

Aviation Meteorology

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Wow! The weatherman was right!

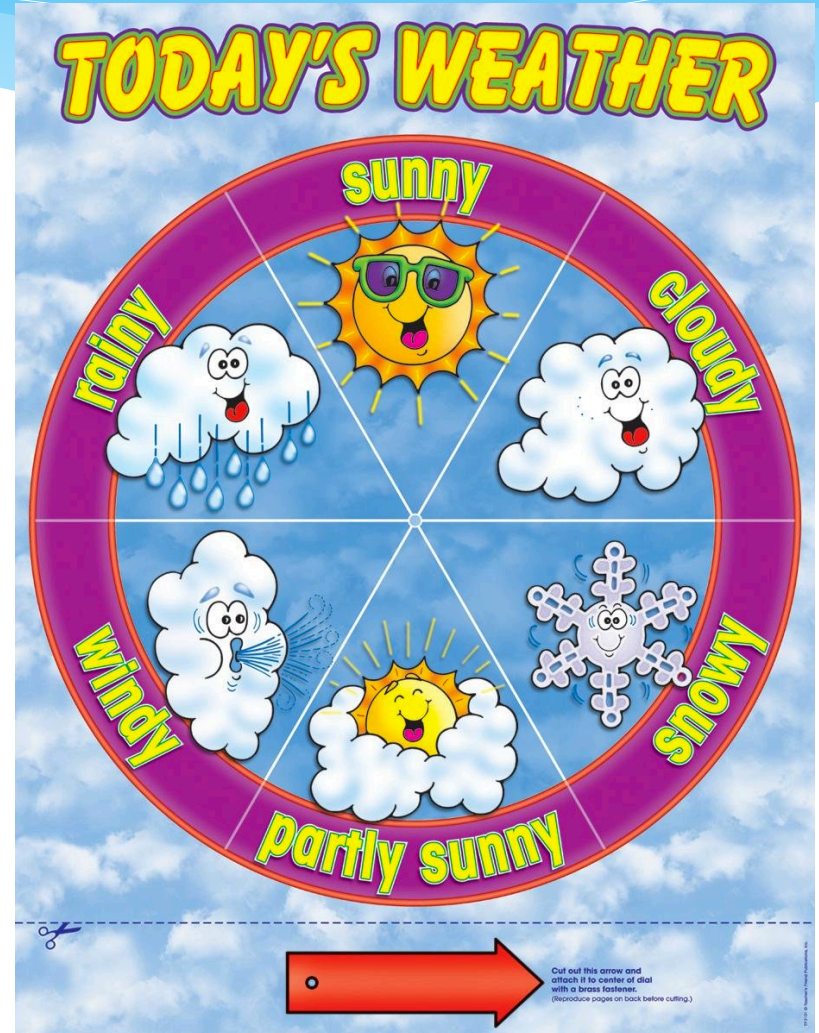
Introduction

- * Objective(s) and Target Audience
- * Basic Meteorology and Terminology Review
- * Weather Sources
- * WX Planning
- * WX Survival Techniques

Note: Good Review for WX Portion Check Ride
Oral, Not a Complete Preparation for WX
Portion of Written Exam

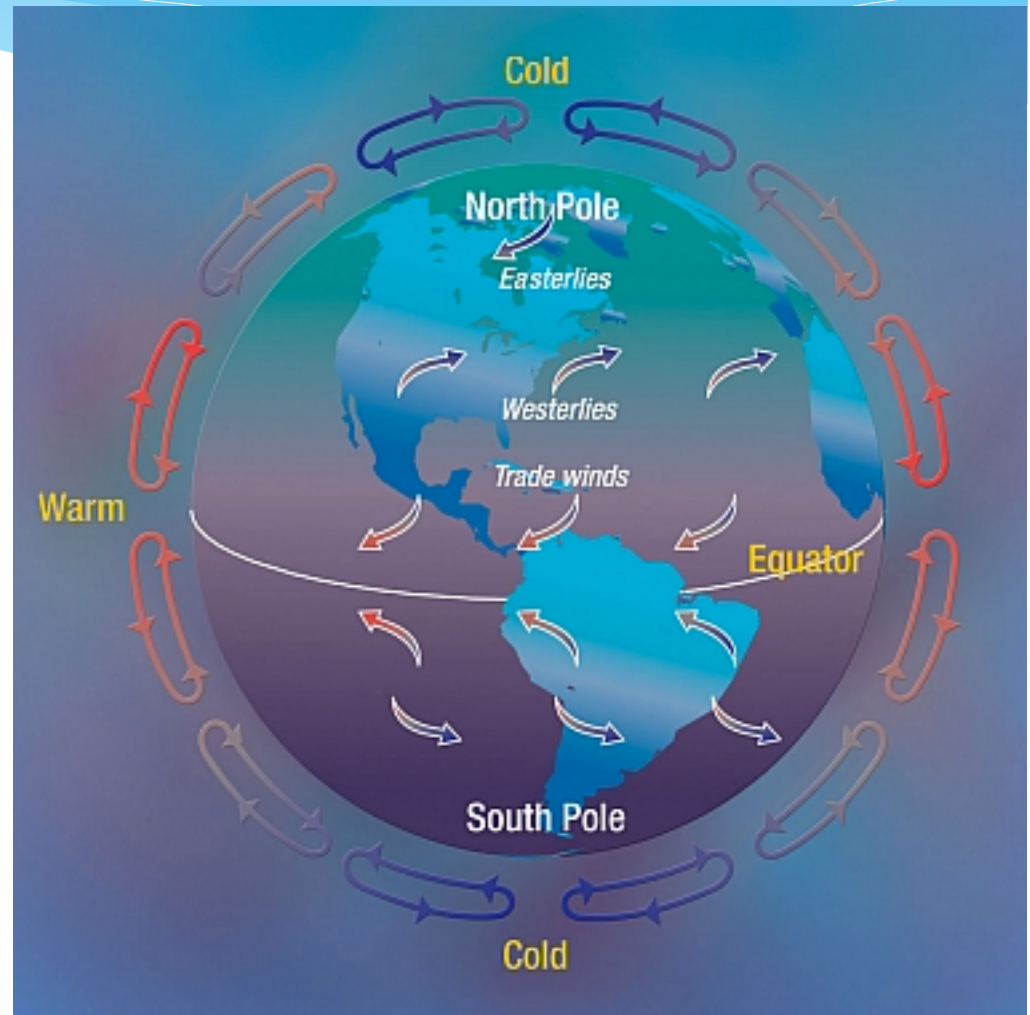
Objective (s)

- * Provide a Basic WX Foundation for the Student and Private Pilot
- * Learn to Acquire and Plan Using WX That Affects Your Flight
- * Eliminate ‘Guesswork’



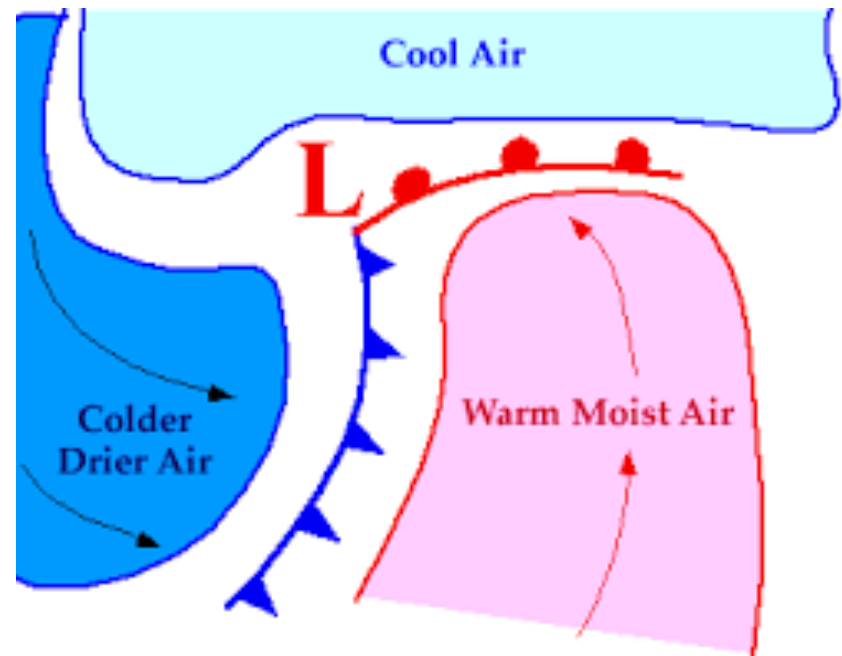
Basic Meteorology

- * Circulation
 - * Solar Heating
 - * Earths Rotation
- * General Patterns
 - * Equatorial
 - * Mid-Latitude
 - * Polar



Circulation

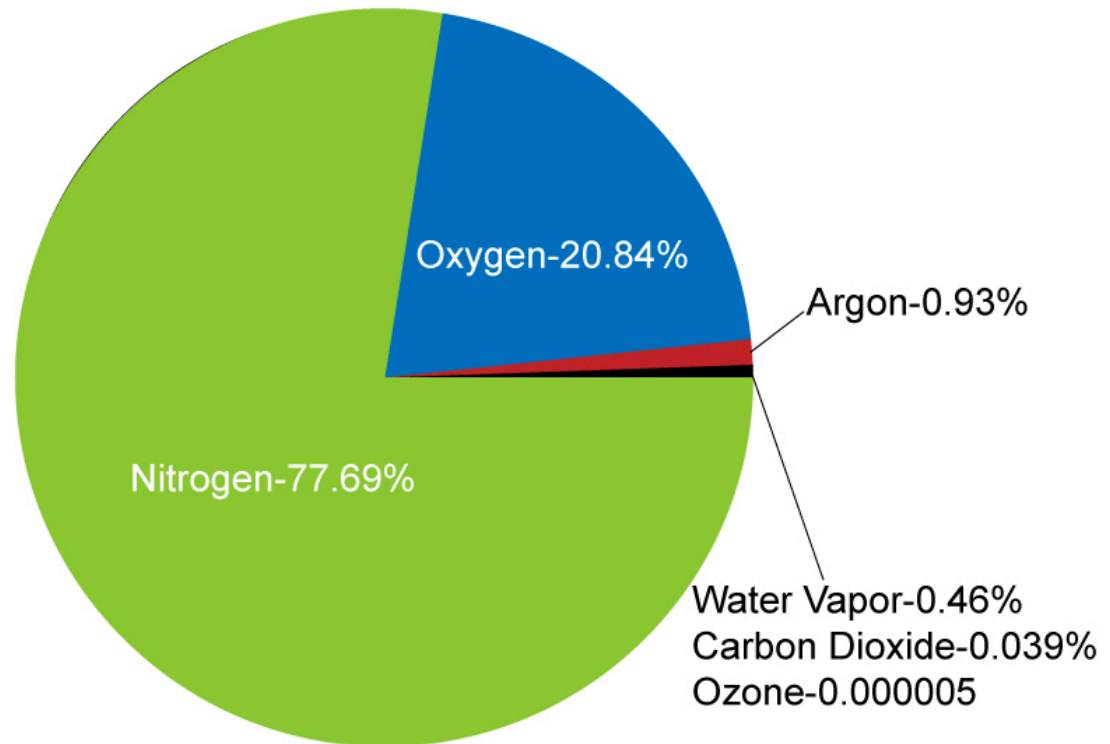
- * Mid-Latitude – Northern Hemisphere
- * Generally Flow of Systems is N to S and E to W
- * Not to Be Confused with Movement of WX Which Can Be in Any Direction



