Aviation Meteorology

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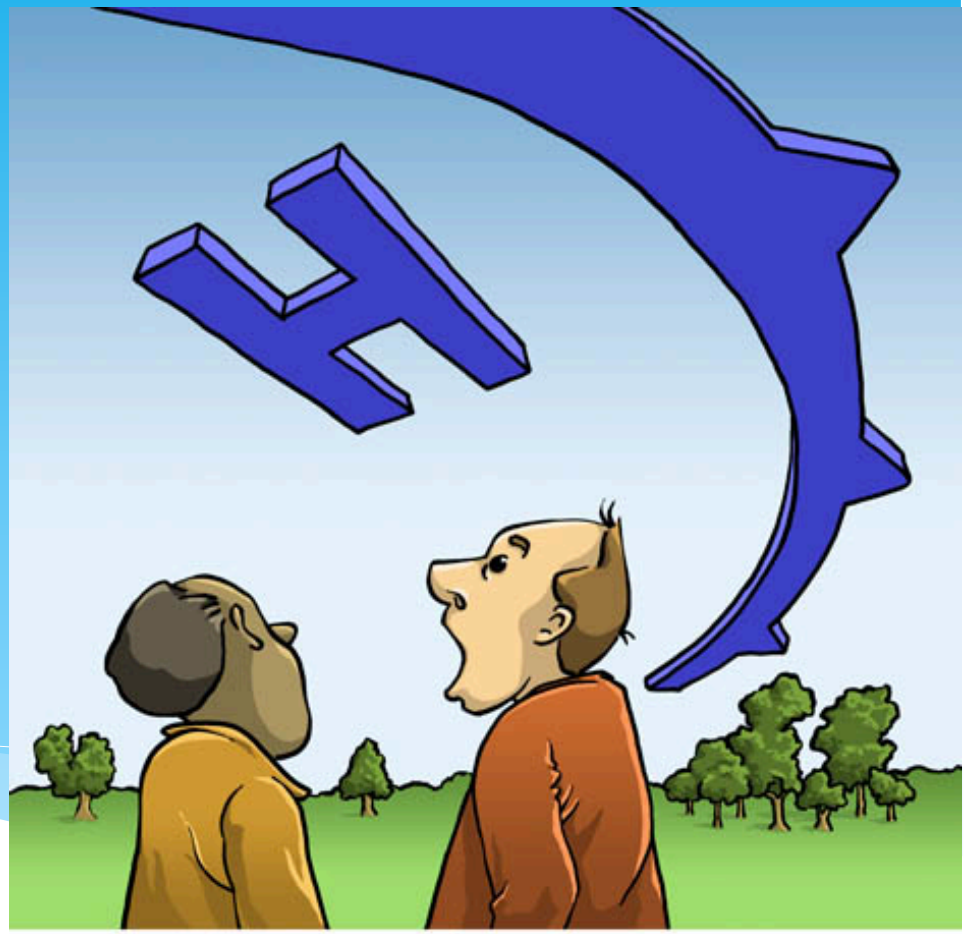
Meteorologist



