Aviation Weather For Pilots

Aviation Weather Fundamentals

Presented by

Mike Cetinich

About Your Instructor

- B.S. Meteorology – San Jose State University
- Pilot Training (50+ hours in tail draggers)
- Career at Jeppesen (28+ years)
  - Aviation Meteorologist
  - Manager of Meteorology
  - Programmer
  - Product Manager
- Life Long Weather Geek

About Today

- Goals
  - Understand Aviation Weather Better
  - Understand Weather in Flight Planning Process
- How
  - Active Participation
- Why
  - Stay Safe & Alive

GA Accidents

(From the 2006 NTSB annual review of GA accidents)

- 17% of accidents having weather as a cause in VMC were fatal
- 72% of accidents having weather as a cause in IMC were fatal
- 18% of all accidents had weather as a cause
- 22% of all fatal accidents had weather as a cause
- Most common weather phenomenon involved in GA accidents:
  - 50% of fatal accidents involved low ceilings, reduced visibility or clouds
  - 73% of non-fatal accidents involved winds during takeoff or landing phase

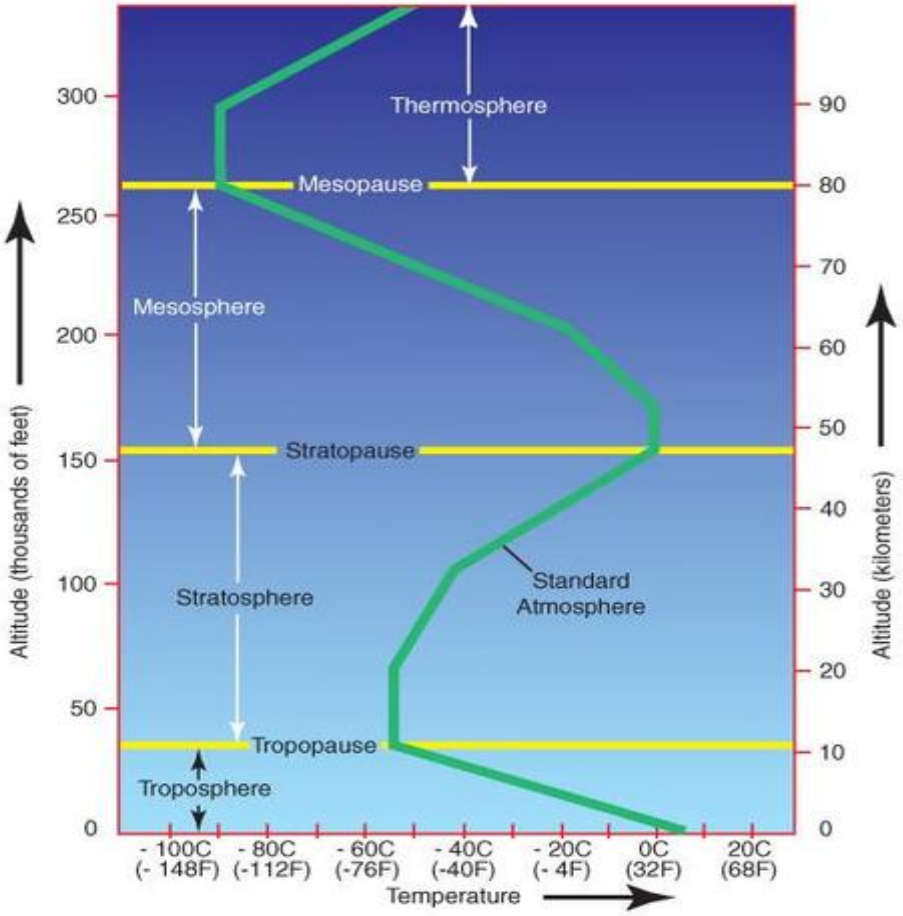
Agenda

- Weather Fundamentals
- Weather Trivia Question & Break
- Flight Planning Scenario
- Weather Trivia Question & Break
- Weather Accident Scenario

Ground Rules

- Get the Information You Want (Ask Questions)
- 2 Breaks – come and go as needed
- Cell Phones Off Please
- Chance to win Prizes – Test Your Weather Trivia knowledge
- Have Fun While Learning

The Atmosphere



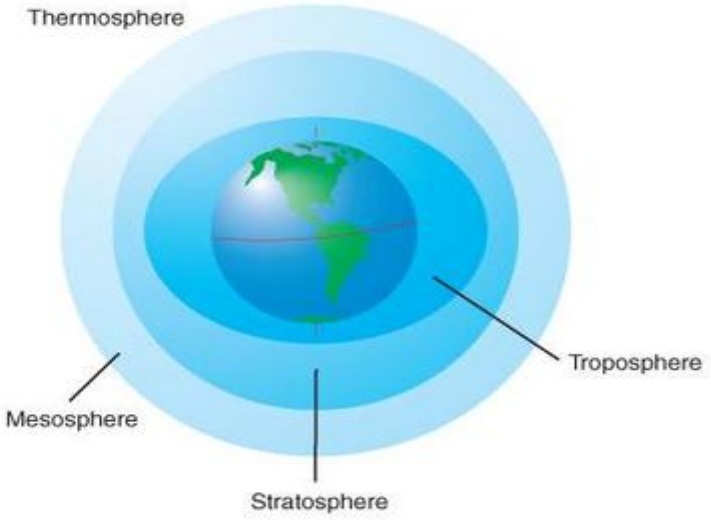
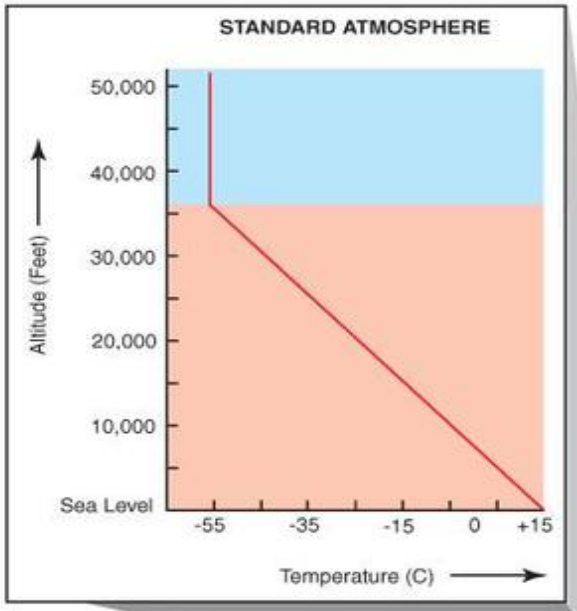


FIG 01-08

Aviation Weather

The Standard Atmosphere



Pressure	Pressure Altitude	
Millibars	Feet	Meters
850	4,781	1,457
700	9,882	3,012
500	18,289	5,574
300	30,065	9,164
250	33,999	10,363
200	38,662	11,784
100	53,083	16,180

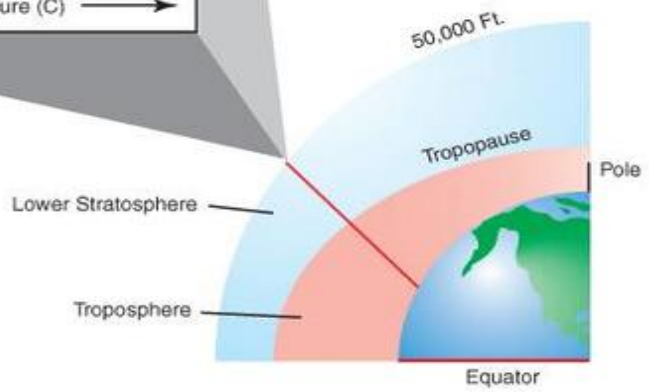


FIG 01-10

Aviation Weather

Pressure & Mass

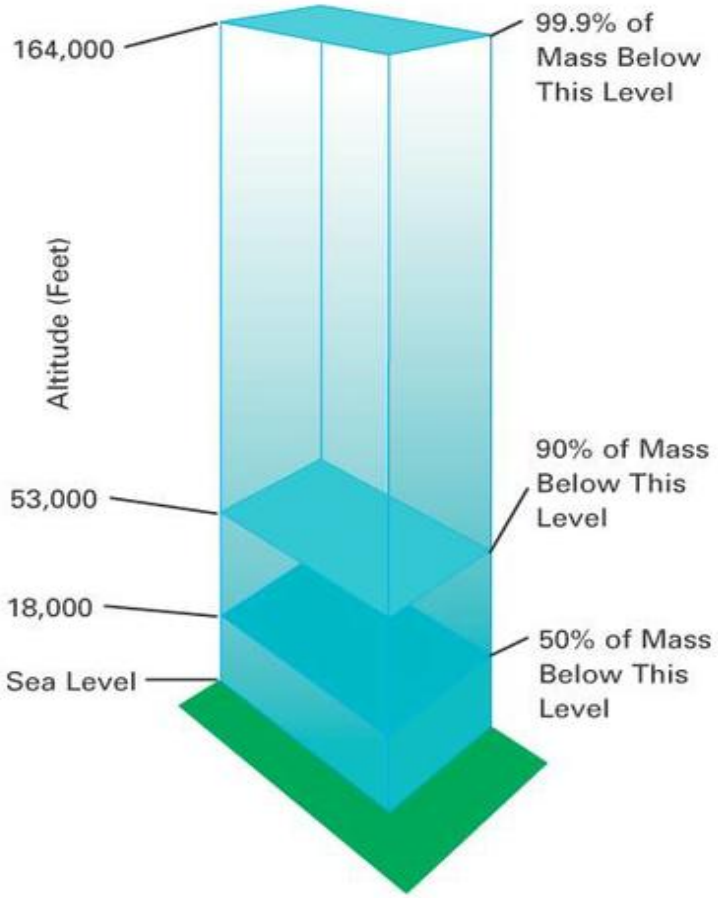


FIG 01-06

Aviation Weather

General Circulation

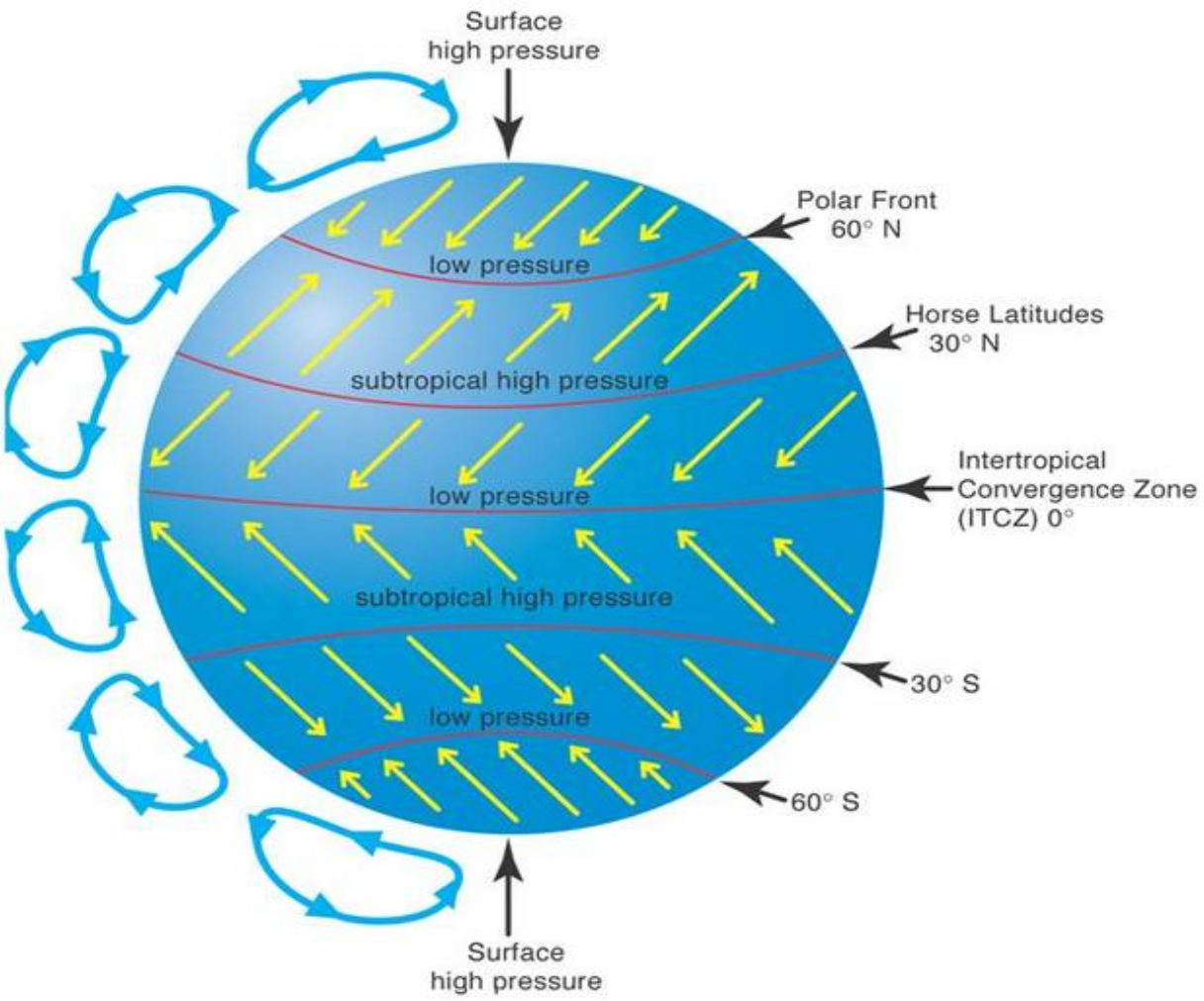


FIG 07-05

Aviation Weather

Jan Surface Circulation

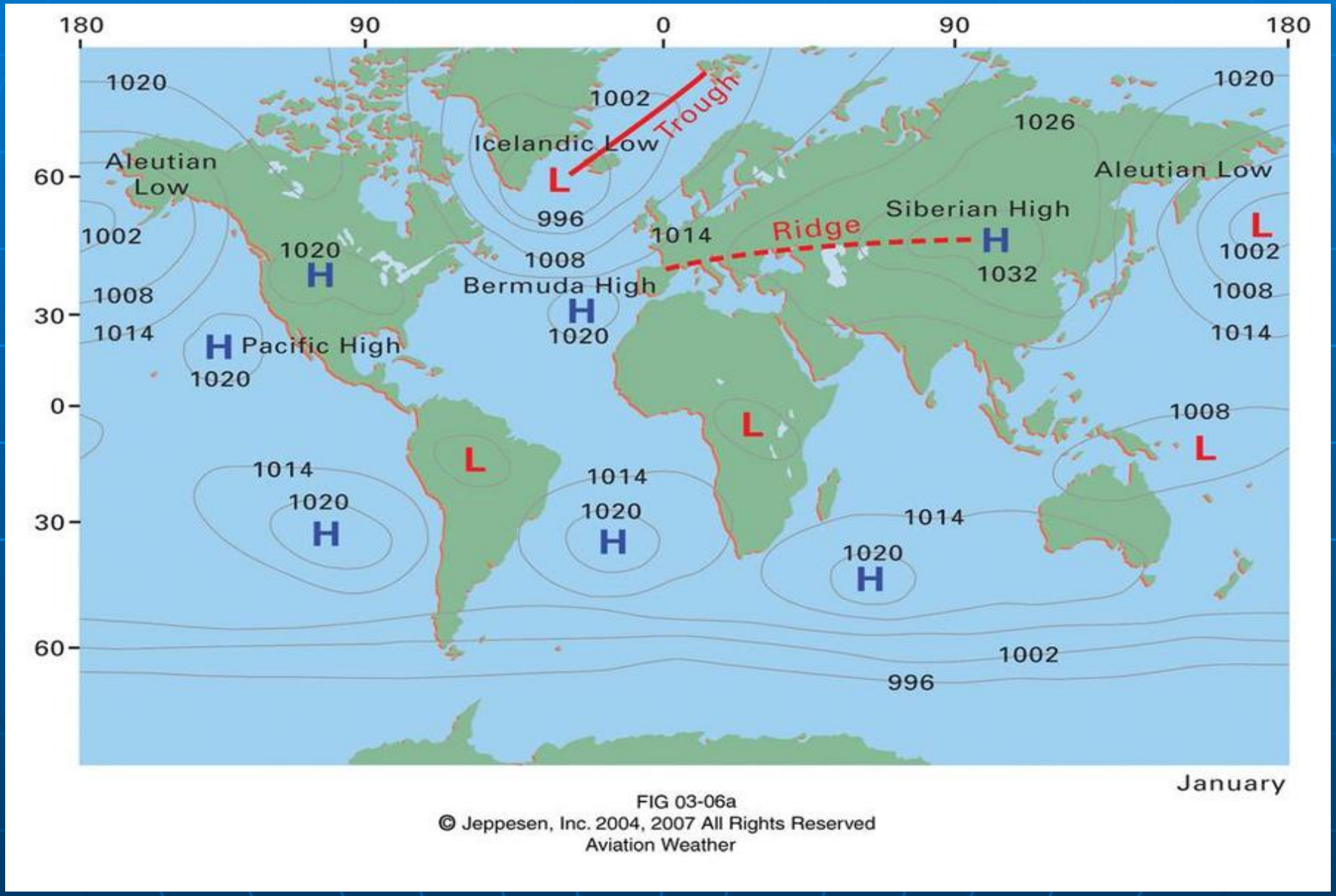


FIG 03-06a

Aviation Weather

Jul Surface Circulation

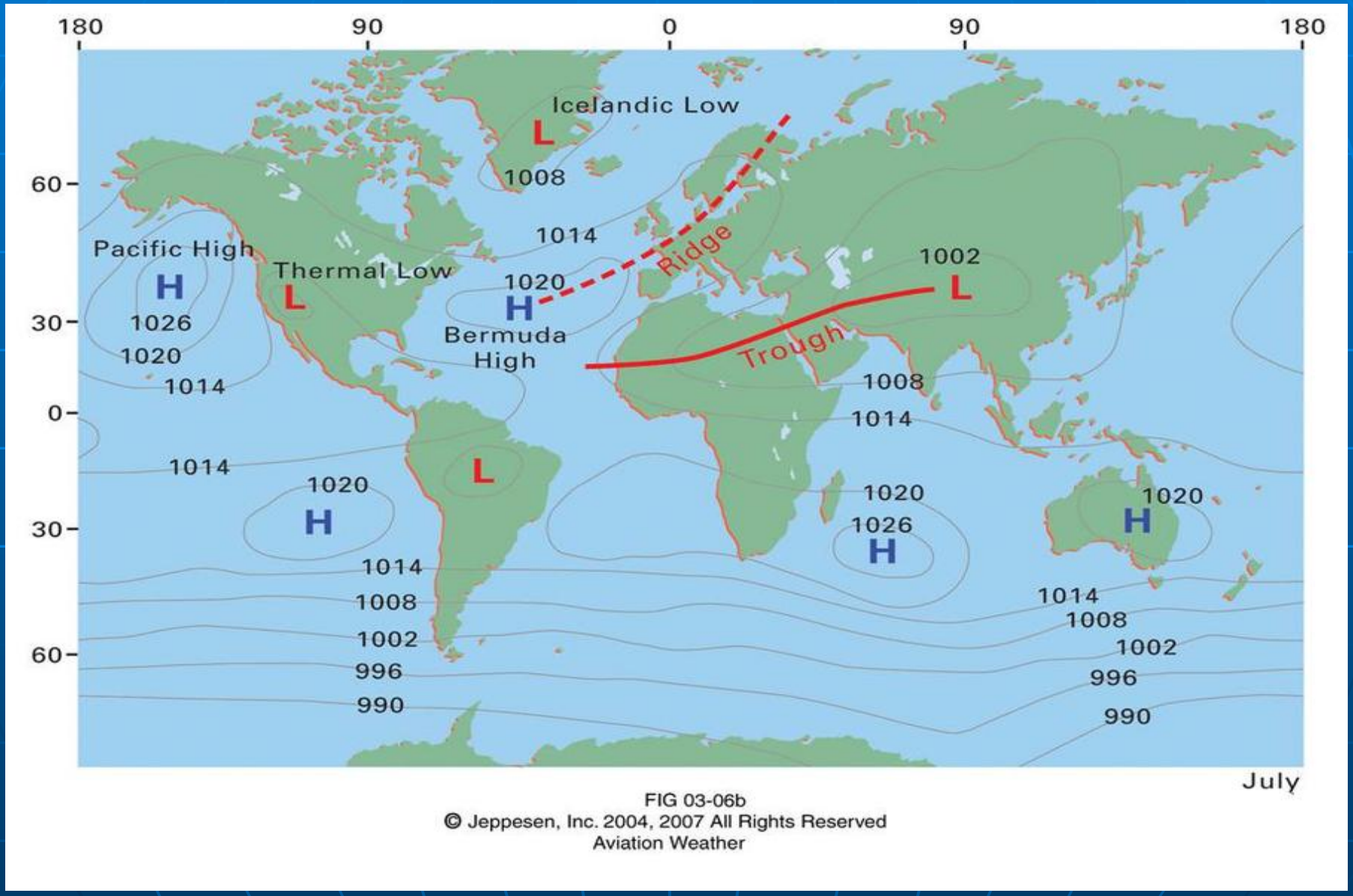


FIG 03-06b

Aviation Weather

Jetstream Circulation

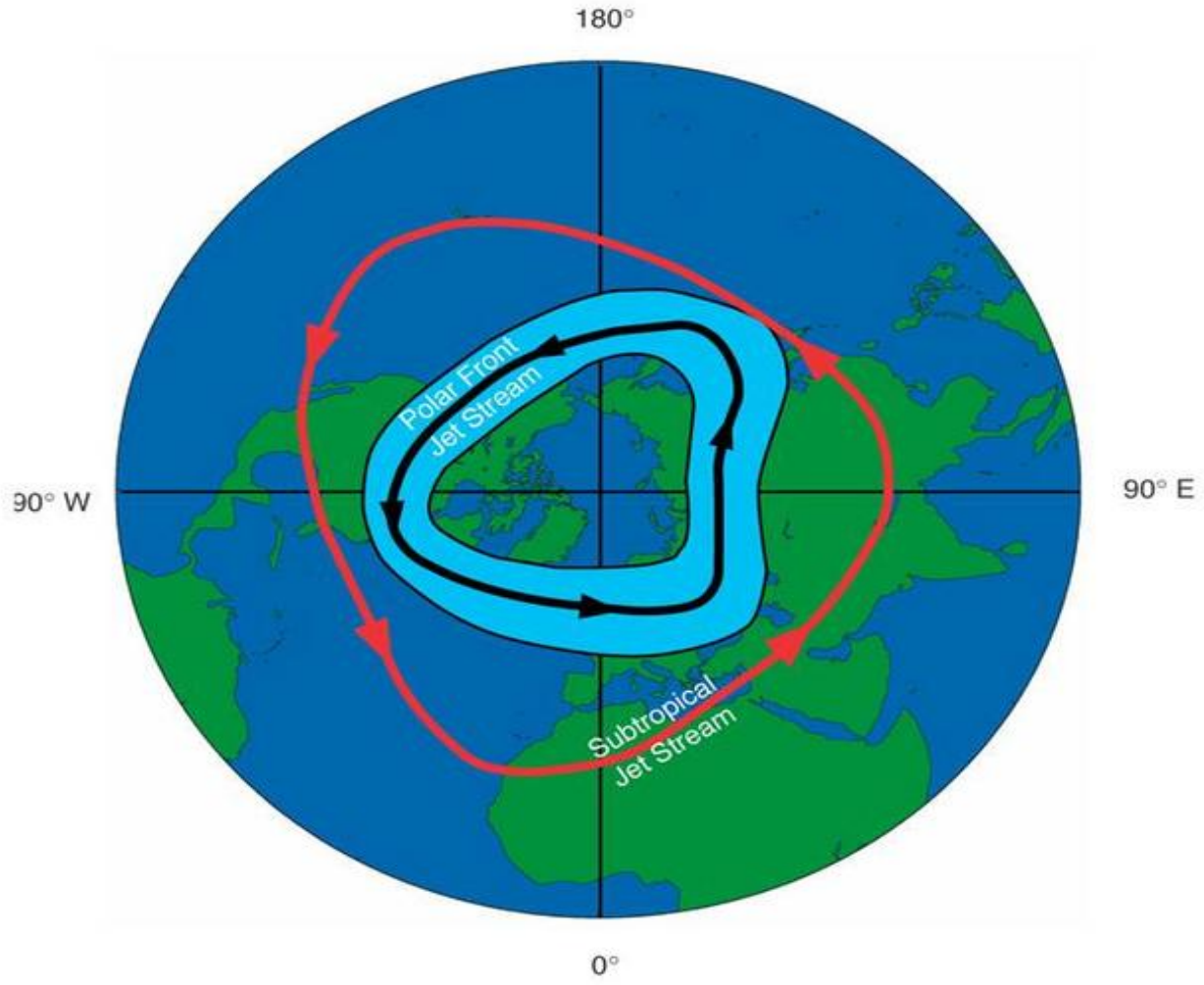
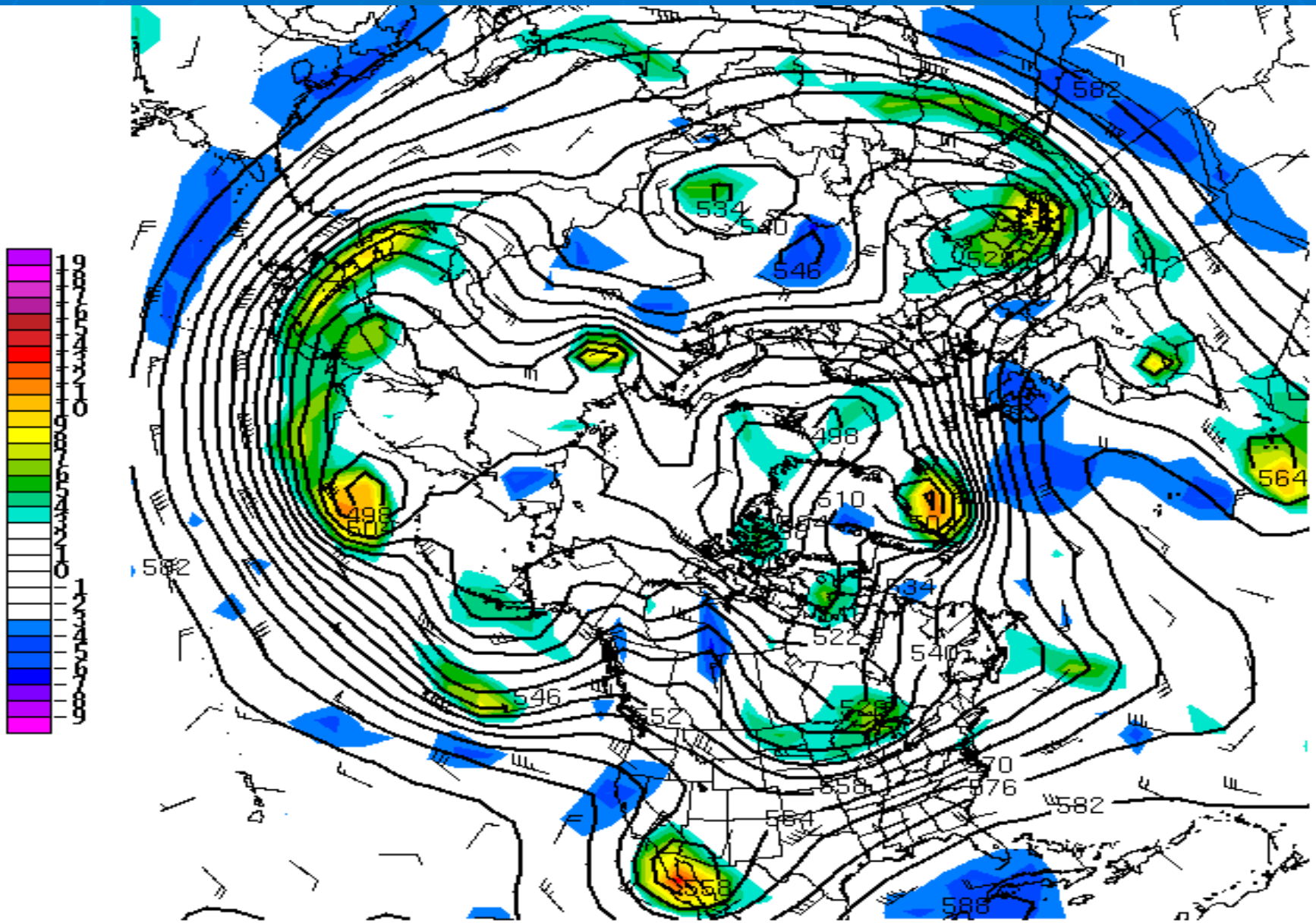


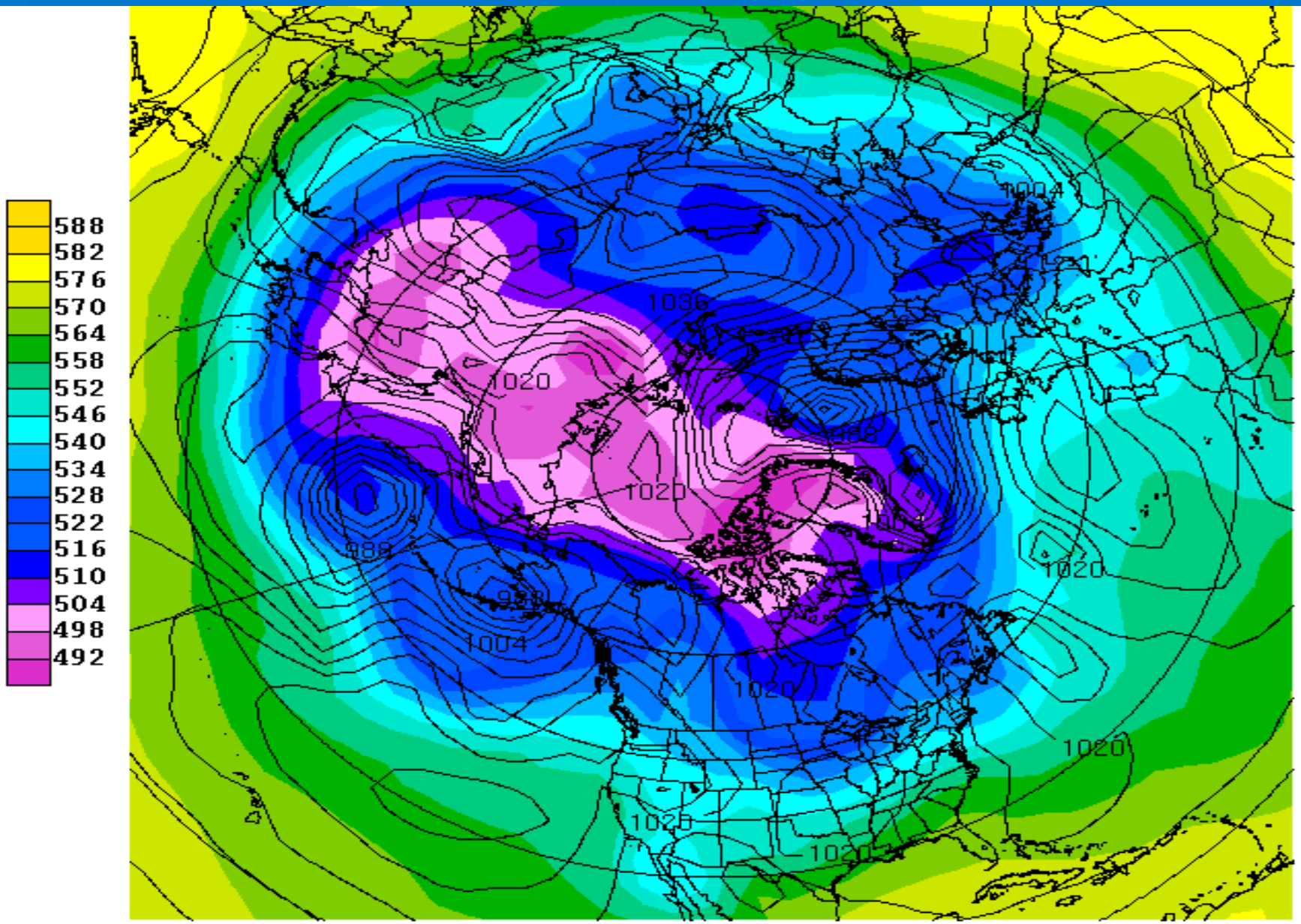
FIG 07-09

Aviation Weather

Global 500 mb Wave Pattern



Global Surface Pattern



Atmosphere is 3D

- The Surface reflects the atmosphere above
  - Ridge Aloft = High Pressure at Surface
  - Trough Aloft = Low Pressure at Surface
  - Exception is Thermal systems (Tropical Cyclones)
    - Low at Surface, High Aloft
- Offset to upper air pattern vs surface pattern
  - Degree of offset indicates stage of development of surface system
    - Large offset indicates developing system
    - Small offset indicates mature or dissipating system