Atmosphere

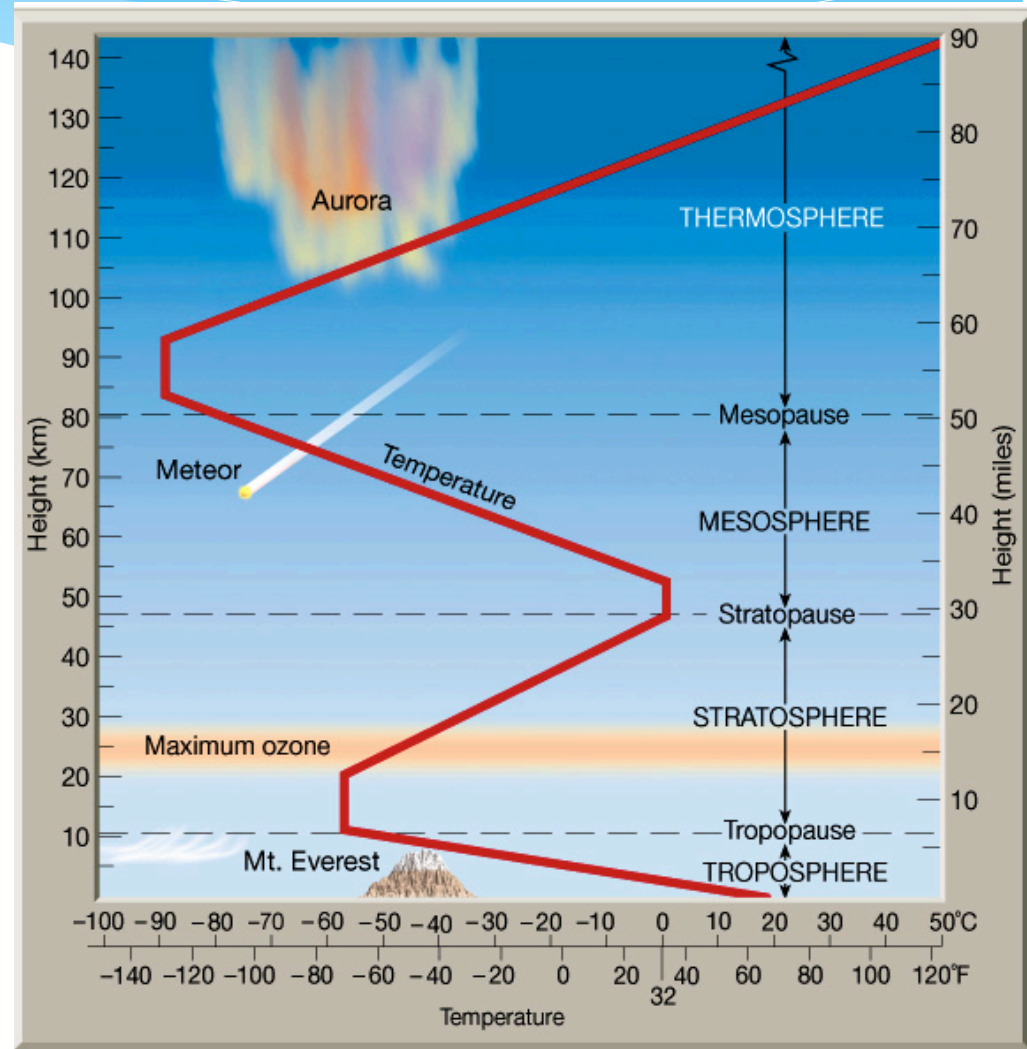
- * Troposphere is Where 'Sensible' WX is Formed
- * Most Important Gas to WX Formation (H_2O)
- * We Call This Water Vapor

Gaseous Composition of the Troposphere



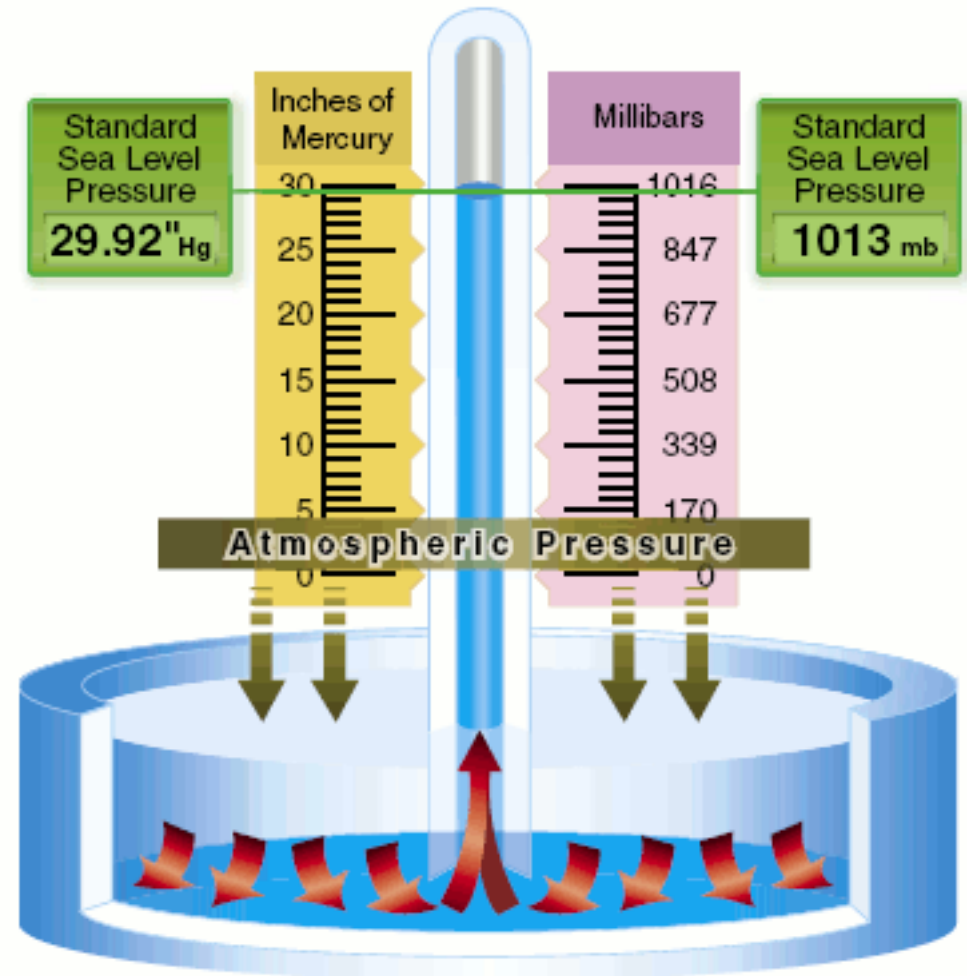
Troposphere

- * Decrease of Temperature and Pressure with Height
- * Extend to Altitudes Between 36K – 56K Ft
- * Standard Environment Lapse Rate
 - * $-2\text{ C}/1000'$
- * Other Lapse Rates Exist



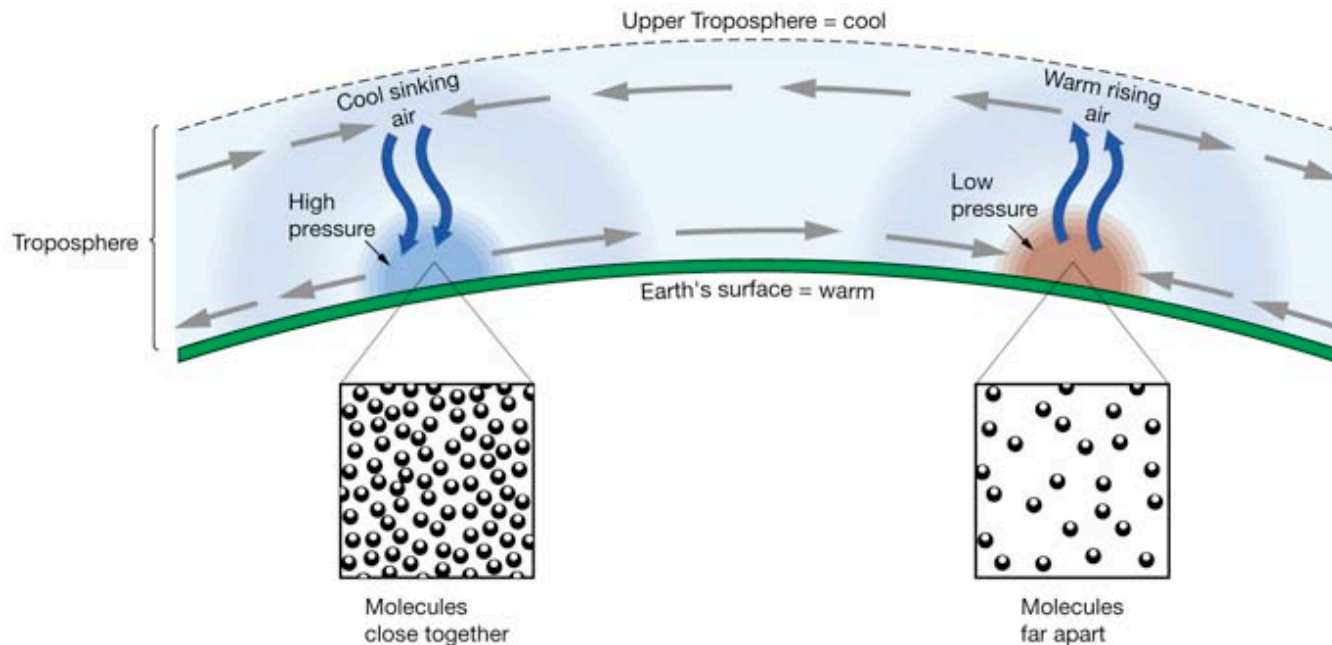
Atmospheric Pressure

- * Decreases With Altitude
- * At Standard Sea Level is 29.92" of Hg
- * Meteorologists Use mb
- * 29.92" Hg =
- * 14.7 #/sq-in

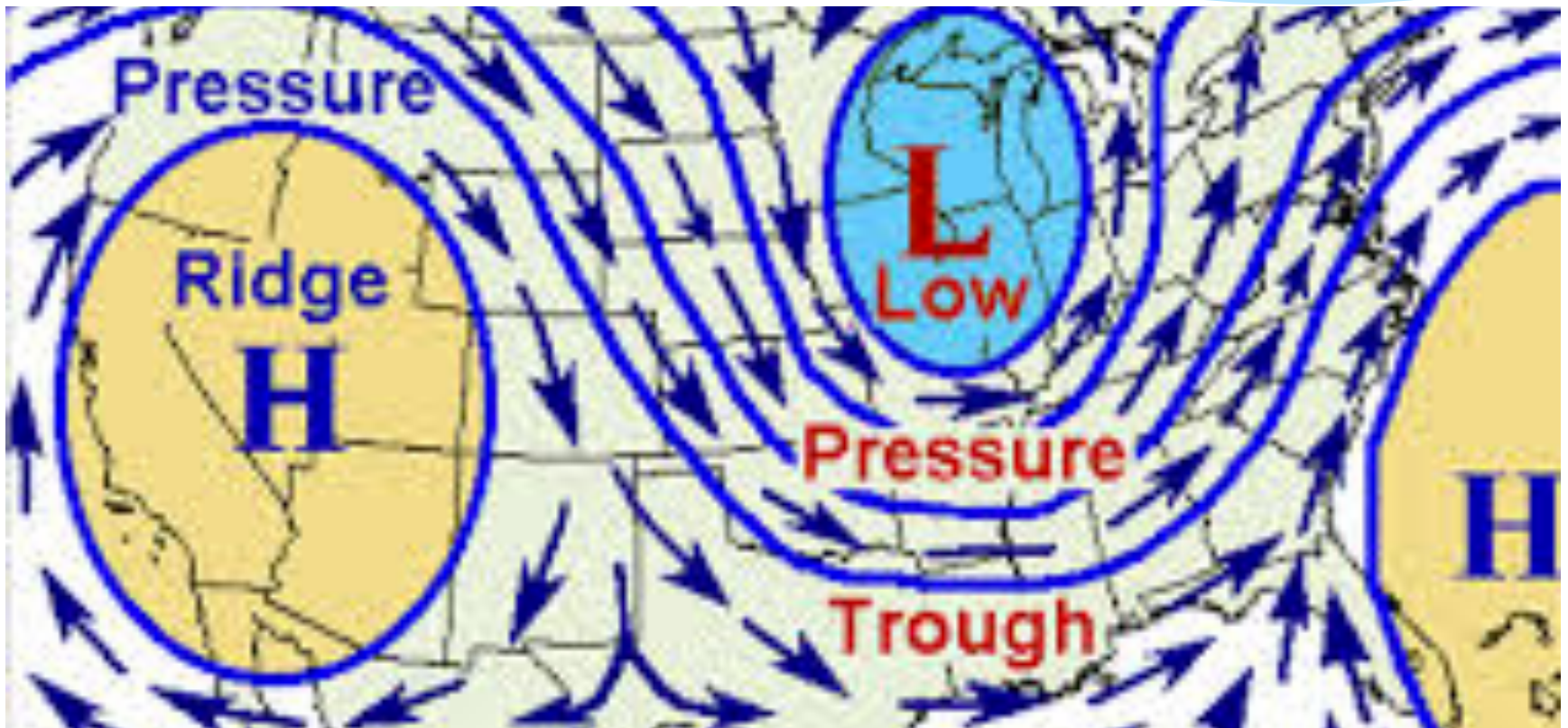


Pressure (cont.)