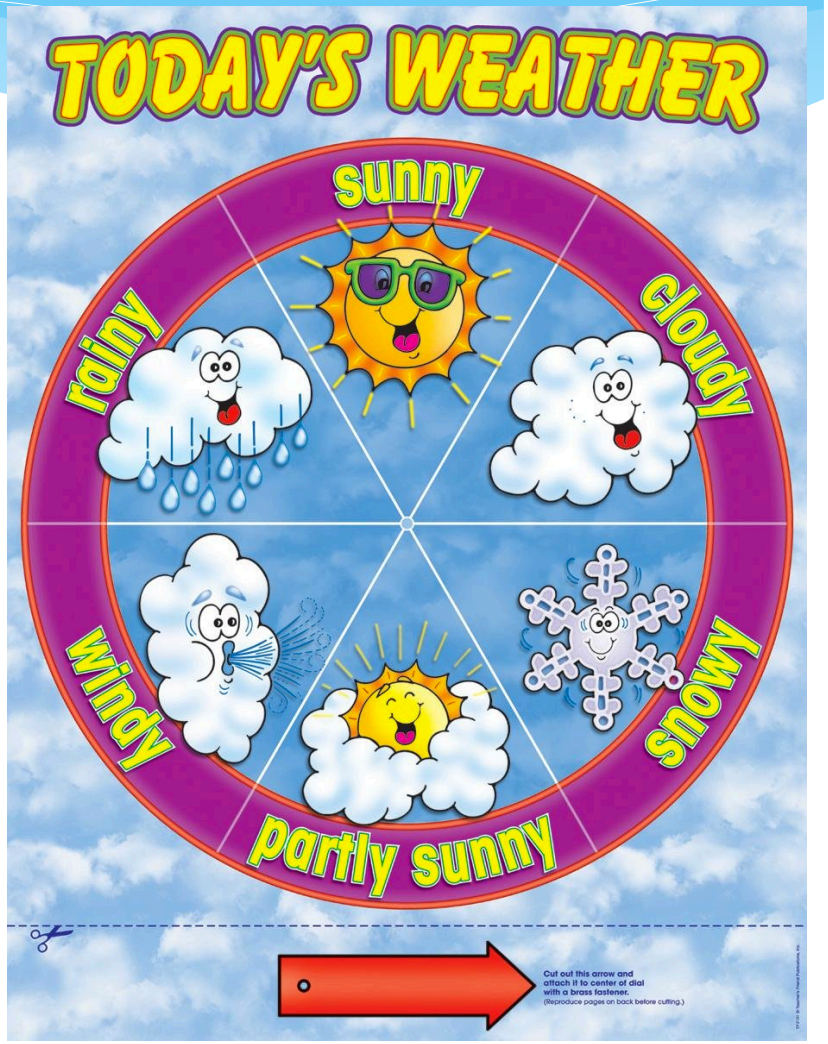
Introduction

* 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

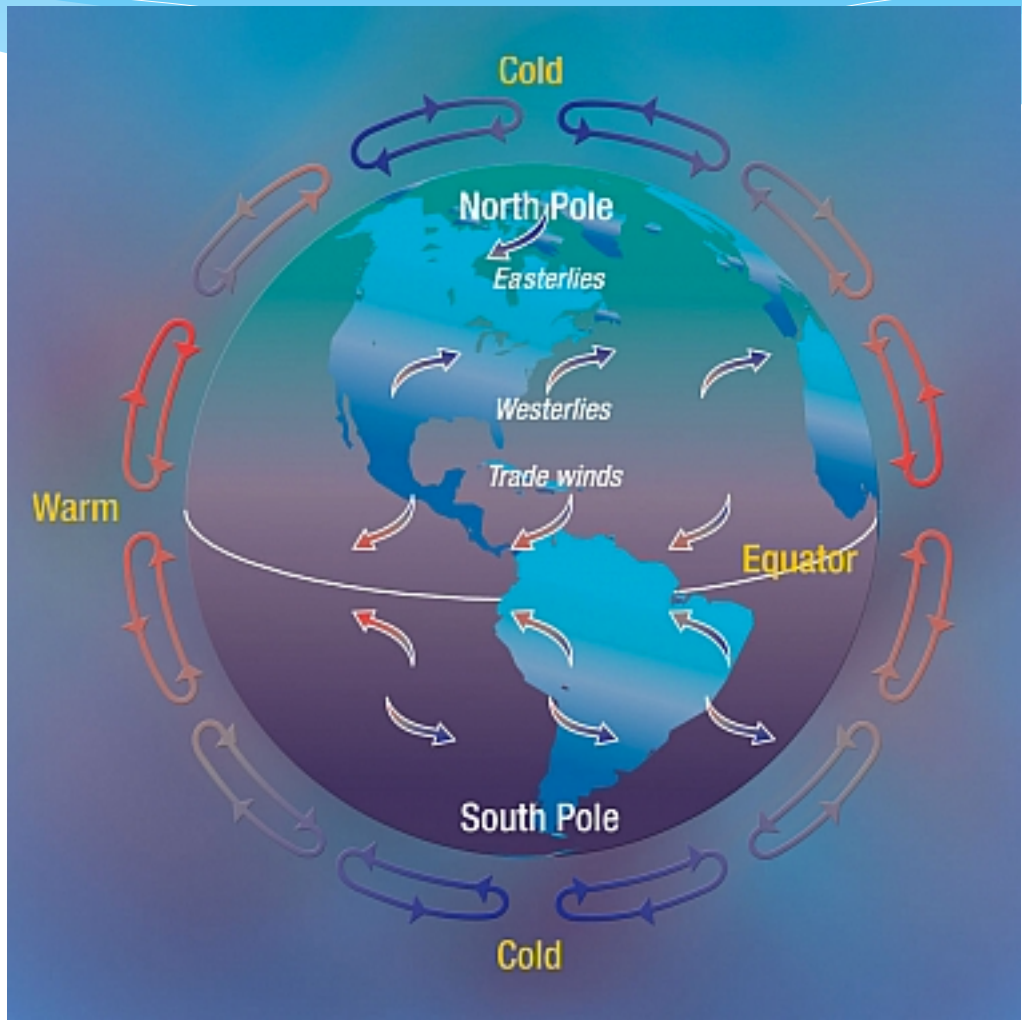
Objective (s)