Developing Wave Cyclone

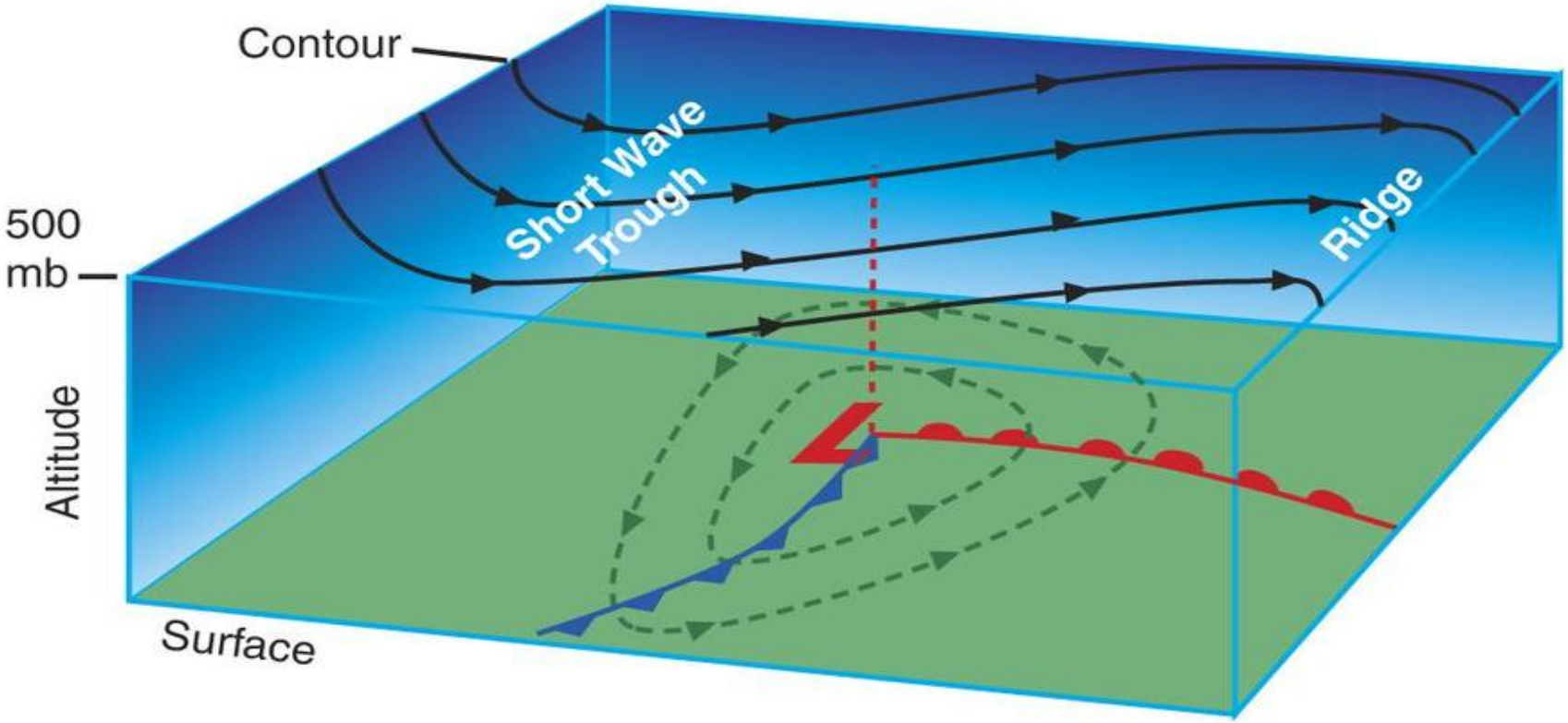


FIG 08-12

Aviation Weather

Mature Cyclone

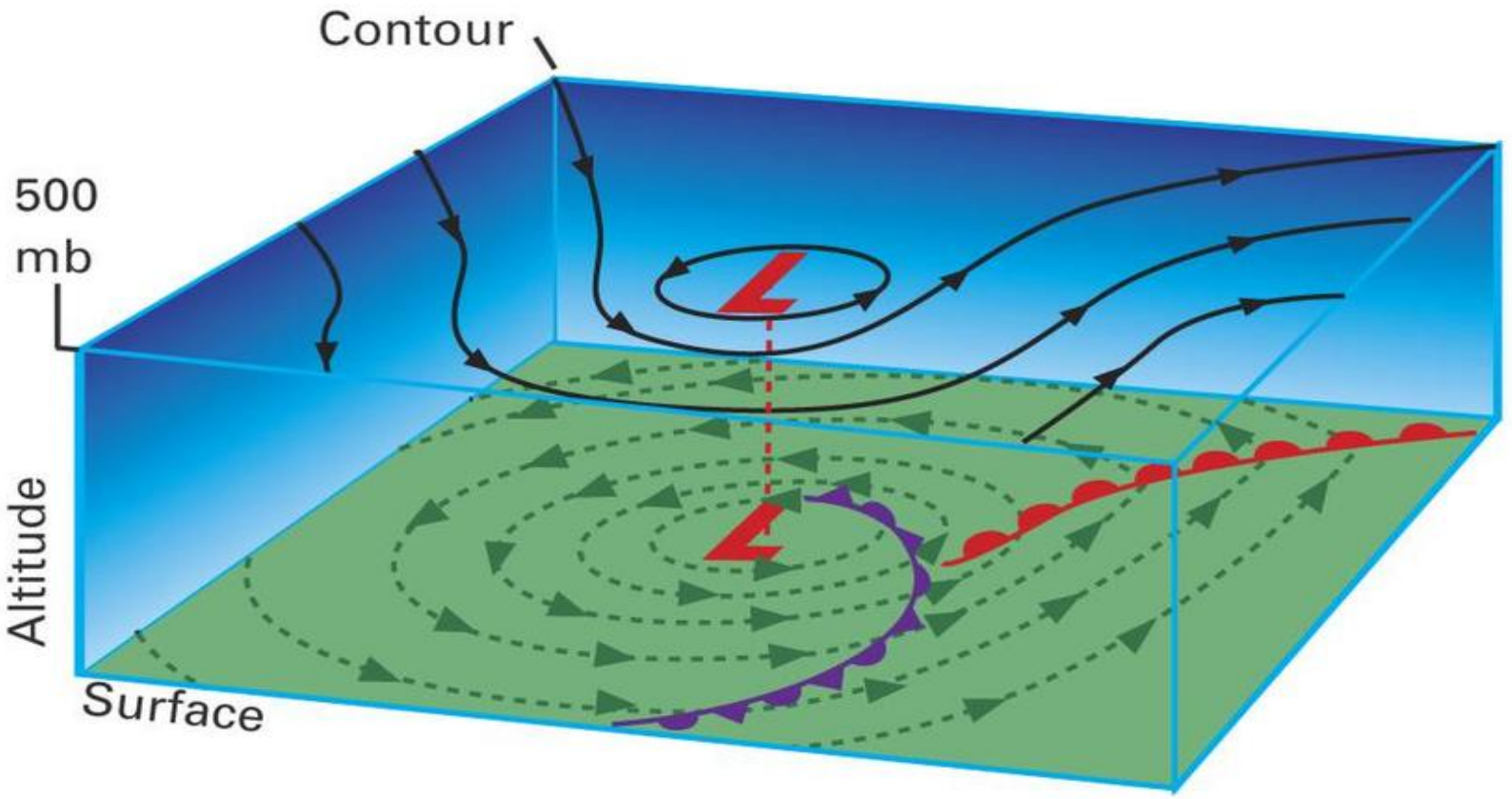
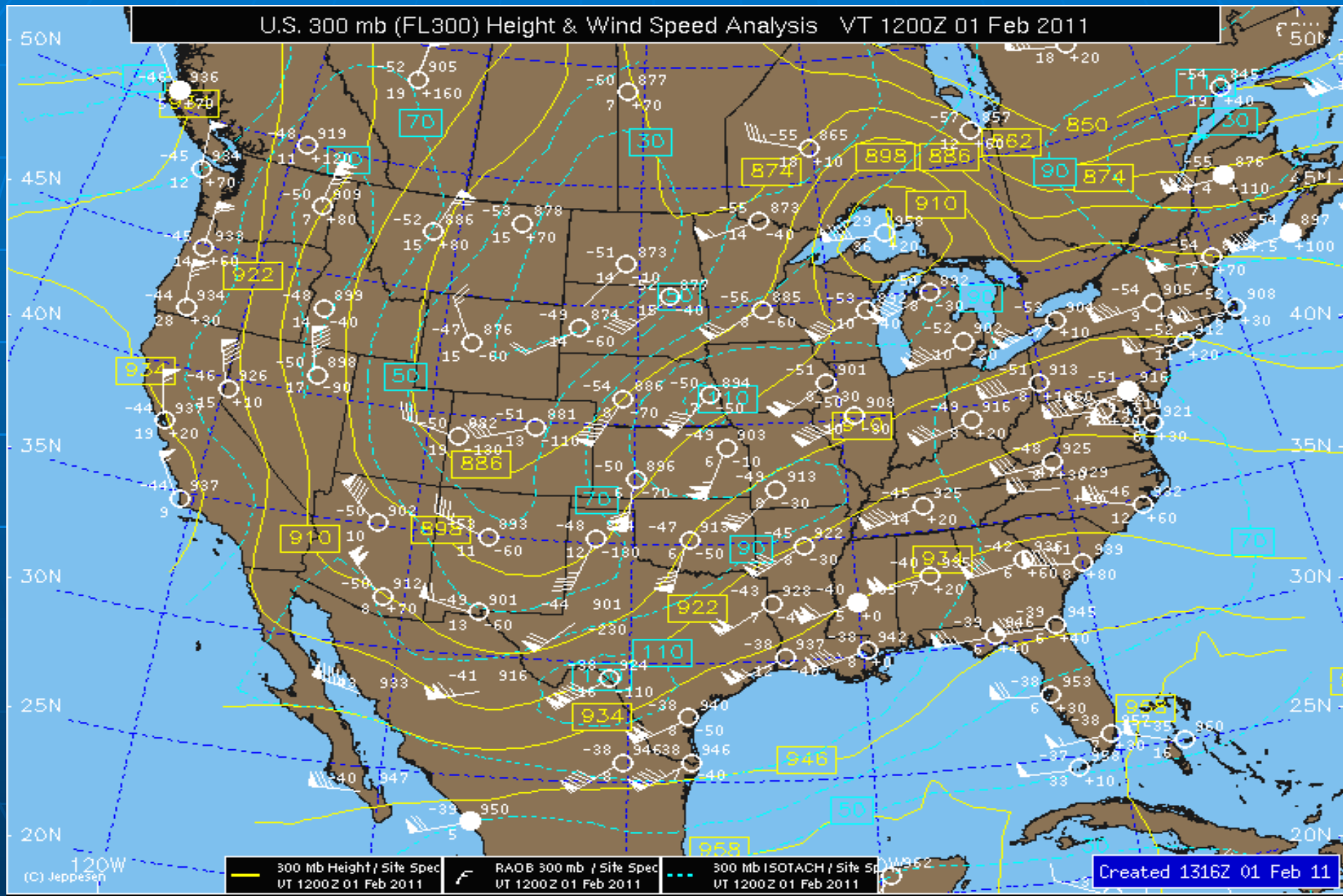


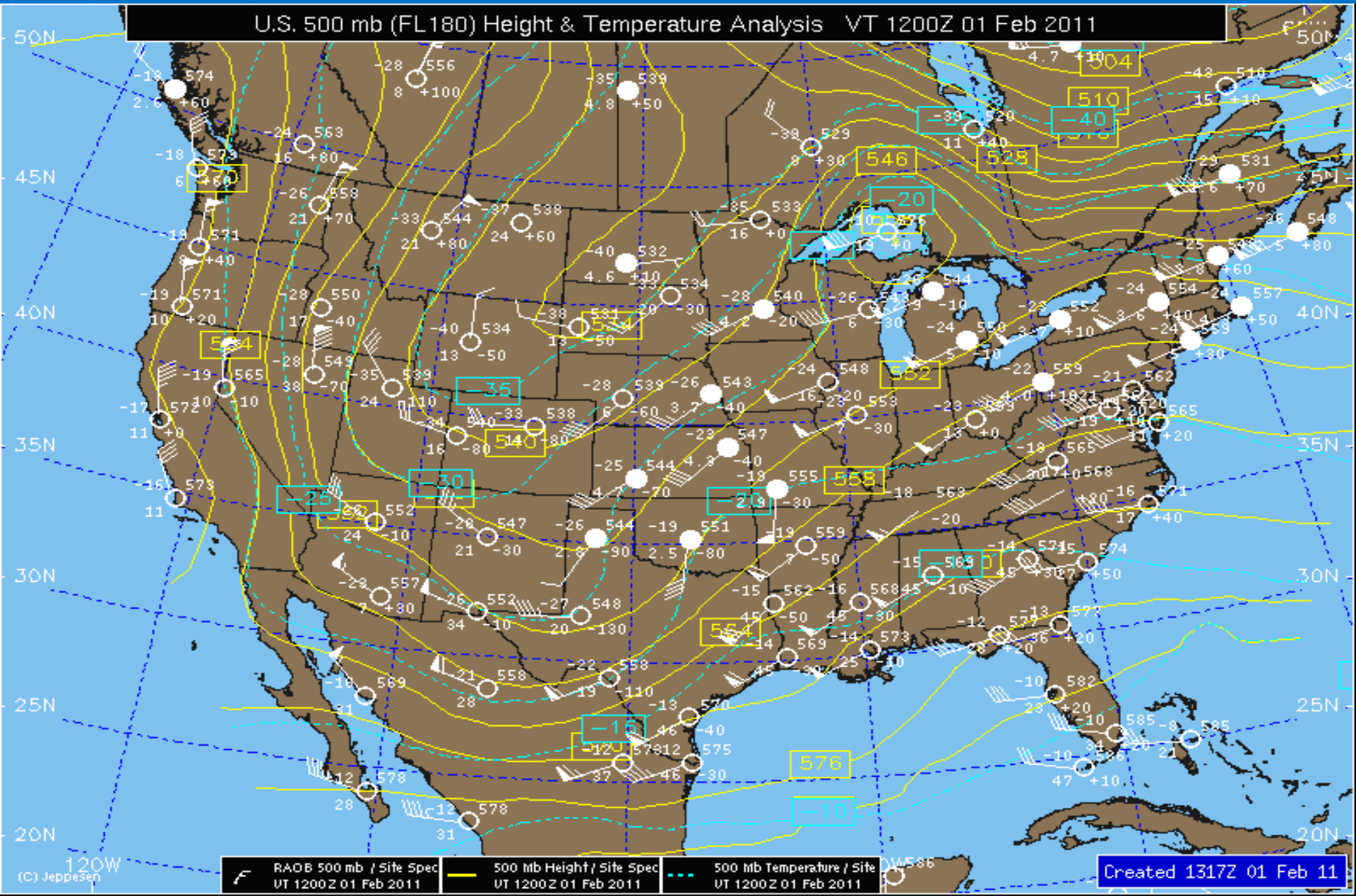
FIG 08-13

Aviation Weather

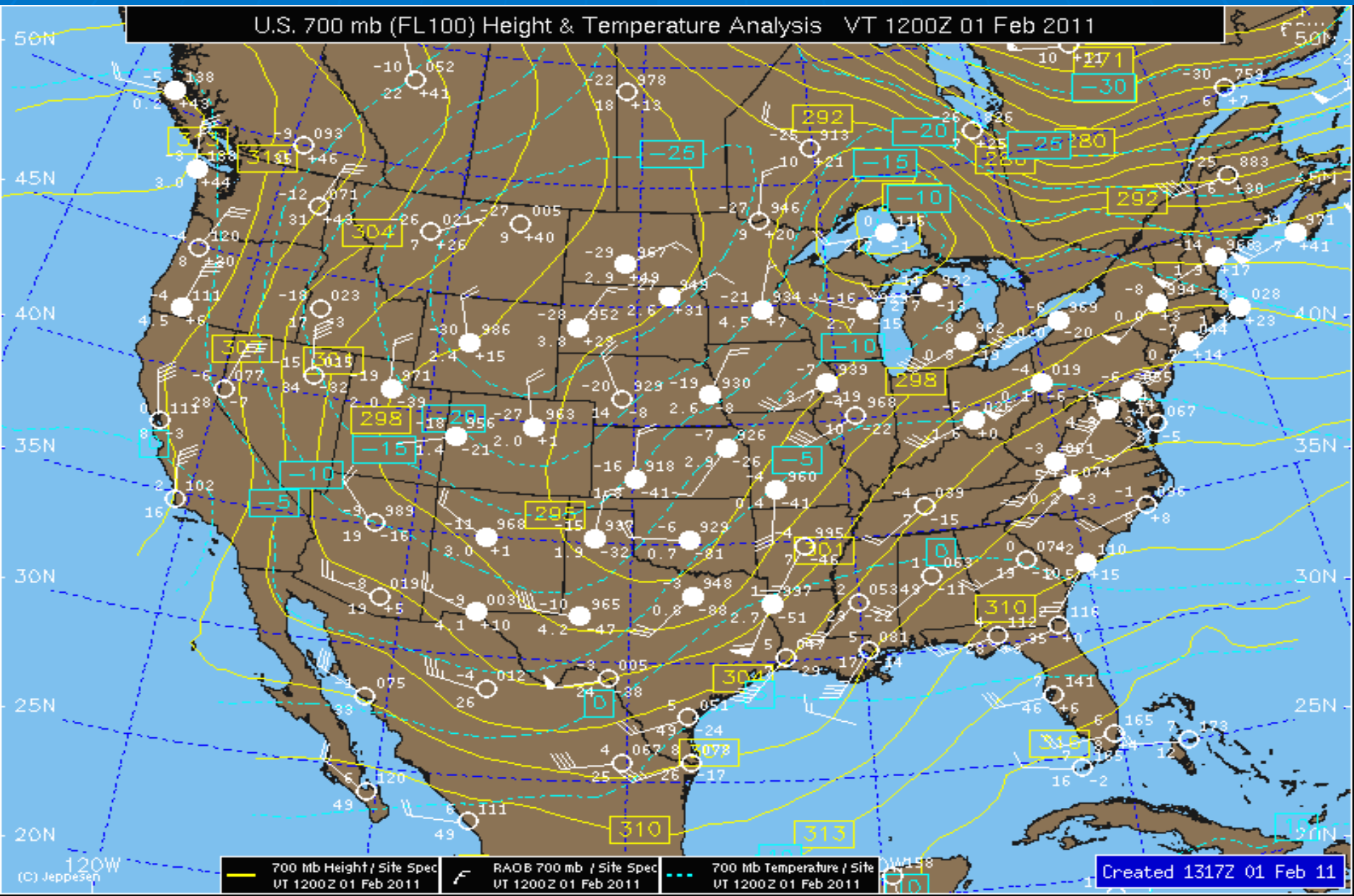
300 mb (FL300) Pattern



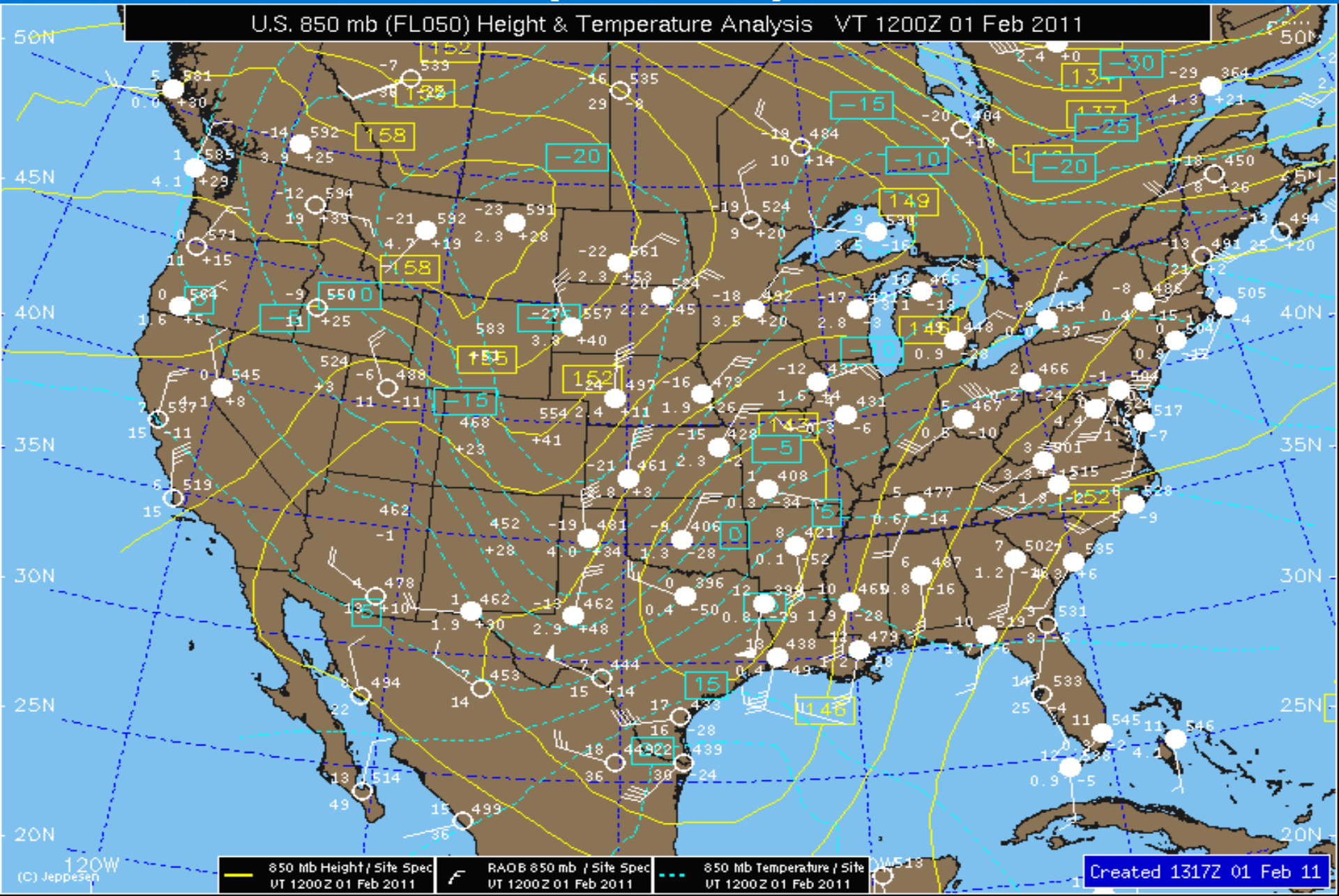
500 mb (FL180) Pattern



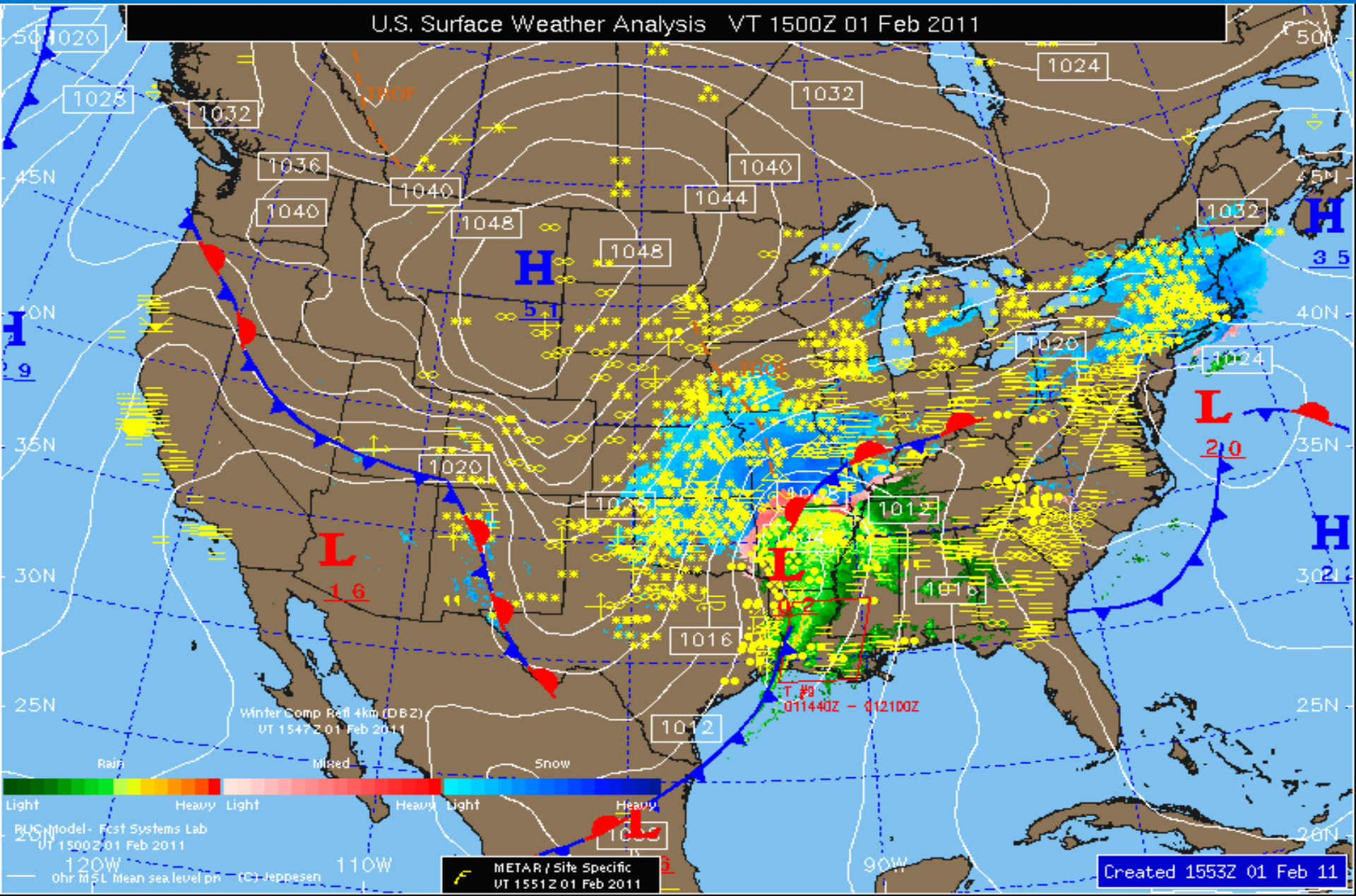
700 mb (FL100) Pattern



850 mb (FL050) Pattern



Surface Pattern



Constant Pressure vs. Altitude

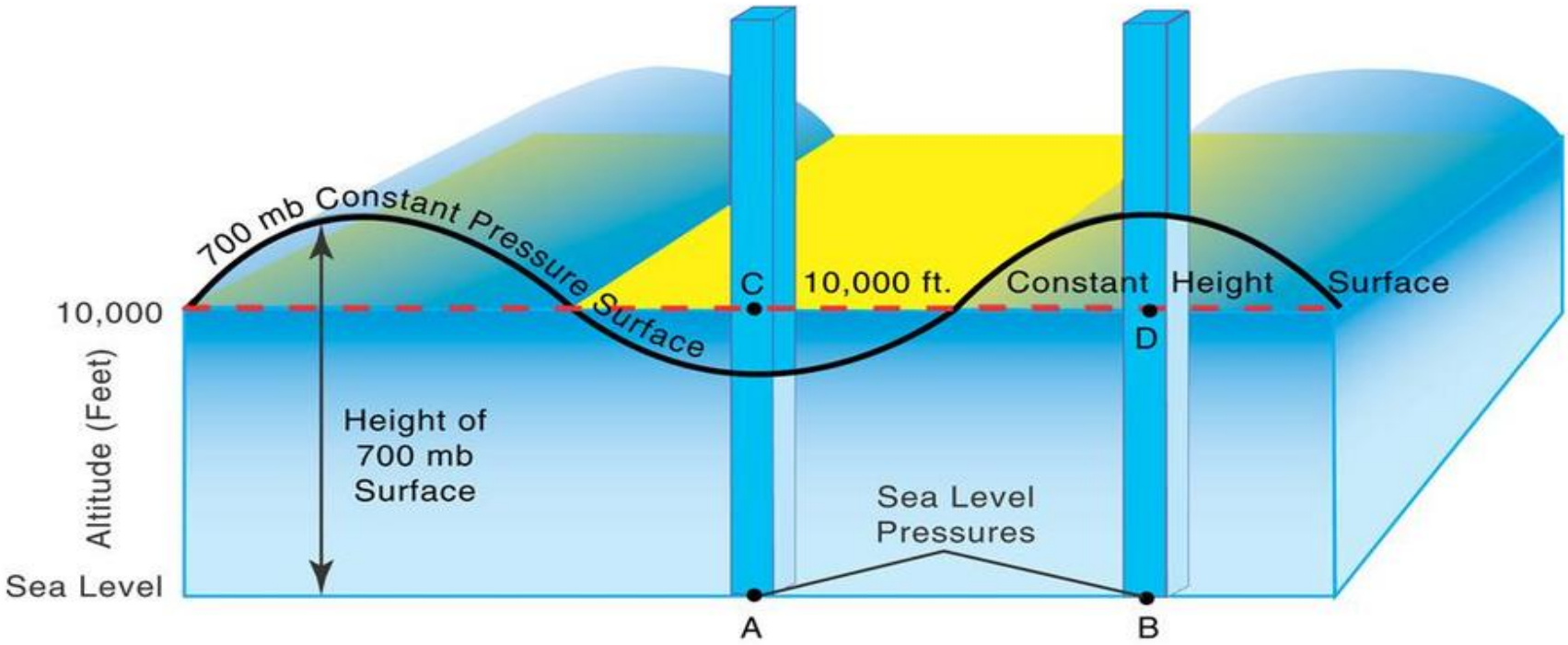


FIG 03-07

Aviation Weather

Air Masses

- Air Mass – A large body of air that consists of homogeneous properties (temp, moisture, stability)
- Source Region – Regions where air masses originate
- Classifications
  - Arctic
  - Continental Polar
  - Maritime Polar
  - Continental Tropical
  - Maritime Tropical
- Modification – Air masses modify as they move over areas of different properties

Fronts

- Front – The discontinuity between two different air masses
- Types
  - Cold front - Cold air mass replacing a warmer air mass
  - Warm front – Warm air mass replacing a colder air mass
  - Stationary front – Boundary between a cold air mass and a warm air mass
  - Occluded front – A cold front overtakes a warm front
- A front is a baroclinic zone, where there are sharp gradients in pressure, temperature, moisture and wind velocity

Air Masses & Fronts

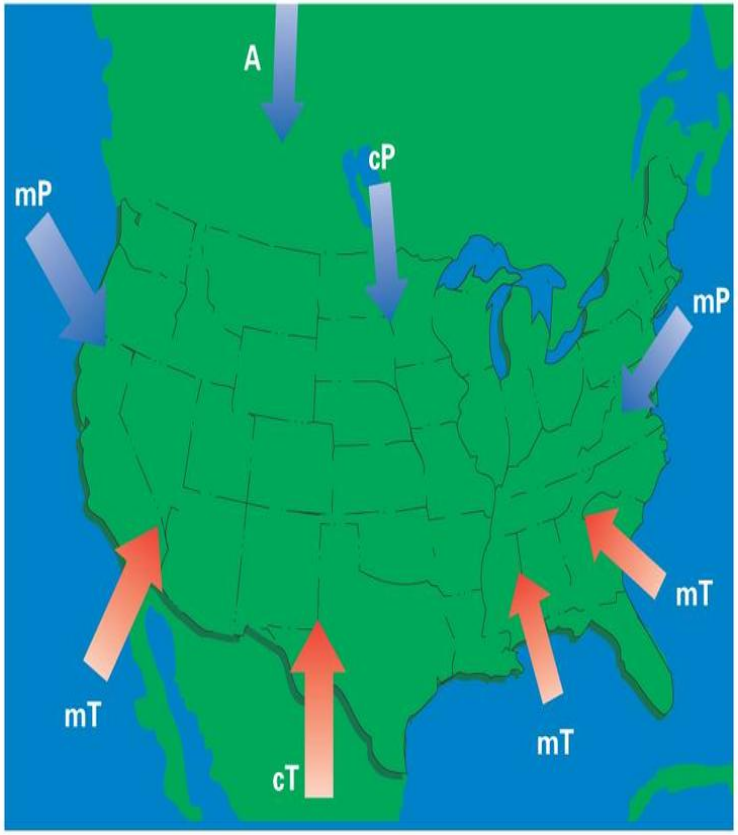


FIG 08-03

Aviation Weather

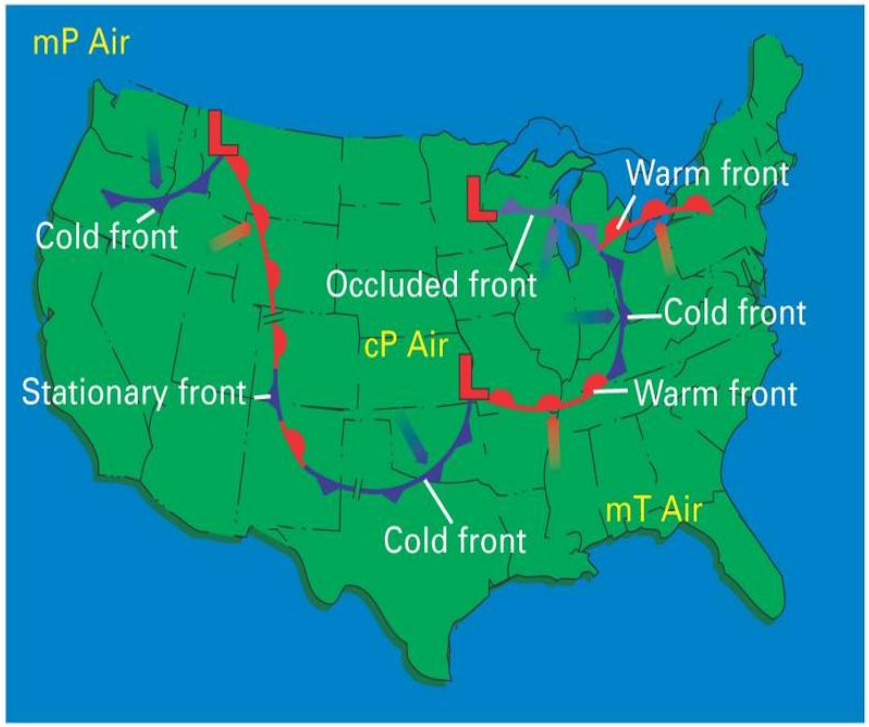


FIG 08-05

Aviation Weather

Frontal Slopes

cold front slope
1:50 to 1:100

warm front slope
1:150 to 1:500

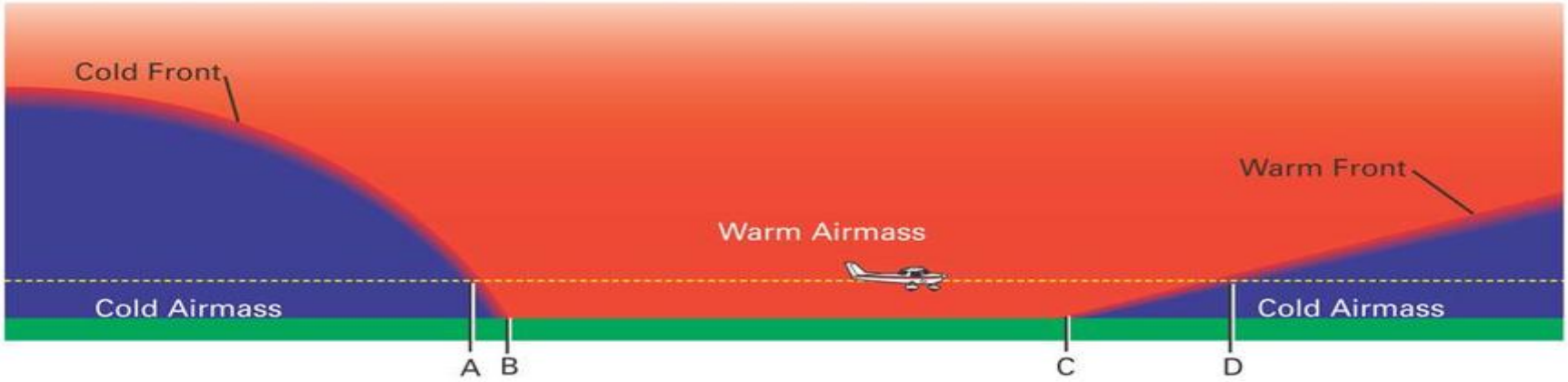


FIG 08-07

Aviation Weather

Frontal Clouds

FIG 08-16

Aviation Weather

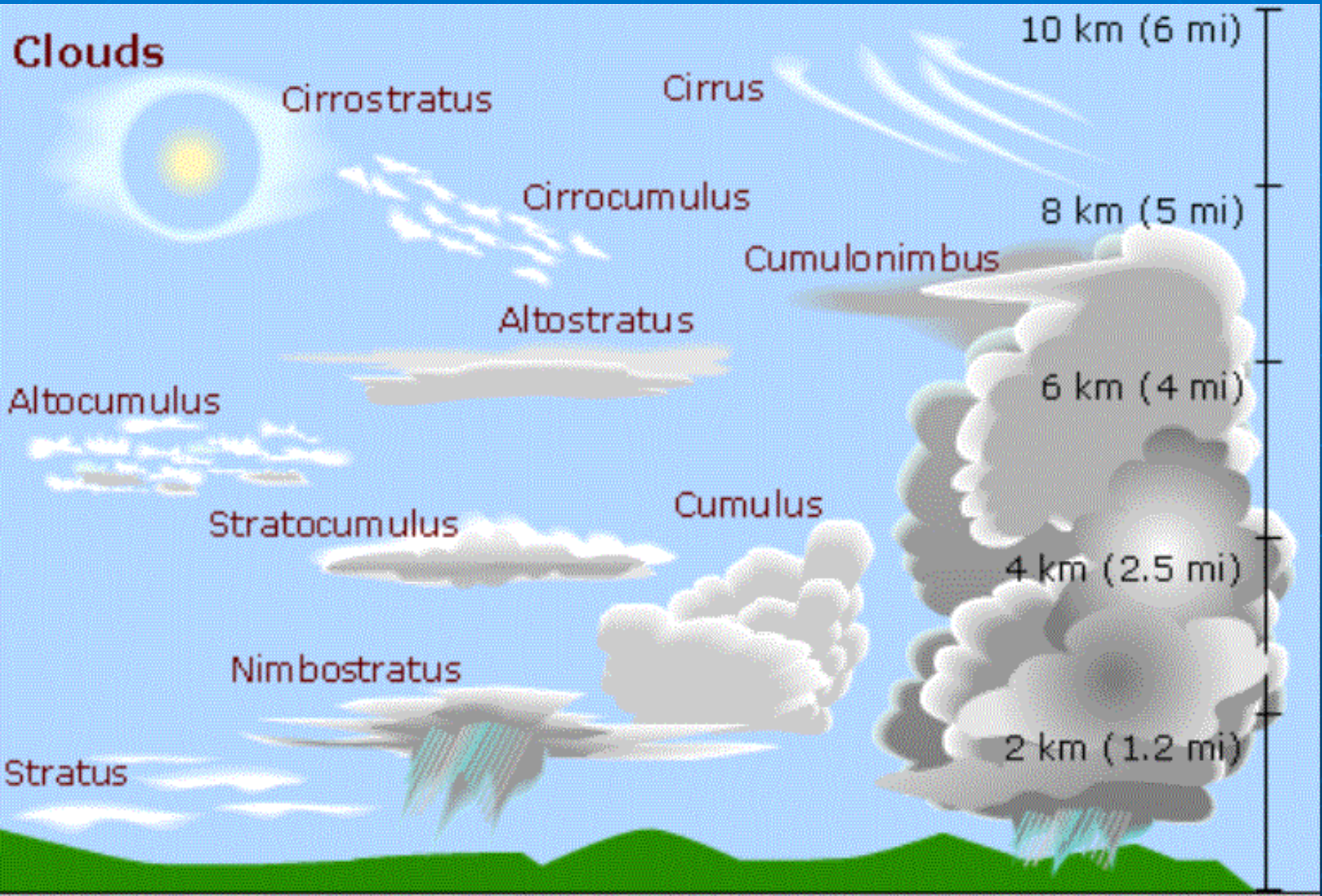
Clouds

- Clouds are characterized by their vertical extent, and their altitude
- Cumuliform Clouds
  - Clouds that have vertical extent, and have strong rising motions associated with them
    - Cumulus, Cumulonimbus, Altocumulus, Cirrocumulus
- Stratiform Clouds
  - Clouds that have limited vertical extent, mostly layered type clouds
    - Stratus, Nimbostratus, Altostratus, Cirrostratus