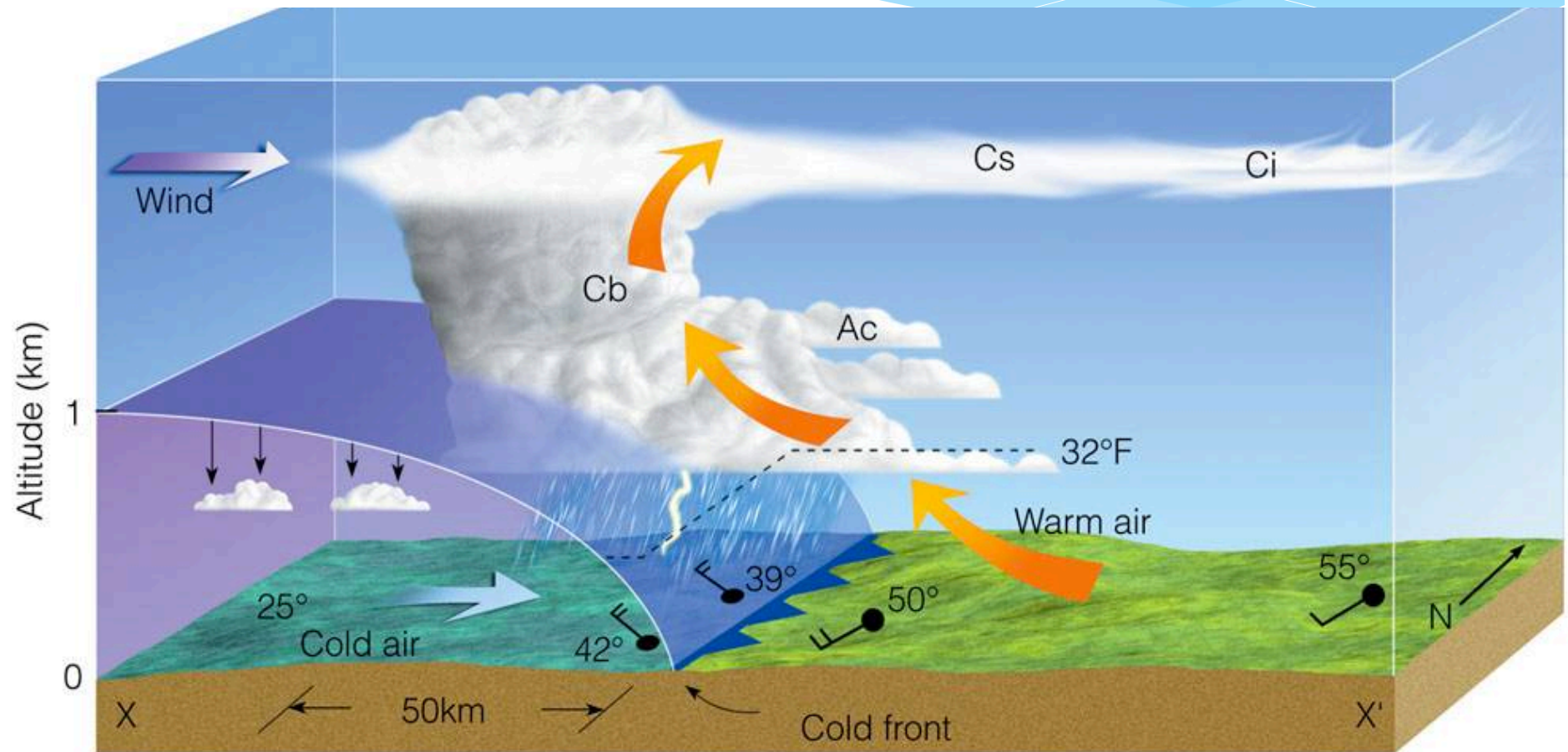
- * More Mass of Gas Above – **High** Pressure
- * Less Mass of Gas Above – **Low** Pressure



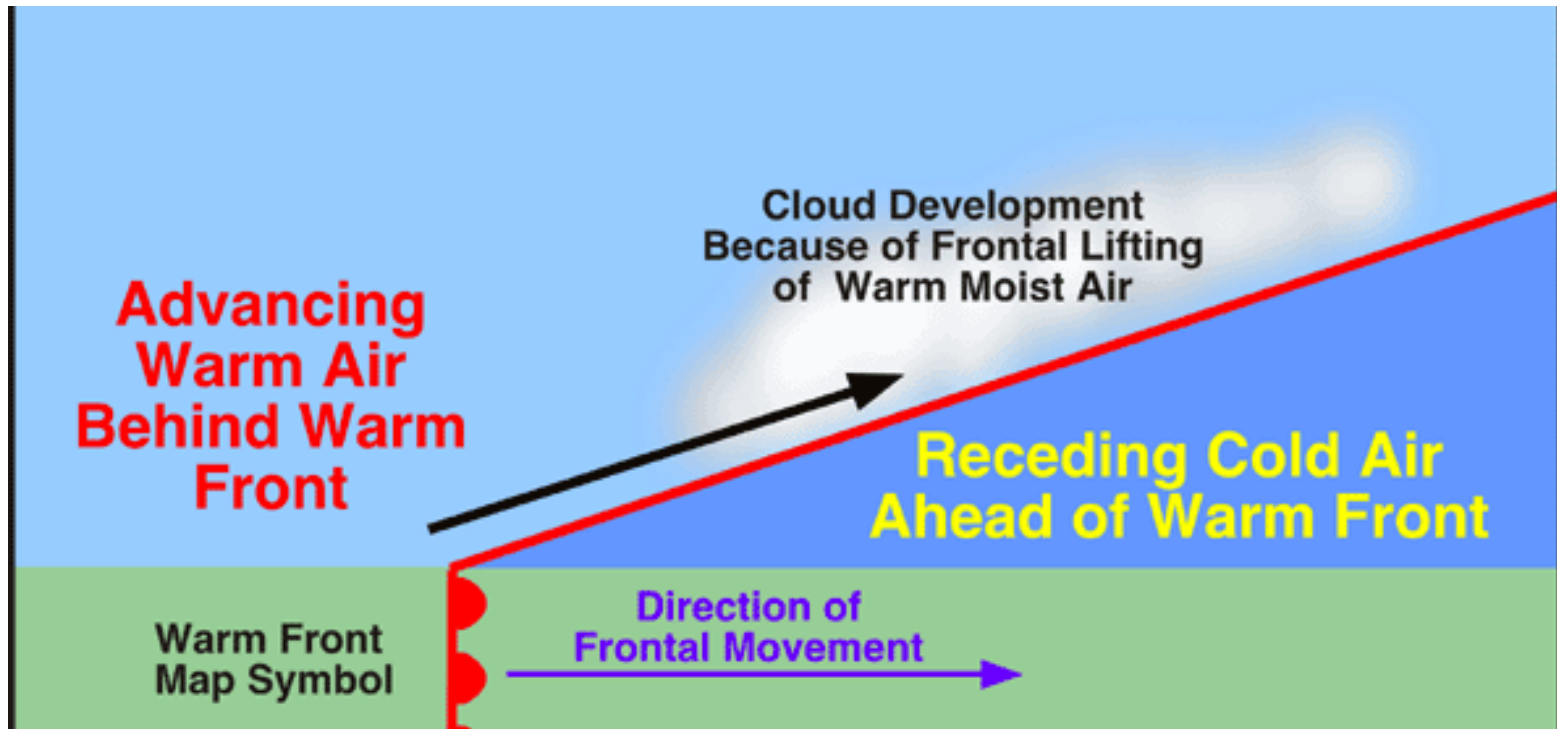
Highs and Lows (Ridges and Troughs)



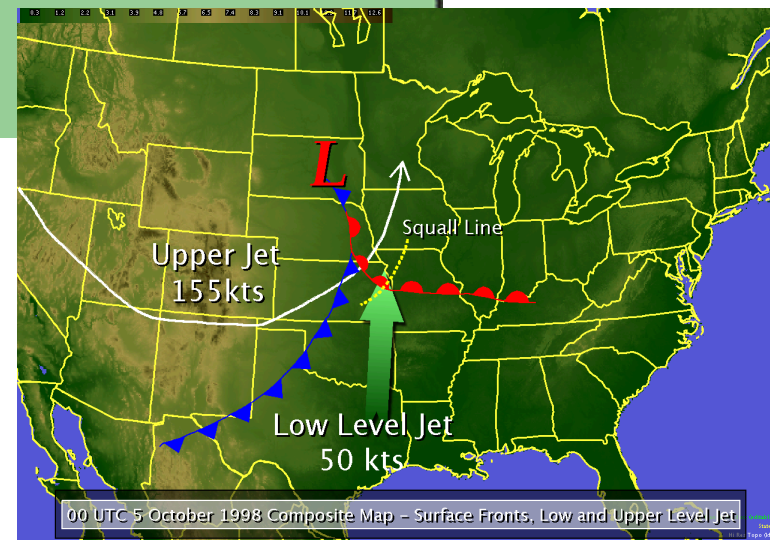
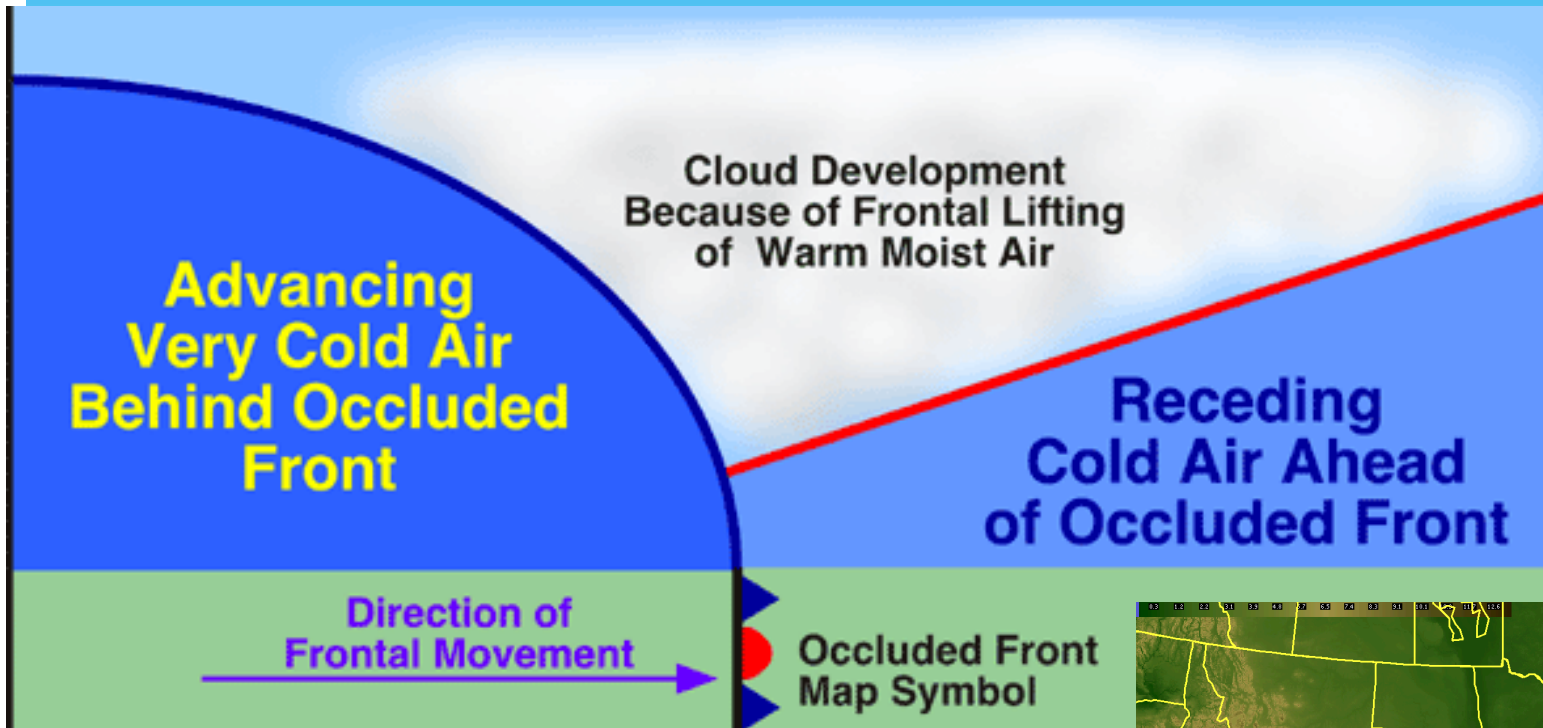
Fronts (Cold Front)