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



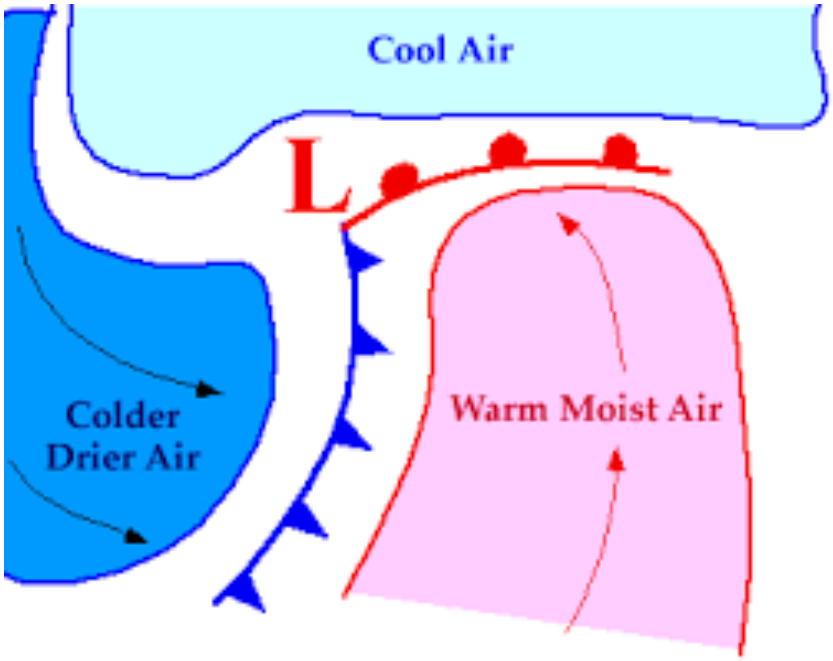
Basic Meteorology

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



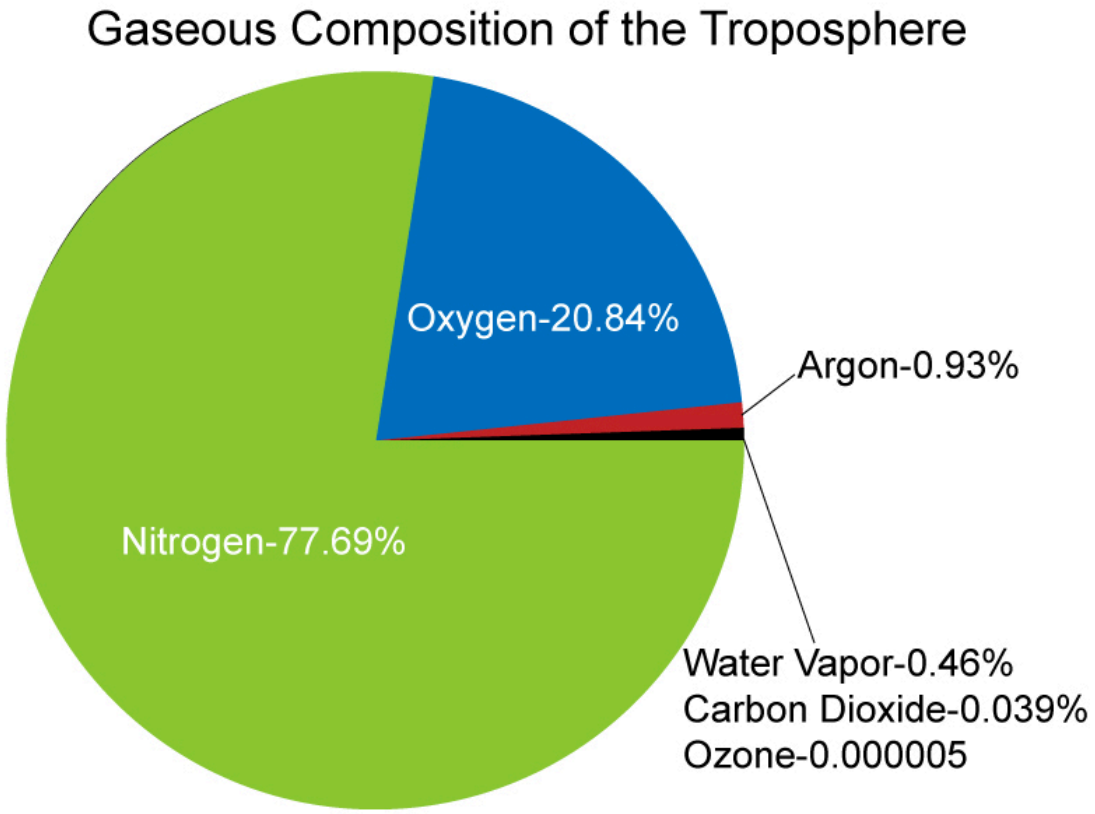
Circulation

* 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



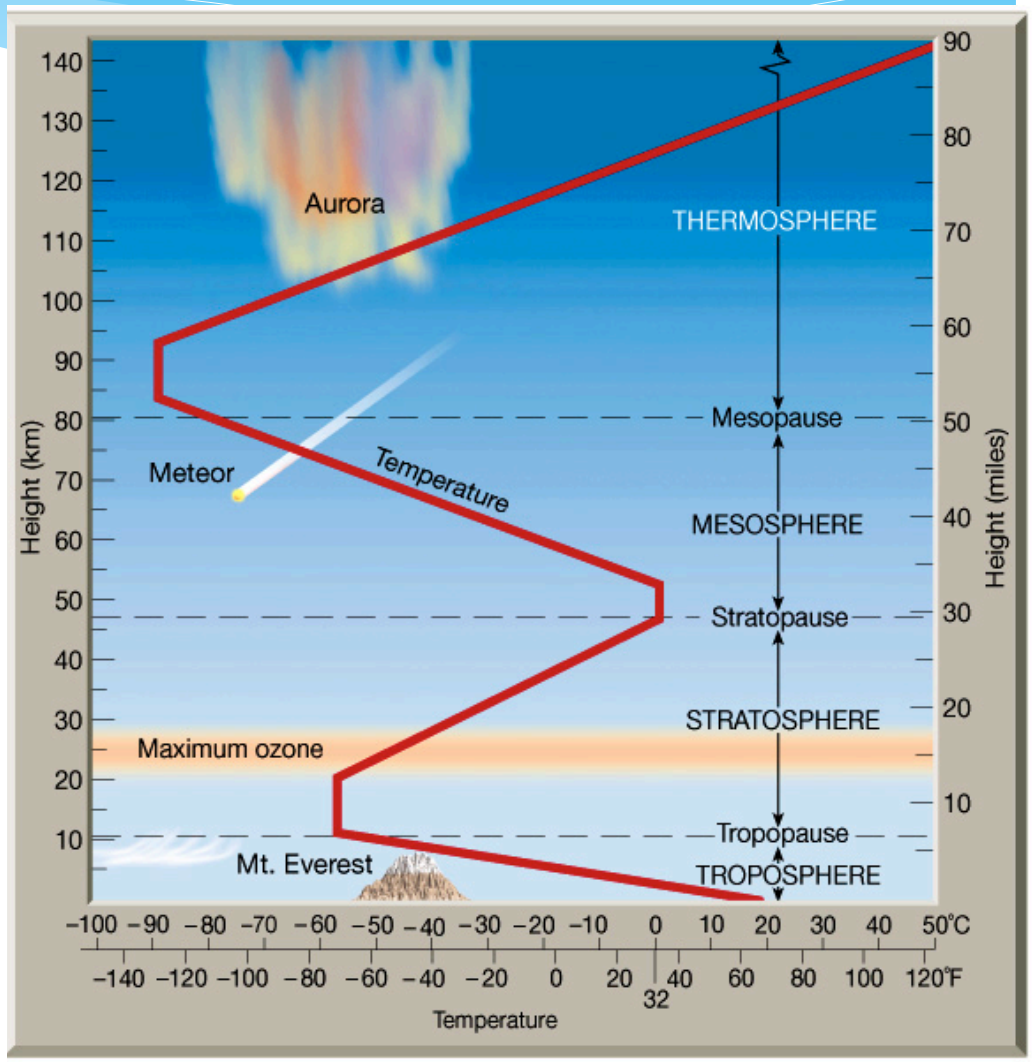
Atmosphere

* Troposphere is Where 'Sensible' WX is Formed
* Most Important Gas to WX Formation (H2O)
* We Call This Water Vapor