Clouds

- Low Clouds
  - Clouds with bases below 6500 ft AGL
  - Cumulus, Stratus, Nimbostratus, Stratocumulus
  - Mostly water droplets, some ice crystals and super cooled droplets
- Middle Clouds
  - Clouds with bases between 6500 and 20,000 ft AGL
  - Altostratus, Altocumulus
  - Water and super cooled droplets, ice crystals
- High Clouds
  - Clouds with bases above 20,000 ft AGL
  - Cirrus, Cirrocumulus, Cirrostratus, Contrails
  - Mostly ice crystals, some super cooled droplets and water

Clouds


Clouds
Cirrostratus
Cirrus
Cirrocumulus
Cumulonimbus
Altostratus
Altocumulus
Cumulus
Stratocumulus
Nimbostratus
Stratus
10 km (6 mi)
8 km (5 mi)
6 km (4 mi)
4 km (2.5 mi)
2 km (1.2 mi)

Atmospheric Stability

- Determined by Atmospheric Lapse Rate (rate of temperature change with altitude)
- Stable Atmosphere
  - Lapse rate < 3.0 deg C (5.4 deg F) per 1000 ft
  - Stratiform clouds
  - Sinking Air
  - Smooth Air
- Unstable Atmosphere
  - Lapse rate > 3.0 deg C (5.4 deg F) per 1000 ft
  - Cumulus clouds
  - Rising Air
  - Turbulent Air

Atmospheric Stability

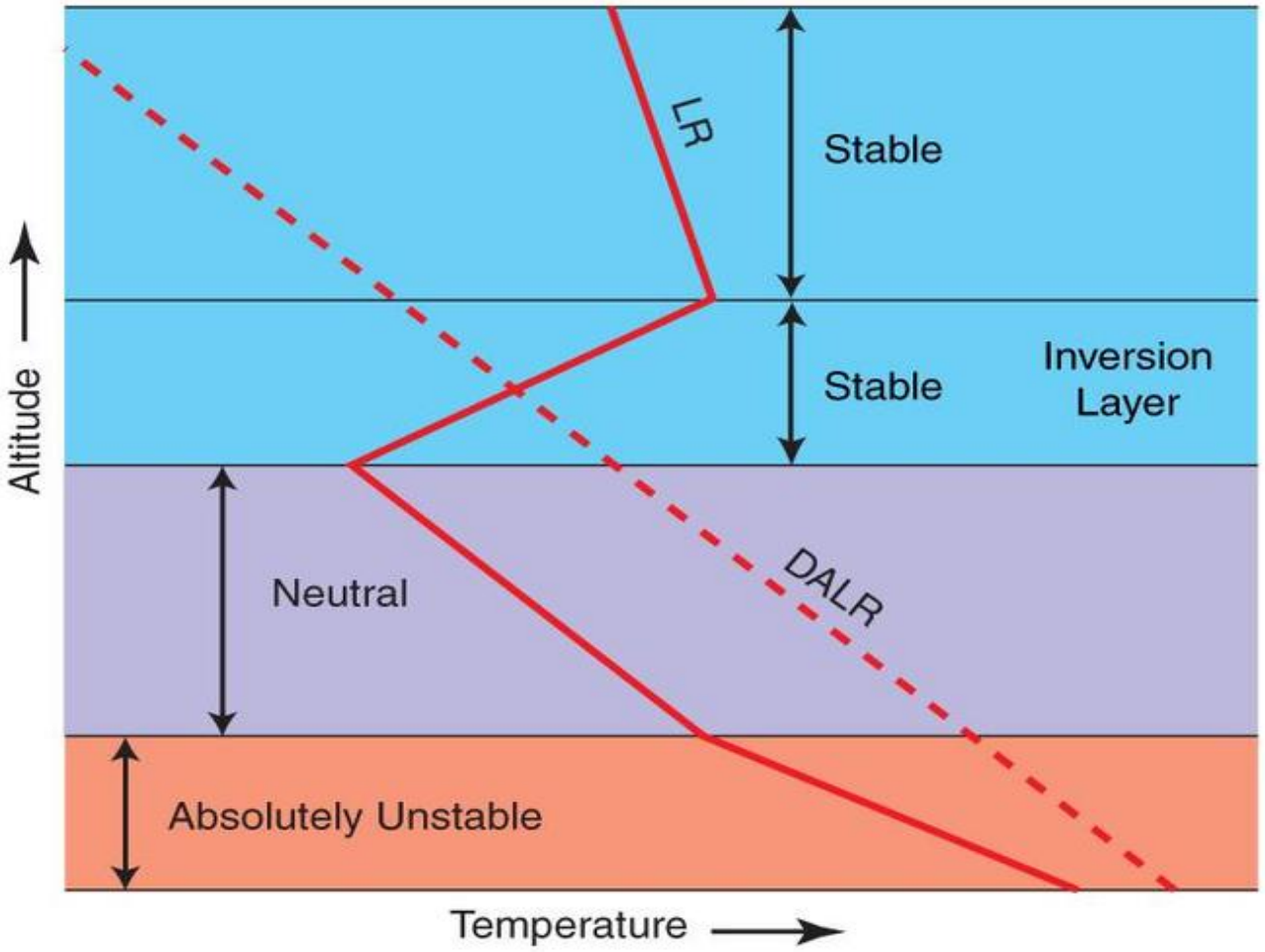
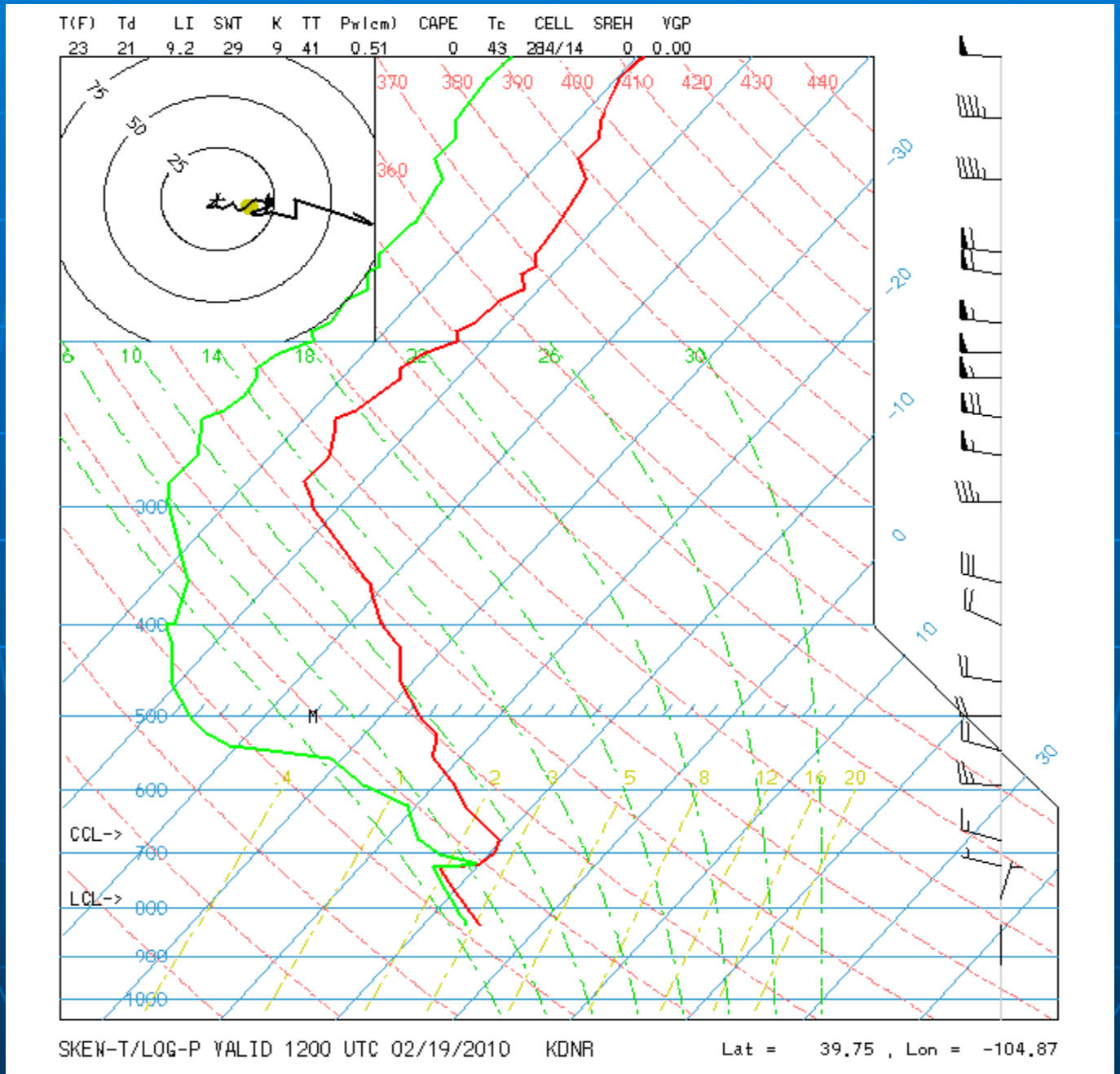


FIG 05-16

Aviation Weather

Denver Skew-T/Log P Diagram



Break

Trivia Question

What is the rate of temperature change with altitude in the troposphere of the International Standard Atmosphere (ISA) ?

A.) 1.0 deg C / 1000 ft

B.) 2.0 deg C / 1000 ft

C.) 3.0 deg C / 1000 ft

D.) 5.4 deg C / 1000 ft

Trivia Question

What is the rate of temperature change with altitude in the troposphere of the International Standard Atmosphere (ISA) ?

Answer:

A.) 1.0 deg C / 1000 ft

B.) 2.0 deg C / 1000 ft

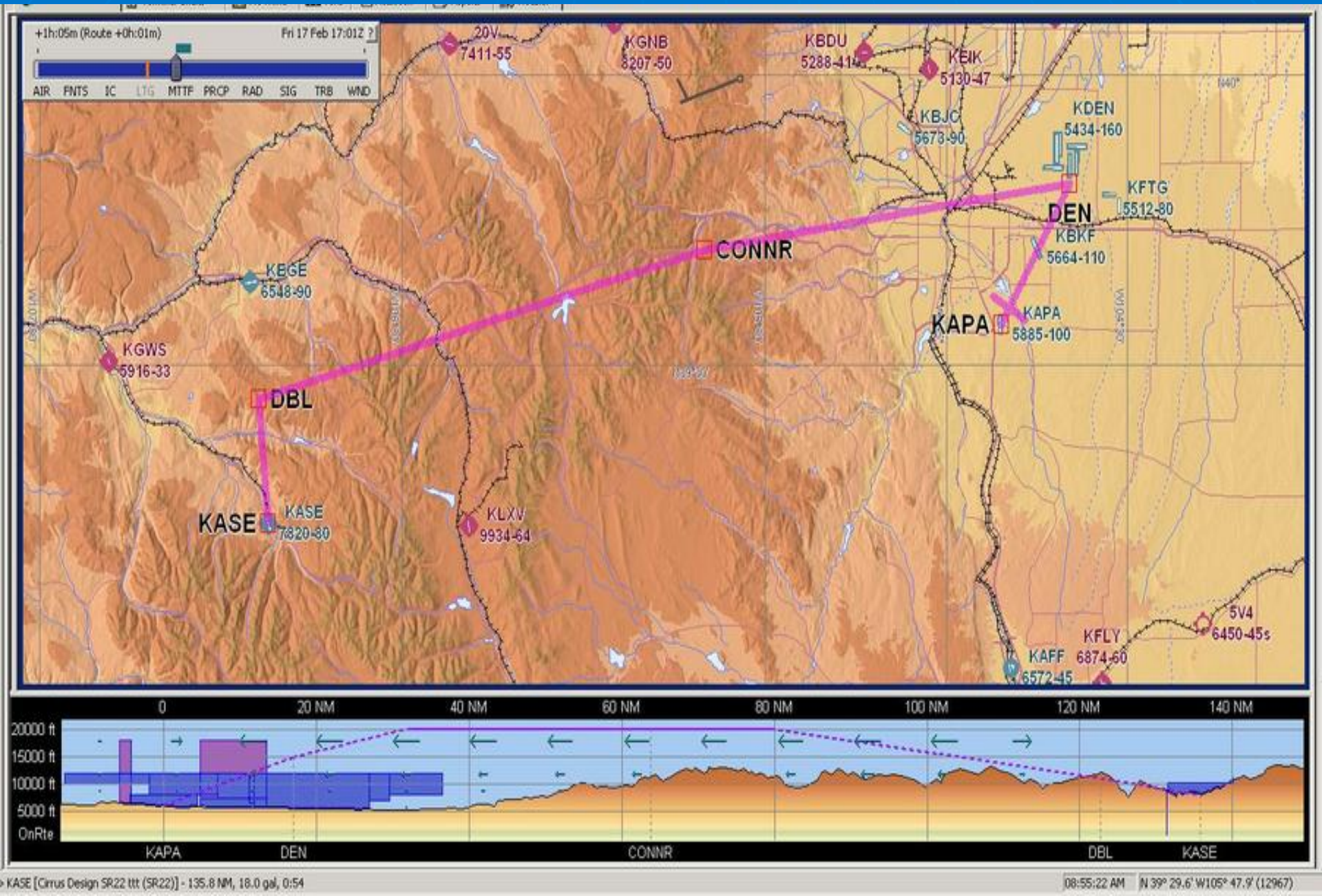
C.) 3.0 deg C / 1000 ft

D.) 5.4 deg C / 1000 ft

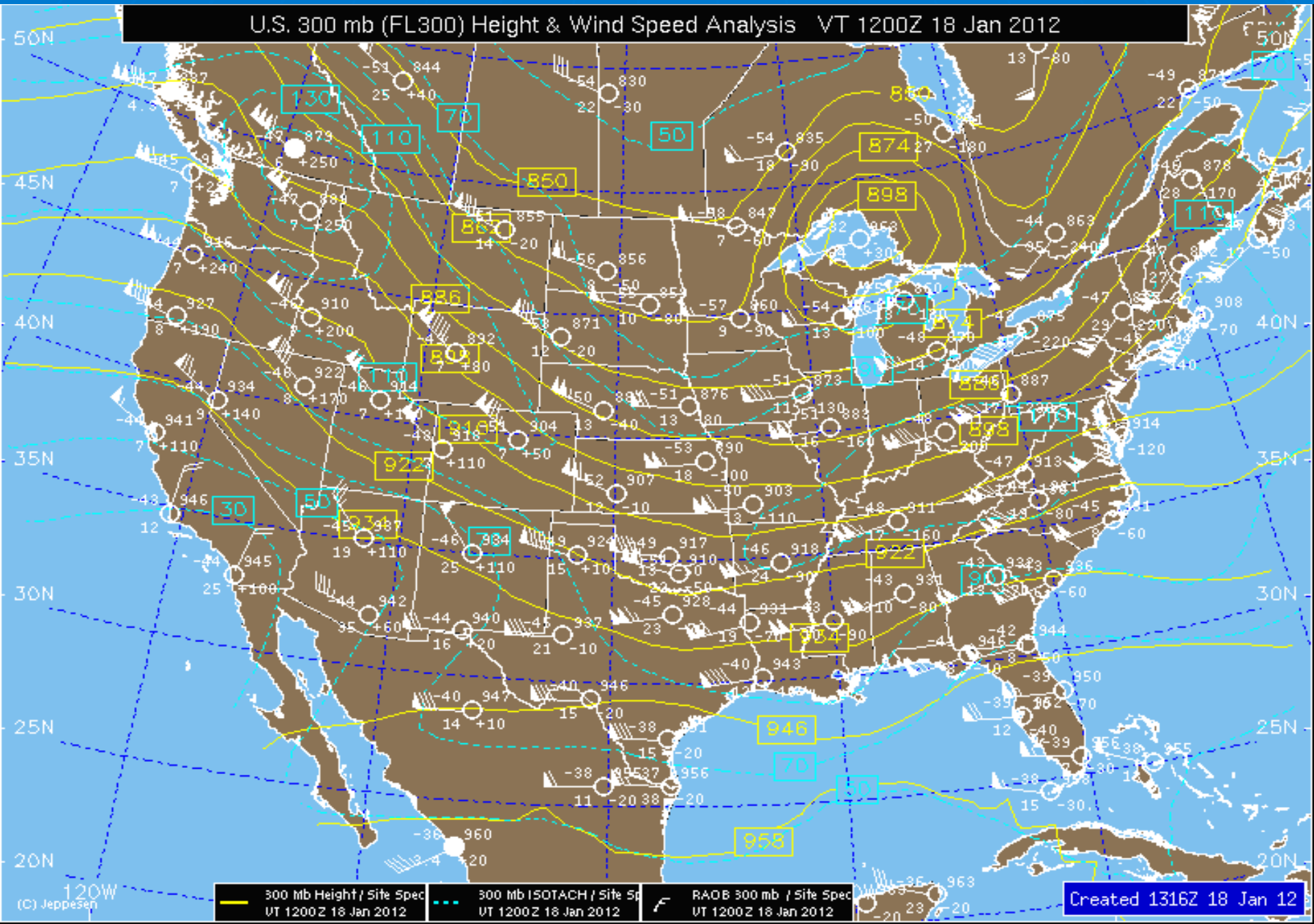
Flight Plan Scenario

- Planning a flight from KAPA to KASE
- Departing KAPA at 2120 UTC (2:20 pm MST) on Jan 18, 2012
- You will be flying a Cirrus SR-22T
- Aircraft is FIKI certified
- Filed an IFR flight plan for FL200
- 1 Passenger will be with you

