlation Coefficient
Biological Targets
Crosby
Sheldon
Old River-Winfree
Houmont Park
Hankamer
Fannett
Taylor Landing
Cove
Winnie
McNair
Stowell
Monroe City
Anahuac
Jacinto City
Galena Park
Baytown
Deer Park
Pasadena
South Houston
La Porte
Beach City
Double Bayou
Shoreacres
Seabrook
High Island
Webster
Smith Point
Friendswood
THOU
League City
Bacliff
Gilchrist
San Leon
Bolivar Peninsula
KHGX
CC 0.5°
Offline
25.8°/ 35.1 nm
99.2 %
2684 ft
29.99900, -94.78403
65 meters/pixel

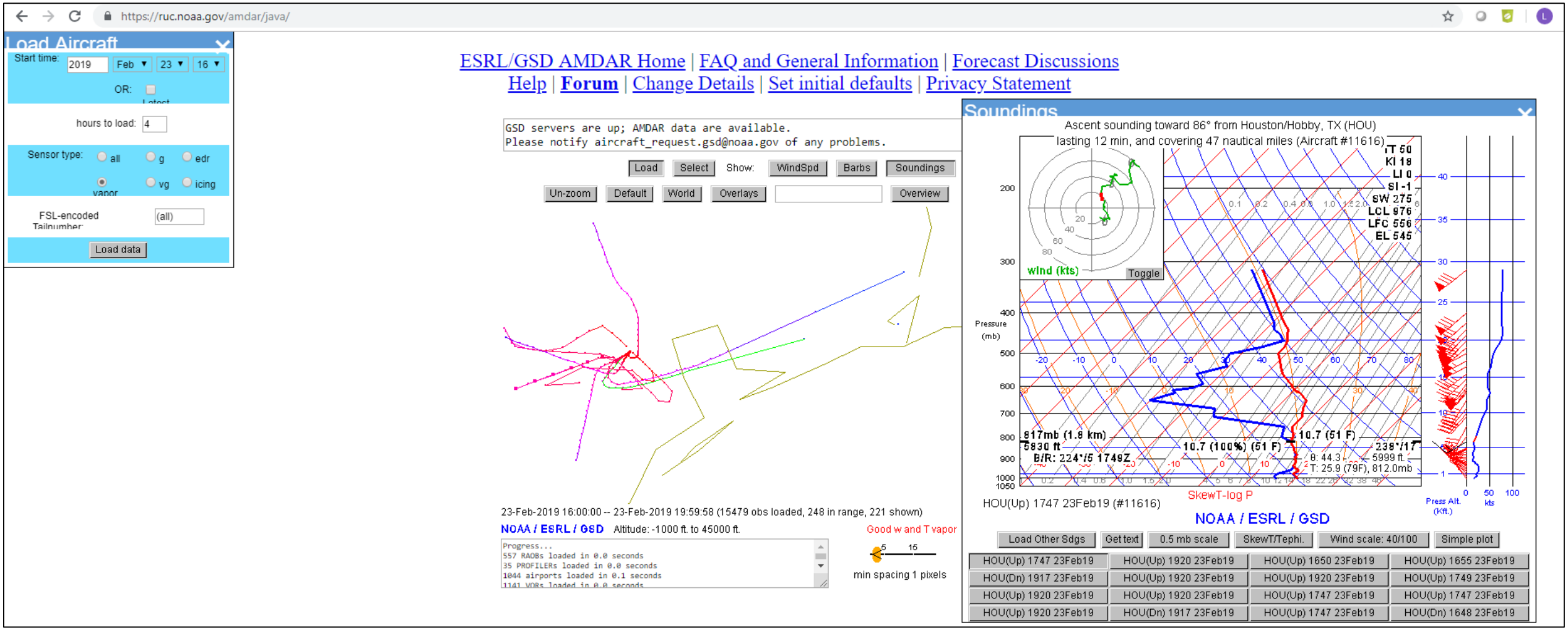
What follows are all the aircraft data with water vapor and temperature sensors ascending and descending into Hobby airport two hours before and within an hour after the accident time. The green flight track on each slide corresponds to the path of the aircraft. The small black line on the sounding plot is sampling data at 6 KFT