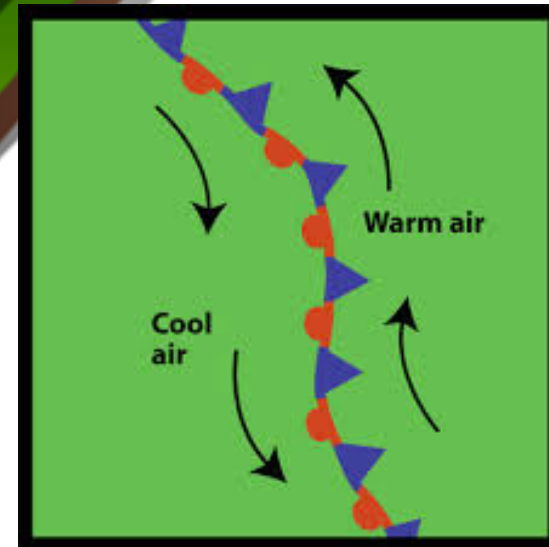
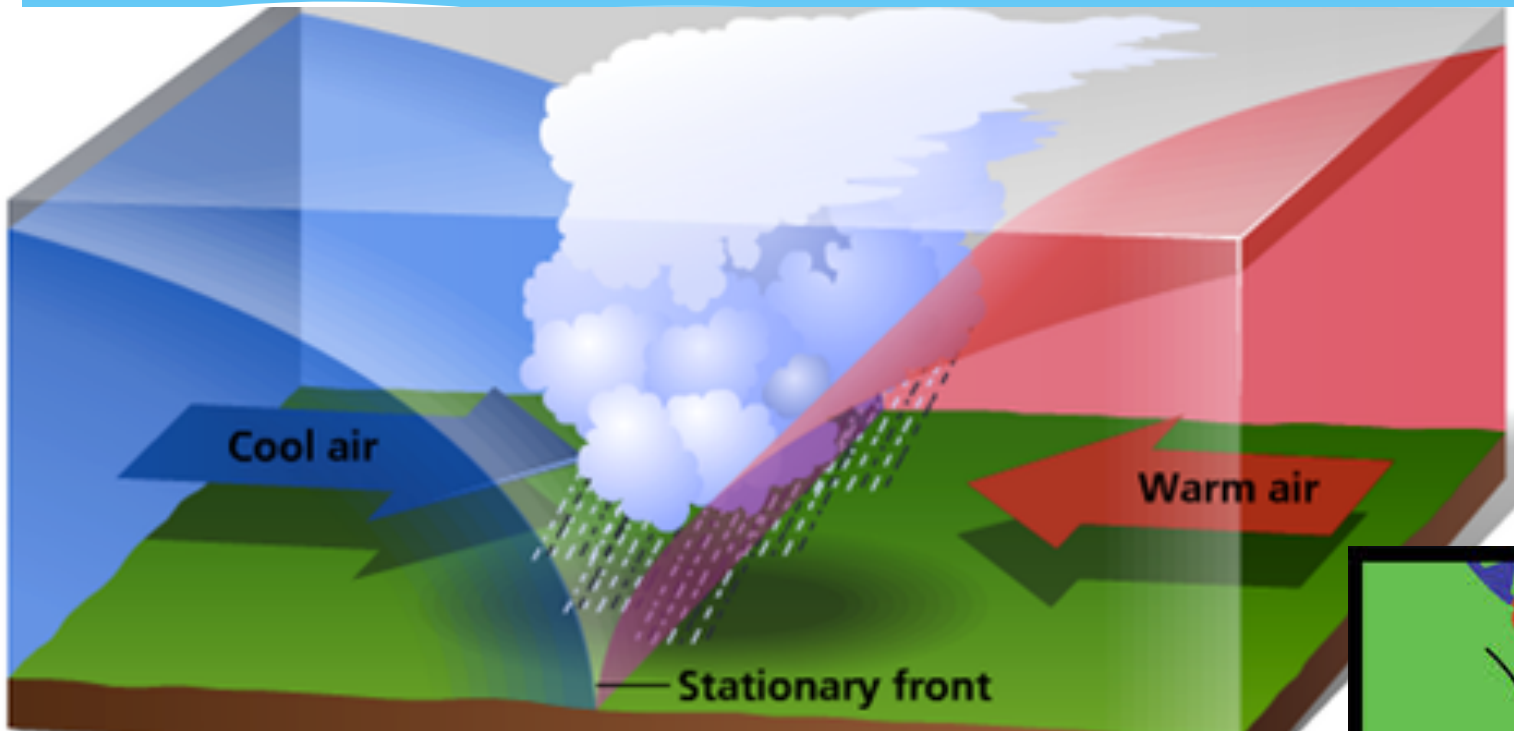
Warm Front



Occluded Front



Stationary Front (little or no movement)

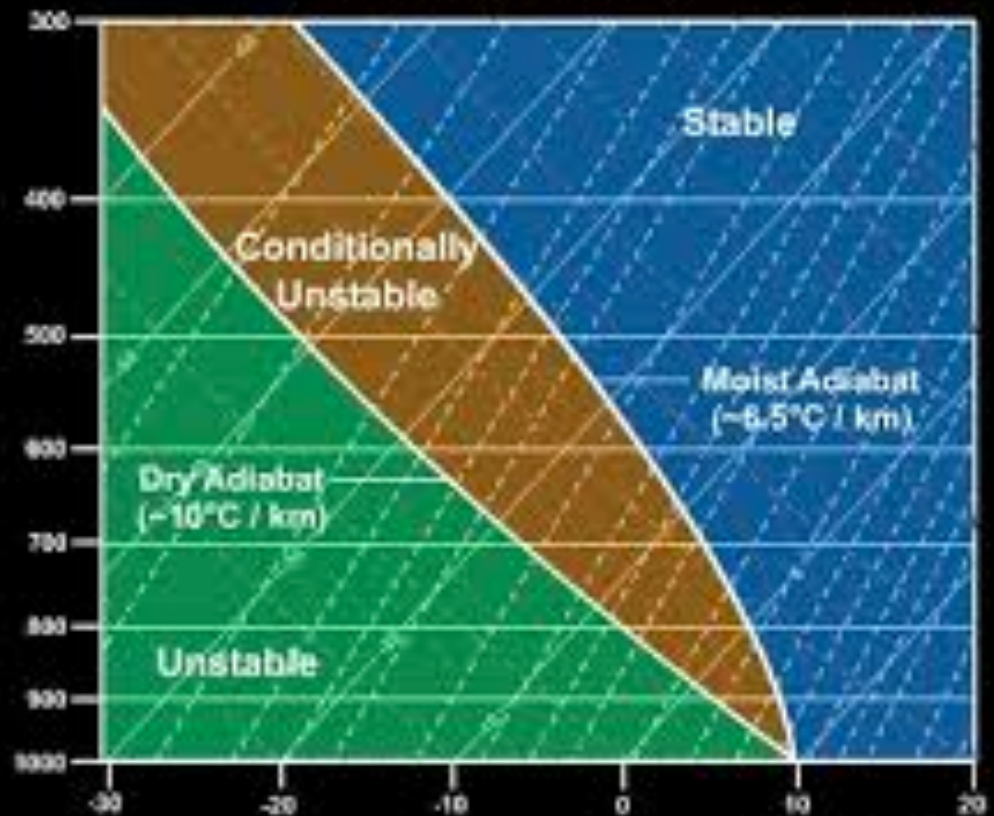


Stability

Meteorologists Consider
'Lifting' Against a 'Real'
Profile

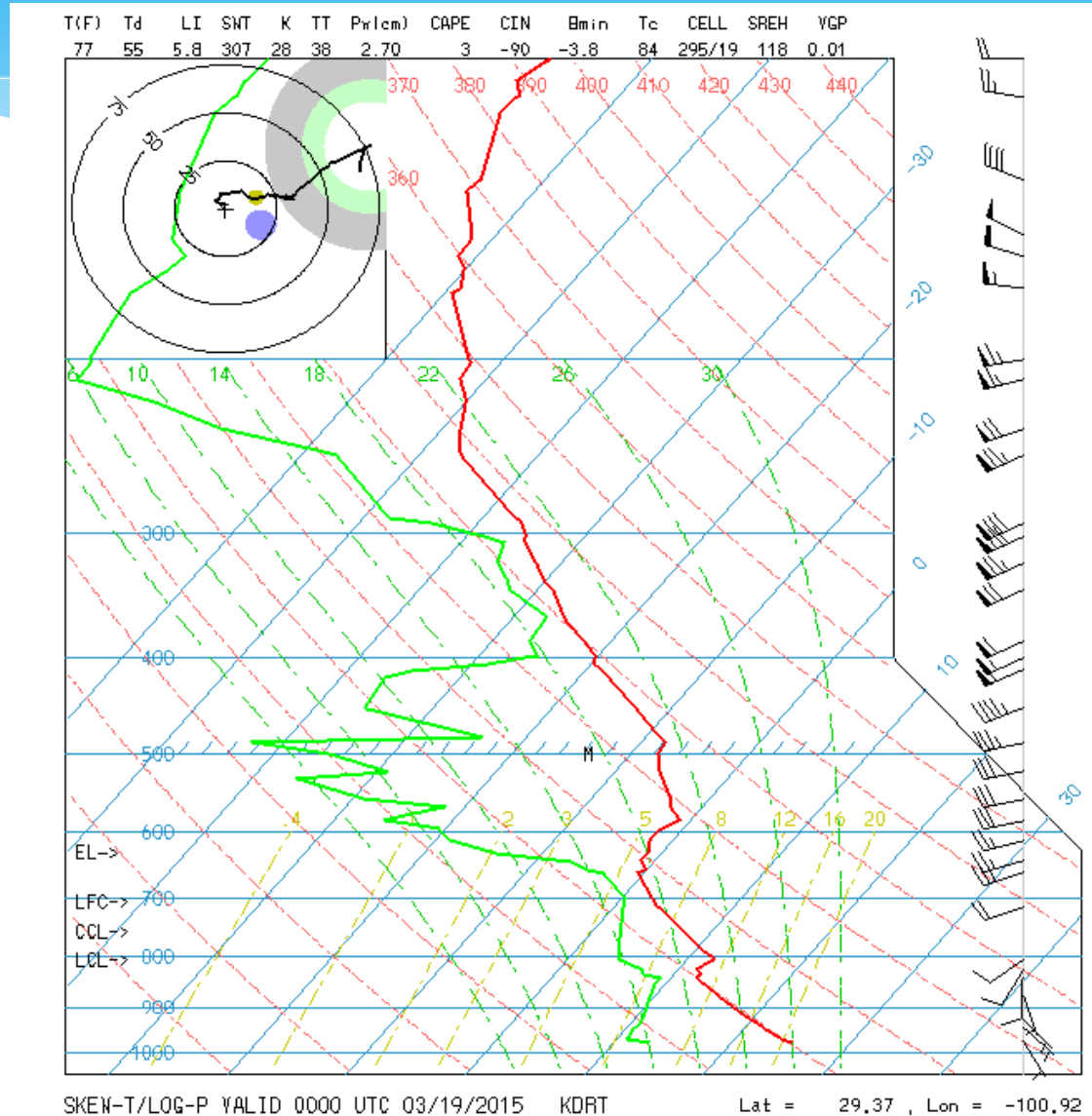
Note there are two lapse
rates, Moist and Dry