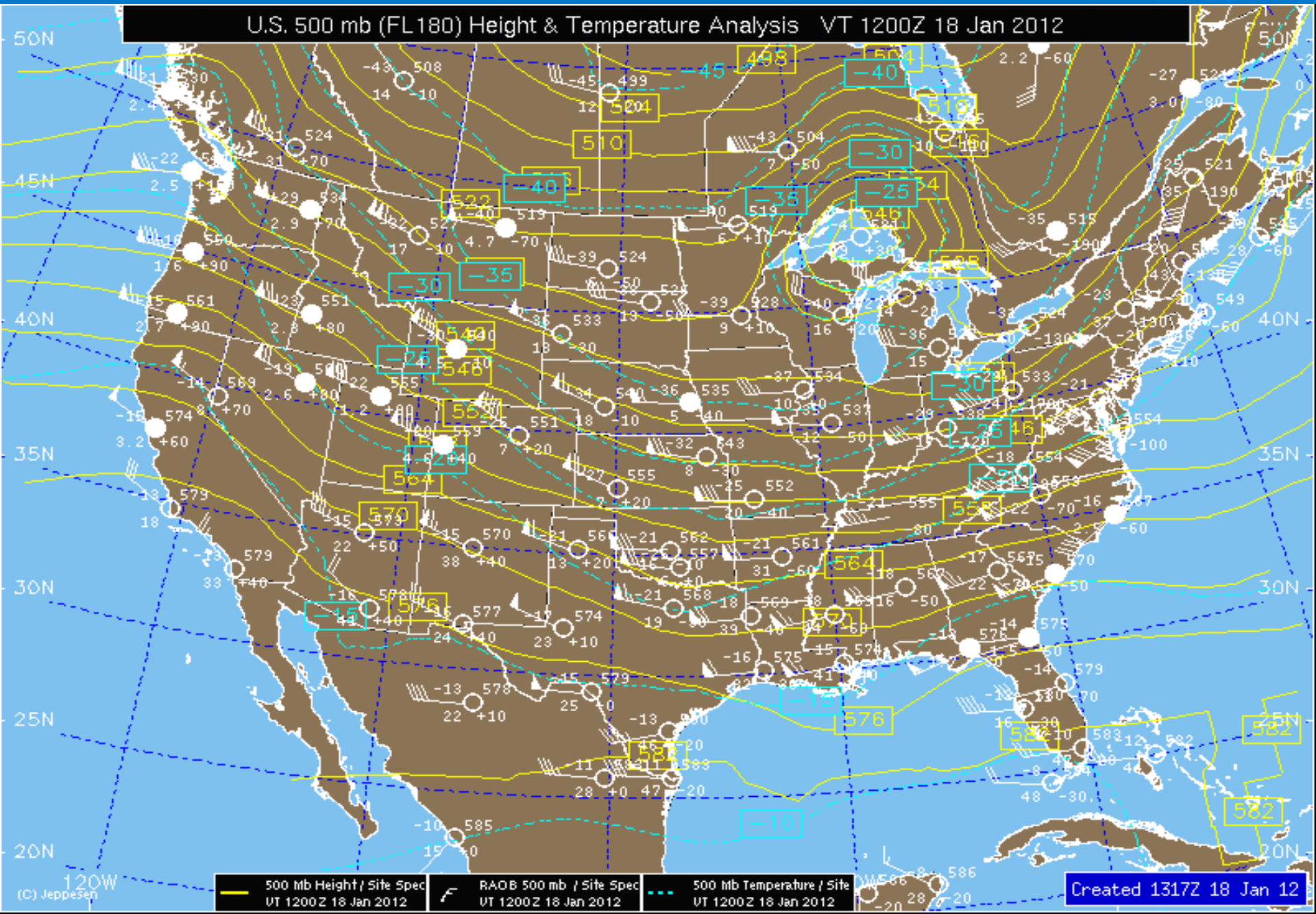
Flight Plan – ROCKI7-CONNR-DBL



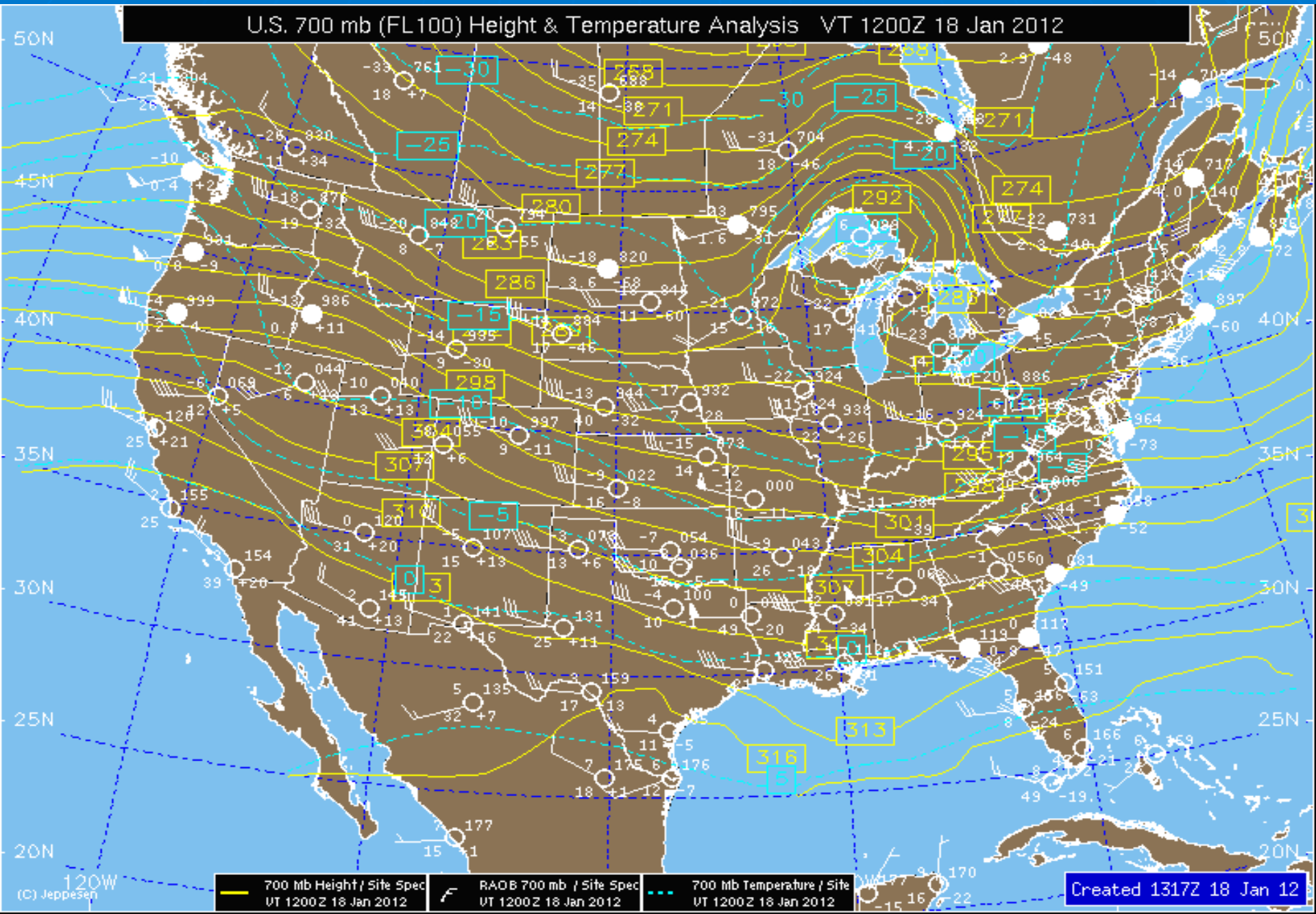
300 mb (FL300) Analysis – 1200 UTC



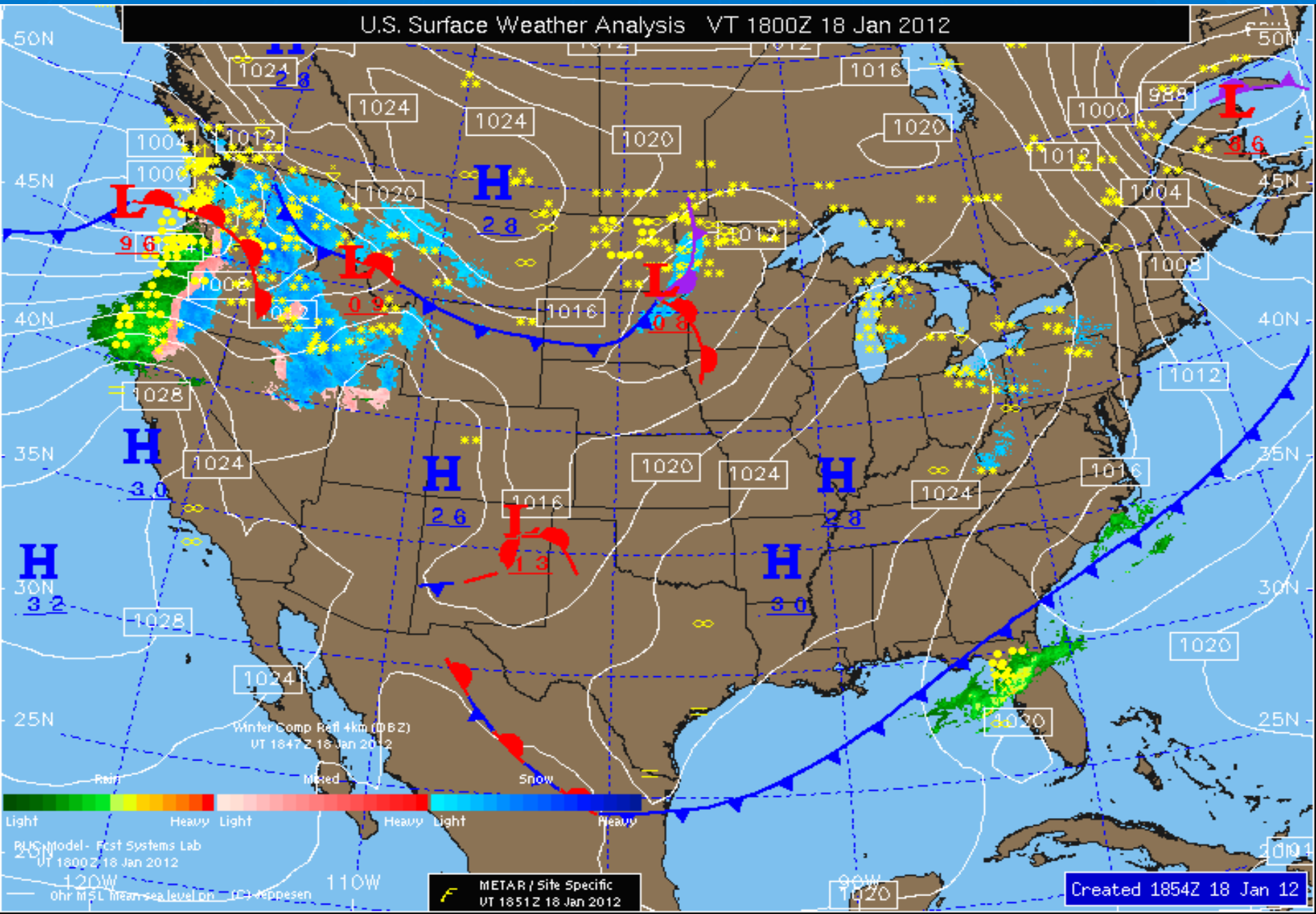
500 mb (FL180) Analysis – 1200 UTC



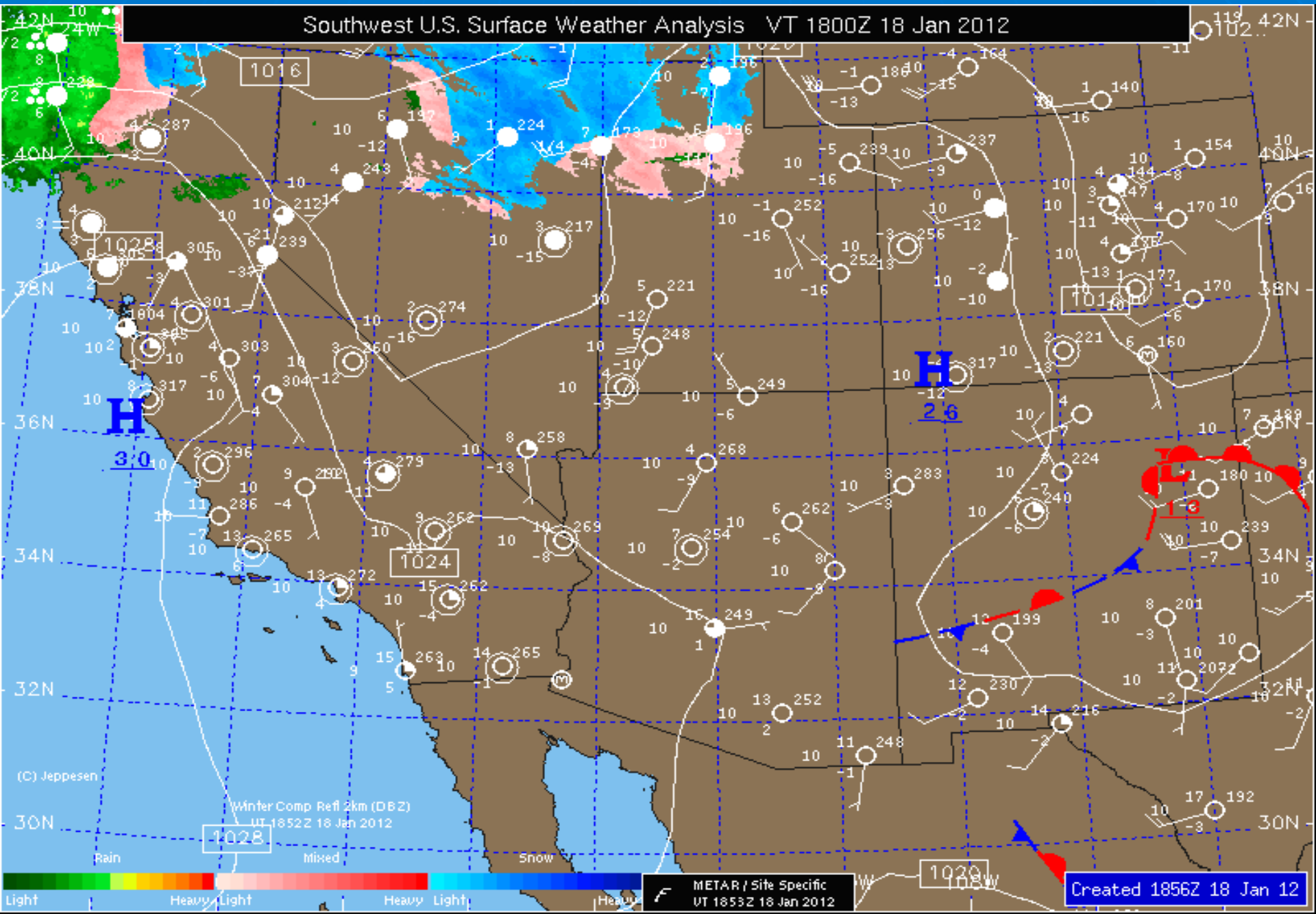
700 mb (FL100) Analysis – 1200 UTC



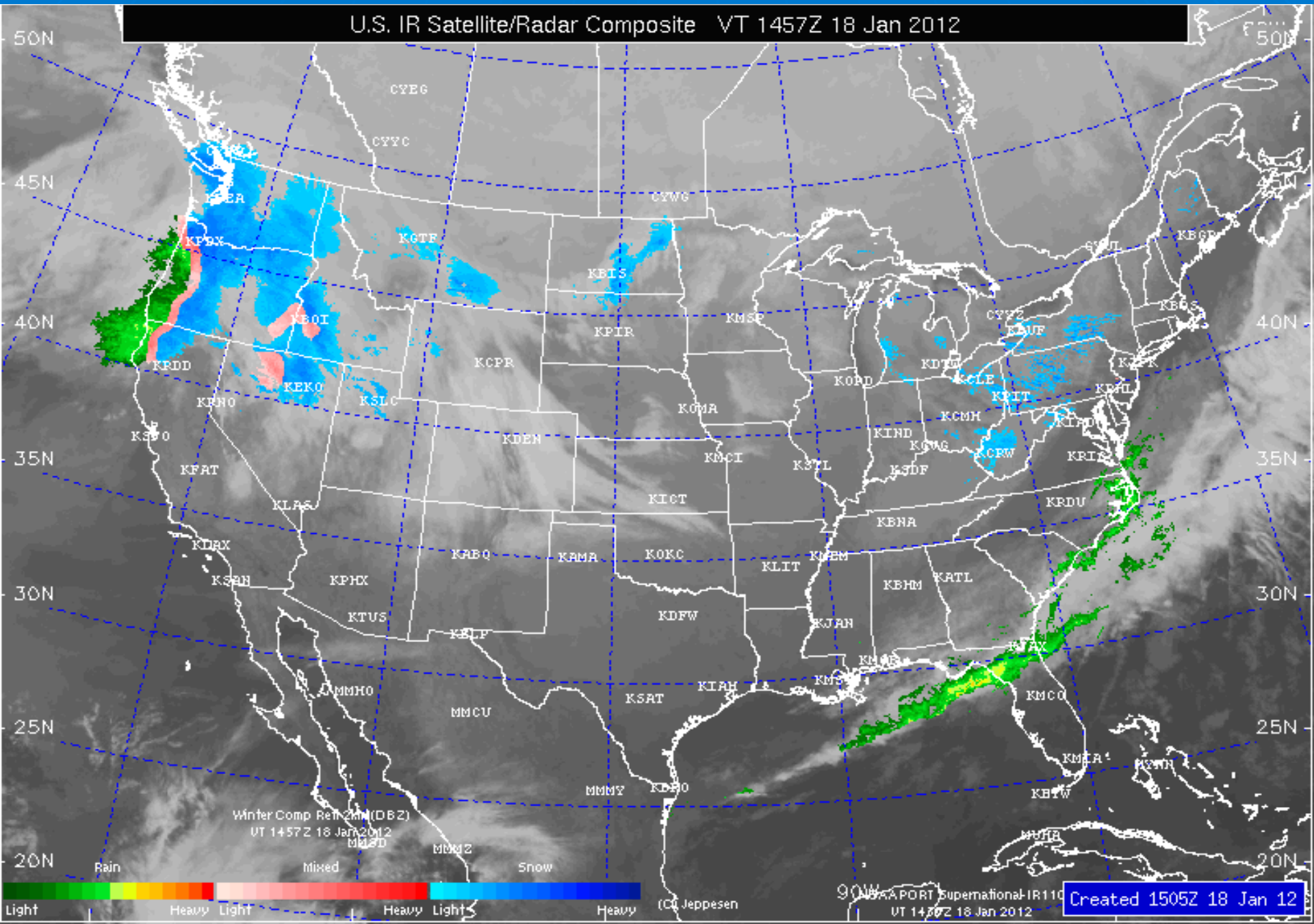
Surface Analysis – 1800 UTC



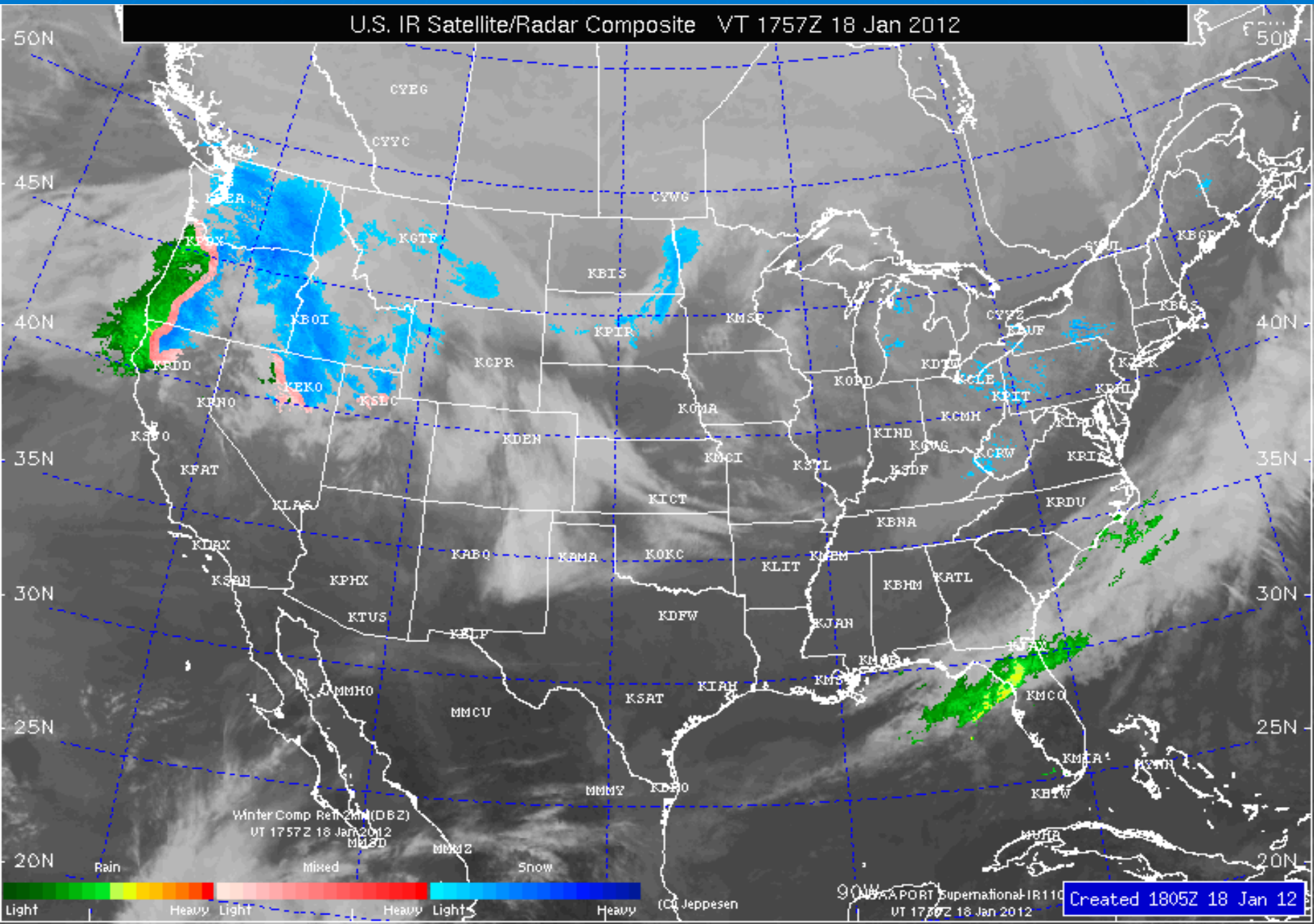
Surface Analysis – 1800 UTC



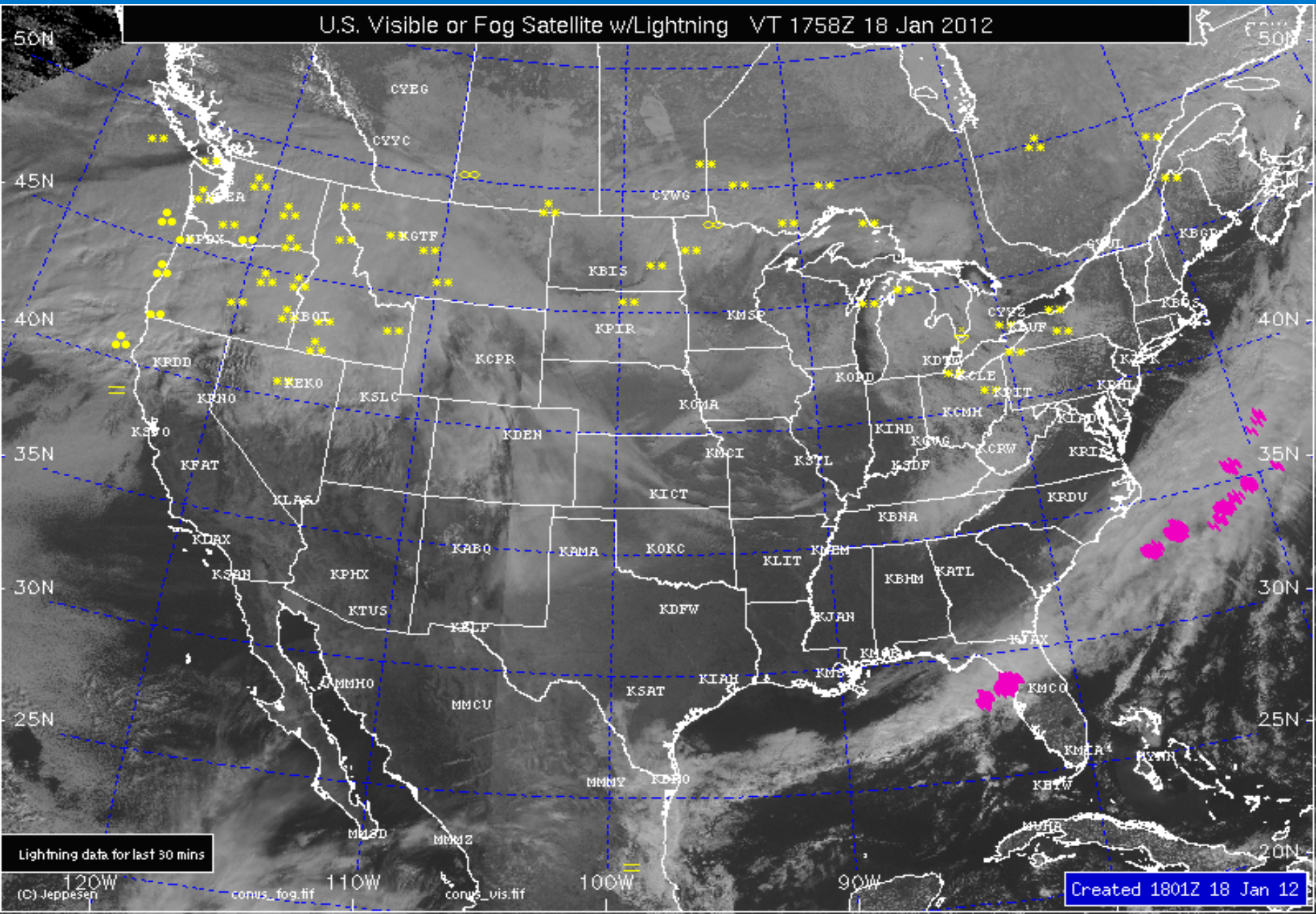
IR Satellite/Radar – 1500 UTC



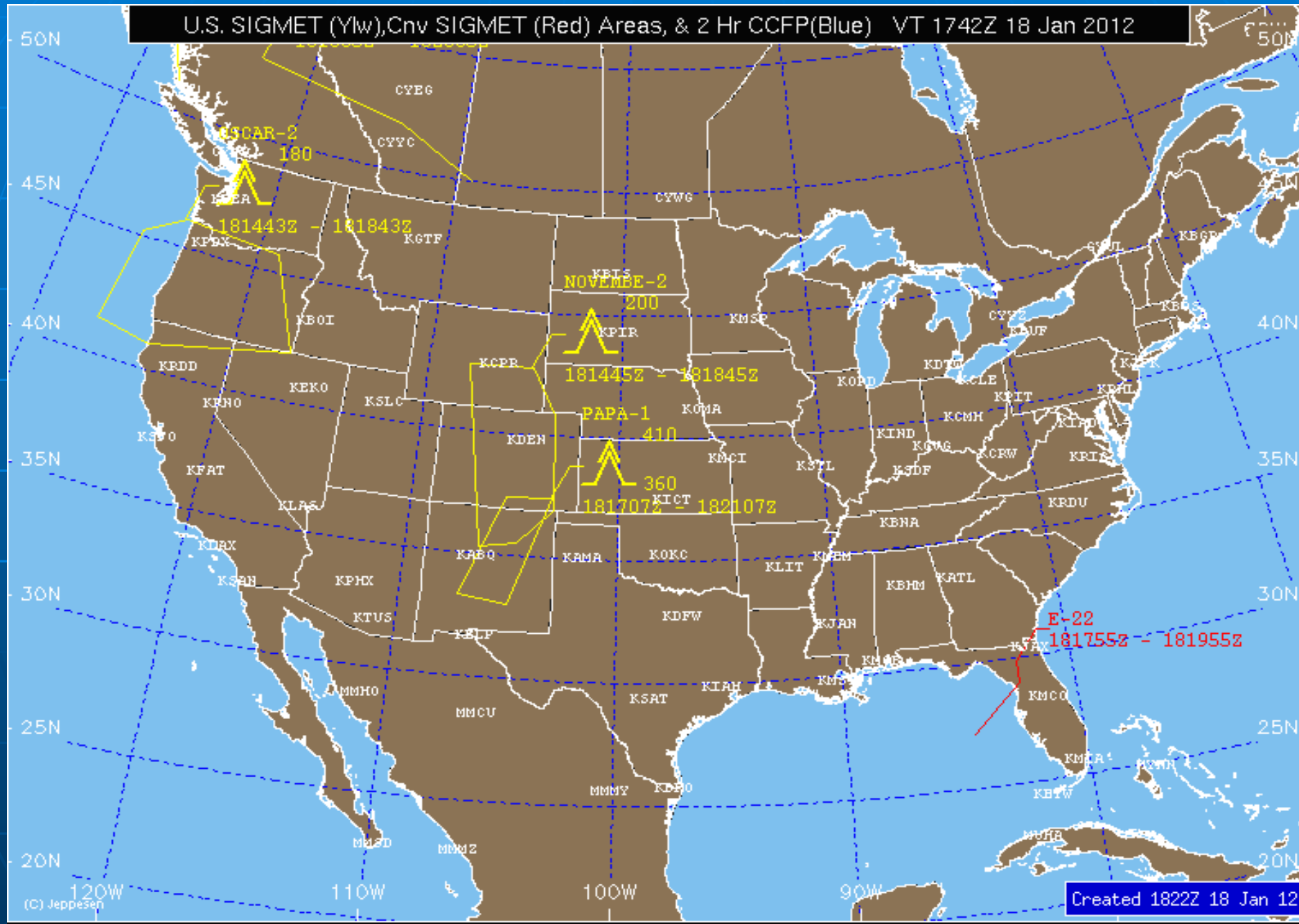
IR Satellite/Radar – 1800 UTC



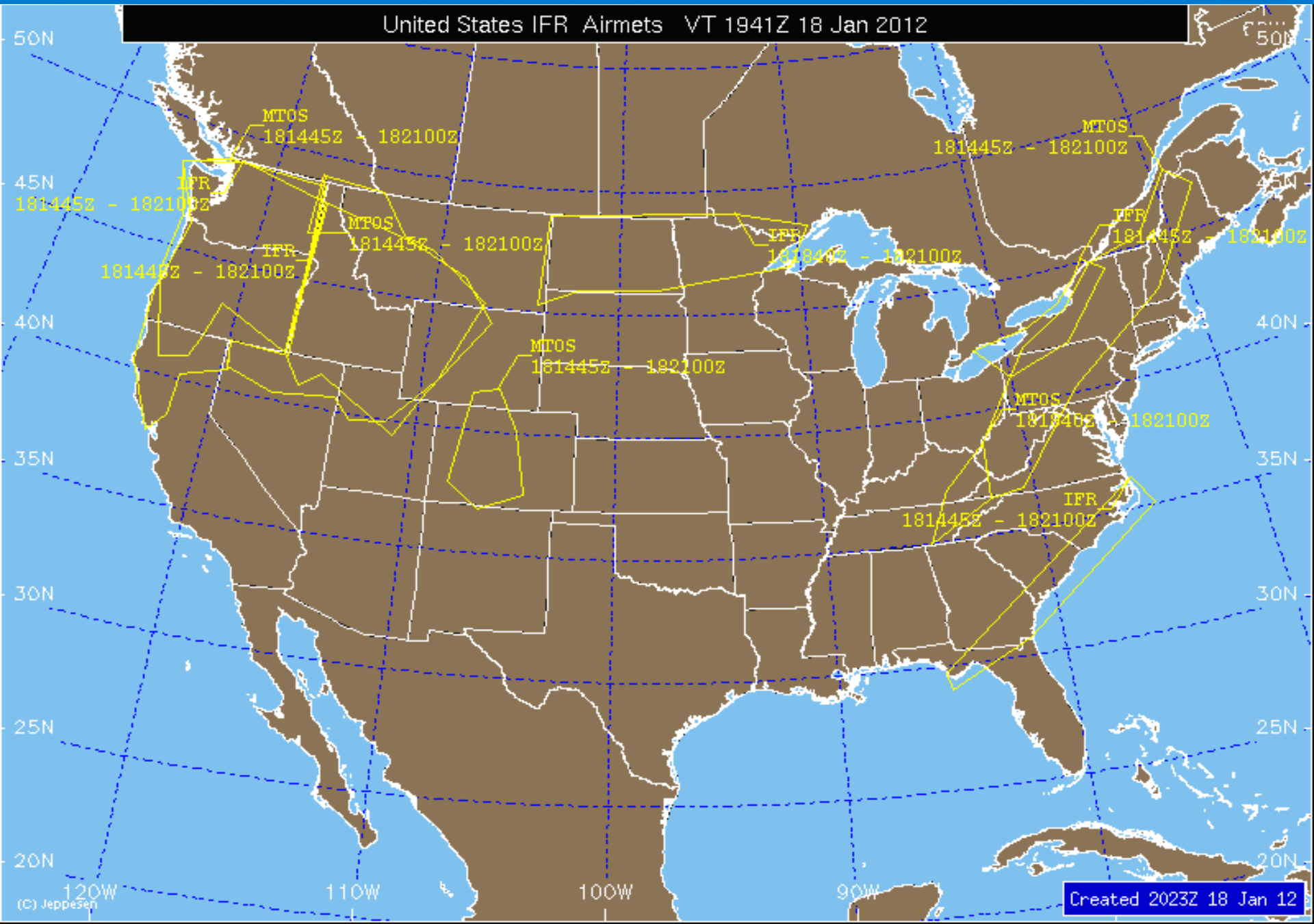
Visible Satellite – 1800 UTC



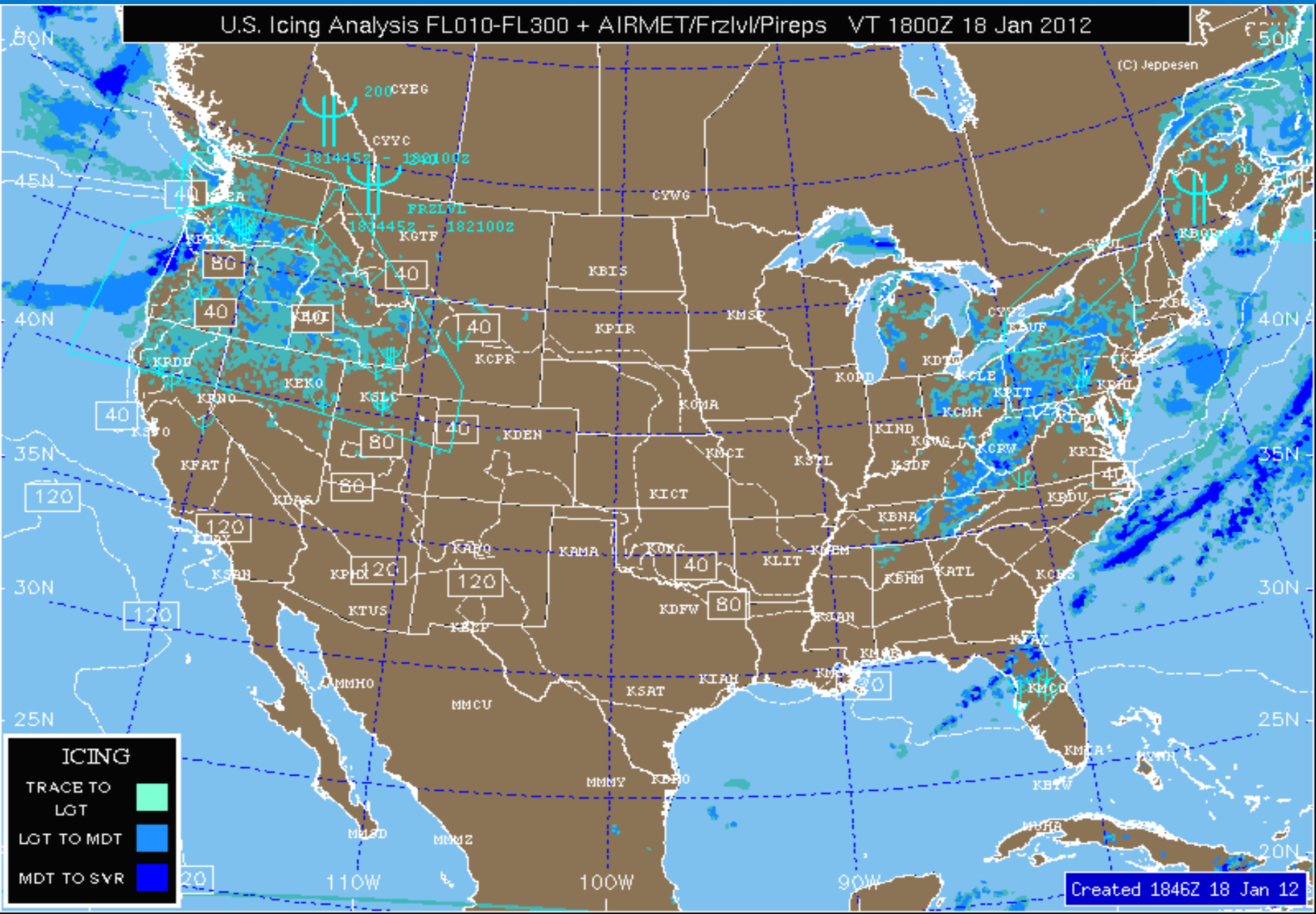
SIGMETs – 1800 UTC



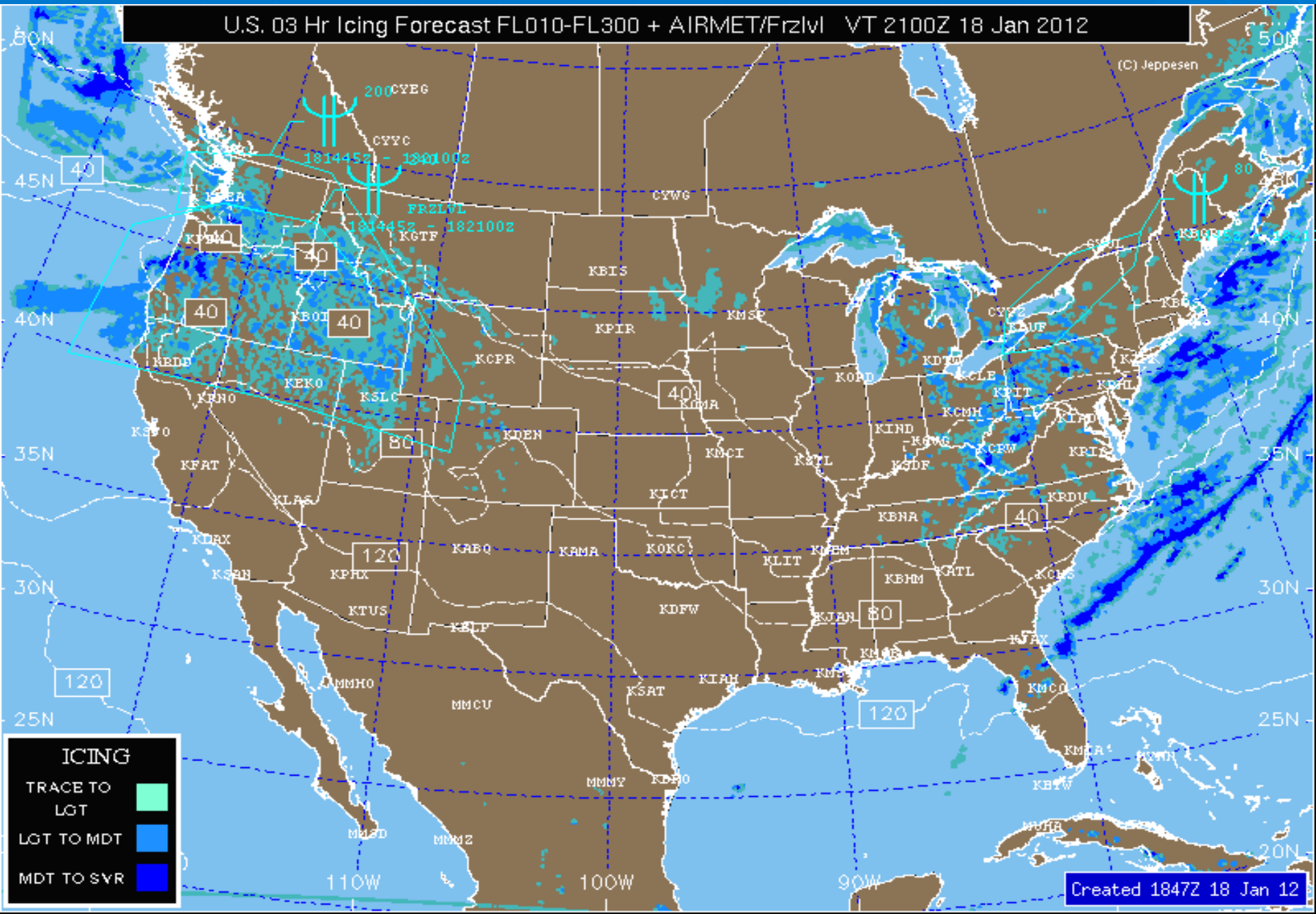
IFR/MTOS AIRMETs – 1900 UTC



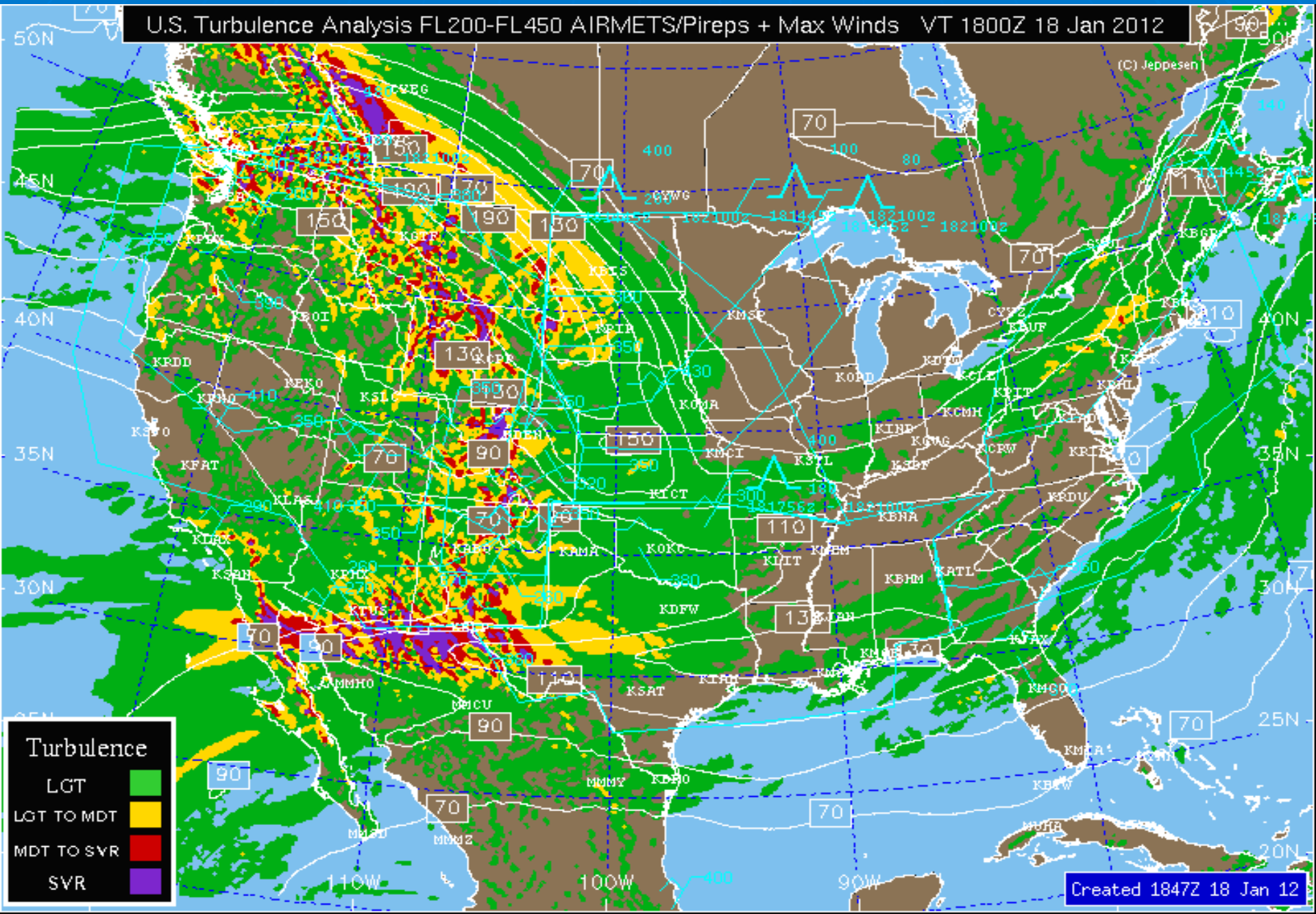
Icing Analysis FL010-300 – 1900 UTC



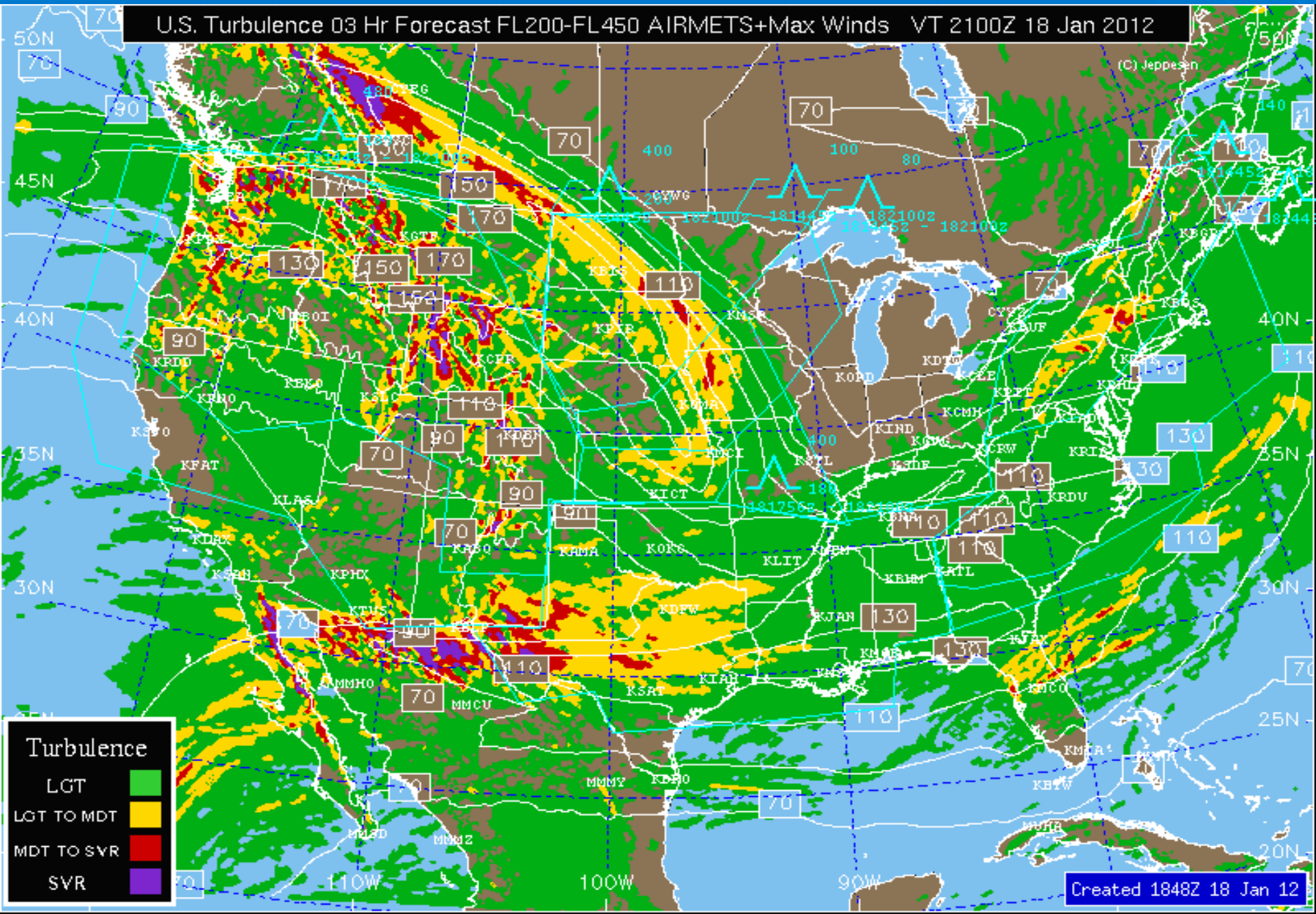
Icing 3 Hr Forecast FL010-300 – 2100 UTC



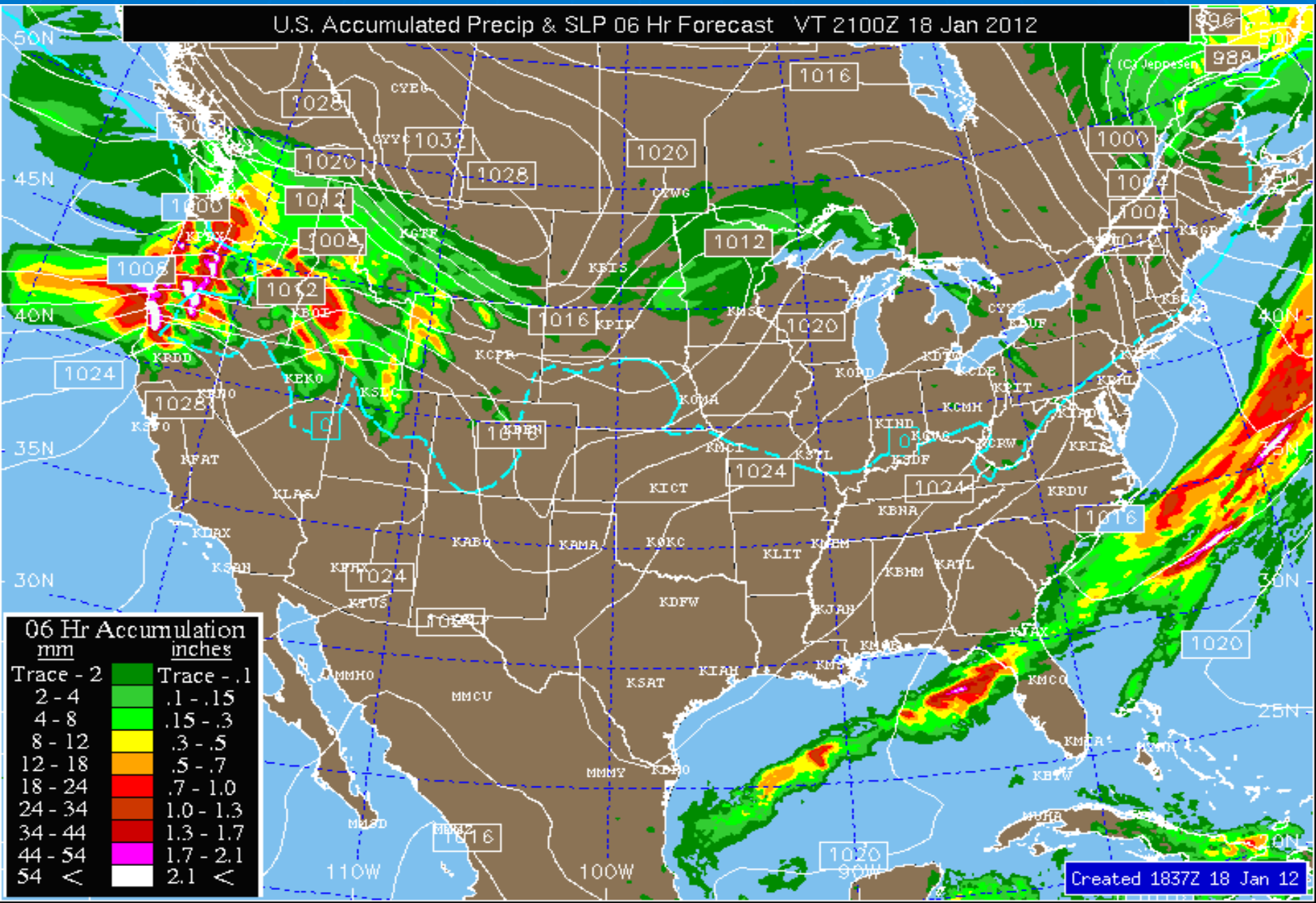
Turbulence Analysis FL200-450 – 1800 UTC



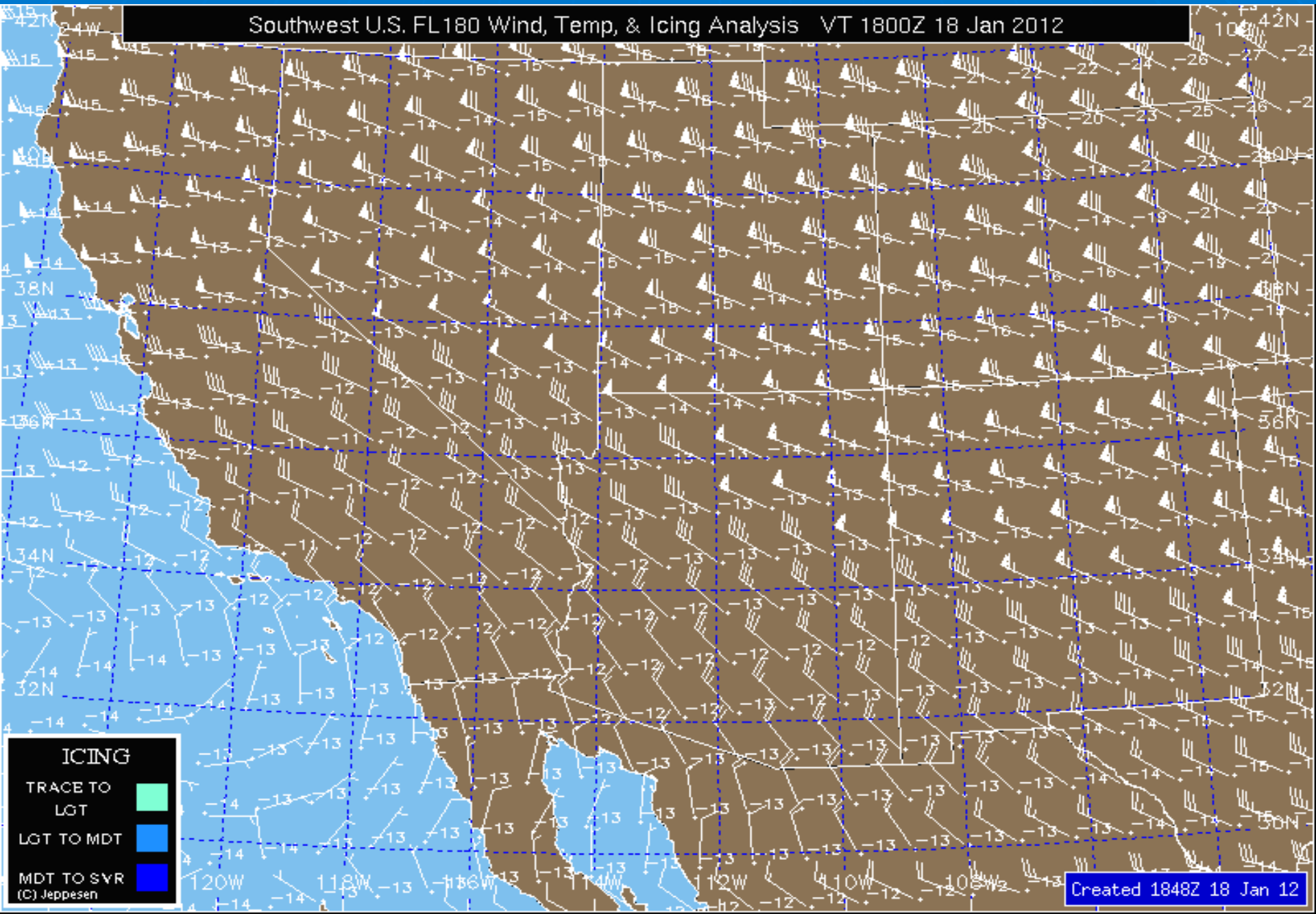
Turbulence 3 Hr Forecast FL200-450 2100UTC