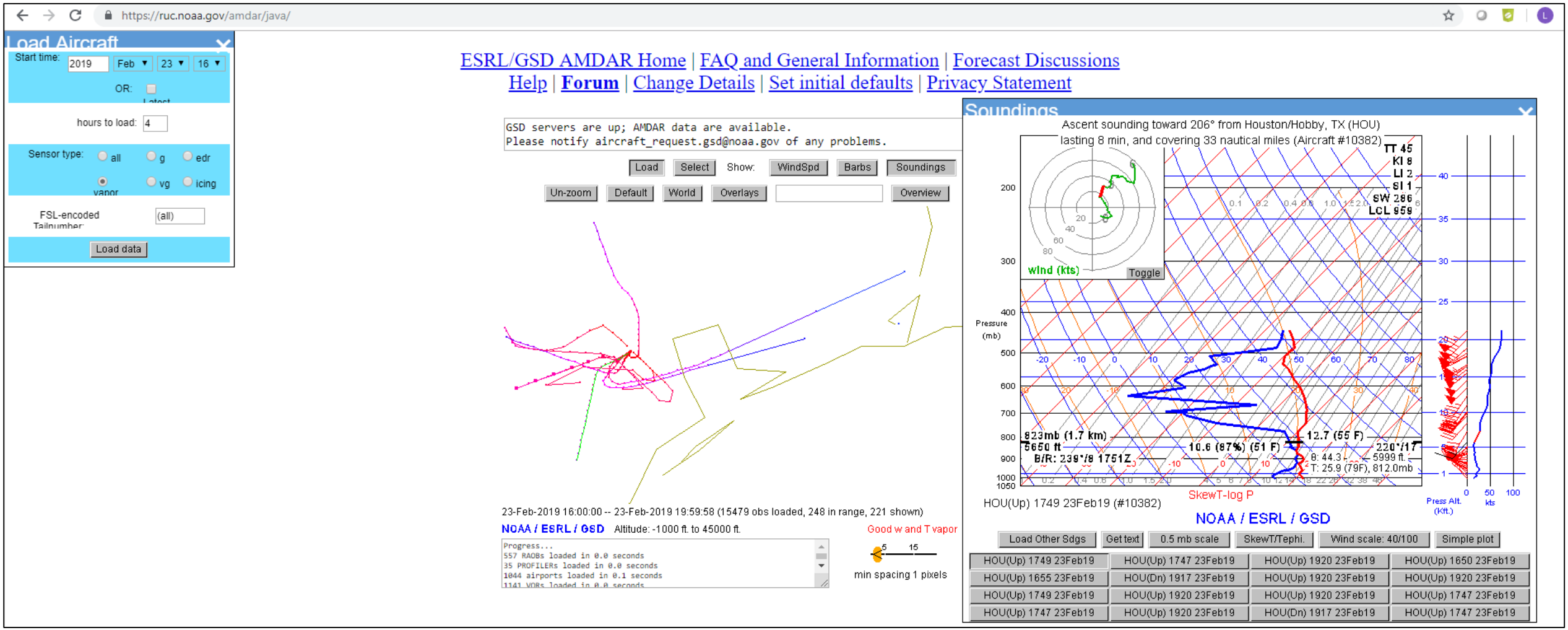
1648Z or 1048 AM CST: Prefrontal warm airmass, no NW winds. Moist layer up to around 6 kft.



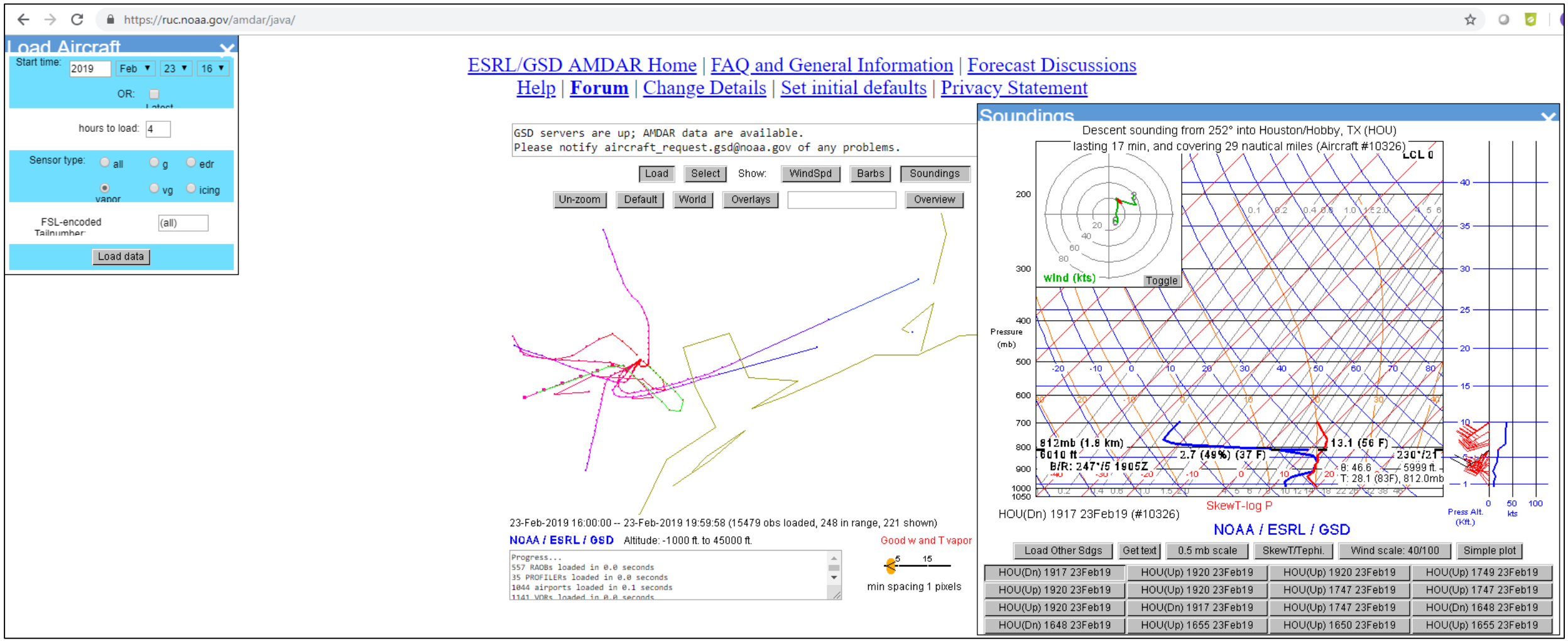
1655Z or 1055 AM CST: Prefrontal warm airmass, no NW winds. Moist layer up to around 6 kft.