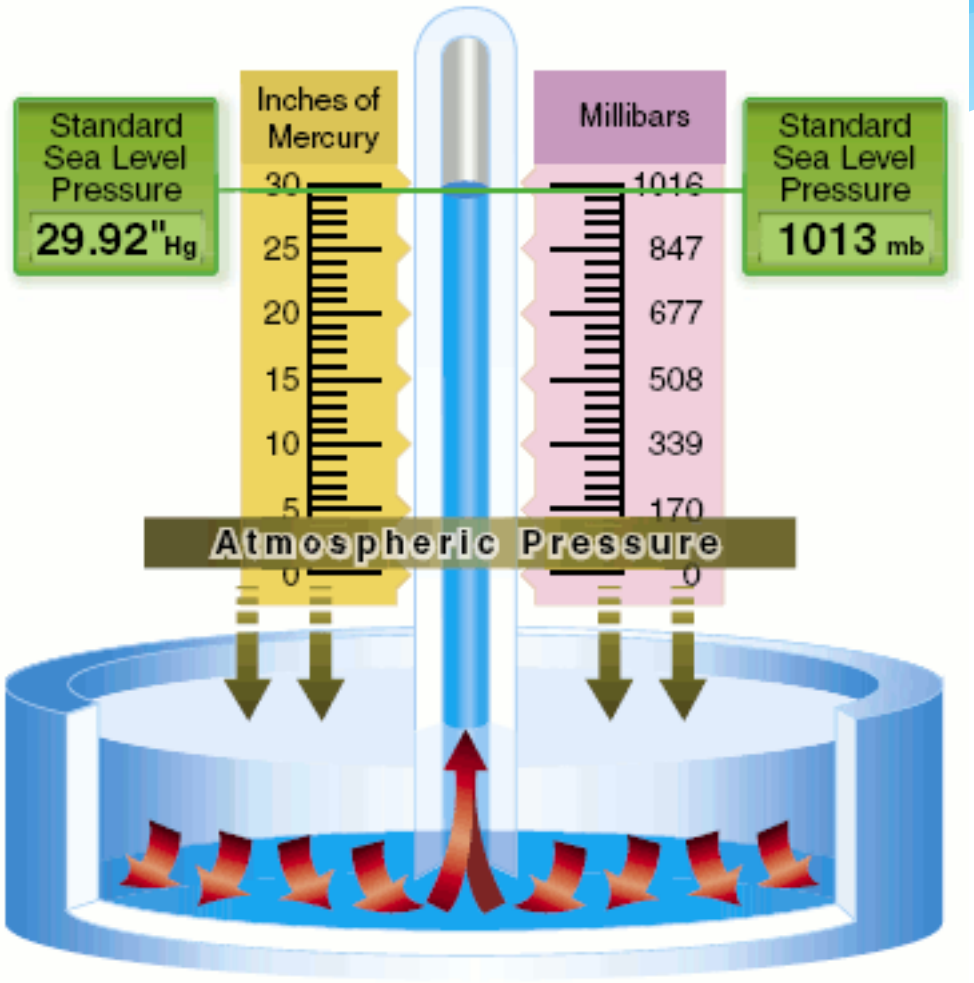
Troposphere

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



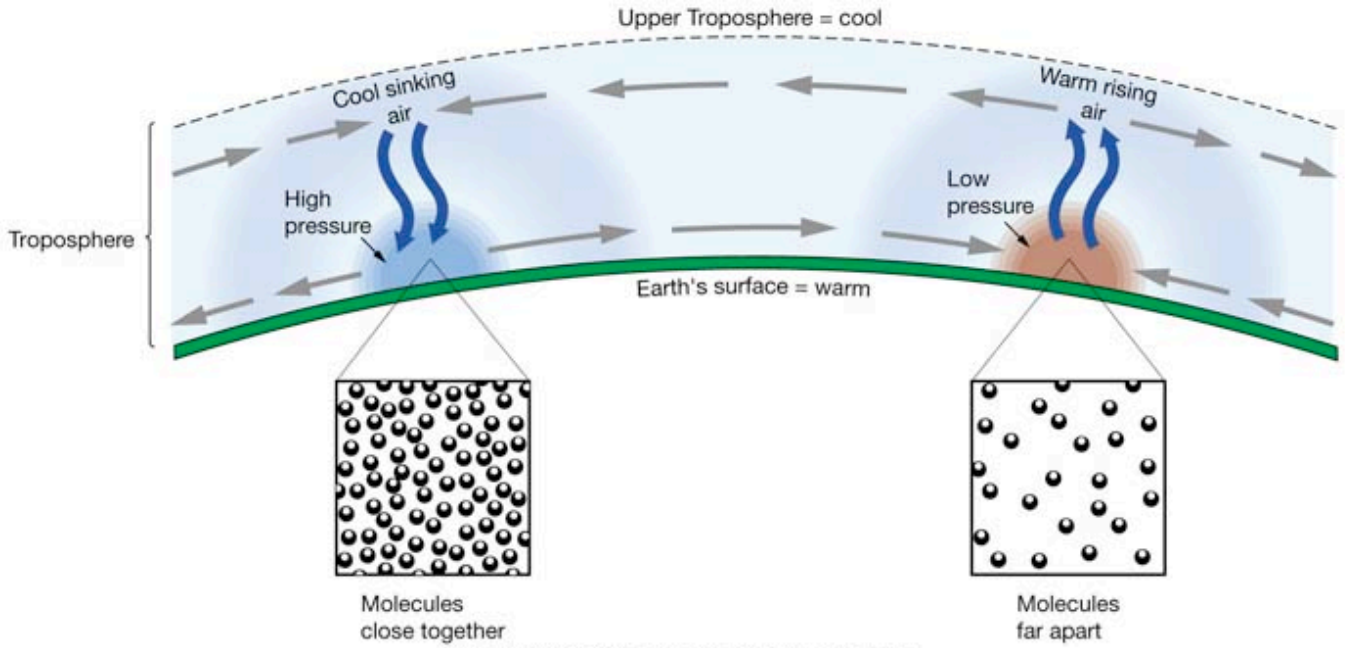