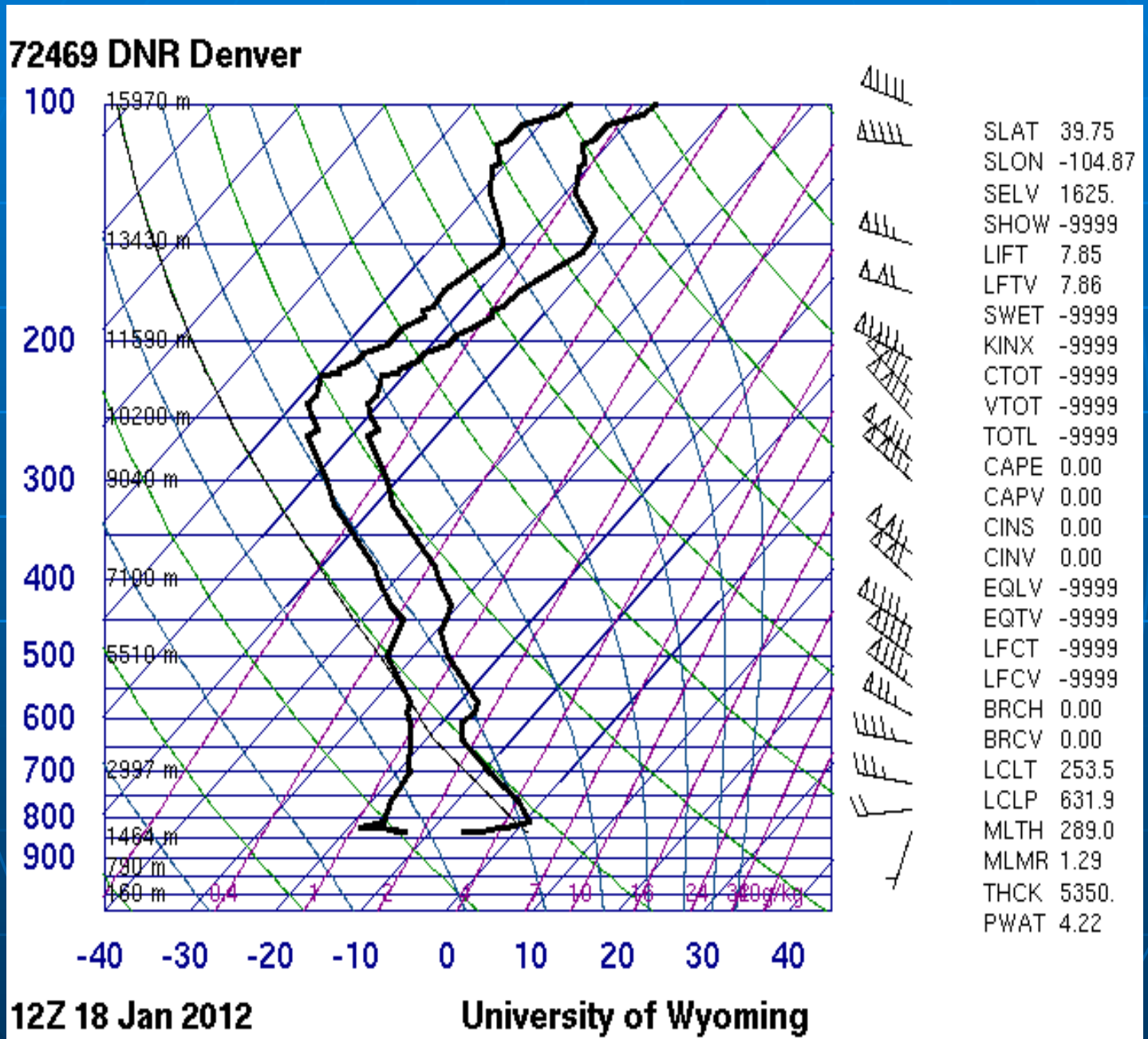
Surface Precip 6 Hr Forecast - 2100UTC



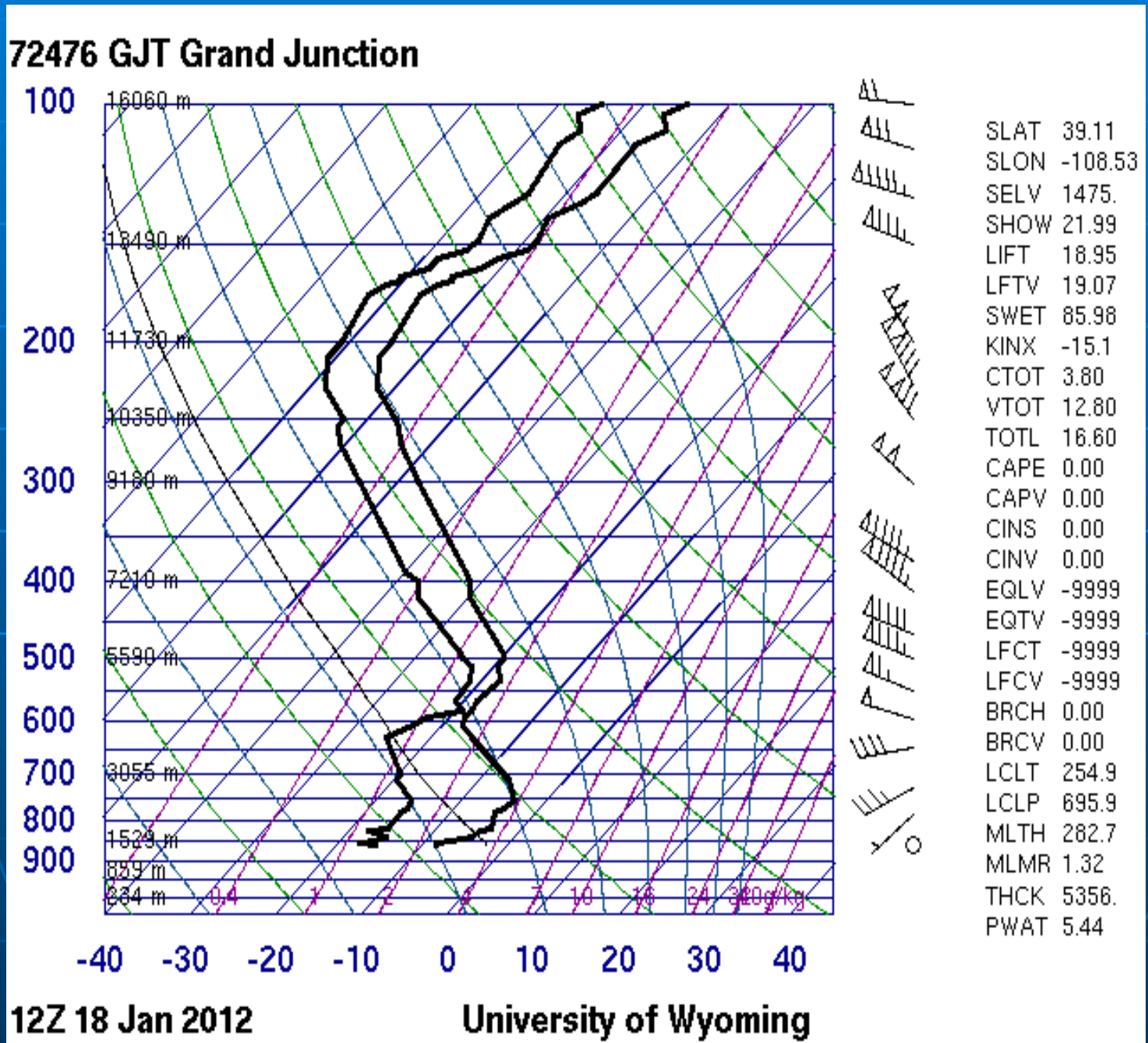
FL180 Winds - 1800UTC



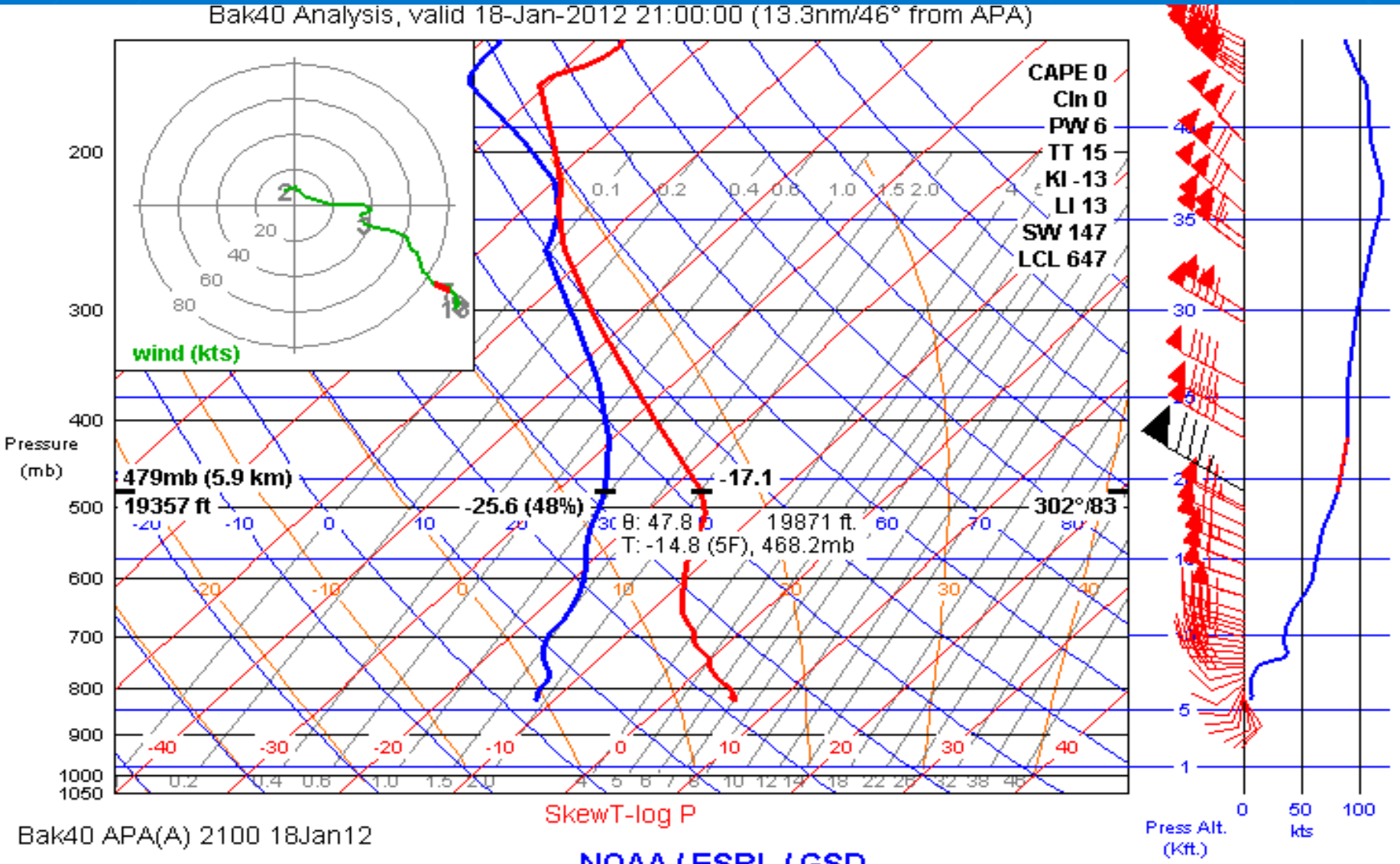
Denver Sounding - 1200UTC



Grand Junction Sounding - 1200UTC



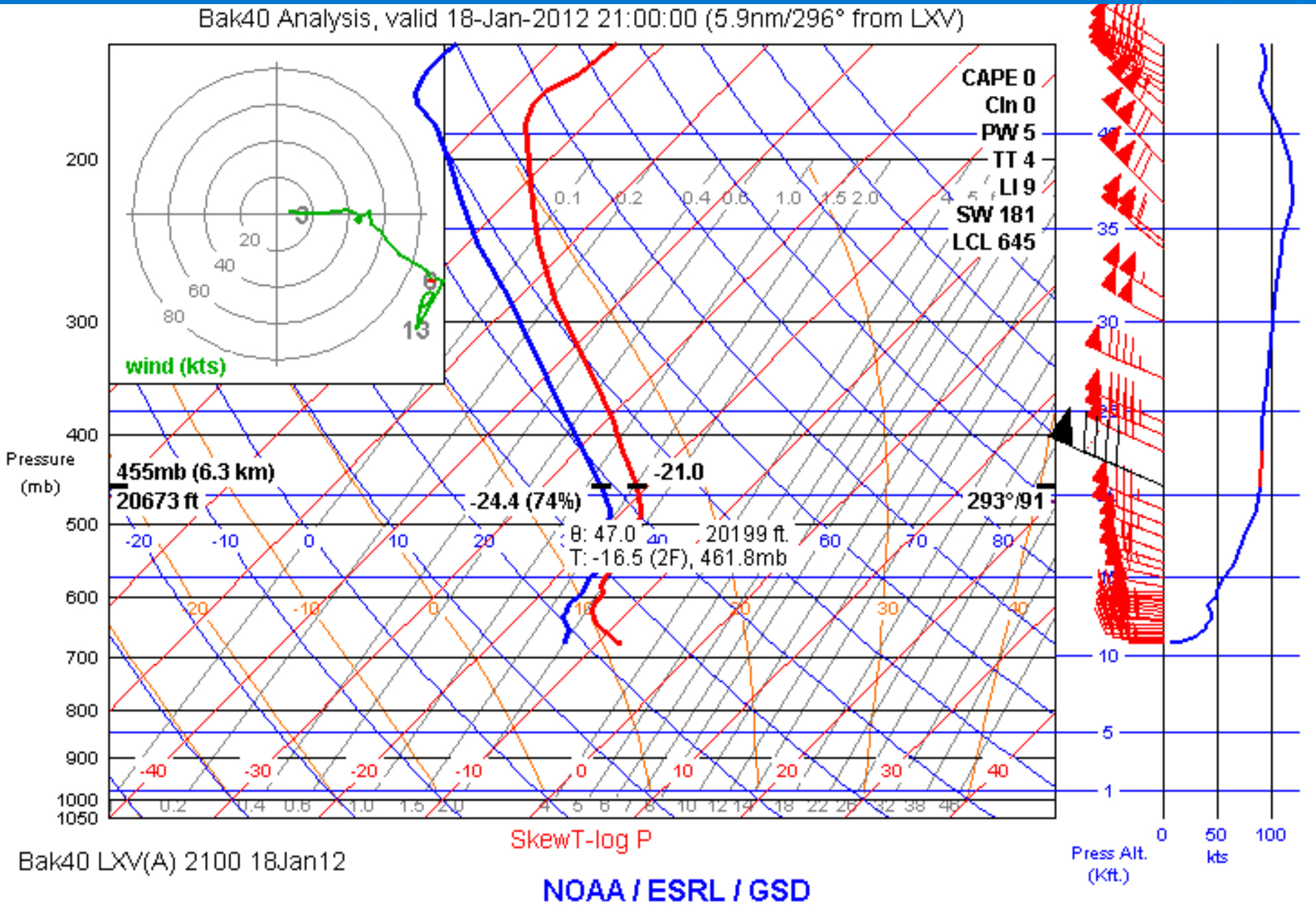
Model Sounding near KAPA - 2100UTC



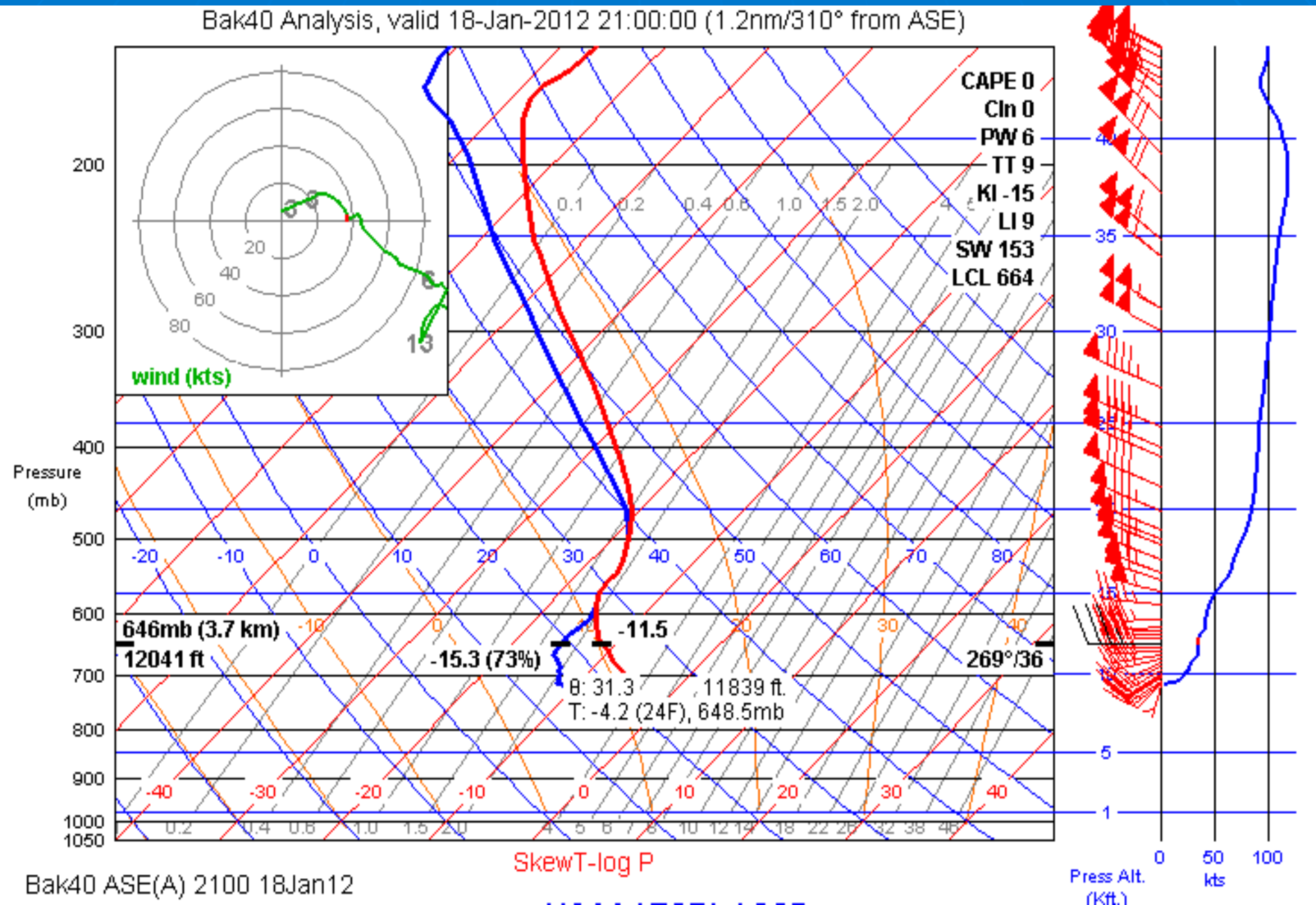
Load Soundings | Get text | 0.5 mb scale | SkewT/Tephi. | Wind scale: 40/100 | Simple plot

ASE(A) 0000 19Jan12	ASE(A) 2300 18Jan12	ASE(A) 2200 18Jan12	ASE(A) 2100 18Jan12
LXV(A) 0000 19Jan12	LXV(A) 2300 18Jan12	LXV(A) 2200 18Jan12	LXV(A) 2100 18Jan12

Model Sounding near KLXV - 2100UTC



Model Sounding near KASE - 2100UTC



1800 UTC METARs

KAPA 181753Z 14008KT 10SM FEW070 SCT120 03/M11 A2988 RMK AO2 SLP147 T00331106 10039 21011 58004

KBJC 181753Z 10008KT 70SM FEW070 SCT120 BKN200 05/M16 A2987

KEGE 181750Z 26014G19KT 10SM BKN090 OVC150 00/M12 A3004

KASE 181753Z 18005KT 10SM OVC070 M04/M11 A3008

Decision Time

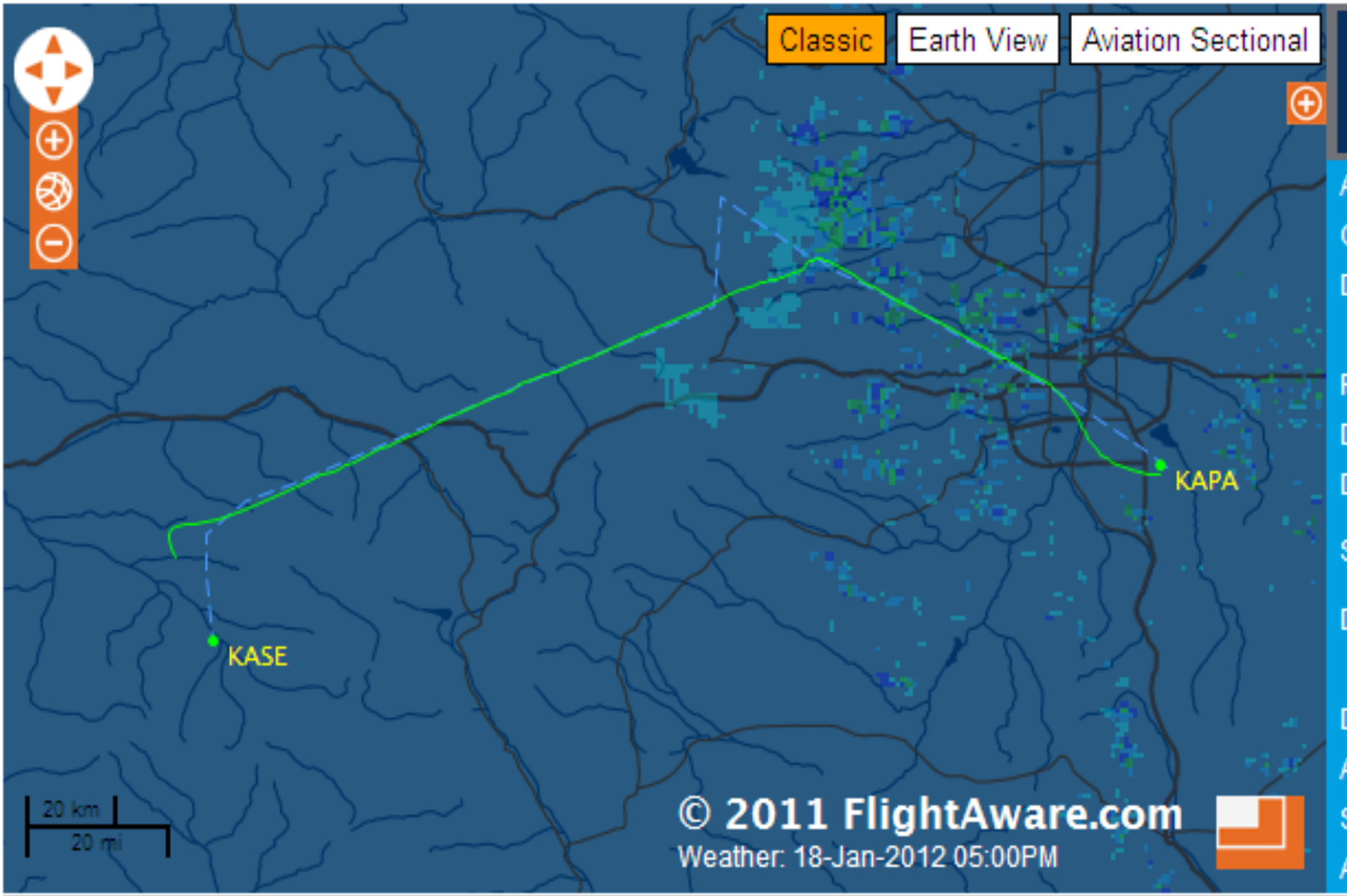
- Current Turbulence SIGMET in effect
- MTOS and Turbulence AIRMETs in effect
- Winds aloft at flight level 75-100 kts
- Satellite Imagery indicates a moderate to strong Mountain Wave
- Some light icing possible

- So who would continue with the flight ?

Discussion

- Someone did actually did decide to proceed with the flight
- Here's what happened

Actual Flight Path

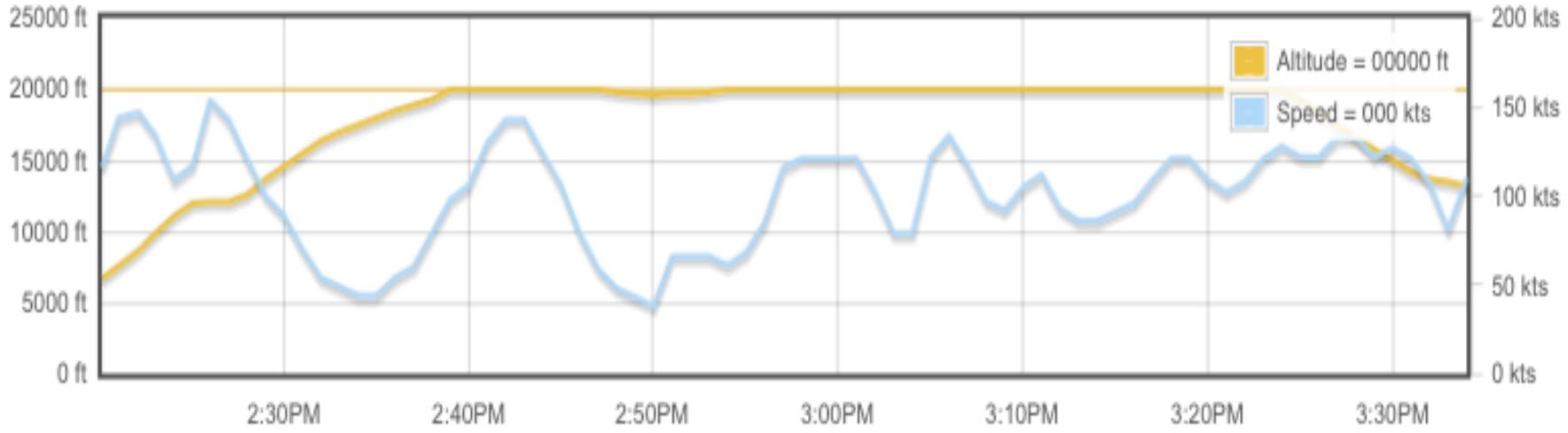


Flight Log – Altitude and Ground Speed

- Flight > N117G > 18-Jan-2012 > KAPA-KASE

Times and Time Zones

All times are in USA: Mountain time to prevent confusion due to time zone crossing. See the N117G flight status page for this flight to view local times or setup timezone preferences in your user account.



Flight Log – Part 1

Time	Position		Orientation		Groundspeed		Altitude		Reporting Facility
USA: Eastern	Latitude	Longitude	Course	Direction	KTS	MPH	feet	Rate	Location/Type
04:20PM	39.5500	-104.8500	270°	West	116	133	6,700		Denver TRACON
04:21PM	39.5500	-104.8833	293°	West	144	166	7,600	960 ↑	Denver TRACON
04:22PM	39.5667	-104.9333	303°	West	147	169	8,700	1,140 ↑	Denver TRACON
04:23PM	39.5833	-104.9667	322°	Northwest	134	154	9,900	1,260 ↑	Denver TRACON
04:24PM	39.6167	-105.0000	339°	North	109	125	11,100	1,020 ↑	Denver TRACON
04:25PM	39.6500	-105.0167	331°	Northwest	117	135	12,000	480 ↑	Denver TRACON
04:26PM	39.6722	-105.0325	332°	Northwest	154	177	12,100	↑	Denver Center
04:27PM	39.7100	-105.0589	316°	Northwest	143	165	12,100	240	Denver Center
04:28PM	39.7292	-105.0828	306°	West	121	139	12,600	780 ↑	Denver Center
04:29PM	39.7442	-105.1094	302°	West	100	115	13,700	960 ↑	Denver Center
04:30PM	39.7569	-105.1361	305°	West	89	102	14,600	900 ↑	Denver Center
04:31PM	39.7656	-105.1522	308°	West	70	81	15,500	900 ↑	Denver Center
04:32PM	39.7719	-105.1631	307°	West	54	62	16,400	720 ↑	Denver Center
04:33PM	39.7781	-105.1736	293°	West	49	56	17,000	540 ↑	Denver Center
04:34PM	39.7825	-105.1869	309°	West	44	51	17,500	480 ↑	Denver Center
04:35PM	39.7911	-105.2006	304°	West	44	51	18,000	480 ↑	Denver Center
04:36PM	39.7994	-105.2164	303°	West	54	62	18,500	420 ↑	Denver Center
04:37PM	39.8103	-105.2381	302°	West	60	69	18,900	360 ↑	Denver Center
04:38PM	39.8231	-105.2647	304°	West	79	91	19,300	540 ↑	Denver Center
04:39PM	39.8400	-105.2969	307°	West	98	113	20,000	300 ↑	Denver Center
04:40PM	39.8569	-105.3264	299°	West	106	122	20,000		Denver Center
04:41PM	39.8761	-105.3719	305°	West	130	150	20,000		Denver Center
04:42PM	39.8994	-105.4150	303°	West	143	165	20,000		Denver Center
04:43PM	39.9208	-105.4581	307°	West	143	165	20,000		Denver Center
04:44PM	39.9397	-105.4903	302°	West	124	143	20,000		Denver Center
04:45PM	39.9525	-105.5169	301°	West	106	122	20,000		Denver Center
04:46PM	39.9611	-105.5358	304°	West	79	91	20,000		Denver Center
04:47PM	39.9694	-105.5519	297°	West	59	68	20,000	-120	Denver Center
04:48PM	39.9736	-105.5628	298°	West	48	55	19,800	-180 ↓	Denver Center
04:49PM	39.9781	-105.5736	254°	West	43	49	19,700	-120 ↓	Denver Center
04:50PM	39.9739	-105.5928	217°	Southwest	38	44	19,600	↓	Denver Center
04:51PM	39.9575	-105.6092	243°	Southwest	66	76	19,700	↑	Denver Center
04:52PM	39.9492	-105.6308	247°	West	66	76	19,700		Denver Center
04:53PM	39.9431	-105.6500	241°	Southwest	66	76	19,800	120 ↑	Denver Center
04:54PM	39.9350	-105.6689	259°	West	61	70	20,000	60 ↑	Denver Center

Flight Log – Part 2

04:57PM	39.9064	-105.7642	241°	Southwest	116	133	20,000		Denver Center
04:58PM	39.8900	-105.8022	242°	Southwest	121	139	20,000		Denver Center
04:59PM	39.8733	-105.8428	242°	Southwest	121	139	20,000		Denver Center
05:00PM	39.8569	-105.8836	242°	Southwest	121	139	20,000		Denver Center
05:01PM	39.8425	-105.9189	241°	Southwest	121	139	20,000		Denver Center
05:02PM	39.8322	-105.9433	241°	Southwest	102	117	20,000		Denver Center
05:03PM	39.8219	-105.9678	243°	Southwest	79	91	20,000		Denver Center
05:04PM	39.8094	-106.0003	241°	Southwest	79	91	20,000		Denver Center
05:05PM	39.7908	-106.0436	244°	Southwest	122	140	20,000		Denver Center
05:06PM	39.7764	-106.0814	238°	Southwest	134	154	20,000		Denver Center
05:07PM	39.7619	-106.1114	246°	West	117	135	20,000		Denver Center
05:08PM	39.7517	-106.1411	254°	West	97	112	20,000		Denver Center
05:09PM	39.7456	-106.1681	243°	Southwest	92	106	20,000		Denver Center
05:10PM	39.7289	-106.2114	238°	Southwest	105	121	20,000		Denver Center
05:11PM	39.7144	-106.2411	243°	Southwest	112	129	20,000		Denver Center
05:12PM	39.7061	-106.2628	240°	Southwest	93	107	20,000		Denver Center
05:13PM	39.6956	-106.2869	239°	Southwest	86	99	20,000		Denver Center
05:14PM	39.6831	-106.3142	242°	Southwest	86	99	20,000		Denver Center
05:15PM	39.6708	-106.3439	245°	Southwest	91	105	20,000		Denver Center
05:16PM	39.6603	-106.3733	239°	Southwest	96	110	20,000		Denver Center
05:17PM	39.6417	-106.4139	240°	Southwest	109	125	20,000		Denver Center
05:18PM	39.6250	-106.4517	245°	Southwest	121	139	20,000		Denver Center
05:19PM	39.6125	-106.4867	239°	Southwest	121	139	20,000		Denver Center
05:20PM	39.6000	-106.5136	241°	Southwest	109	125	20,000		Denver Center
05:21PM	39.5853	-106.5486	238°	Southwest	102	117	20,000		Denver Center
05:22PM	39.5686	-106.5836	247°	West	108	124	20,000		Denver Center
05:23PM	39.5561	-106.6214	240°	Southwest	121	139	20,000		Denver Center
05:24PM	39.5392	-106.6589	242°	Southwest	128	147	20,000	-360	Denver Center
05:25PM	39.5225	-106.6994	242°	Southwest	122	140	19,300	-840 ↓	Denver Center
05:26PM	39.5058	-106.7397	240°	Southwest	122	140	18,400	-900 ↓	Denver Center
05:27PM	39.4889	-106.7772	240°	Southwest	133	153	17,500	-900 ↓	Denver Center
05:28PM	39.4722	-106.8147	255°	West	133	153	16,600	-900 ↓	Denver Center
05:29PM	39.4636	-106.8578	252°	West	122	140	15,800	-840 ↓	Denver Center
05:30PM	39.4531	-106.9008	264°	West	127	146	15,000	-840 ↓	Denver Center
05:31PM	39.4508	-106.9303	264°	West	121	139	14,200	-660 ↓	Denver Center
05:32PM	39.4486	-106.9600	184°	South	107	123	13,700	-360 ↓	Denver Center
05:33PM	39.4194	-106.9625	162°	South	81	93	13,500	-300 ↓	Denver Center
05:34PM	39.3861	-106.9486	162°	South	110	127	13,200	-300 ↓	Denver Center

Summary

- So the pilot actually conducted the flight and landed safely in KASE
- What's to learn here ?
- Would the pilot make another similar trip ?

Break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Weather Trivia Question

In the record tornado outbreak of April 2011, appx how may tornadoes were reported in April 2011 ?

A.) 250
B.) 500
C.) 600
D.) 750

Weather Trivia Question

In the record tornado outbreak of April 2011, appx how may tornadoes were reported in April 2011 ?