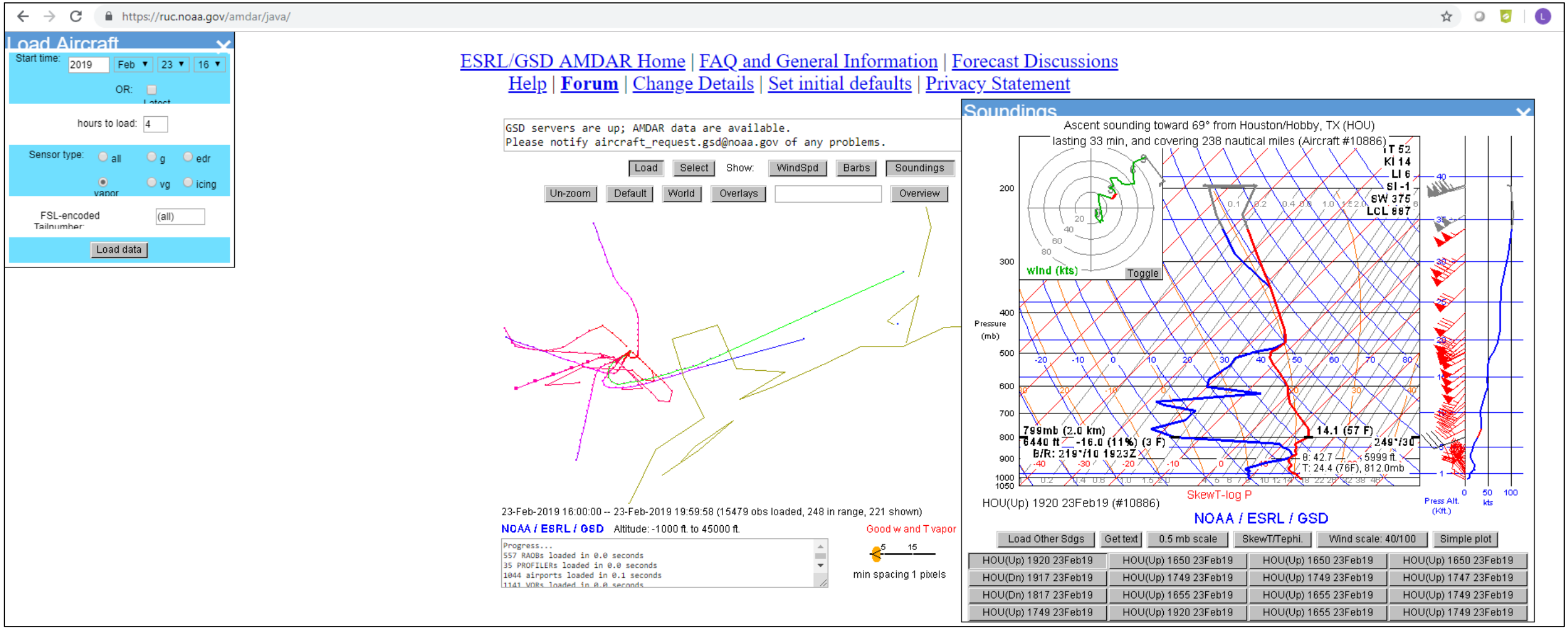
1747Z (1147 AM) Behind the front,
NW winds through 2890 FT, then
becoming W, then SW