Skew-T Log P Diagram Showing Stability Fields for an Air Parcel
at 1000 hPa and 10°C

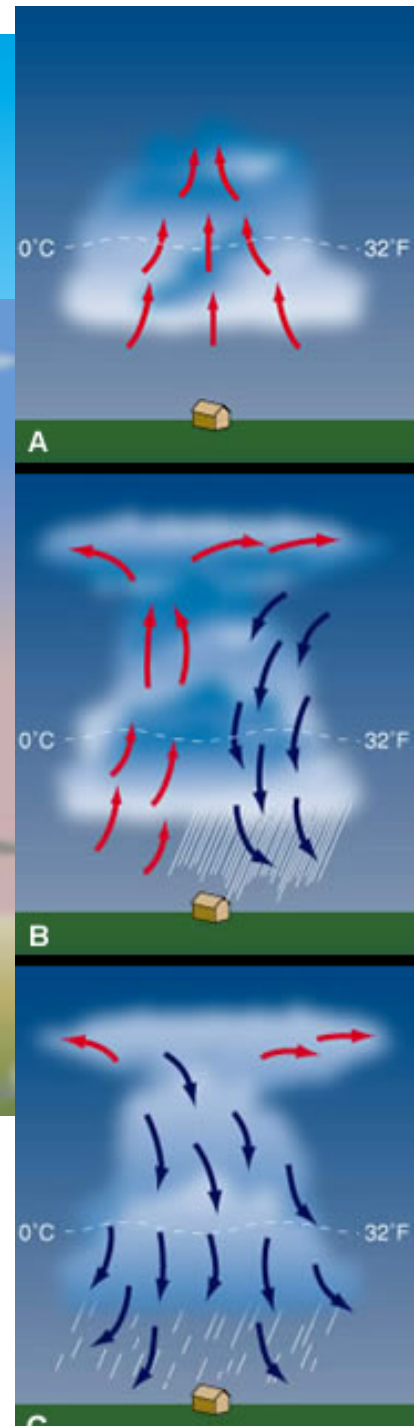


Example (Small Layer of Instability)

- * KDRT 00Z 3/19/15
- * Note Level of Free Convection (LFC) is at 700 mB to the Equilibrium Level (EL) at about 625 mB
- * If LFC is Low and EL is High Conditions Of Instability Exist for Thunderstorms



Thunderstorms

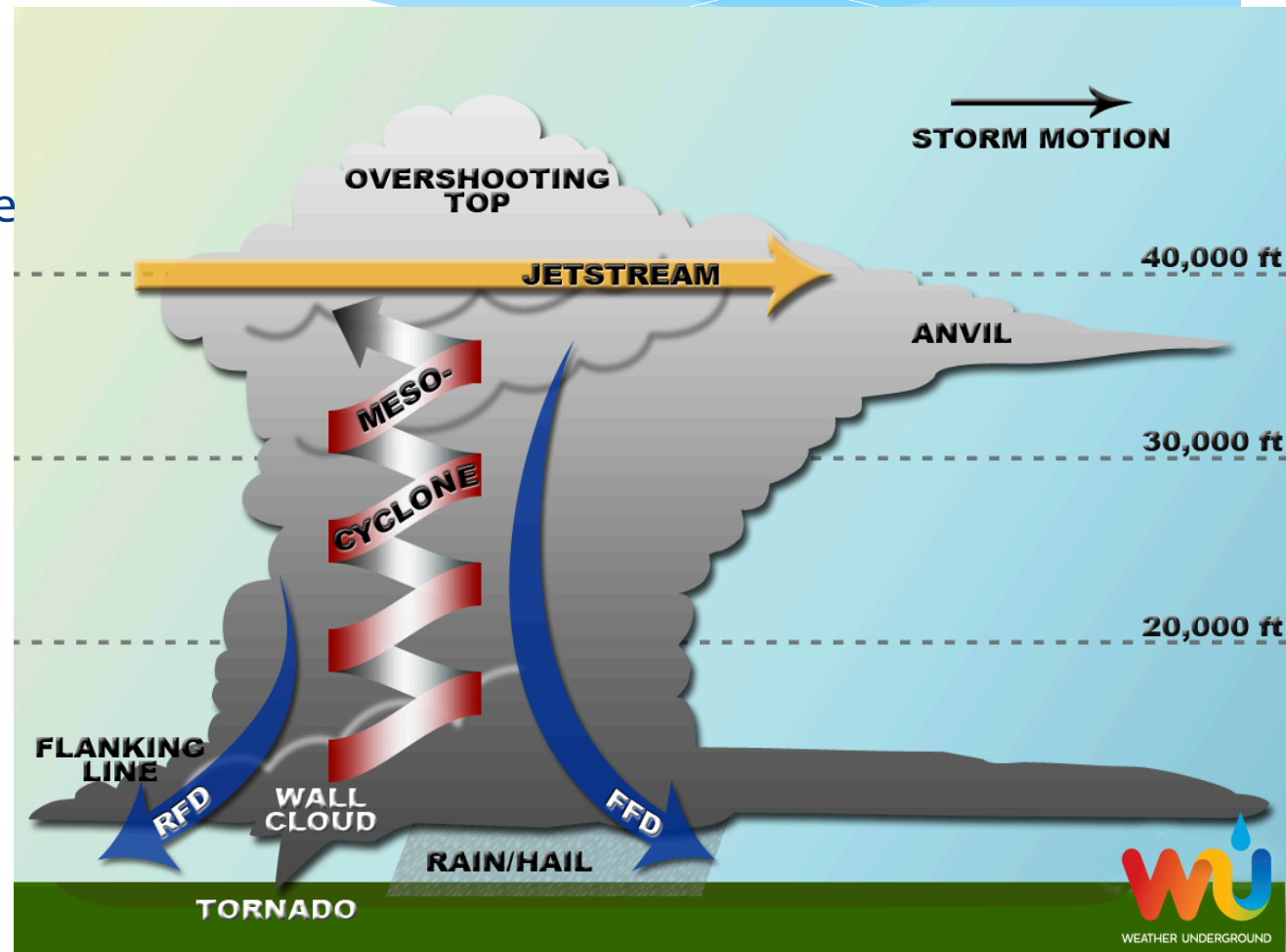


- A. Convective or Cumulus Stage
- B. Mature Stage
- C. Dissipating Stage

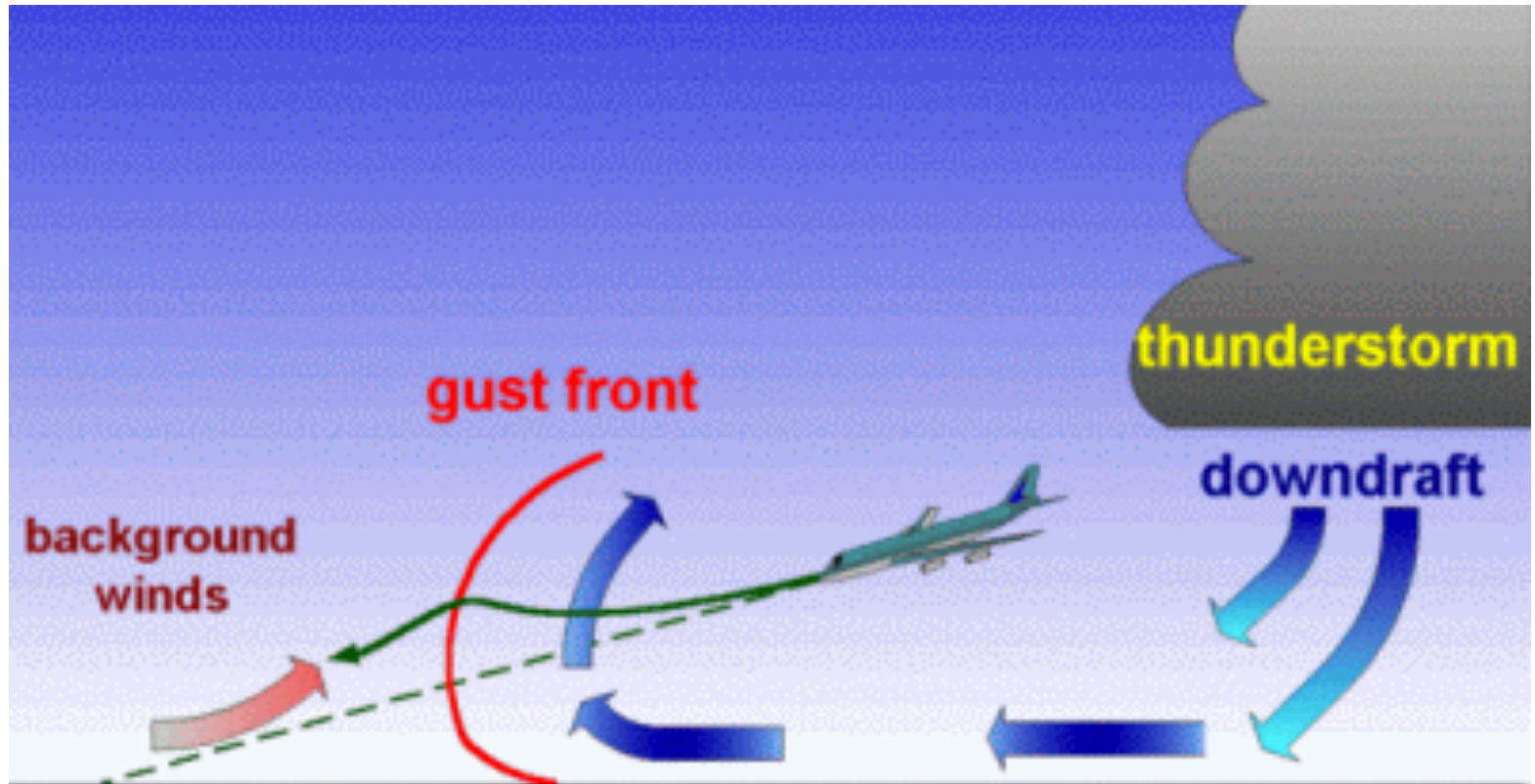
Thunderstorm Ingredients and By-Products

- * Moisture
- * Unstable Atmosphere
- * Lifting Force

- * Tornadoes
- * Gust Fronts
- * Wind Shear
- * Hail
- * Turbulence
- * Squall Lines
- * Lighting