Answer:

A.) 250

B.) 500

C.) 600

D.) 750

753 confirmed tornadoes recorded in April 2011. Previous monthly record was May 2003 with 542

Weather Accident Review

- Flight from KTEB to KPDK on Dec 20, 2011
- Flight conducted in a TBM-700 N731CA
- Pilot, age 43, was instrument rated and had 1400 total flight hours and current medical

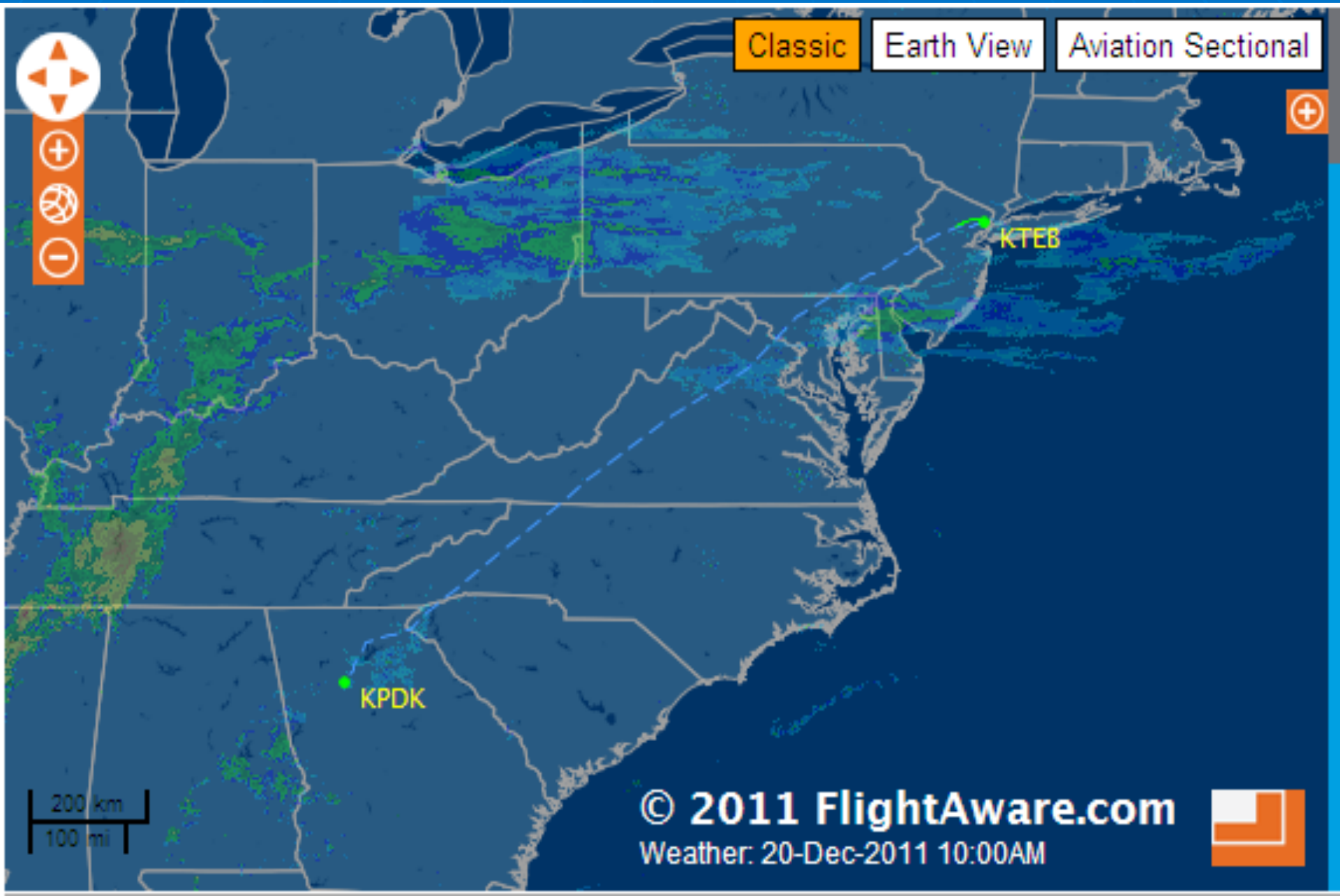
Weather Accident Review

- Flight departed KTEB at 1450 UTC (09:50 AM EST) on Dec 20, 2011
- Pilot was in contact with KZNY ARTCC, and reported he was in icing conditions at FL170.
- Pilot request a climb to a higher altitude and was cleared for FL200.
- Aircraft reached FL179 and then began a descent.
- Radar and radio contact was lost at appx 1505 UTC

Weather Accident Review

- Aircraft was manufactured 2005 and equipped with a P&W PT6A-64 turbo prop engine with 750 hp.
- Last annual inspection was performed on July 27, 2011.
- Aircraft had 702 total flight hours.
- Aircraft impacted the wooden median on I-287 appx 1 mile north of Morristown, NJ.
- Pilot and 4 passengers fatally injured.

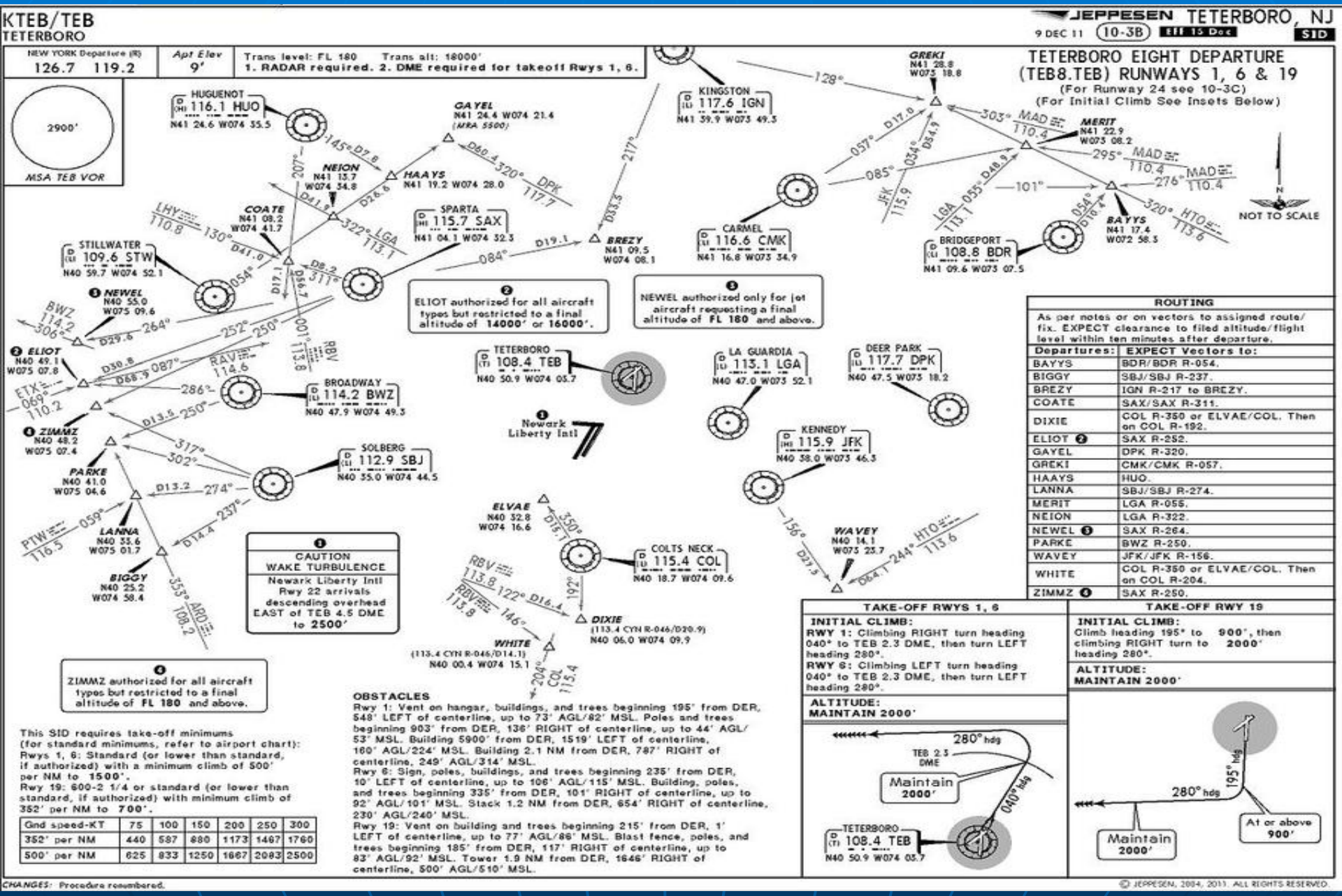
Filed Flight Plan + Radar



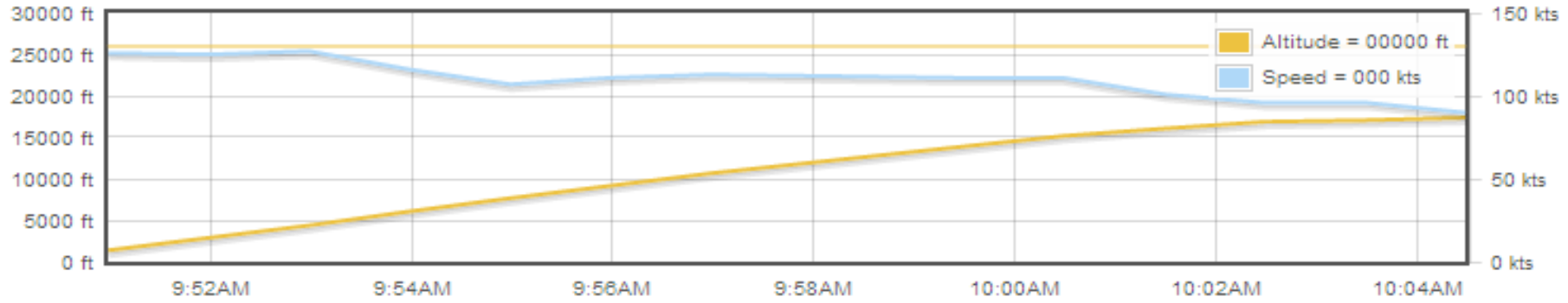
Flight Path


CTAF 123.0
BLAIRSTOWN NJ
1N7 372-30
STILLWATER
109.6 STW
CTAF 122.9
Newton NJ
3N5 620-25
9.6 MILLVILLE
CTAF 122.8
ANDOVER NJ
Aerobflex-Andover
12N 583-19
BROADWAY
114.2 BWZ
BWZ
CTAF 122.9
Hackettstown NJ
N05 670-22
SPARTA
115.7 SAX
CTAF 122.8
LINCOLN PARK NJ
N07 182-29
TETERBORO
108.4 TEB
2.3 DME TEB
15° to 410 feet
KTEB
ATIS 135.5
CTAF 139.8
CALDWELL NJ
Essex Co
KCDW 172-45
ATIS 124.25
CTAF 118.1
MORRISTOWN
NJ -Mun
KMMU 187-59
ATIS 115.7
NEWARK NJ
-Liberty Intl
KEWR 18-110
V3-405-419
V249
V213
V252
0 10 NM 20 NM 30 NM 40 NM 50 NM
15000 ft
10000 ft
5000 ft
On Ntw
KTEB 2.30M KTEB
BWZ

KTEB SID for RWY 01/06/19

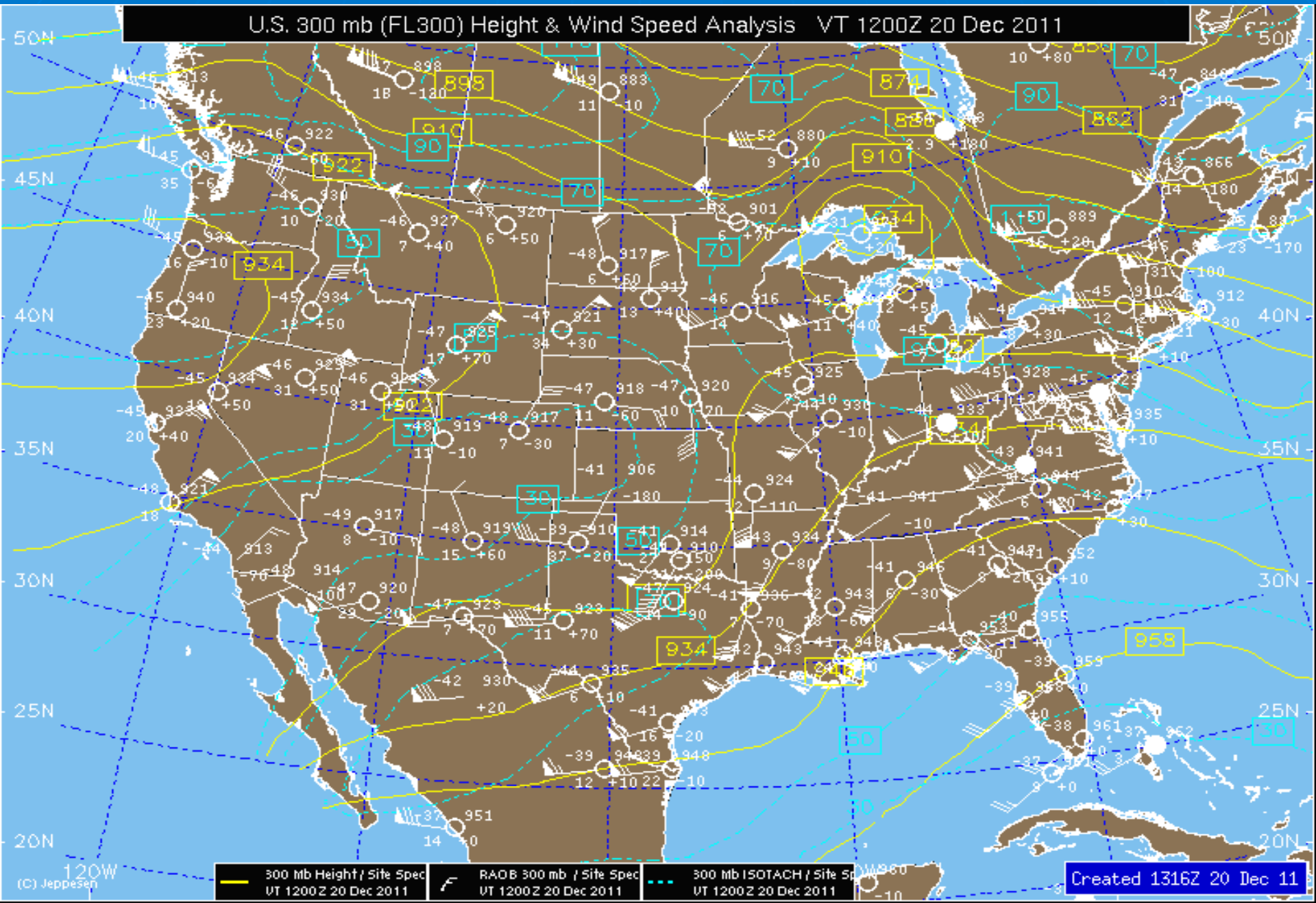


Flight Record

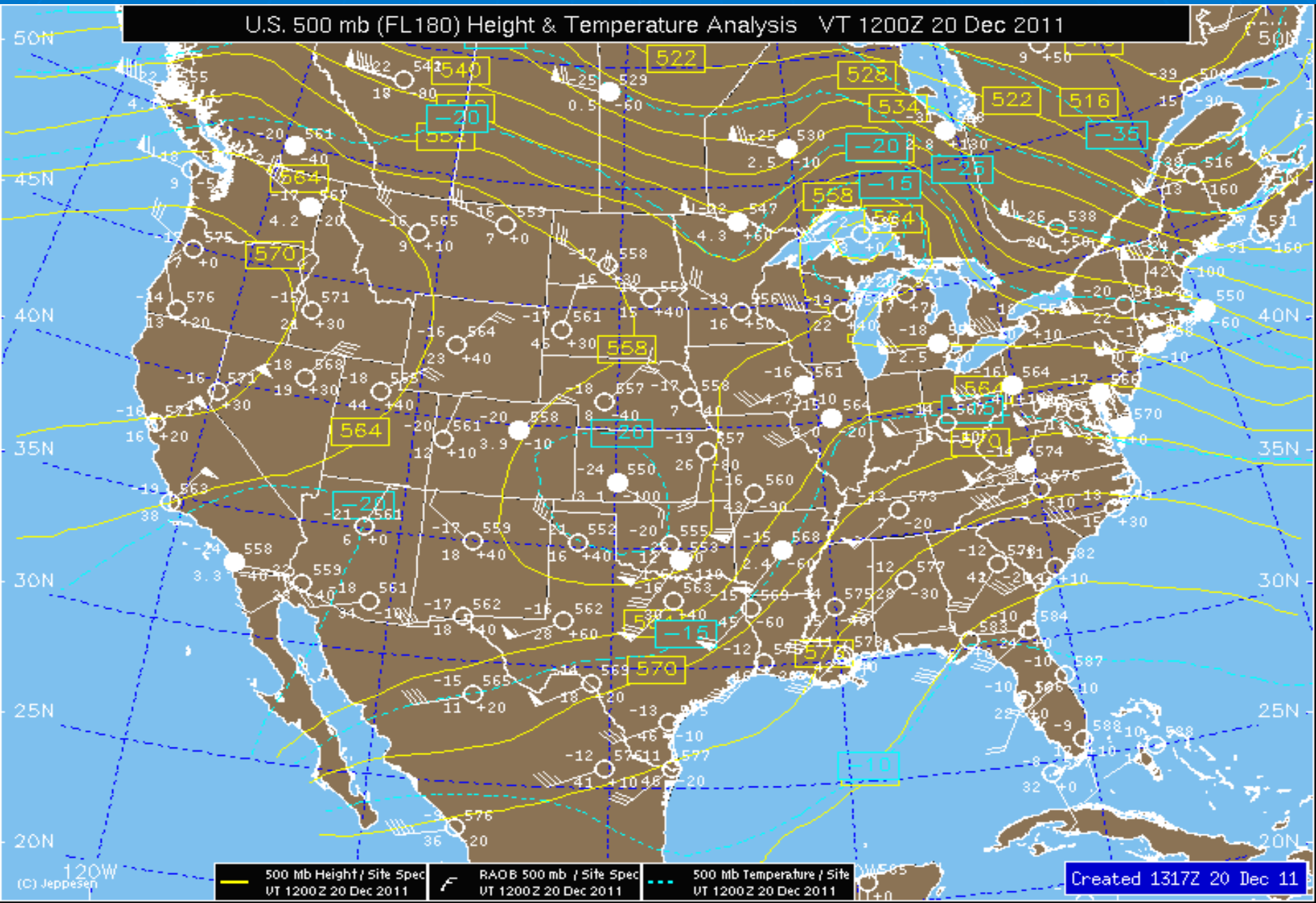


Time	Position		Orientation		Groundspeed		Altitude		Reporting Facility
USA: Eastern	Latitude	Longitude	Course	Direction	KTS	MPH	feet	Rate	Location/Type
09:50AM	40.8833	-74.0333	270°	West	126	145	1,400		New York TRACON
09:51AM	40.8833	-74.0833	270°	West	125	144	2,900	1,500 ↑	New York TRACON
09:52AM	40.8833	-74.1167	294°	West	127	146	4,400	1,560 ↑	New York TRACON
09:53AM	40.9000	-74.1667	270°	West	116	133	6,100	1,620 ↑	New York TRACON
09:54AM	40.9000	-74.2000	270°	West	107	123	7,700	1,500 ↑	New York TRACON
09:55AM	40.9000	-74.2333	237°	Southwest	111	128	9,200	1,500 ↑	New York TRACON
09:56AM	40.8833	-74.2667	249°	West	113	130	10,700	1,320 ↑	New York TRACON
09:59AM	40.8550	-74.3622	236°	Southwest	111	128	13,900	1,260 ↑	New York Center
10:00AM	40.8372	-74.3969	241°	Southwest	111	128	15,200	1,080 ↑	New York Center
10:01AM	40.8258	-74.4239	239°	Southwest	101	116	16,100	840 ↑	New York Center
10:02AM	40.8125	-74.4533	241°	Southwest	96	110	16,900	480 ↑	New York Center
10:03AM	40.7992	-74.4853	226°	Southwest	96	110	17,100	240 ↑	New York Center
10:04AM	40.7839	-74.5064	226°	Southwest	90	104	17,400	300 ↑	New York Center

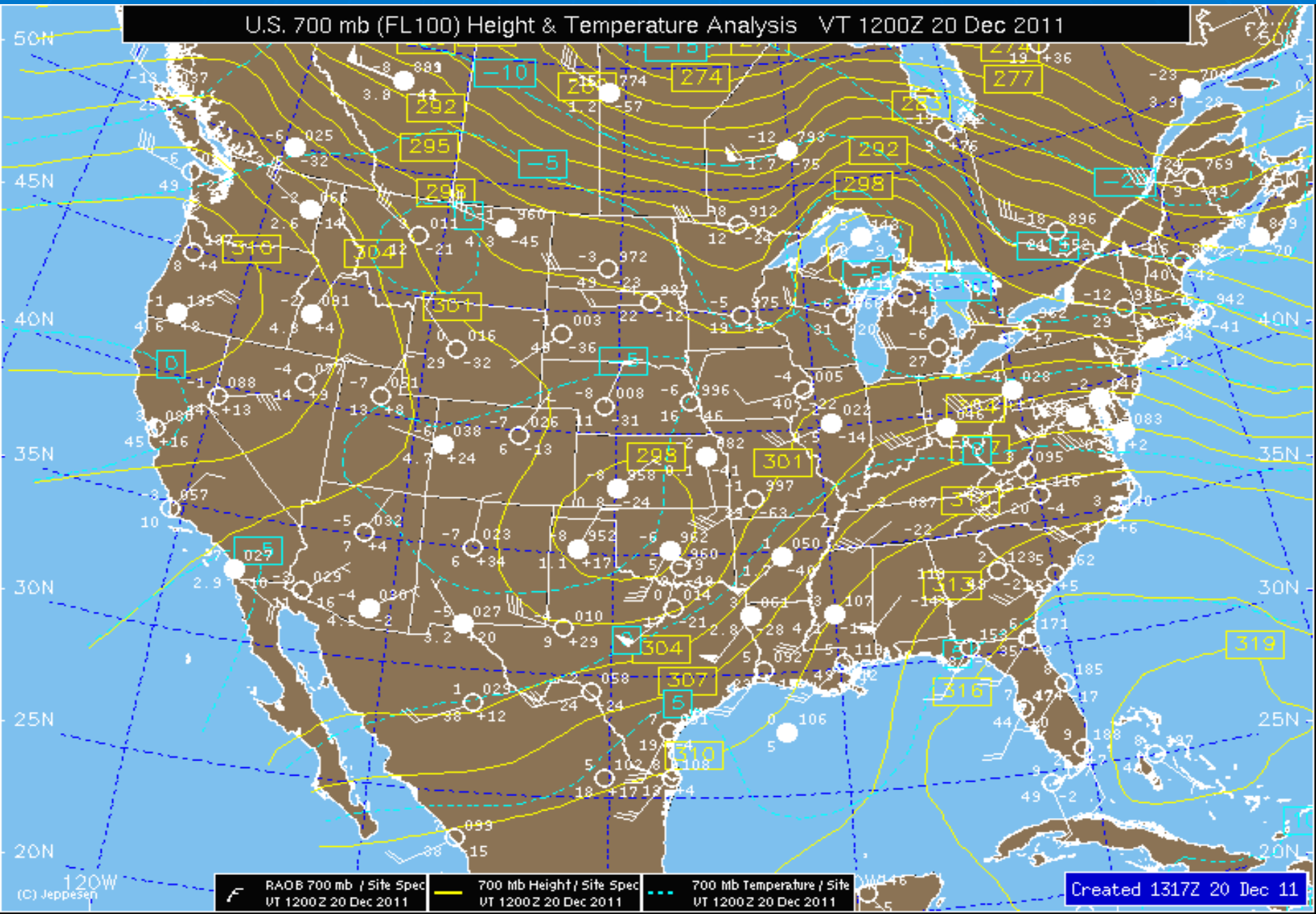
300 mb (FL300) Analysis – 12/20/11 1200 UTC



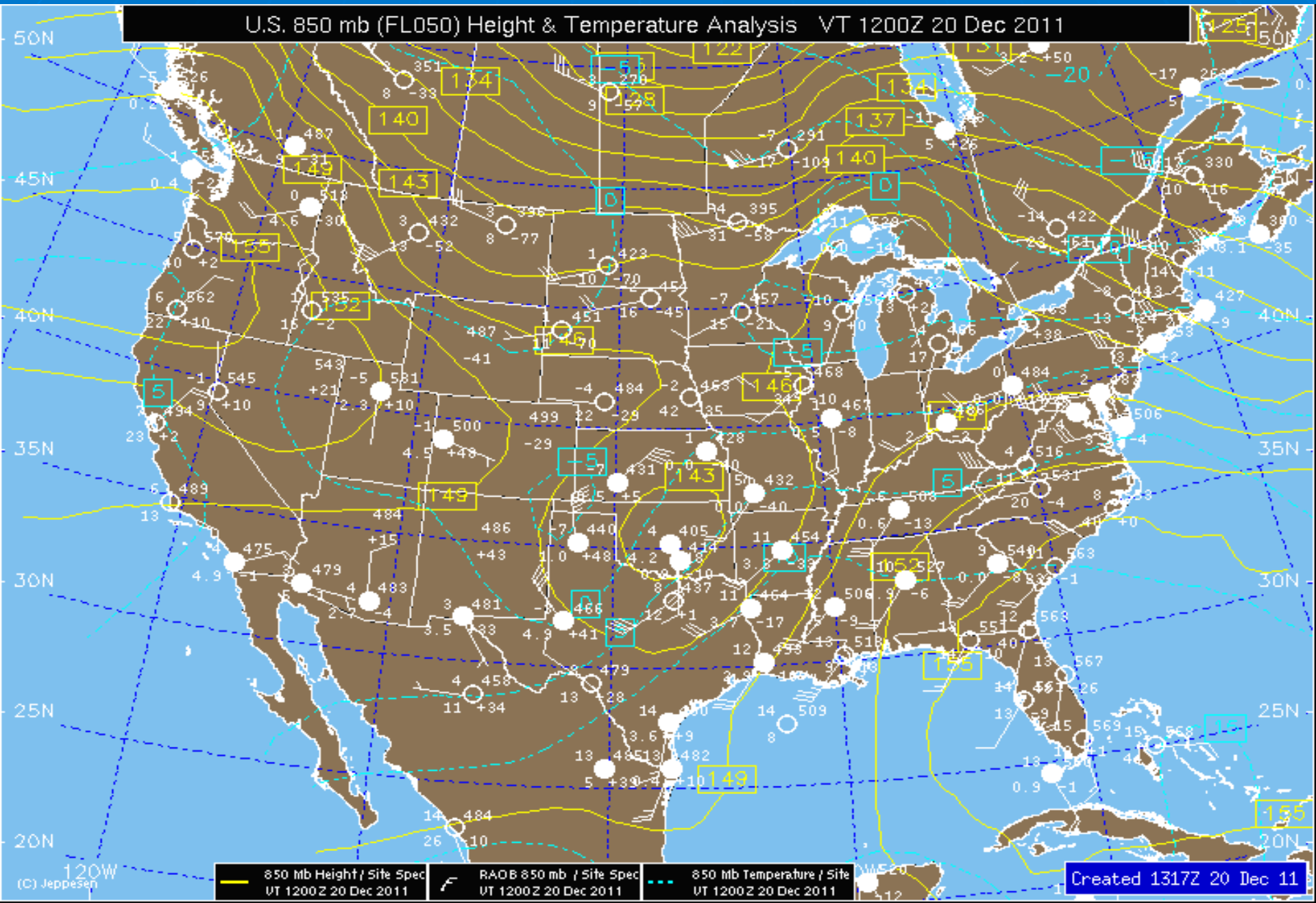
500 mb (FL180) Analysis – 12/20/11 1200 UTC



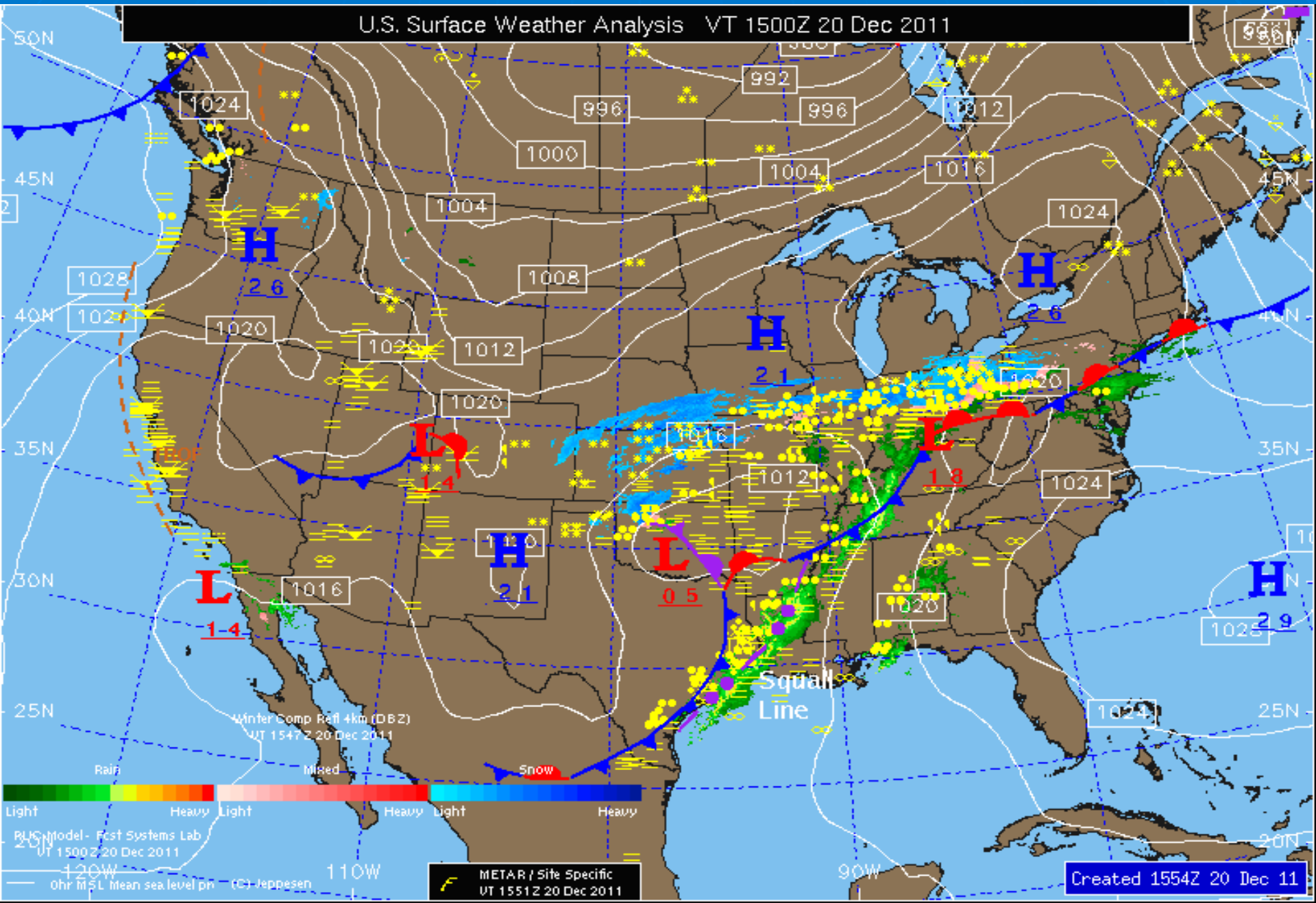
700 mb (FL100) Analysis – 12/20/11 1200 UTC



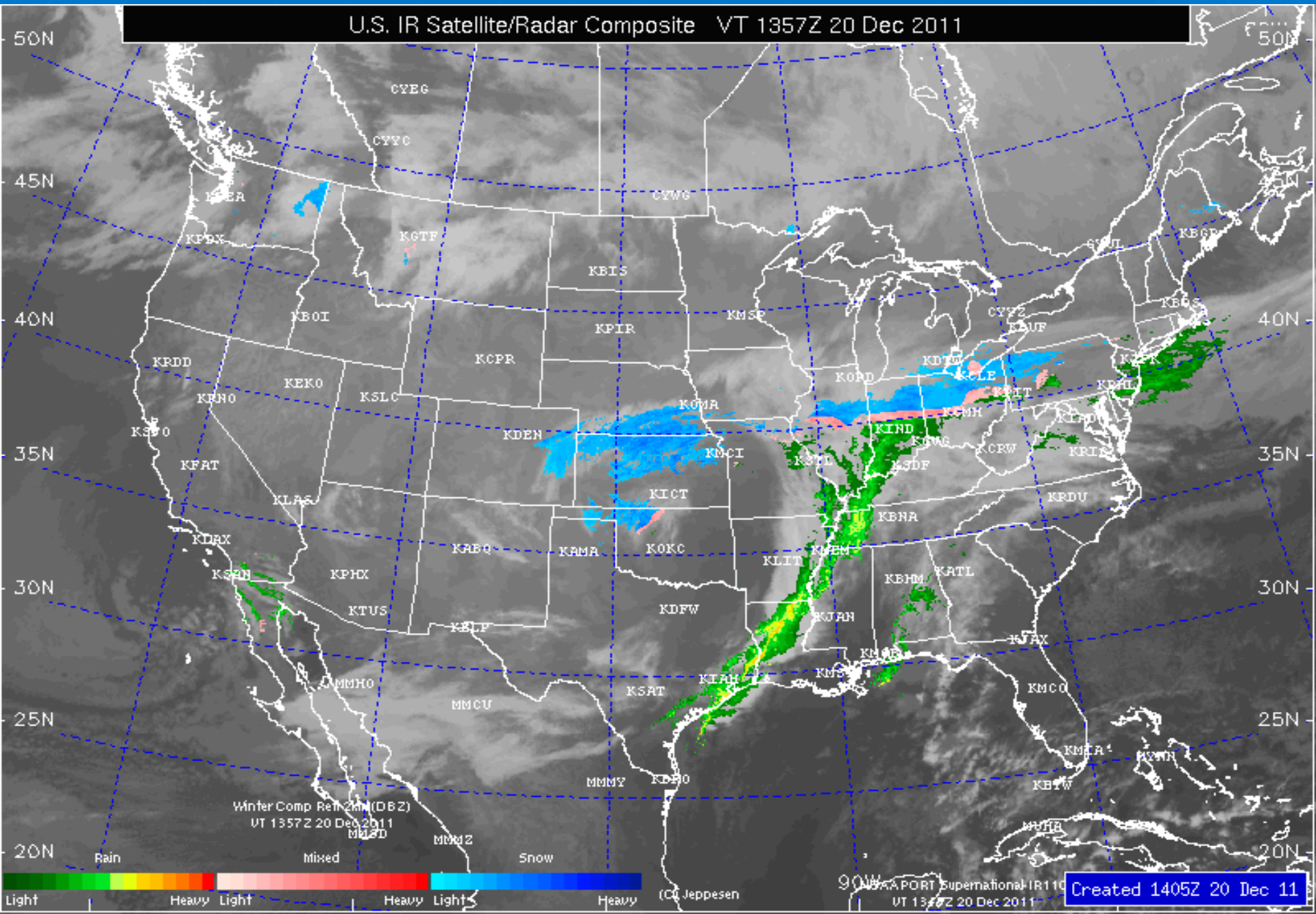
850 mb (FL050) Analysis – 12/20/11 1200 UTC