Atmospheric Pressure

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

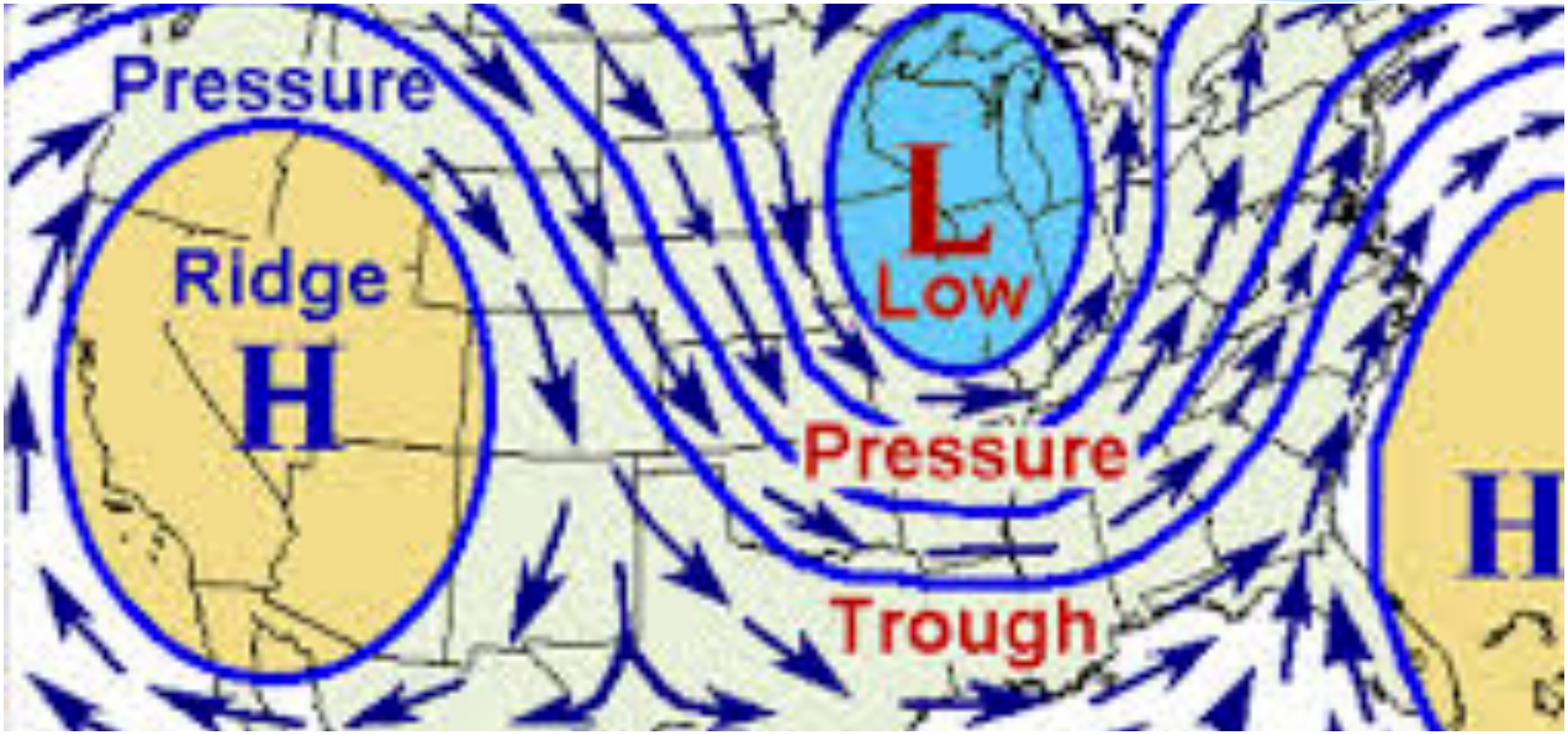


Pressure (cont.)