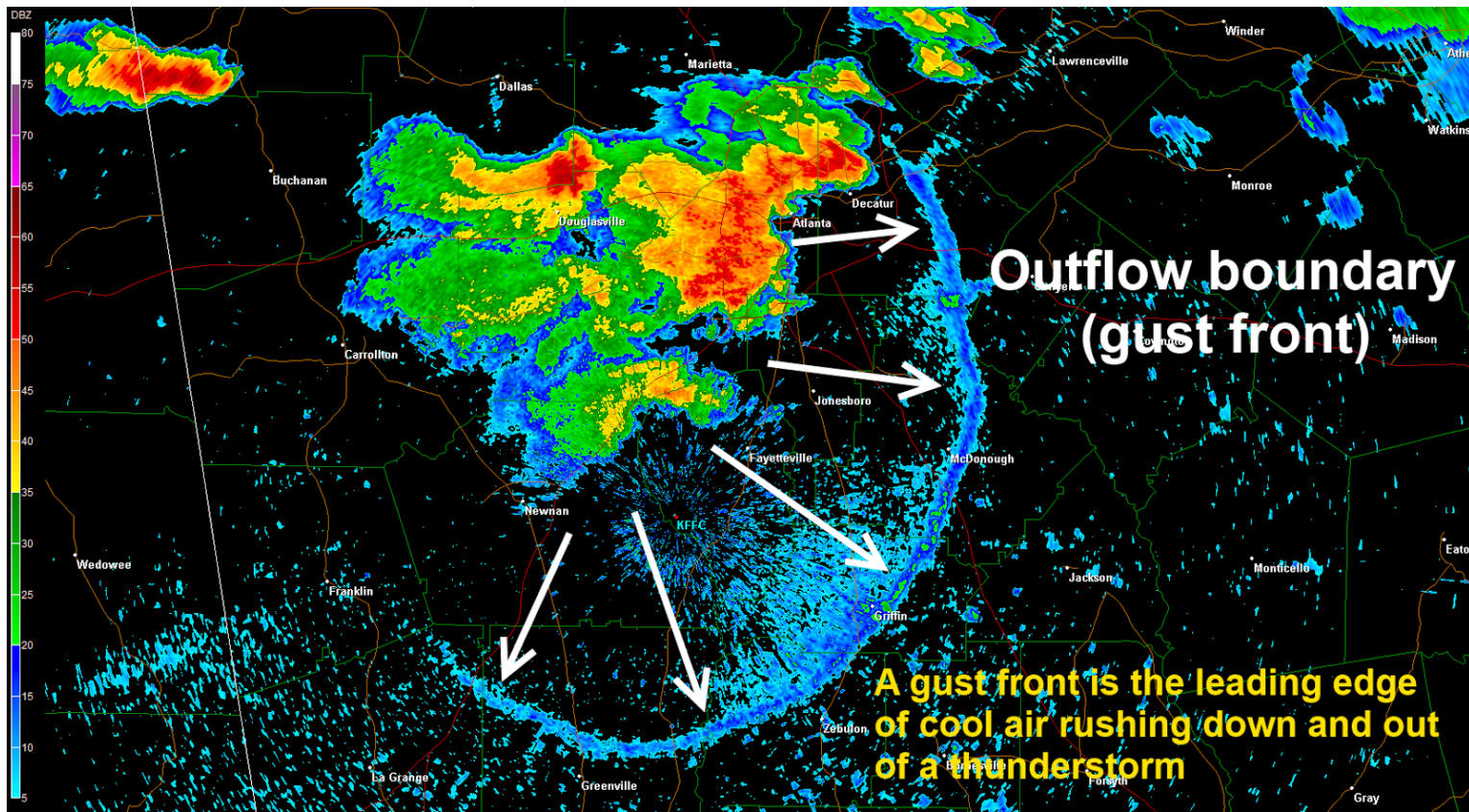


Gust Fronts



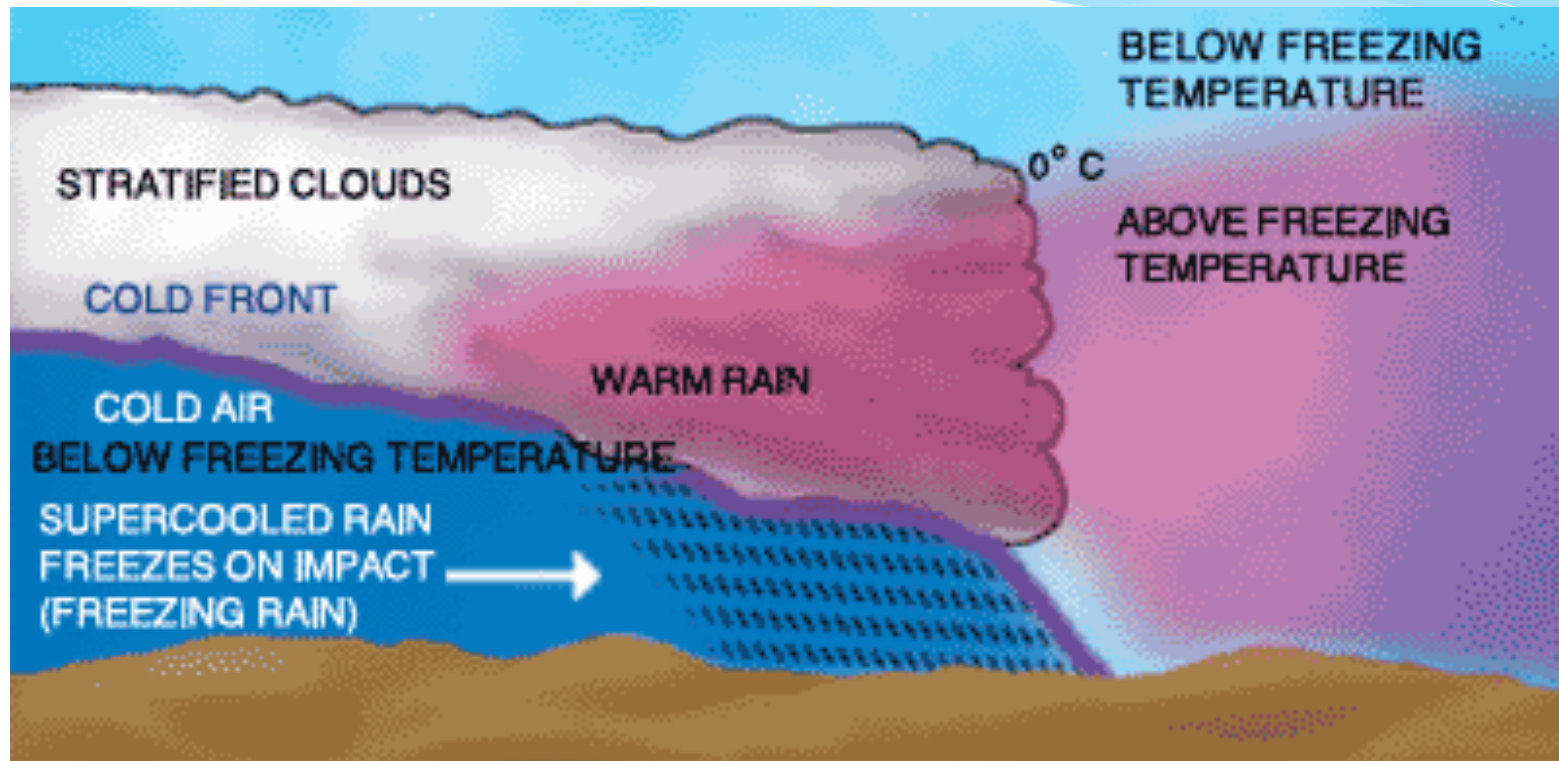
Gust Front (cont.)

- * One Type of Wind Shear
- * Strong Increase or Decrease in Aircraft Performance



Icing

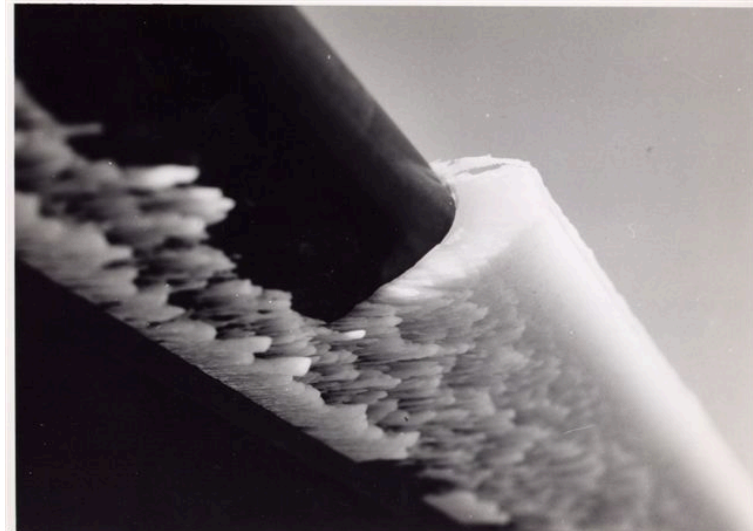
Rime, Clear, Mixed



FREEZING RAIN WITH A COLD FRONT WILL CAUSE ICING

Icing (cont.)

- * Adds Drag and Weight
- * Dramatically Reduces Lift
- * Airfoil Shape May be Radically Disturbed
- * May Form on Areas Hard to See, i.e., Horizontal and Vertical Stabilizers, Propeller
- * Can Build Rapidly, In Some Cases in Less Than a Minute



Frost

- * Clear Cold Morning
- * Radiation Cooling
- * Water Vapor Goes to Solid On Surfaces Below Freezing

- * Same Effects as Ice
- * To Remove:
 - * Prist (a de-ice solution)
 - * Wipe Off
 - * Park Plane in Sun
 - * Wait 'til it Melts, Have a Cup of Coffee and Read Poetry

Warmth, warmth, more warmth! for we
are dying of cold and not darkness. It is
not the night that kills, but the frost.

The Tragic Sense of Life (1913)

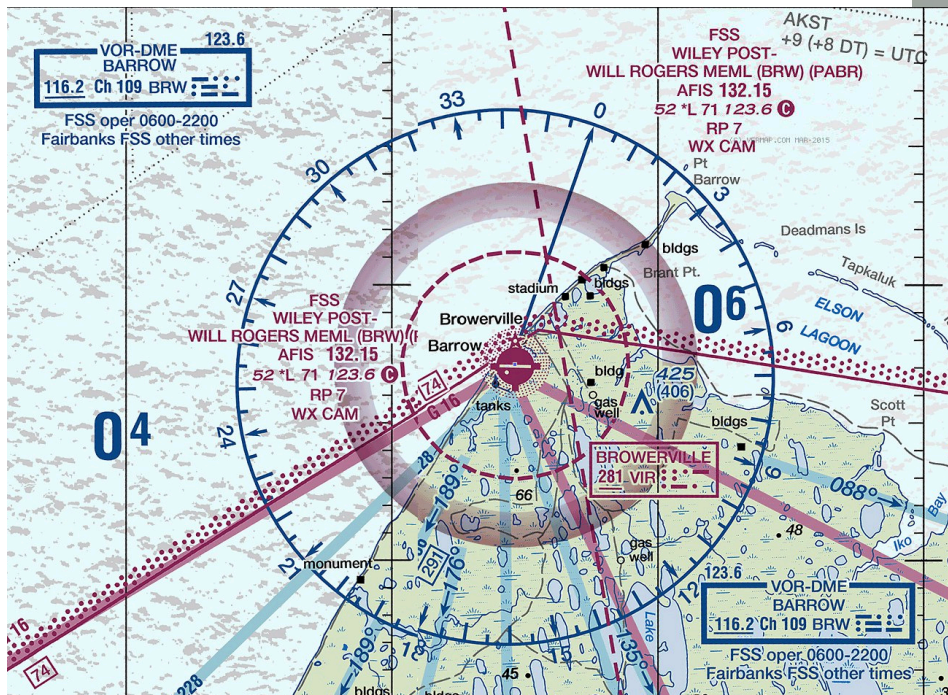
Weather Sources



FSS

(122.2 MHz or 1-800-WXBRIEF)

- * WX Briefings
- * Outlook > 6 Hr
- * Standard < 6 Hr
- * Abbreviated or Update



BARROW FSS
FREQ. 123.6 MHZ
PILOT BRIEFING UPSTAIRS



FSS (cont.)