1749 Z, (1149 AM) NW winds through 2650 FT, then becoming W, then SW

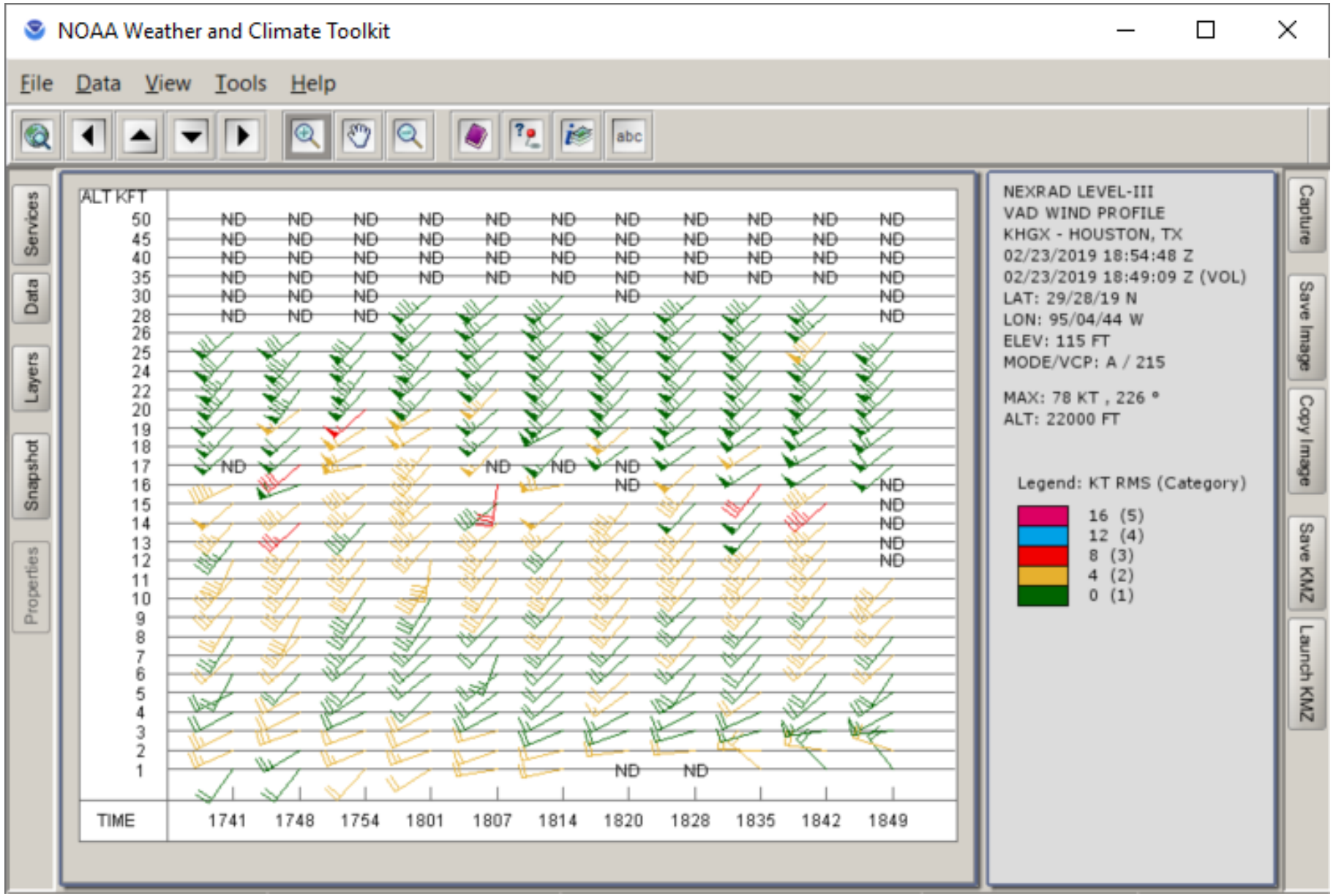


1917Z (117 PM CST) NW winds through 2499 FT, then becoming W, then SW



1920Z (120 PM CST) NW winds through 3090 FT, then becoming W, then SW

Near the radar site the (KHGX) VAD Wind profile shows horizontal winds ahead of the cold front of SW 20-25 knots through a deep layer. The surface front passed through around 1835Z (1235 PM CST)



Near the radar site (KHGX) the NW winds behind the front extended up to 2500-3000 FT.
The surface front passed through around 1835 Z (1235 PM CST). Note than in the aircraft data and in the VAD Wind profile around the radar site, the NW winds behind the front did not extend above 3 kft. So, we feel pretty confident now that at around 6 kft the Atlas aircraft experienced continued SW winds and not a shift to the NW at that height. We do expect that there was turbulence near the front due to vertical motion that the Atlas aircraft likely experienced.