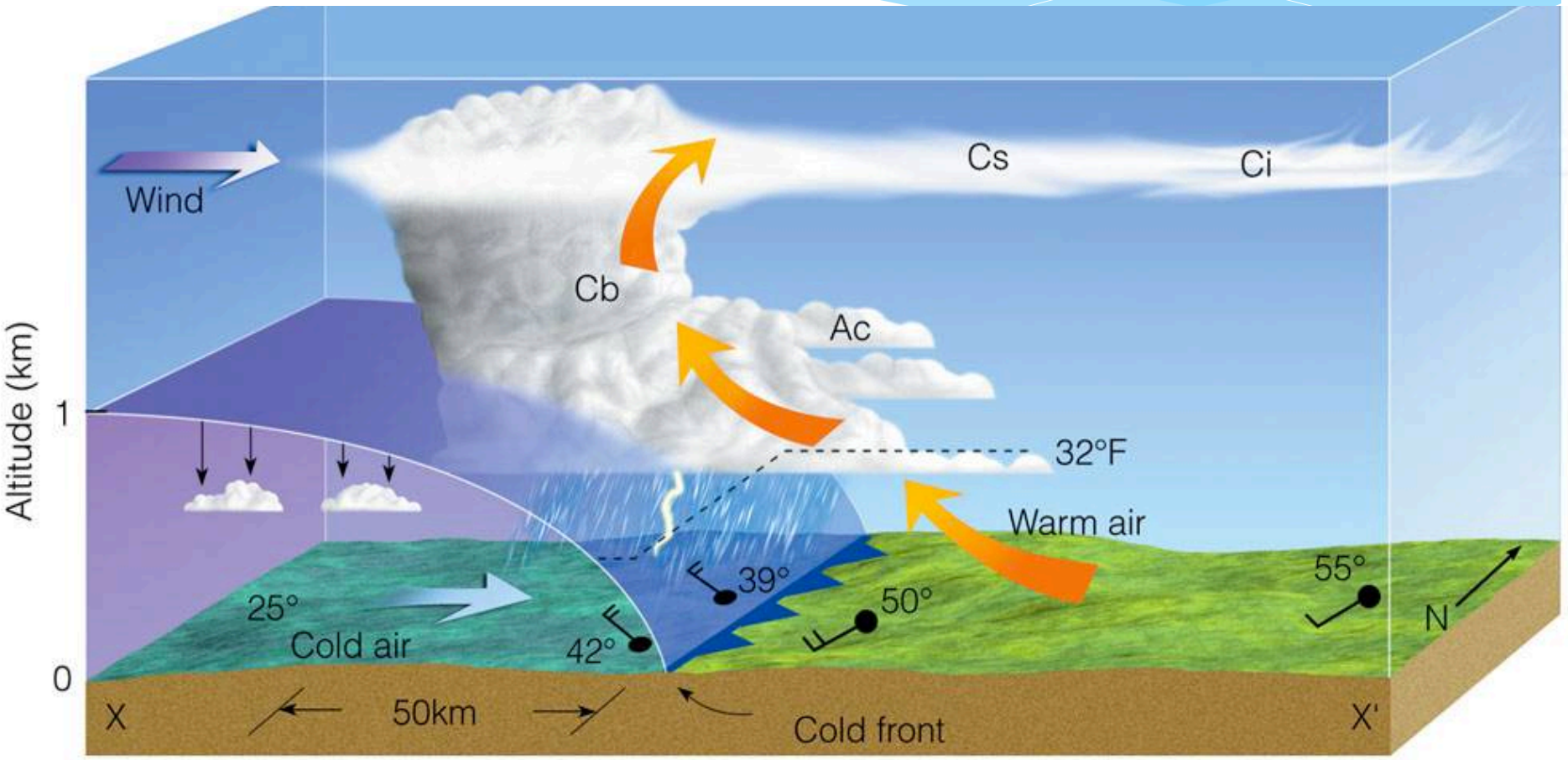
* More Mass of Gas Above – **High** Pressure
* Less Mass of Gas Above – **Low** Pressure



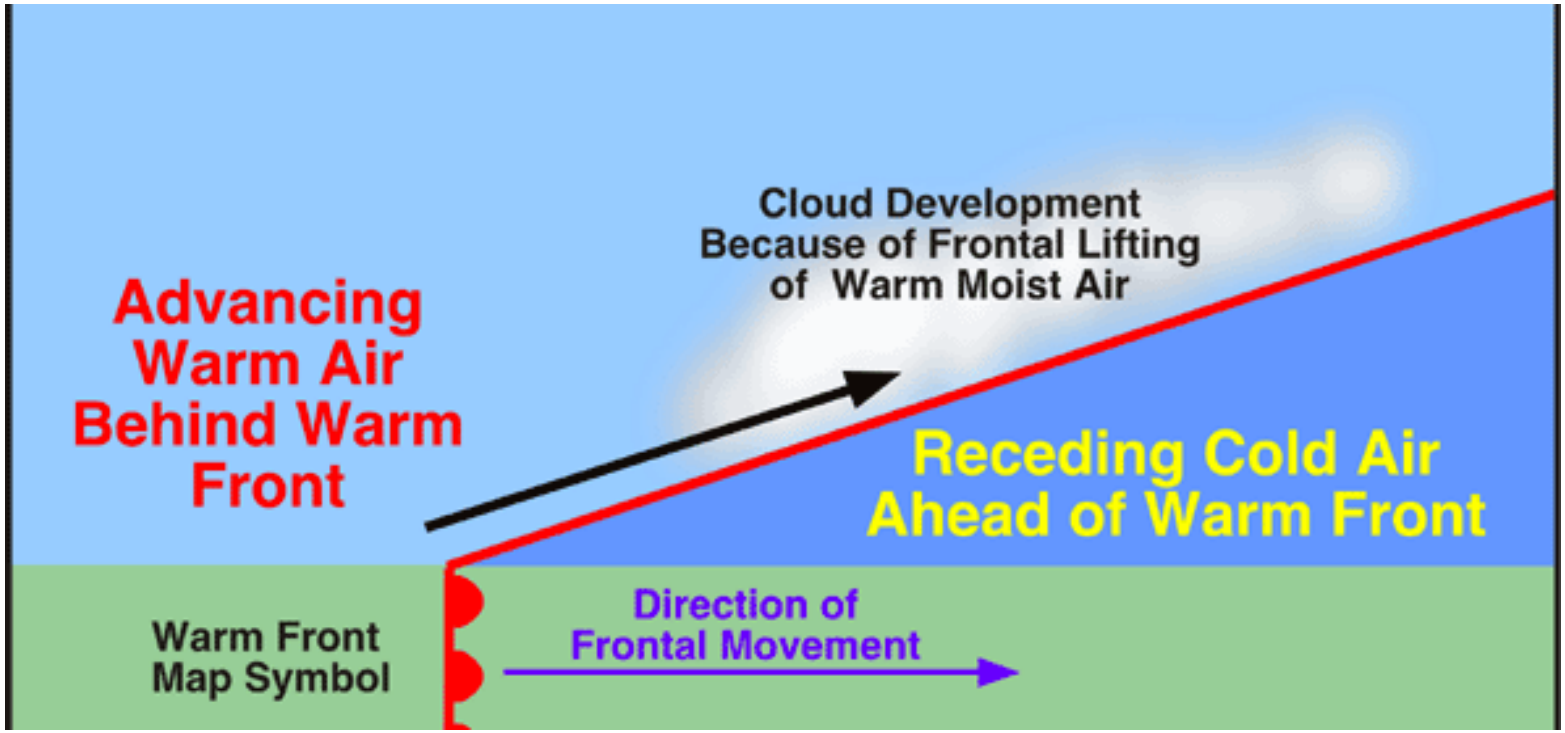
Highs and Lows (Ridges and Troughs)