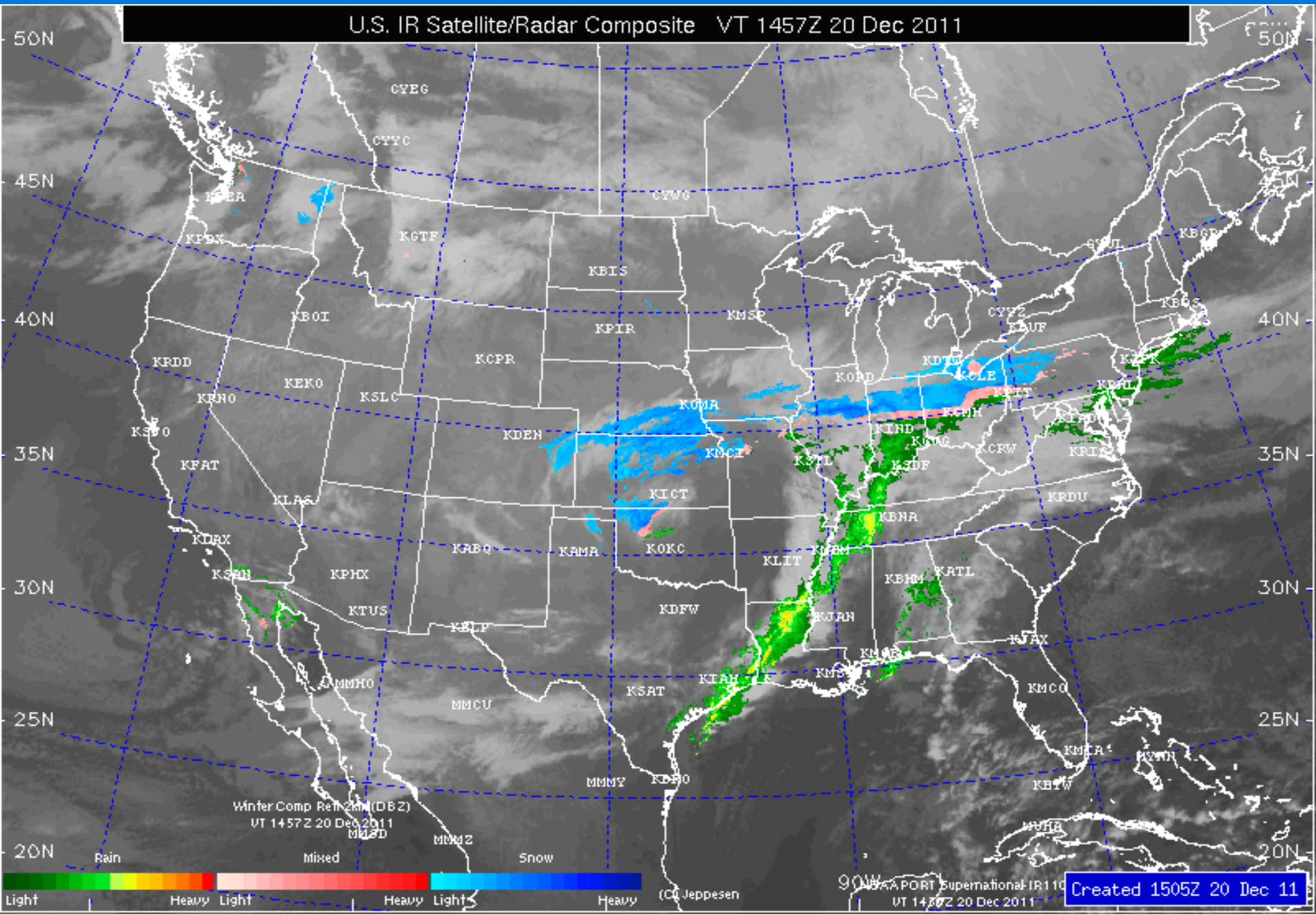
850 mb (FL050) Analysis – 12/20/11 1200 UTC



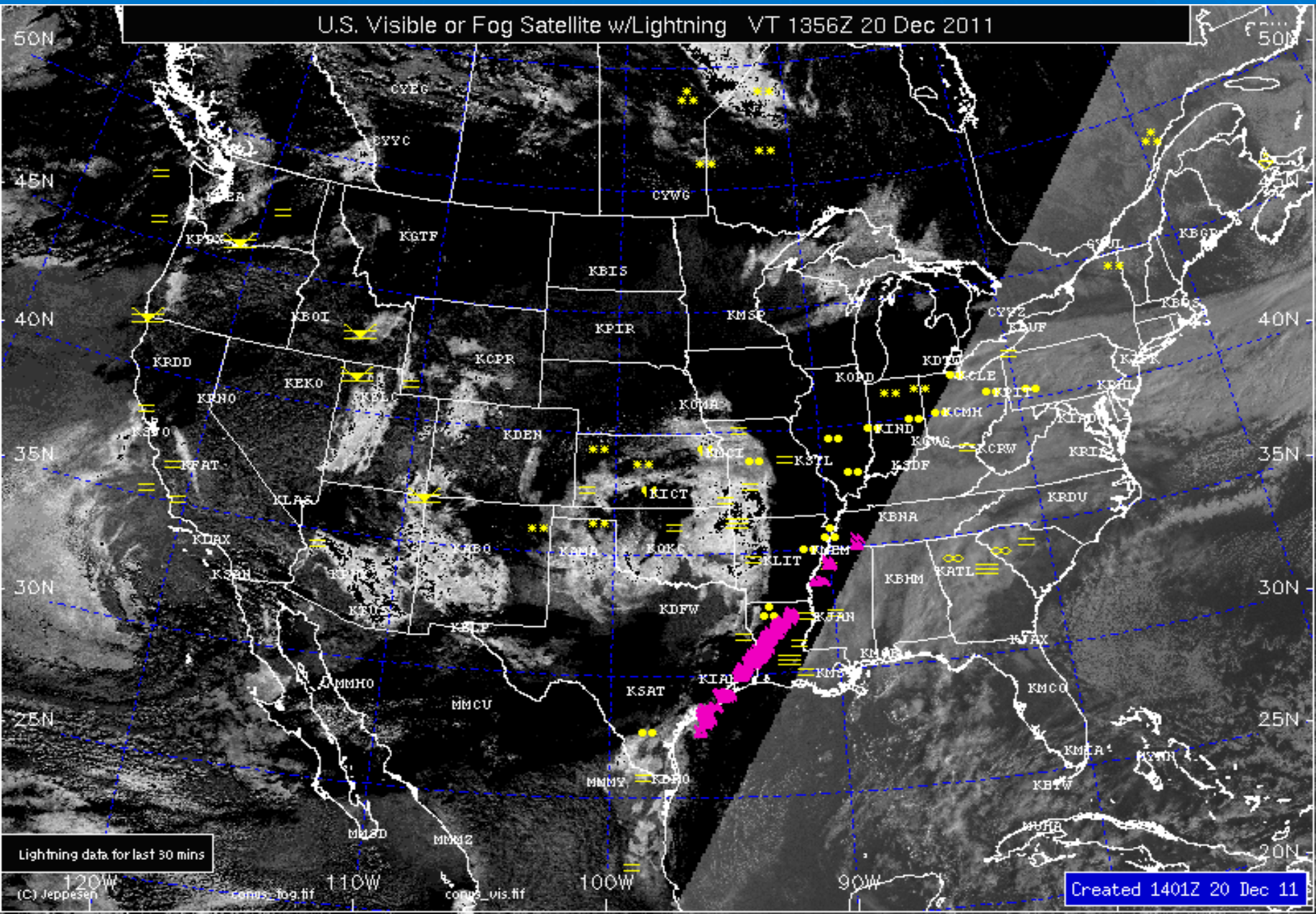
IR Sat/Radar Dec 20, 2011 1400 UTC



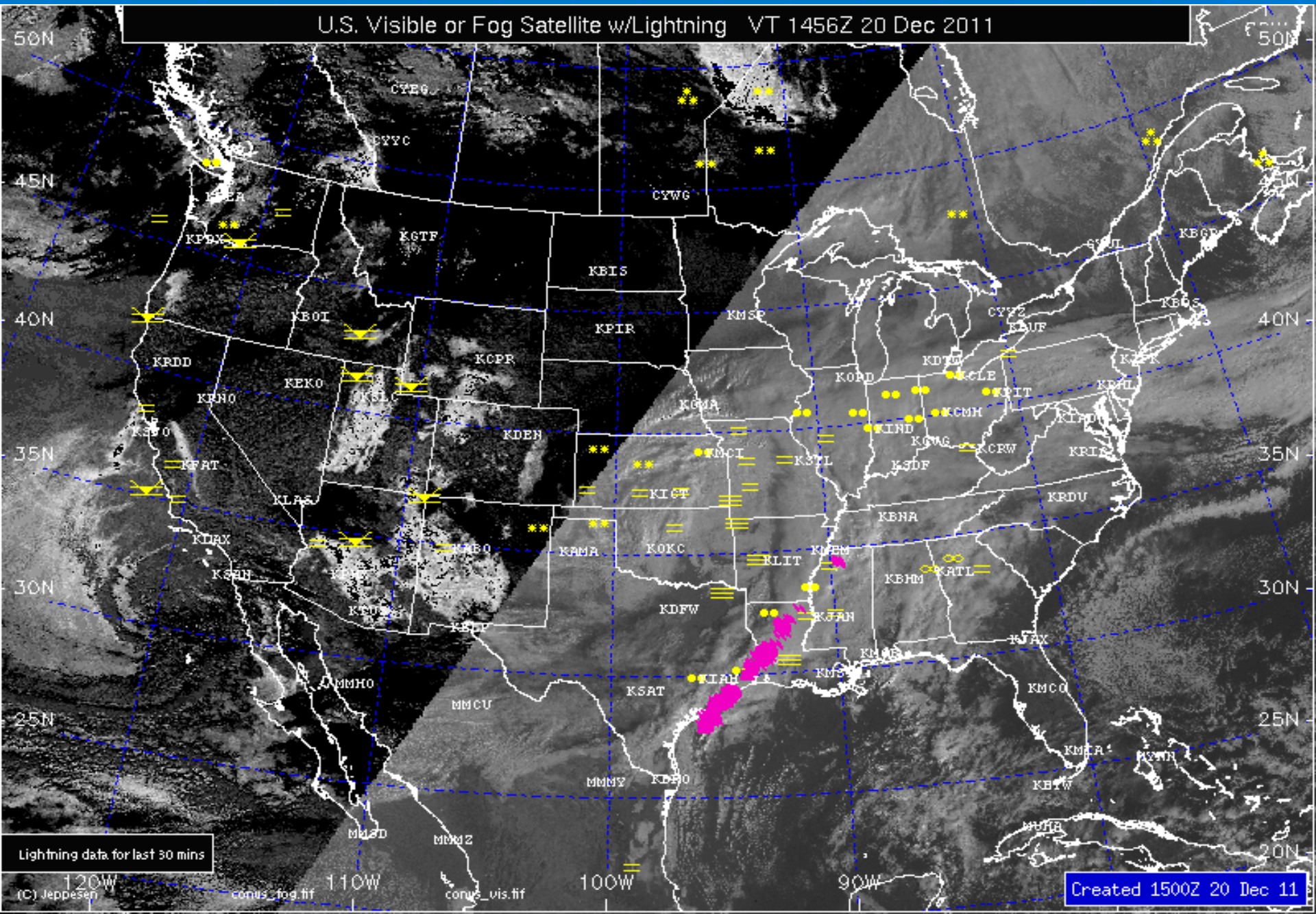
IR Sat/Radar Dec 20, 2011 1500 UTC



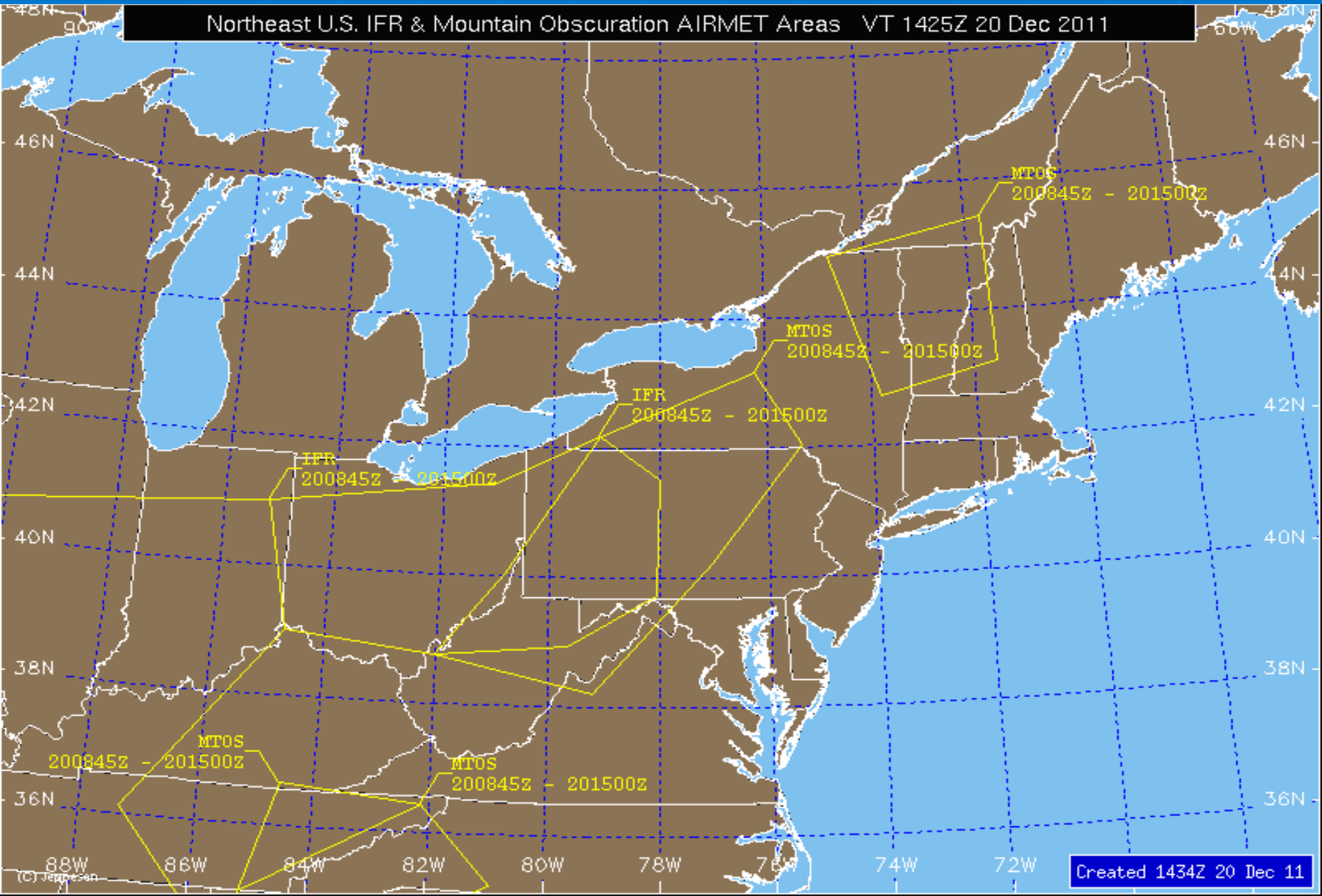
Visible Satellite Dec 20, 2011 1400 UTC



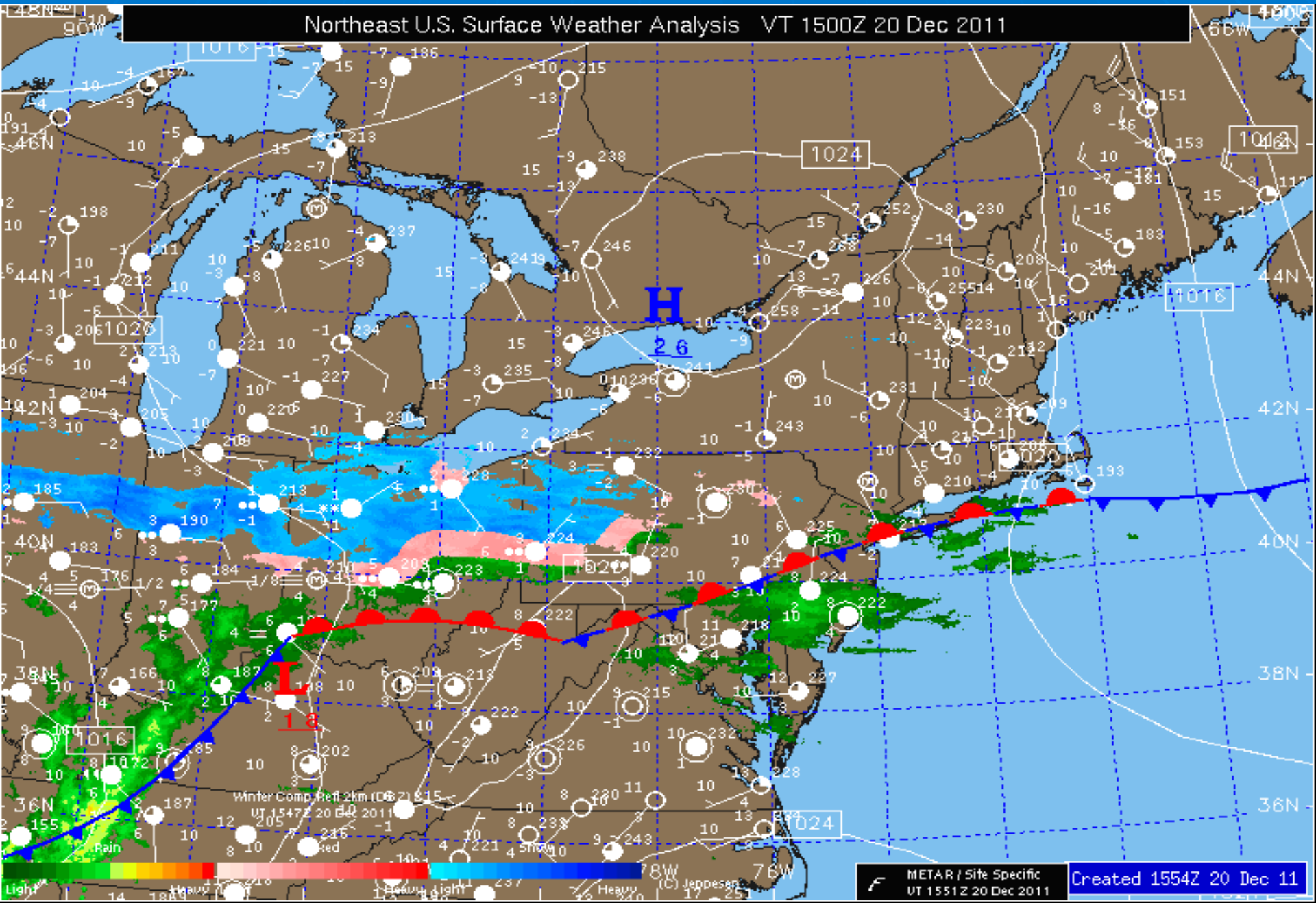
Visible Satellite Dec 20, 2011 1500 UTC



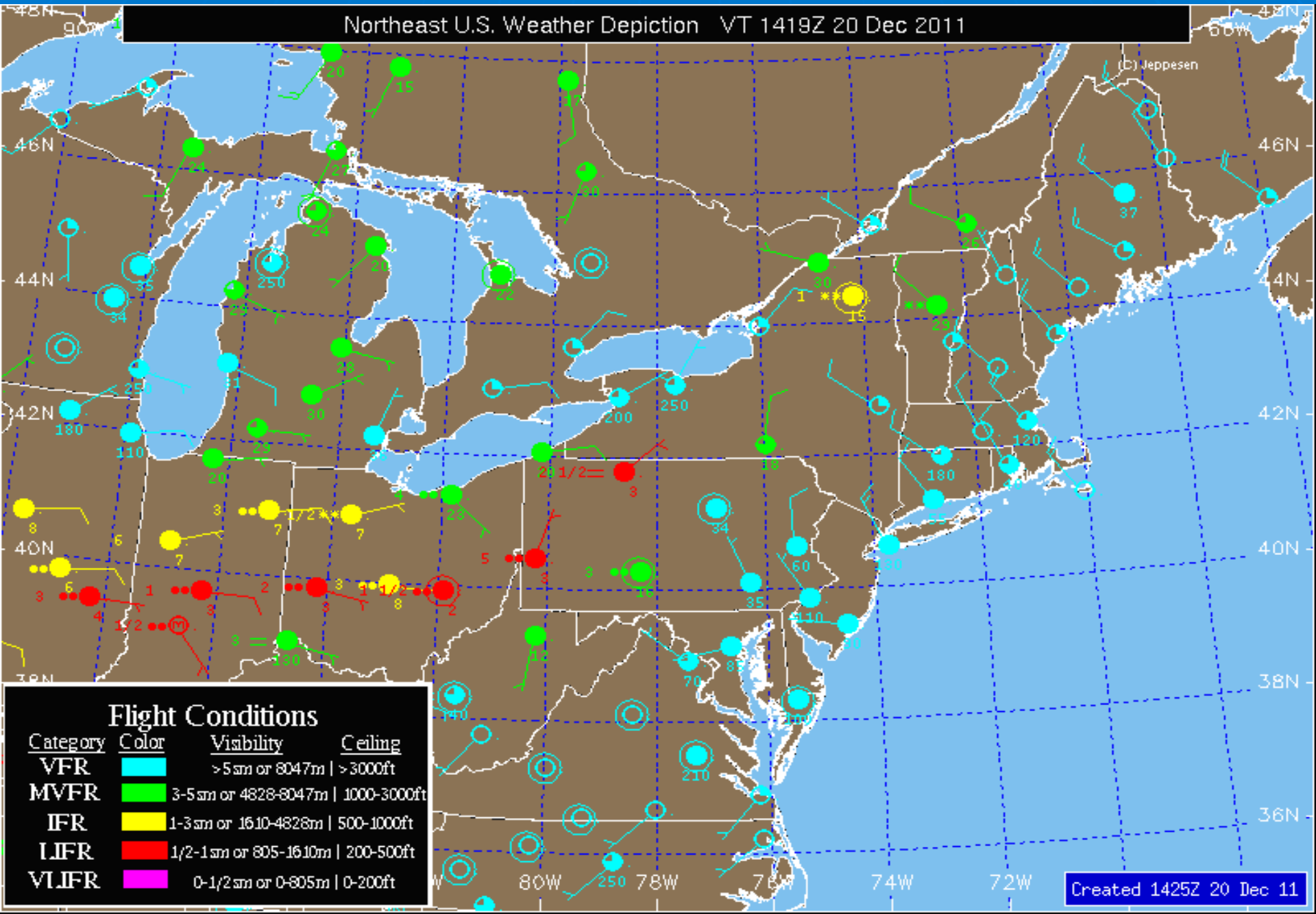
IFR AIRMETs Dec 20, 2011 1425 UTC



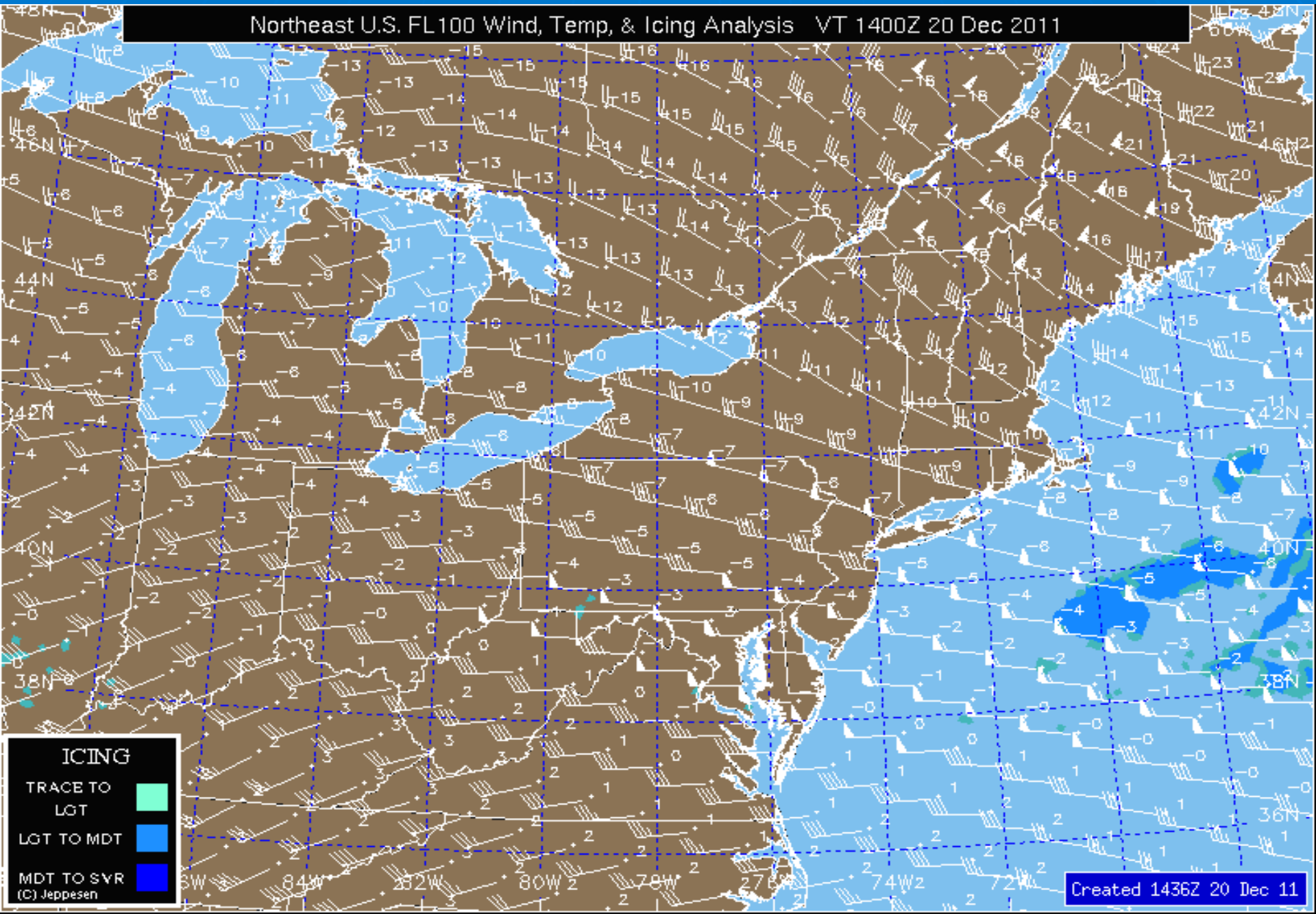
Surface Wx Dec 20, 2011 1500 UTC



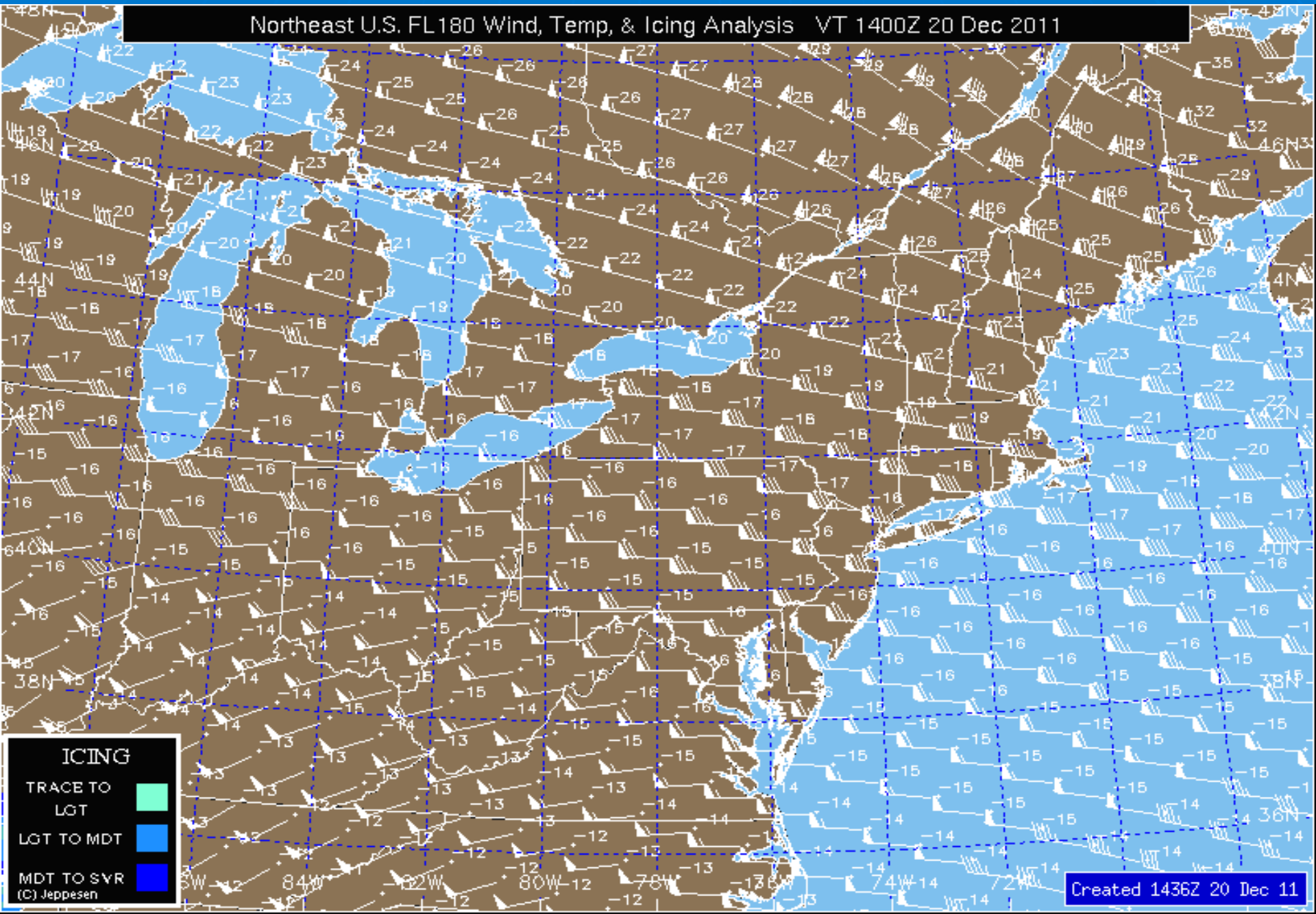
Wx Depiction 12/20/11 1400 UTC



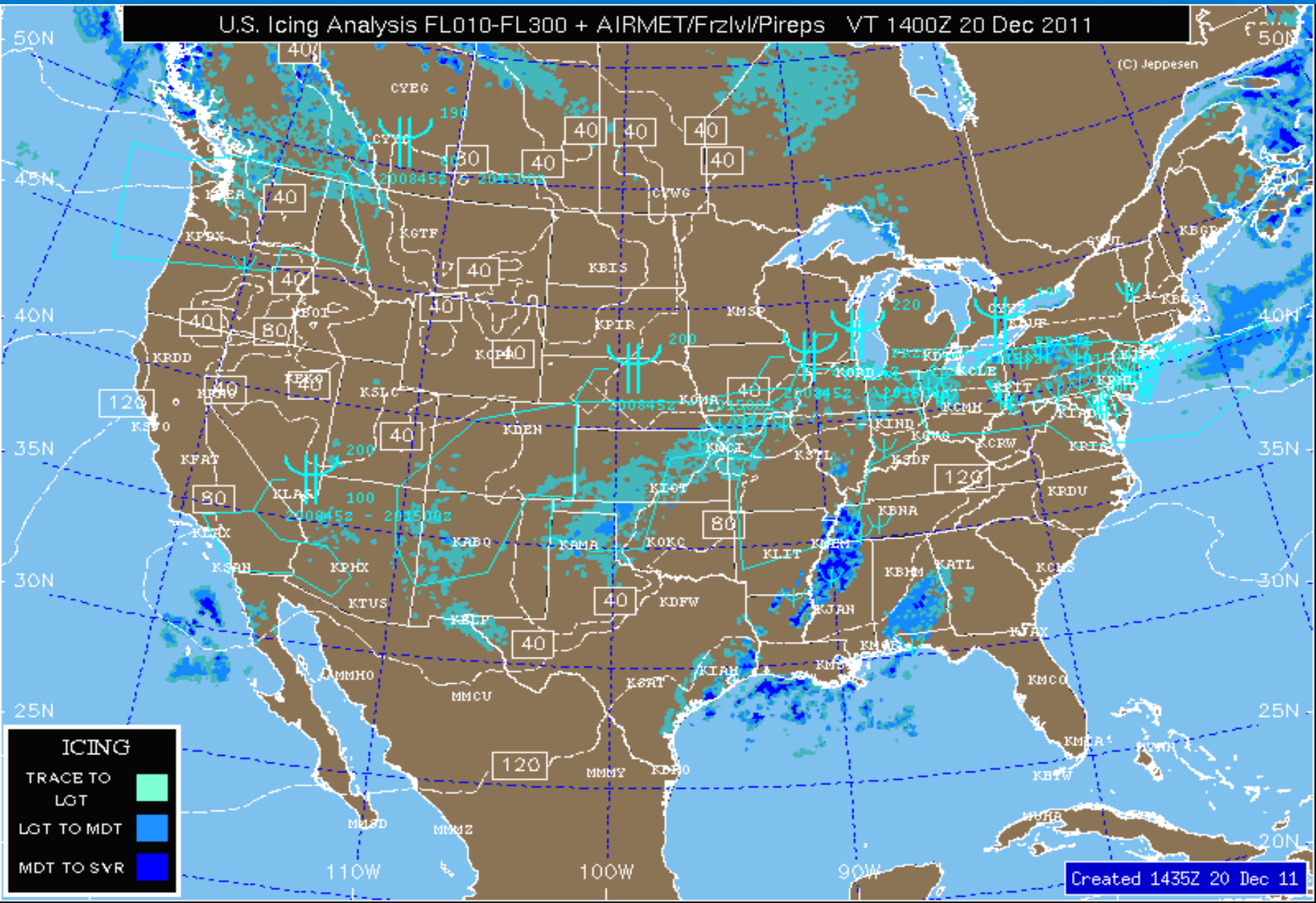
FL100 Winds & Icing 12/20/11 1400 UTC



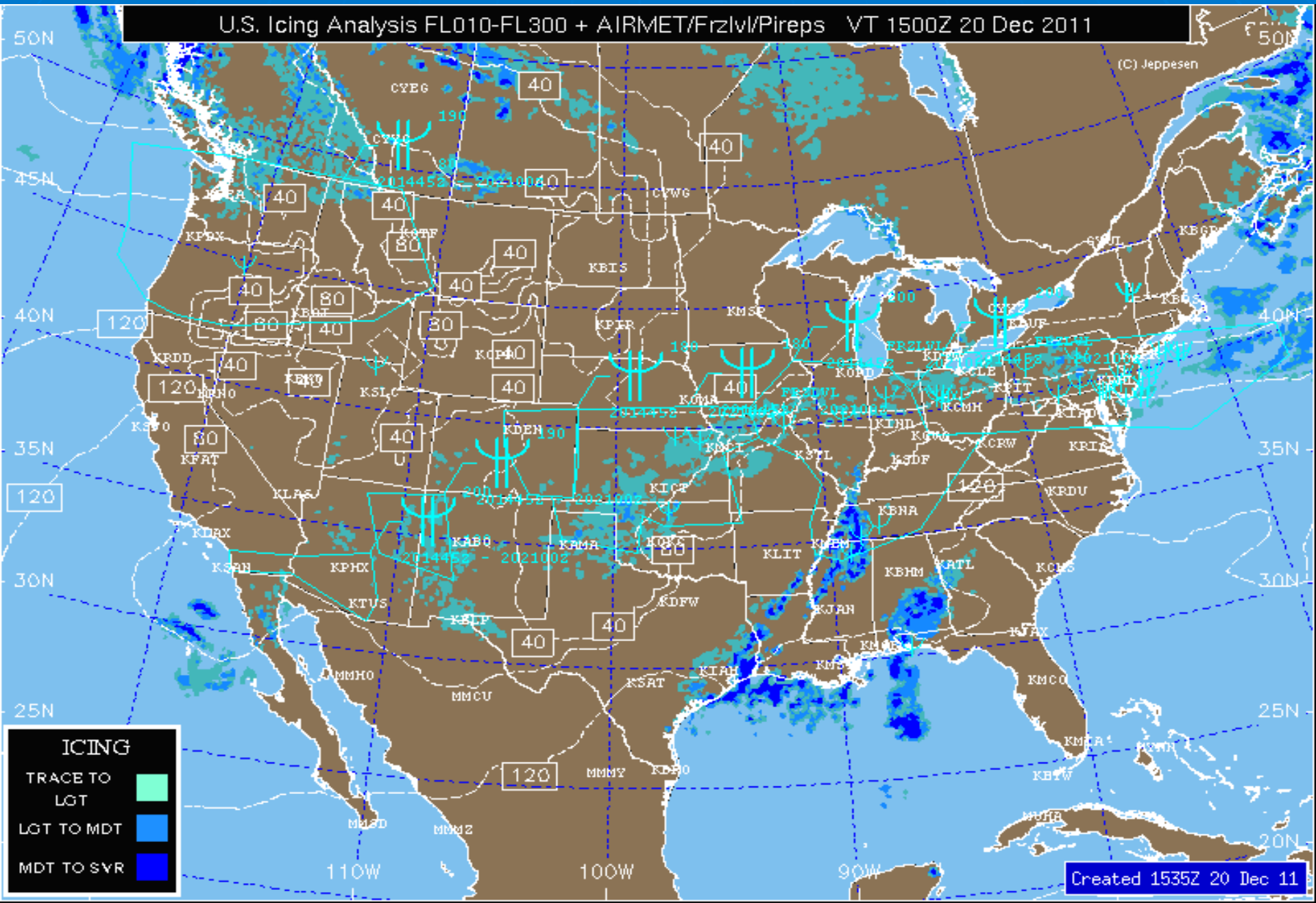
FL180 Winds & Icing 12/20/11 1400 UTC



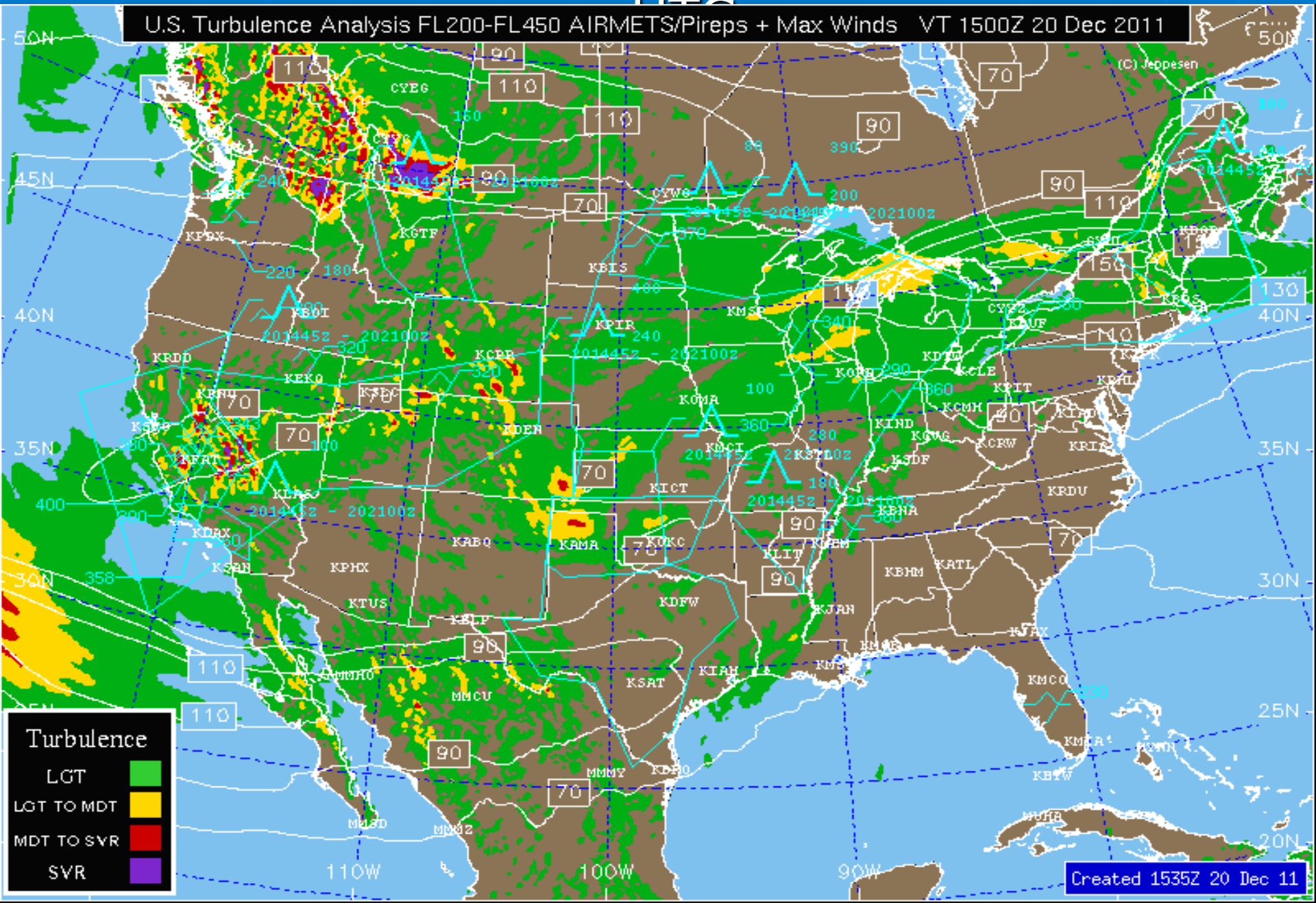
Icing Analysis FL010-300 12/20/11 1400 UTC