- * Most FSSs Have Been Taken Over By Lockheed-Martin
- * Your WX Briefing Is NOT Provided by WX Forecaster or Meteorologist
 - * They Are Trained WX Briefers
- * Most In-Flight Access is by Means of a Radio Communications Outlet (RCO)
 - * E.g., Here at KHYI it is 122.55
 - * Important to Identify Your Position

DUAT or DUATS

- * DUAT (DTC) – DUATS (CSC)
- * Extensive Internet Services
- * Need Pilot License to Get Account
- * FREE!

The screenshot shows the CSC DUATS Standard Low Weather Briefing web interface. At the top, there is a navigation bar with links for Home, Weather, Flight Planning, Database Search, My Account, Help, and Log Out, along with the CSC logo. The main heading is "DUATS Standard Low Weather Briefing". Below this, there is a grid of buttons for various weather services: Entire Briefing, Dep Closest WX, Dest Closest WX, FA Hazards and Flight Precautions, Area Forecast, Area Forecast Turbulence, Severe Weather Outlook, Severe Weather Warnings, SIGMETs, Convective SIGMETs, Center Weather Advisory, AIRMETs, METARs, Pilot Reports, Radar Summaries, Terminal Forecasts, Winds Aloft, NOTAMS, and FDC NOTAMS. A "Print Entire Briefing" button is also present. The interface displays session information: "Session Number : 00869", "Transaction number: 021775", and "Wed Mar 18 14:56:07 2015 (UTC)". A status message reads "Working... Please wait." The main content area is titled "Departure Closest Terminal Weather" and shows a weather observation for "San Marcos TX [KHYI]" on the 18th at 9:50am CDT (1450Z), with details: "wind 180° at 6 knots, visibility 10 miles, 8,000 feet broken, temperature 19°C (66°F), dewpoint 14°C (57°F), altimeter 30.08."

14:57:05 UTC
09:57:05 CDT

DUATS Standard Low Weather Briefing

Home Weather Flight Planning Database Search My Account Help Log Out **CSC**

Entire Briefing Dep Closest WX Dest Closest WX FA Hazards and Flight Precautions Area Forecast Area Forecast Turbulence Severe Weather Outlook
Severe Weather Warnings SIGMETs Convective SIGMETs Center Weather Advisory AIRMETs METARs Pilot Reports Radar Summaries Terminal Forecasts
Winds Aloft NOTAMS FDC NOTAMS

Print Entire Briefing

Session Number : 00869
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Working... Please wait.

Departure Closest Terminal Weather

San Marcos TX [KHYI] hourly observation on the 18th at 9:50am CDT (1450Z)
wind 180° at 6 knots, visibility 10 miles, 8,000 feet broken, temperature 19°C (66°F), dewpoint 14°C (57°F), altimeter 30.08.

FSS Online

(<https://www.1800wxbrief.com>)

- * Similar Content to DUAT/DUATS
- * Clunky Interface
- * No Pilot License Req'd
- * FREE!

LOCKHEED MARTIN
FLIGHT SERVICES



Home Weather ▾ Flight Planning & Briefing ▾ Airports ▾ UAS ▾ Account ▾ Links ▾ Help ▾ Logout

Welcome GARY A WHITE

Wed Mar 18 10:53:48 CDT | 15:53:48 Z

CONUS

Atlantic

Mexico/Caribbean

South America

Pacific

Canada

Alaska

Single Site Radar

▶ Current Weather

▶ Adverse Weather Conditions

▶ General Forecasts (Prog Charts)

▶ Winds

▶ Barotropic Level Products (MB Charts)

aviationweather.gov

- * No Briefing
- * Data and Graphics
- * Best Feature – Aviation Forecast Discussion

The screenshot shows the NOAA National Weather Service Aviation Weather Center website. At the top, there are logos for NOAA and the National Weather Service, followed by the text "AVIATION WEATHER CENT" and "NOAA NATIONAL WEATHER SERVICE". Below this is a navigation bar with a search box containing "Local Forecast" and a "Go" button, and a menu with options: "HOME", "ADVISORIES", "FORECASTS", and "OBSERVATIONS". The main content area features a map of the United States with various weather symbols and a red arrow pointing to the "Avn. Forecast Disc." option in a dropdown menu. The dropdown menu is open, showing a list of options: "Convection", "Turbulence", "Icing", "Winds/Temps", "Prog Charts", "TAFs", "WAFS Forecasts", "Area Forecasts", and "Avn. Forecast Disc.". The "Avn. Forecast Disc." option is highlighted with a red arrow. The map shows a weather system over the Pacific Northwest with a pressure of 120 and a temperature of 35. The text "Valid at 1557 UTC 18 Mar 2015" is displayed above the map.

Aviation Forecast Discussion

- * Informal Concise Discussion from WX Forecaster Who Prepares Area Forecasts
- * Great to Supplement Area Forecast for Your Specific Area

(EXTRACTED FROM FXUS64 KEWX 181155)

NATIONAL WEATHER SERVICE AUSTIN/SAN ANTONIO TX

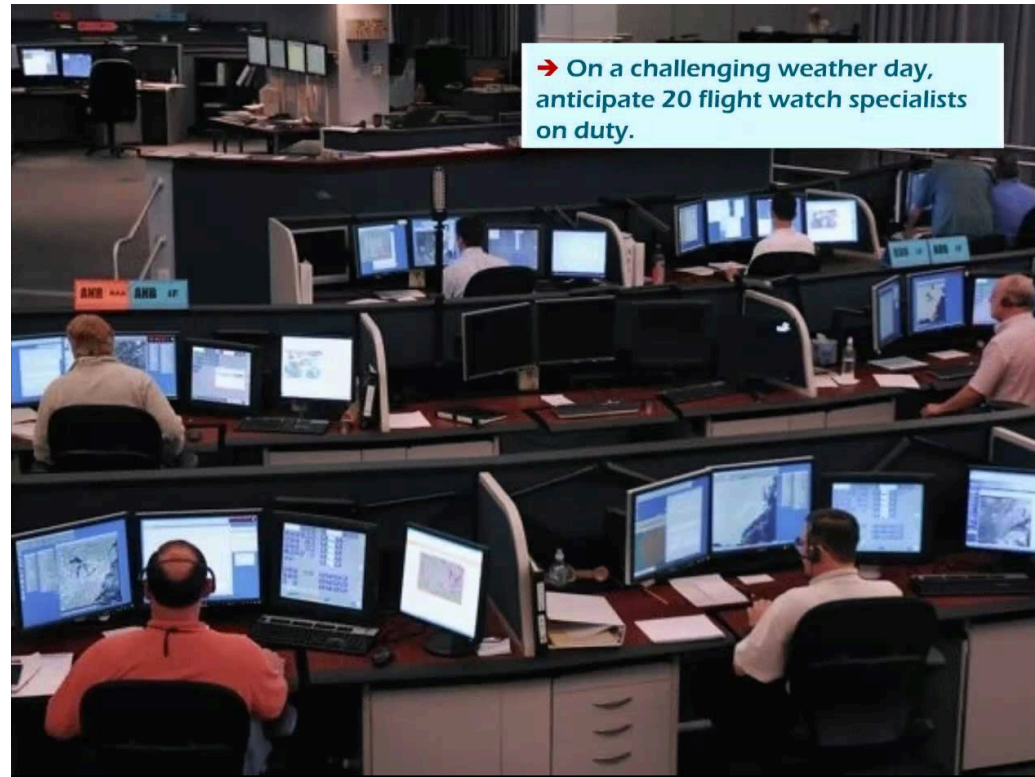
655 AM CDT WED MAR 18 2015

/12Z TAFS/

EXPECTING MVFR CIGS FOR AREA SITES THIS MORNING THROUGH EARLY THIS AFTERNOON. VFR CONDITIONS RETURN AROUND 20Z/21Z TIME FRAME ALONG I-35 SITES AND 22Z FOR KDRT. RAIN CHANCES CONTINUE ACROSS THE AREA THROUGH THIS EVENING AS IT CLEARS FROM WEST TO EAST. CIGS AND VBSYS WILL LOWER TO MVFR/IFR CATEGORIES LATE THIS EVENING INTO THE OVERNIGHT HOURS.

Flight Watch (EFAS 122.0)

- * En-route WX Updates
- * Available 0600-2200 Local
- * WX Forecaster
- * Tailored to Your Flight
- * Located at ARTCC
- * Sub-Function of FSS
- * Receive PIREPS
- * Assist in Emergencies
- * Suggest Alternate Routes



Satellite

- * Best for 'Big Picture'
- * Three Basic Types
 - * Visual
 - * IR
 - * Water Vapor



Hurricane Dennis as seen by NOAA GOES-12 infrared band on July 10, 2005.



Hurricane Katrina as seen by NOAA GOES-12 infrared band on August 29, 2005.