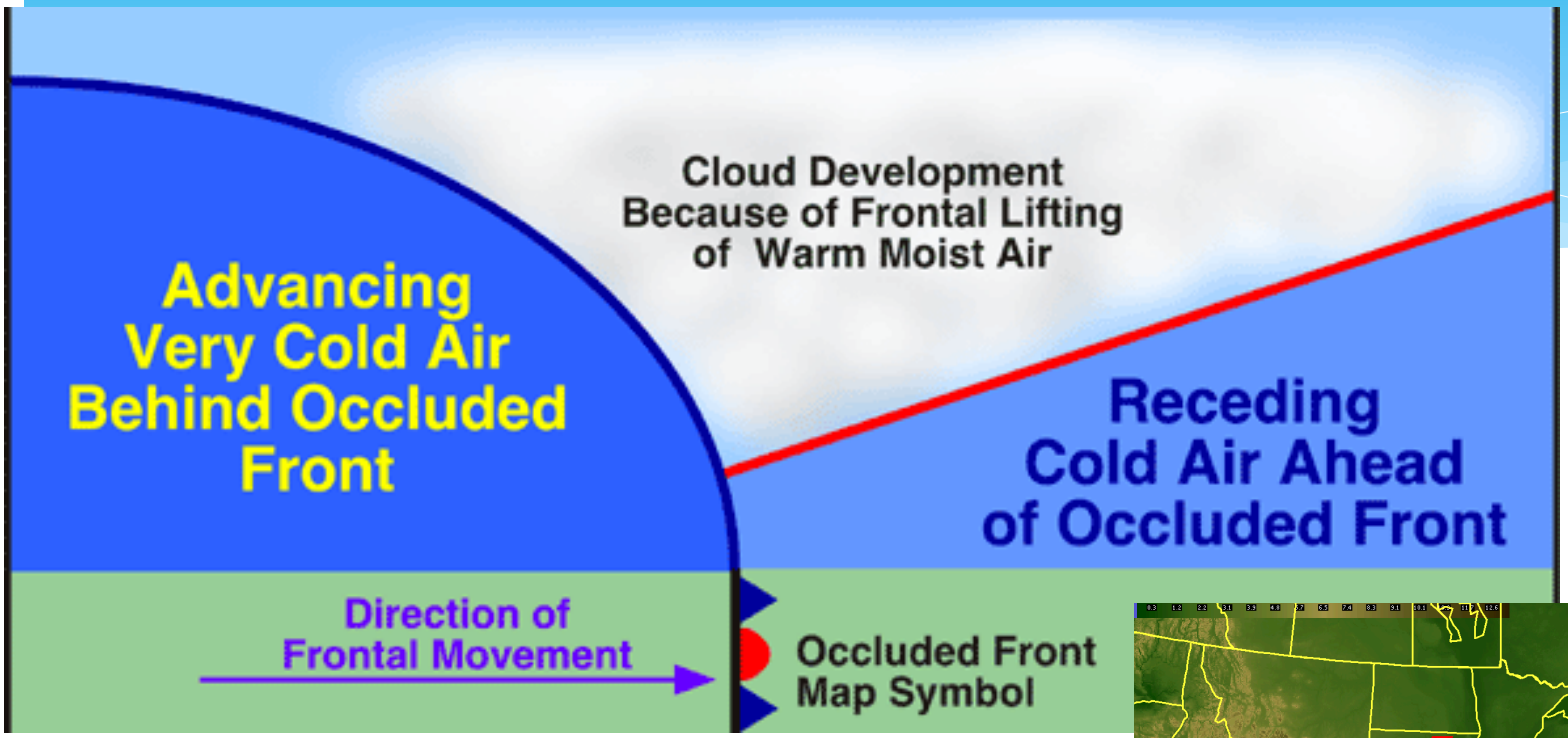
Fronts (Cold Front)