Icing Analysis FL010-300 12/20/11 1500 UTC



Turbulence Analysis FL010-300 12/20/11 1500 UTC



METARs

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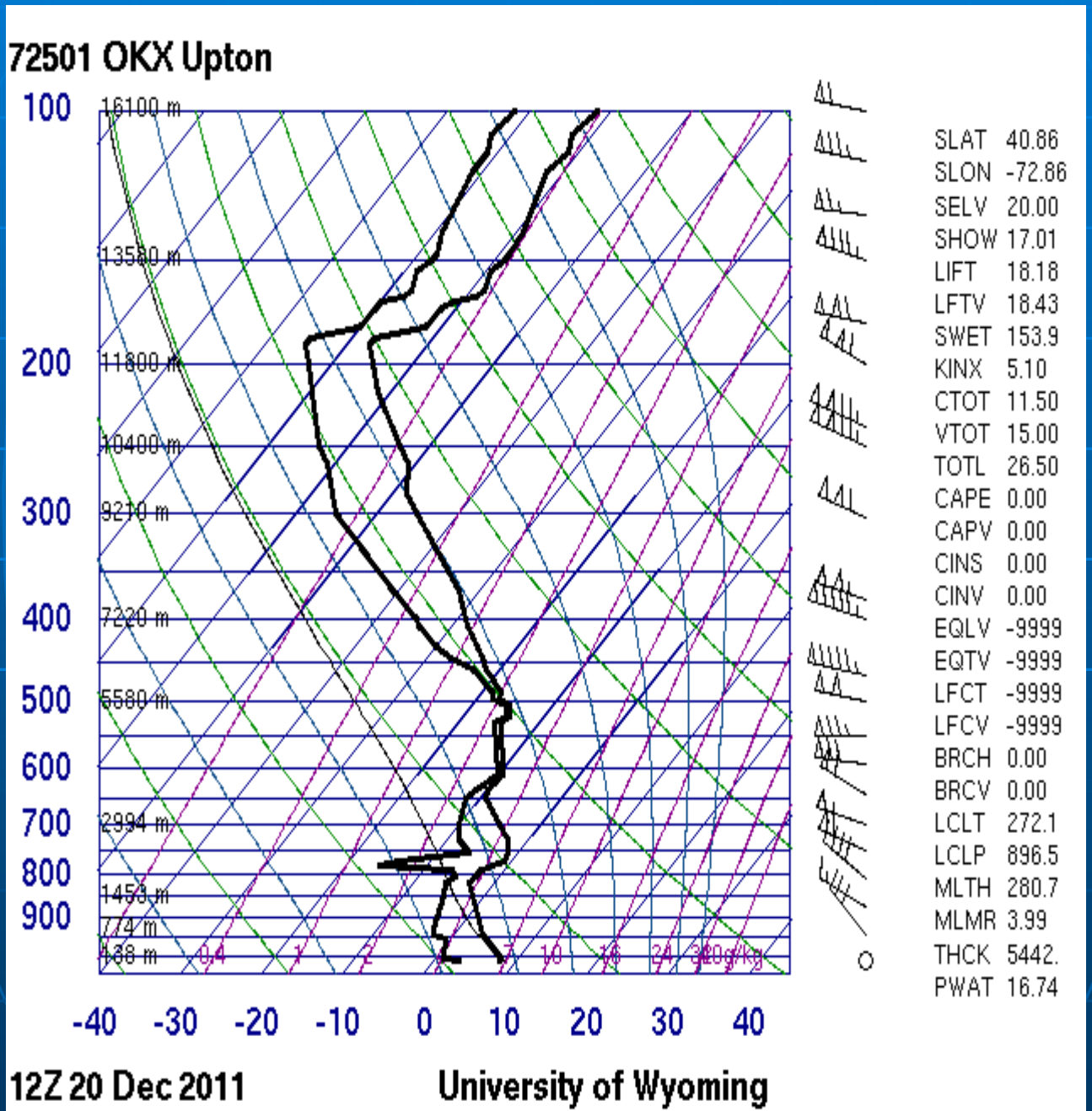
KCDW 201253Z 34005KT 10SM BKN048 OVC070 06/M01 A3015 RMK AO2 SLP214 T00611011

KTEB 201351Z 33007KT 10SM SCT070 07/M02 A3016
KEWR 201351Z 33010KT 10SM FEW040 SCT110 BKN130 07/M01 A3016
KCDW 201353Z 33007KT 10SM FEW070 06/M01 A3017 RMK AO2 SLP223 T00611011

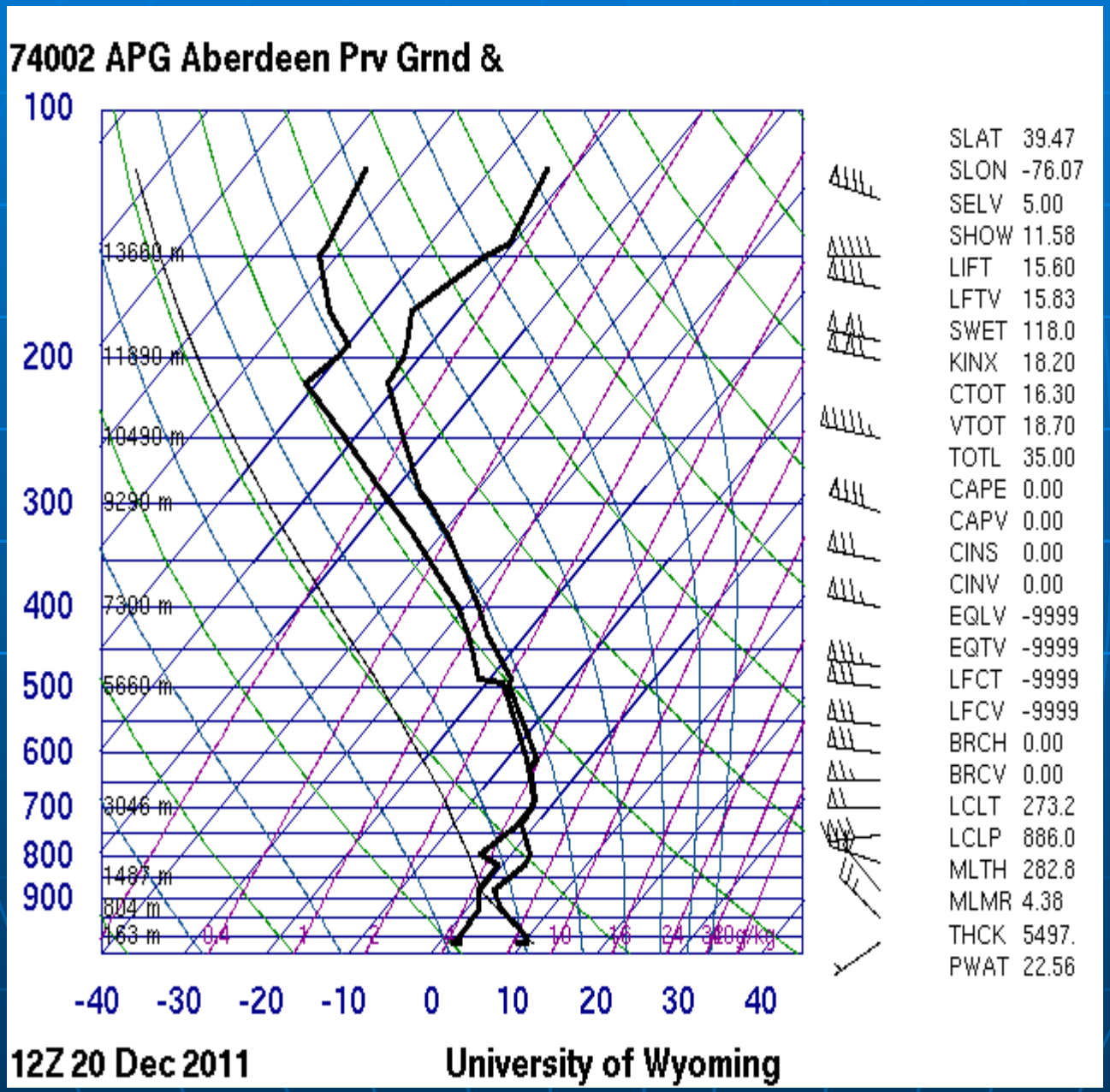
KTEB 201451Z 34008KT 10SM CLR 07/M02 A3017
KEWR 201451Z 35012G19KT 10SM FEW040 BKN120 07/M02 A3017
KCDW 201453Z VRB04KT 10SM CLR 06/M01 A3018 RMK AO2 SLP225 T00561011 51025

KTEB 201551Z 34006KT 10SM CLR 07/M02 A3017
KEWR 201551Z 35010KT 10SM FEW040 BKN110 07/M02 A3017
KCDW 201553Z 00000KT 10SM FEW120 06/M02 A3018 RMK AO2 SLP225 T00561017

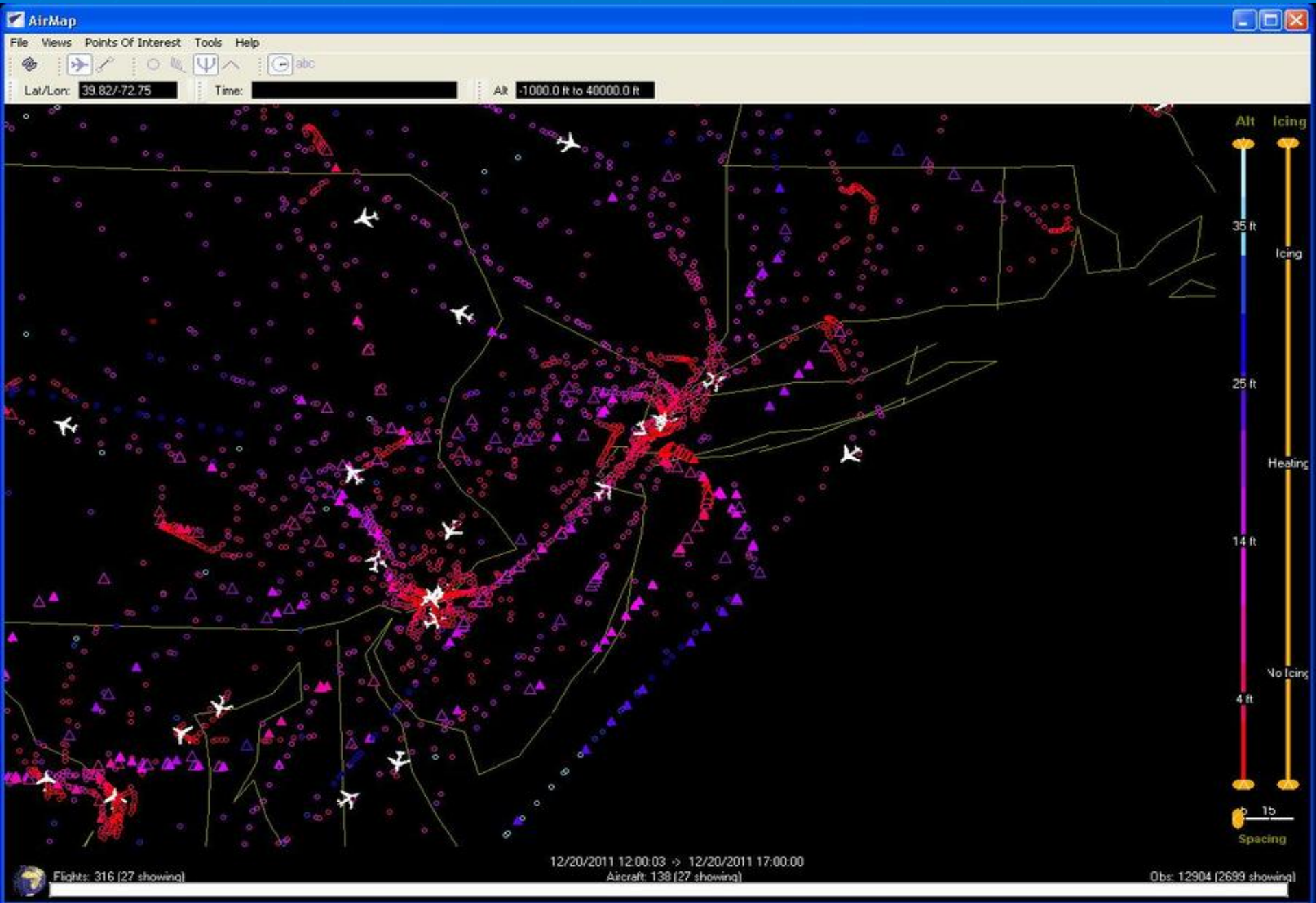
OKX Sounding Dec 20, 2011 1200 UTC



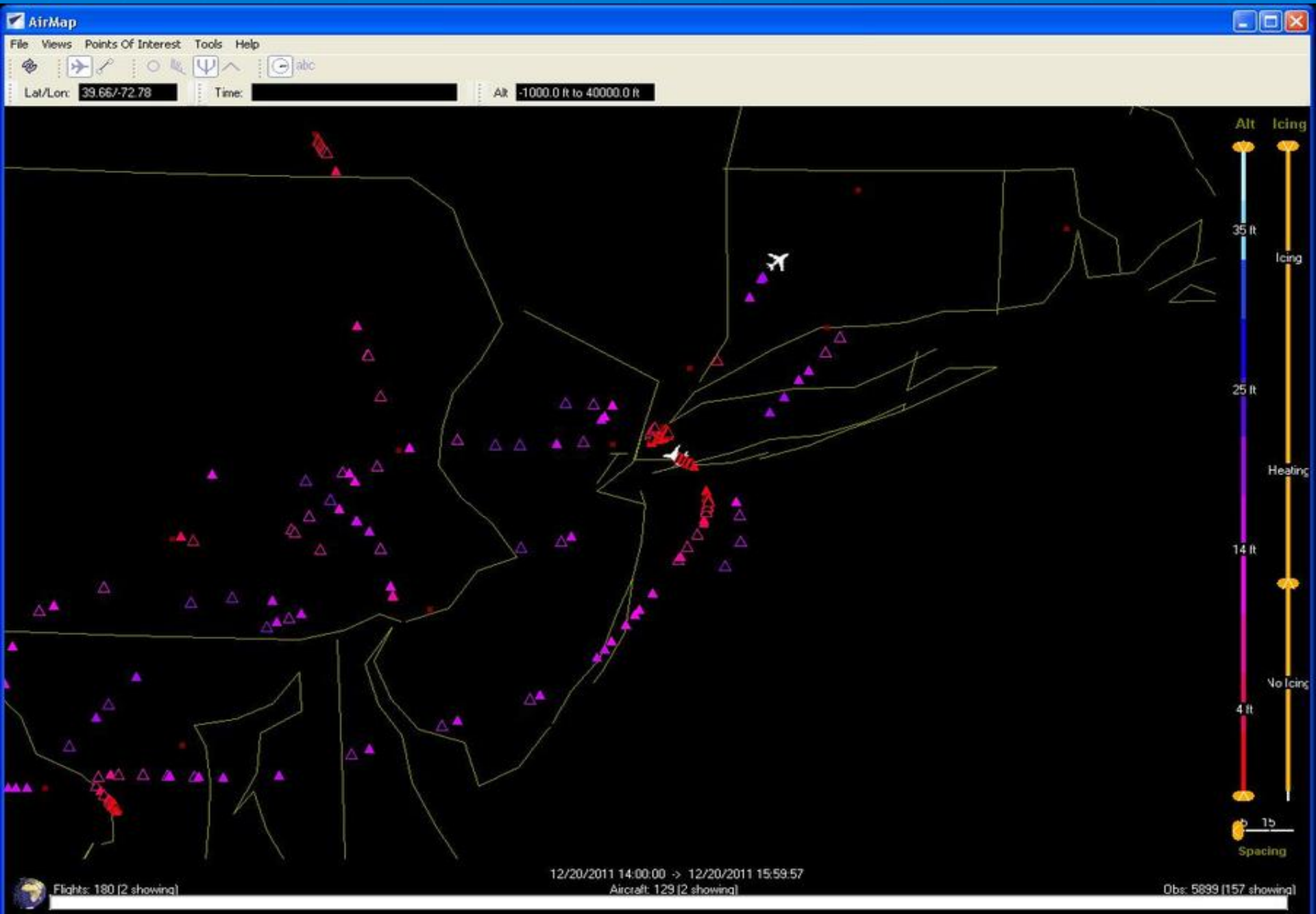
APG Sounding Dec 20, 2011 1200 UTC



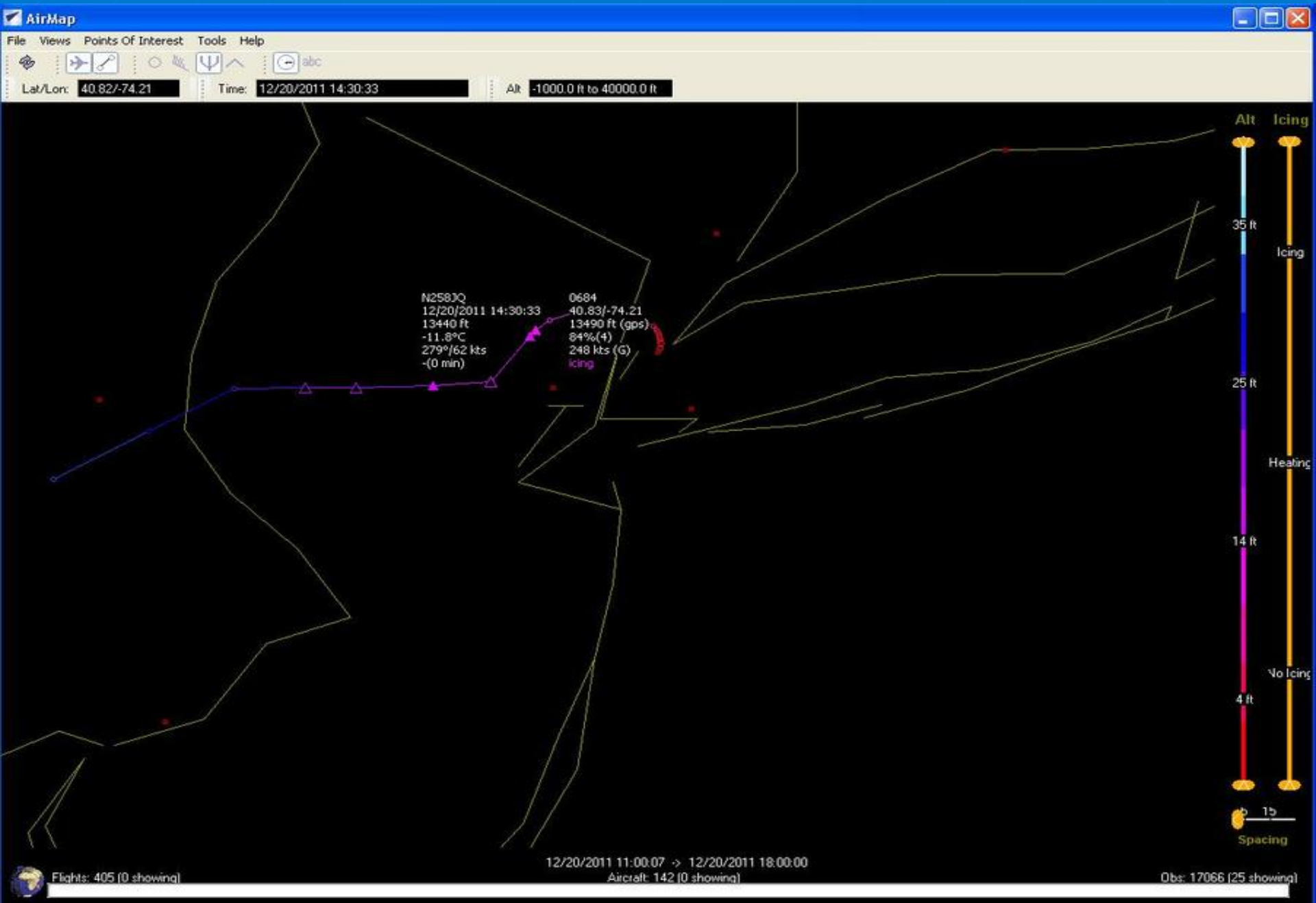
Aircraft Reports 12/20/11 1200-1700 UTC



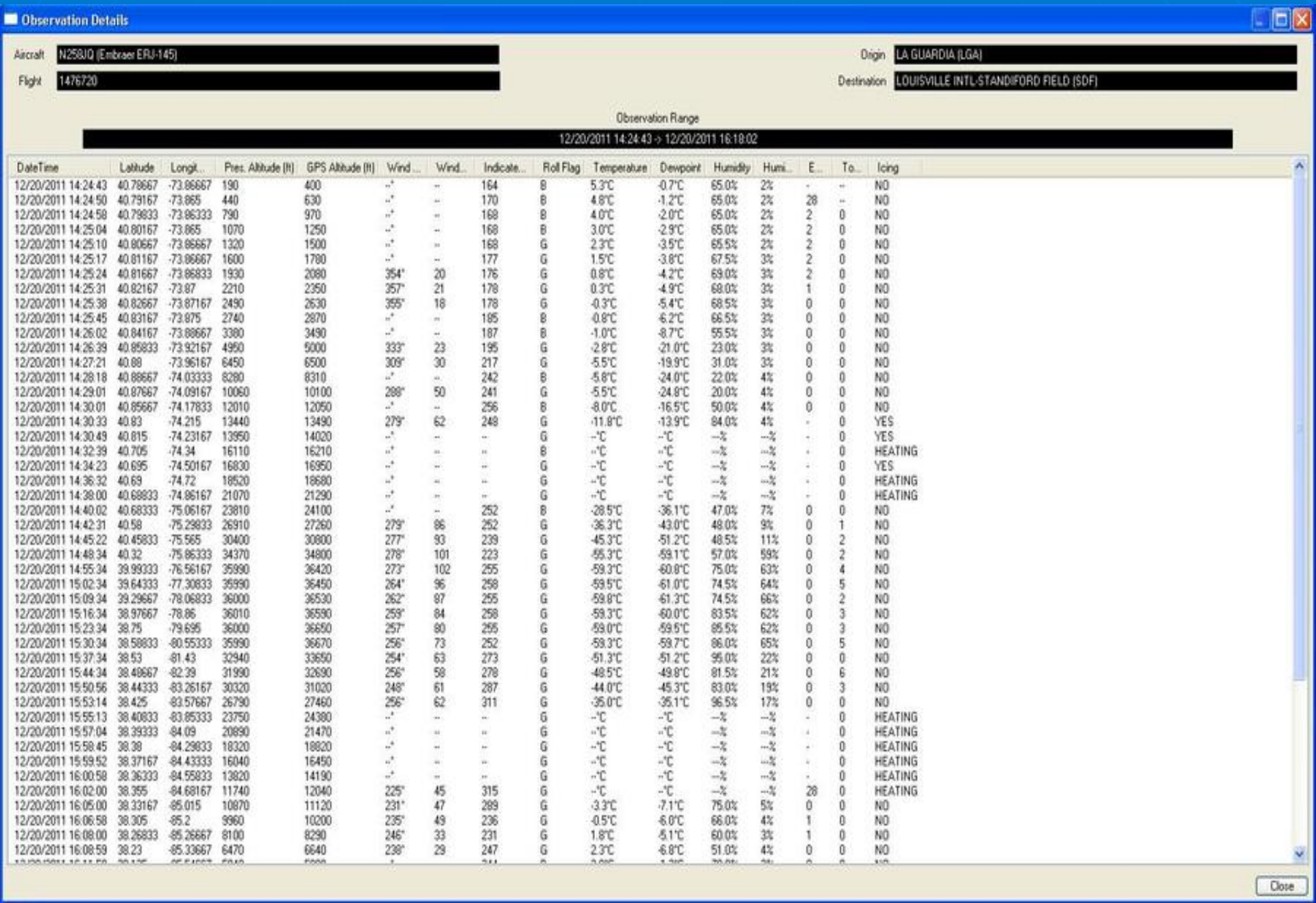
Aircraft Icing Reports 12/20/11 14-16 UTC



Aircraft Reports 12/20/11 1430 UTC



Aircraft Reports 12/20/11 1430 UTC



Observation Details

Aircraft: N258JQ (Embraer ERJ-145)
Flight: 1476720
Origin: LA GUARDIA (LGA)
Destination: LOUISVILLE INTL-STANDIFORD FIELD (SDF)

Observation Range: 12/20/2011 14:24:43 -> 12/20/2011 16:18:02

DateTime	Latitude	Longit...	Pres. Altitude (ft)	GPS Altitude (ft)	Wind ...	Wind...	Indicate...	Roll Flag	Temperature	Dewpoint	Humidity	Humi...	E...	To...	Icing
12/20/2011 14:24:43	40.78667	-73.86667	190	400	-°	--	164	B	5.3°C	-0.7°C	65.0%	2%	-	--	NO
12/20/2011 14:24:50	40.79167	-73.865	440	630	-°	--	170	B	4.8°C	-1.2°C	65.0%	2%	28	--	NO
12/20/2011 14:24:58	40.79833	-73.86333	790	970	-°	--	168	B	4.0°C	-2.0°C	65.0%	2%	2	0	NO
12/20/2011 14:25:04	40.80167	-73.865	1070	1250	-°	--	168	B	3.0°C	-2.9°C	65.0%	2%	2	0	NO
12/20/2011 14:25:10	40.80667	-73.86667	1320	1500	-°	--	168	G	2.3°C	-3.5°C	65.5%	2%	2	0	NO
12/20/2011 14:25:17	40.81167	-73.86667	1600	1780	-°	--	177	G	1.5°C	-3.8°C	67.5%	3%	2	0	NO
12/20/2011 14:25:24	40.81667	-73.86833	1930	2080	354°	20	176	G	0.8°C	-4.2°C	69.0%	3%	2	0	NO
12/20/2011 14:25:31	40.82167	-73.87	2210	2350	357°	21	178	G	0.3°C	-4.9°C	68.0%	3%	1	0	NO
12/20/2011 14:25:38	40.82667	-73.87167	2490	2630	355°	18	178	G	-0.3°C	-5.4°C	68.5%	3%	0	0	NO
12/20/2011 14:25:45	40.83167	-73.875	2740	2870	-°	--	185	B	-0.8°C	-6.2°C	66.5%	3%	0	0	NO
12/20/2011 14:26:02	40.84167	-73.88667	3380	3490	-°	--	187	B	-1.0°C	-8.7°C	55.5%	3%	0	0	NO
12/20/2011 14:26:39	40.85833	-73.92167	4950	5000	333°	23	195	G	-2.8°C	-21.0°C	23.0%	3%	0	0	NO
12/20/2011 14:27:21	40.88	-73.96167	6450	6500	309°	30	217	G	-5.5°C	-19.9°C	31.0%	3%	0	0	NO
12/20/2011 14:28:18	40.88667	-74.03333	8280	8310	-°	--	242	B	-5.8°C	-24.0°C	22.0%	4%	0	0	NO
12/20/2011 14:29:01	40.87667	-74.09167	10060	10100	288°	50	241	G	-5.5°C	-24.8°C	20.0%	4%	0	0	NO
12/20/2011 14:30:01	40.85667	-74.17833	12010	12050	-°	--	256	B	-8.0°C	-16.5°C	50.0%	4%	0	0	NO
12/20/2011 14:30:33	40.83	-74.215	13440	13490	279°	62	248	G	-11.8°C	-13.9°C	84.0%	4%	-	0	YES
12/20/2011 14:30:49	40.815	-74.23167	13950	14020	-°	--	--	G	--°C	--°C	---%	---%	-	0	YES
12/20/2011 14:32:39	40.705	-74.34	16110	16210	-°	--	--	B	--°C	--°C	---%	---%	-	0	HEATING
12/20/2011 14:34:23	40.695	-74.50167	16830	16950	-°	--	--	G	--°C	--°C	---%	---%	-	0	YES
12/20/2011 14:36:32	40.69	-74.72	18520	18680	-°	--	--	G	--°C	--°C	---%	---%	-	0	HEATING
12/20/2011 14:38:00	40.68833	-74.86167	21070	21290	-°	--	--	G	--°C	--°C	---%	---%	-	0	HEATING
12/20/2011 14:40:02	40.68333	-75.06167	23810	24100	-°	--	252	B	-28.5°C	-36.1°C	47.0%	7%	0	0	NO
12/20/2011 14:42:31	40.58	-75.23833	26910	27260	279°	86	252	G	-36.3°C	-43.0°C	48.0%	9%	0	1	NO
12/20/2011 14:45:22	40.45833	-75.565	30400	30800	277°	93	239	G	-45.3°C	-51.2°C	48.5%	11%	0	2	NO
12/20/2011 14:48:34	40.32	-75.86333	34370	34800	278°	101	223	G	-55.3°C	-59.1°C	57.0%	59%	0	2	NO
12/20/2011 14:55:34	39.99333	-76.56167	35990	36420	273°	102	255	G	-59.3°C	-60.8°C	75.0%	63%	0	4	NO
12/20/2011 15:02:34	39.64333	-77.30833	35990	36450	264°	96	258	G	-59.5°C	-61.0°C	74.5%	64%	0	5	NO
12/20/2011 15:09:34	39.29667	-78.06833	36000	36530	262°	87	255	G	-59.8°C	-61.3°C	74.5%	66%	0	2	NO
12/20/2011 15:16:34	38.97667	-78.86	36010	36590	259°	84	258	G	-59.3°C	-60.0°C	83.5%	62%	0	3	NO
12/20/2011 15:23:34	38.75	-79.695	36000	36650	257°	80	255	G	-59.0°C	-59.5°C	85.5%	62%	0	3	NO
12/20/2011 15:30:34	38.58833	-80.55333	35990	36670	256°	73	252	G	-59.3°C	-59.7°C	86.0%	65%	0	5	NO
12/20/2011 15:37:34	38.53	-81.43	32940	33650	254°	63	273	G	-51.3°C	-51.2°C	95.0%	22%	0	0	NO
12/20/2011 15:44:34	38.48667	-82.39	31990	32690	256°	58	278	G	-48.5°C	-49.8°C	81.5%	21%	0	6	NO
12/20/2011 15:50:56	38.44333	-83.26167	30320	31020	248°	61	287	G	-44.0°C	-45.3°C	83.0%	19%	0	3	NO
12/20/2011 15:53:14	38.425	-83.57667	26790	27460	256°	62	311	G	-35.0°C	-35.1°C	96.5%	17%	0	0	NO
12/20/2011 15:55:13	38.40833	-83.85333	23750	24380	-°	--	--	G	--°C	--°C	---%	---%	-	0	HEATING
12/20/2011 15:57:04	38.39333	-84.09	20890	21470	-°	--	--	G	--°C	--°C	---%	---%	-	0	HEATING
12/20/2011 15:58:45	38.38	-84.29833	18320	18820	-°	--	--	G	--°C	--°C	---%	---%	-	0	HEATING
12/20/2011 15:59:52	38.37167	-84.43333	16040	16450	-°	--	--	G	--°C	--°C	---%	---%	-	0	HEATING
12/20/2011 16:00:58	38.36333	-84.55833	13820	14190	-°	--	--	G	--°C	--°C	---%	---%	-	0	HEATING
12/20/2011 16:02:00	38.355	-84.68167	11740	12040	225°	45	315	G	--°C	--°C	---%	---%	28	0	HEATING
12/20/2011 16:05:00	38.33167	-85.015	10870	11120	231°	47	289	G	-3.3°C	-7.1°C	75.0%	5%	0	0	NO
12/20/2011 16:06:58	38.305	-85.2	9960	10200	235°	49	236	G	-0.5°C	-6.0°C	66.0%	4%	1	0	NO
12/20/2011 16:08:00	38.26833	-85.26667	8100	8290	246°	33	231	G	1.8°C	-5.1°C	60.0%	3%	1	0	NO
12/20/2011 16:08:59	38.23	-85.33667	6470	6640	238°	29	247	G	2.3°C	-6.8°C	51.0%	4%	0	0	NO

Close

Witness Description

- It was like the plane was doing tricks or something, twirling and flipping," said Chris Covello, of Rockaway Township, N.J. "It started going straight down. I thought any second they were going to pull up. But then the wing came off and they went straight down." Covello said he saw the descent from the car dealership where he works.

NTSB Description

- Tuesday afternoon, NTSB investigators said Buckalew had requested clearance to a higher altitude shortly before the airplane dropped off radar. Earlier, Buckalew had a seven-second conversation with a controller, but the NTSB said it wasn't clear if he was reporting that he had encountered icing or was asking about the location of possible icing conditions. On ATC recordings, a controller is heard telling Buckalew about "moderate rime" up to 17,000 feet, according to The Associated Press. "We'll let you know what happens when we get in there," the pilot says. "If we can go straight through it, that's no problem for us."

ATC Voice Recording

http://www.avweb.com/avwebflash/news/IcingCitedInTBM700FreewayCrash_205909-1.html

Summary

- Icing AIRMET was in effect, and some reports of moderate to severe icing were being reported in the area
- Pilot was climbing when plane appears to have lost control
- What other factors may have contributed ?
- What other actions could the pilot have taken to produce a different outcome ?