NOAA GOES N Series spacecraft



GOES

Geostationary Operational Environmental Satellites

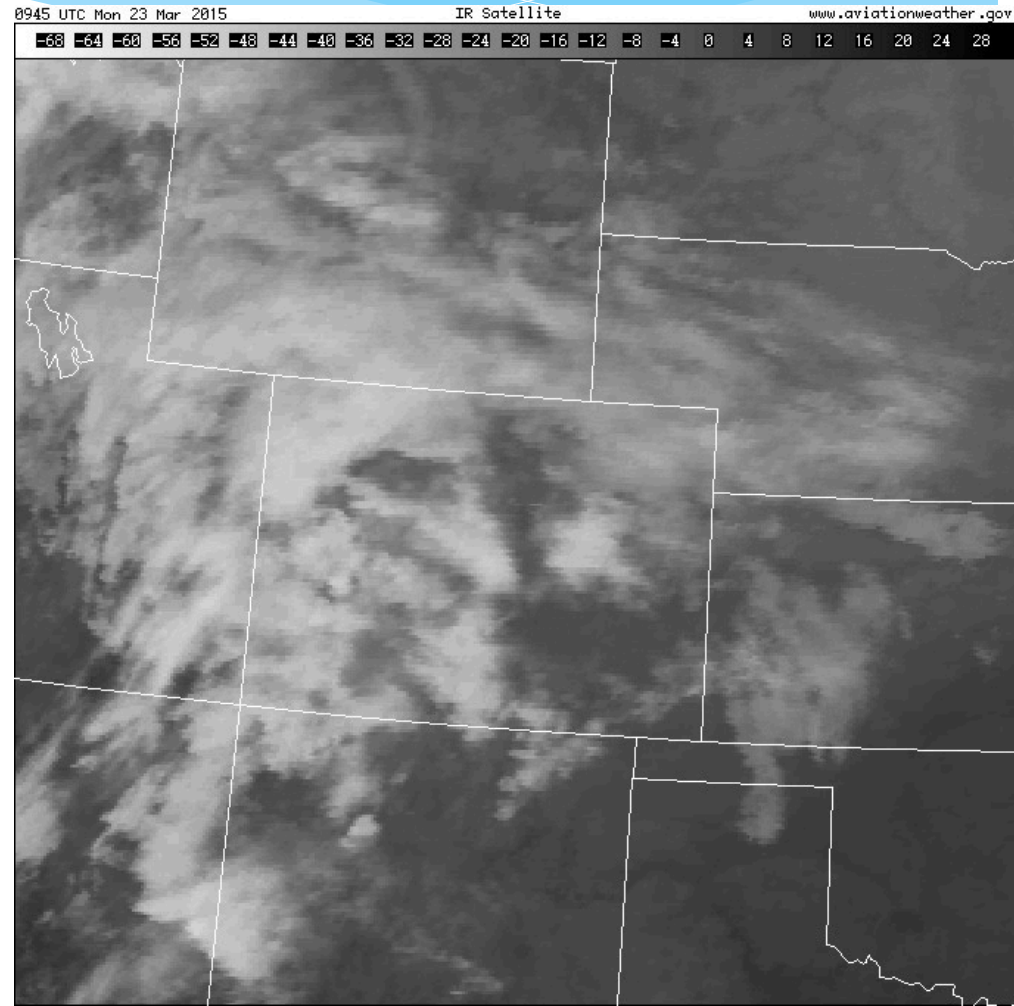
Visual

- * Kodak in the Sky
- * Only During Daylight Hours



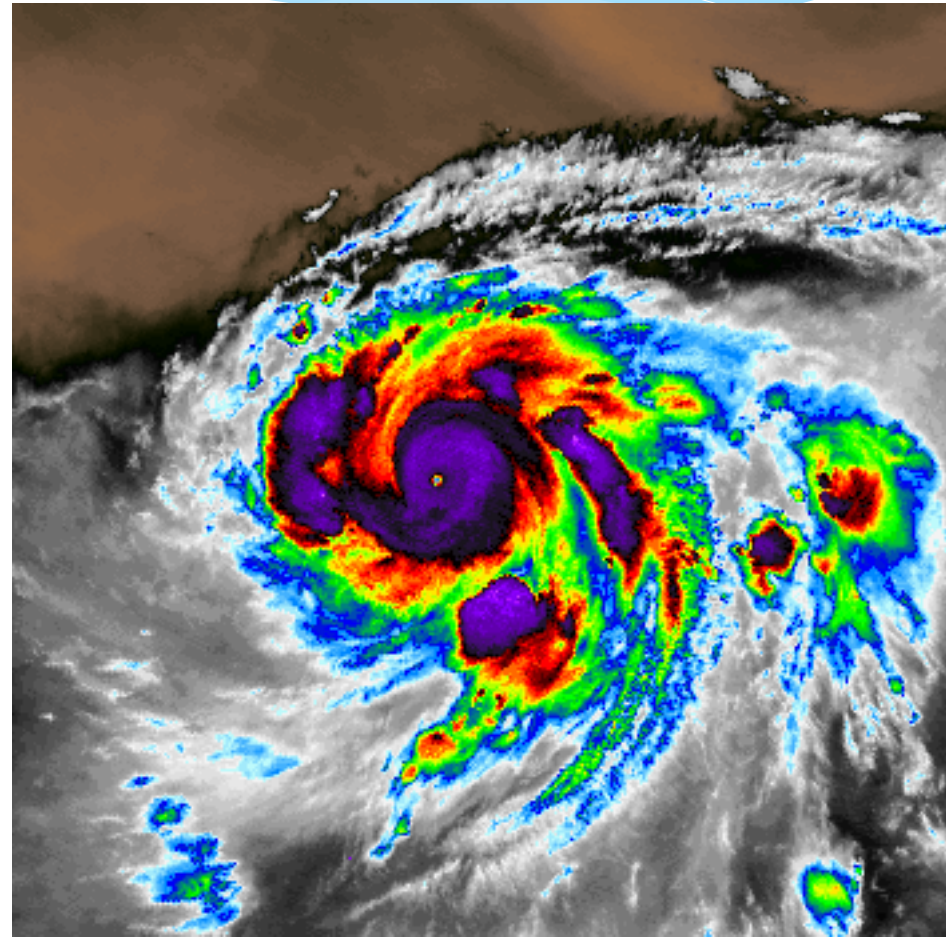
Infrared (IR)

- * Cloud Height Inferred By Temperature
- * Colder is Higher
- * Whiter is Colder
- * 24 Hr Availability



Water Vapor

- * Moisture Content in Atmosphere
- * Not Always a Cloud
- * Can be Color Enhanced



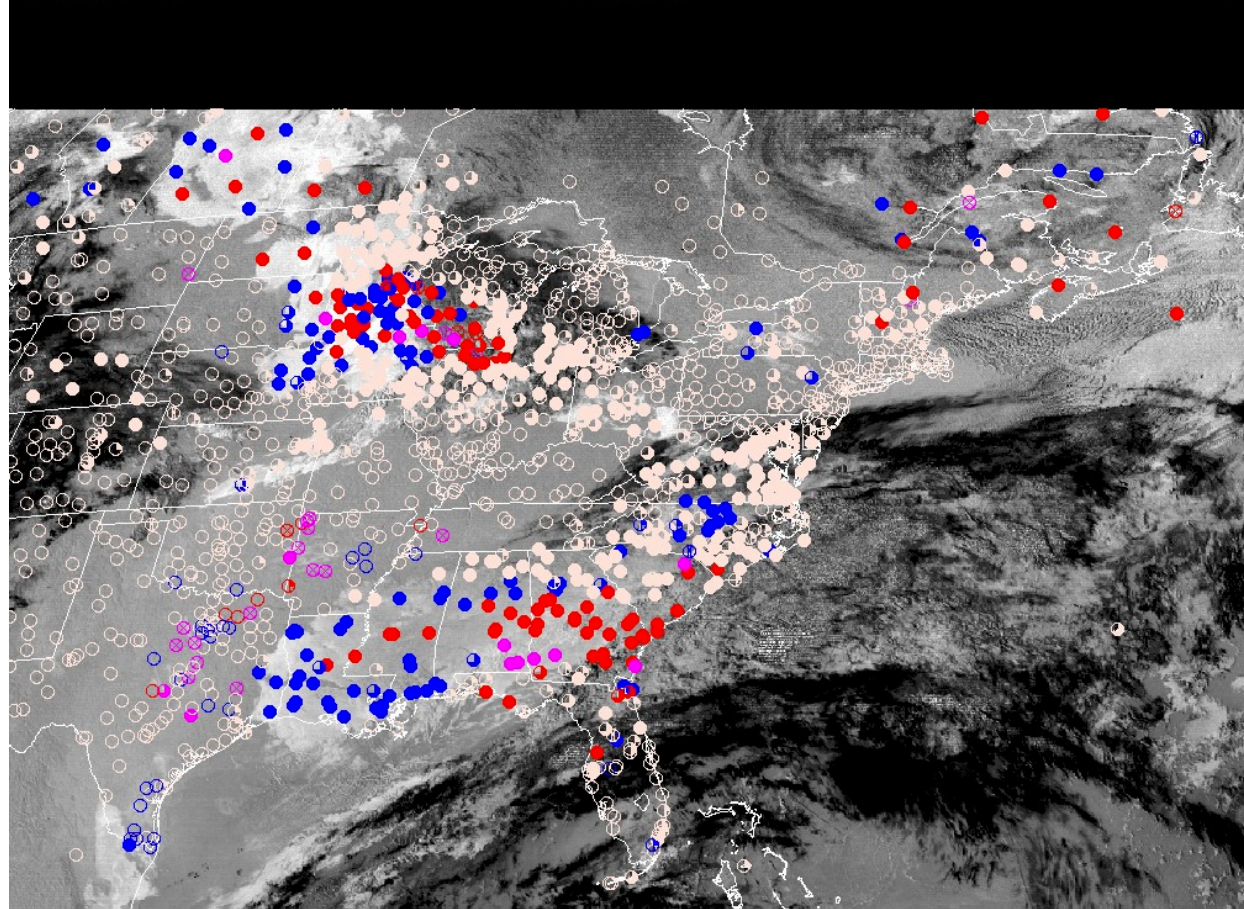
Can Be Tailored for Aviation

- * E.g., GOES Vis/Fog with Current METAR Ceiling
- * Vis/Fog is Composite of Visible and IR Images

0945 UTC Mon 23 Mar 2015

Visible Satellite

www.aviationweather.gov



Internet Provides Access to WX Products

- * WX Information Overload
- * Develop Your Own Strategy
- * Use Aviation Tailored Products
- * FSS Briefing
 - * Standard Format
 - * Human Interaction



WX Planning

(<http://w5gw.com/images/WX.pdf>)

- * Become 'Weather Wise'
- * Develop Habit to Watch National and Local Weather on TV Daily
- * WX Planning Begins 4-5 Days Before a Flight
 - * Get the 'Big Picture' First
- * Use FSS, DUAT/DUATS, and Internet Services
- * Develop Personal Go-No-Go Criteria
- * File a Flight Plan
- * Don't Forget Flight Watch
- * Have a Plan 'B'

Survival Techniques

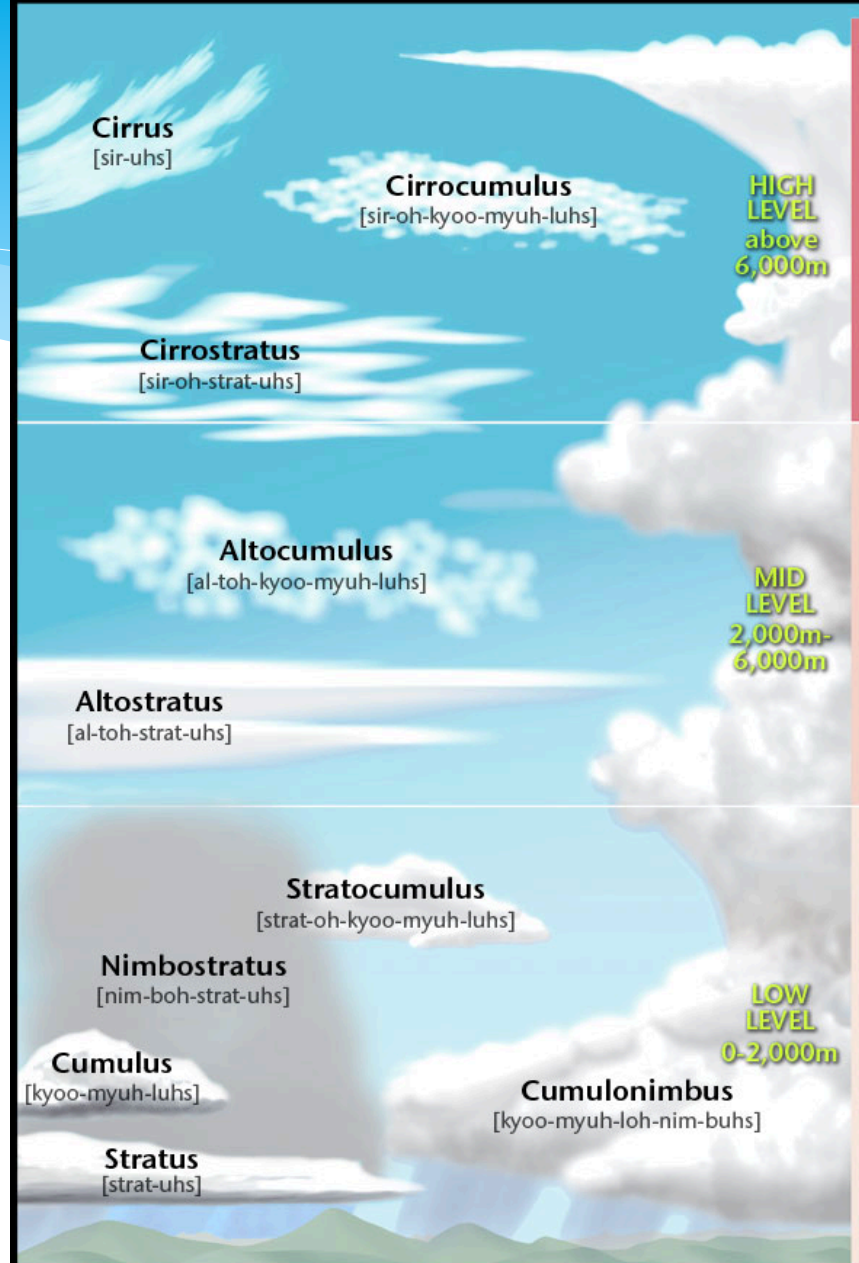
- * Develop Personal Set of WX Minimums
 - * E.g. Winds less than 25 knots, Min Ceiling 3,000' AGL, Visibility Greater than 7 Miles
- * Stay 20 Miles Away from Convective Activity
- * Know Your Clouds and the WX and Risks They Produce
- * Become Adapt at Interpreting METARs and TAFs

Common Clouds

Cb, or Cumulonimbus Extends Up to Top Troposphere

Other Clouds Cause Lowered Ceilings, Reduced Visibility, etc.

What is the Cloud and Risk(s) Below ?



What Are Risks Here ?



OMG! Not Another Question