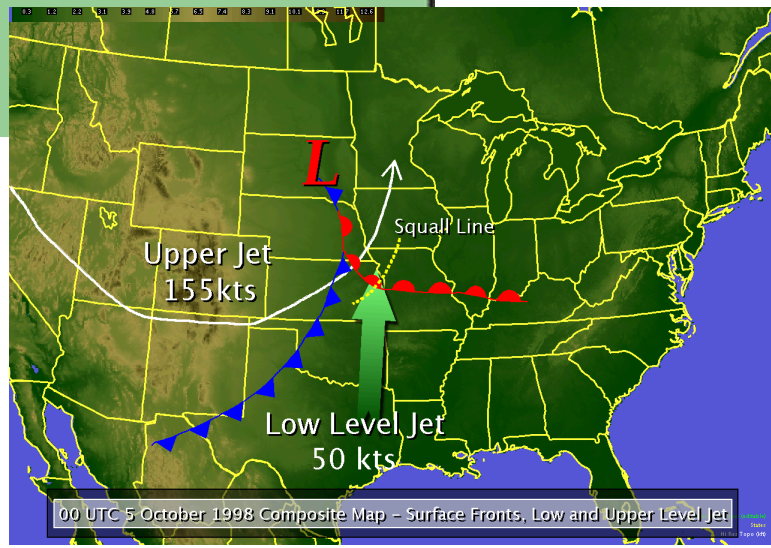


Warm Front

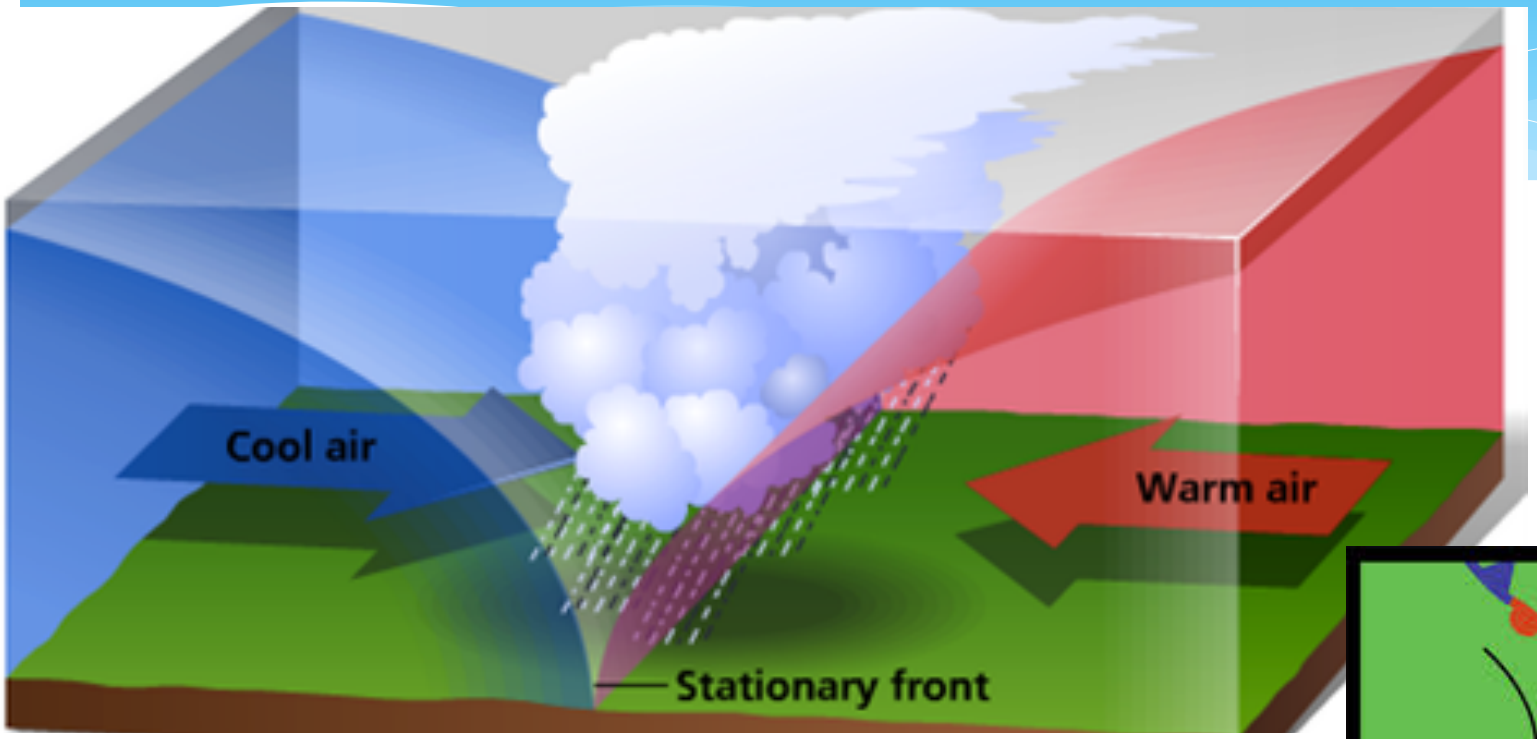

Cloud Development
Because of Frontal Lifting
of Warm Moist Air
Advancing
Warm Air
Behind Warm
Front
Receding Cold Air
Ahead of Warm Front
Warm Front
Map Symbol
Direction of
Frontal Movement

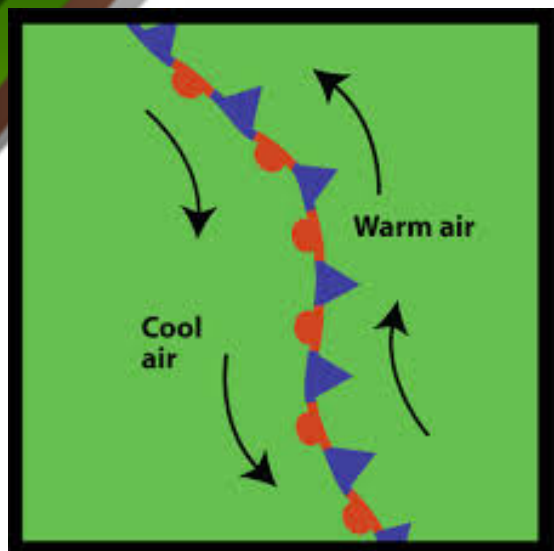
Occluded Front





Stationary Front
(little or no movement)

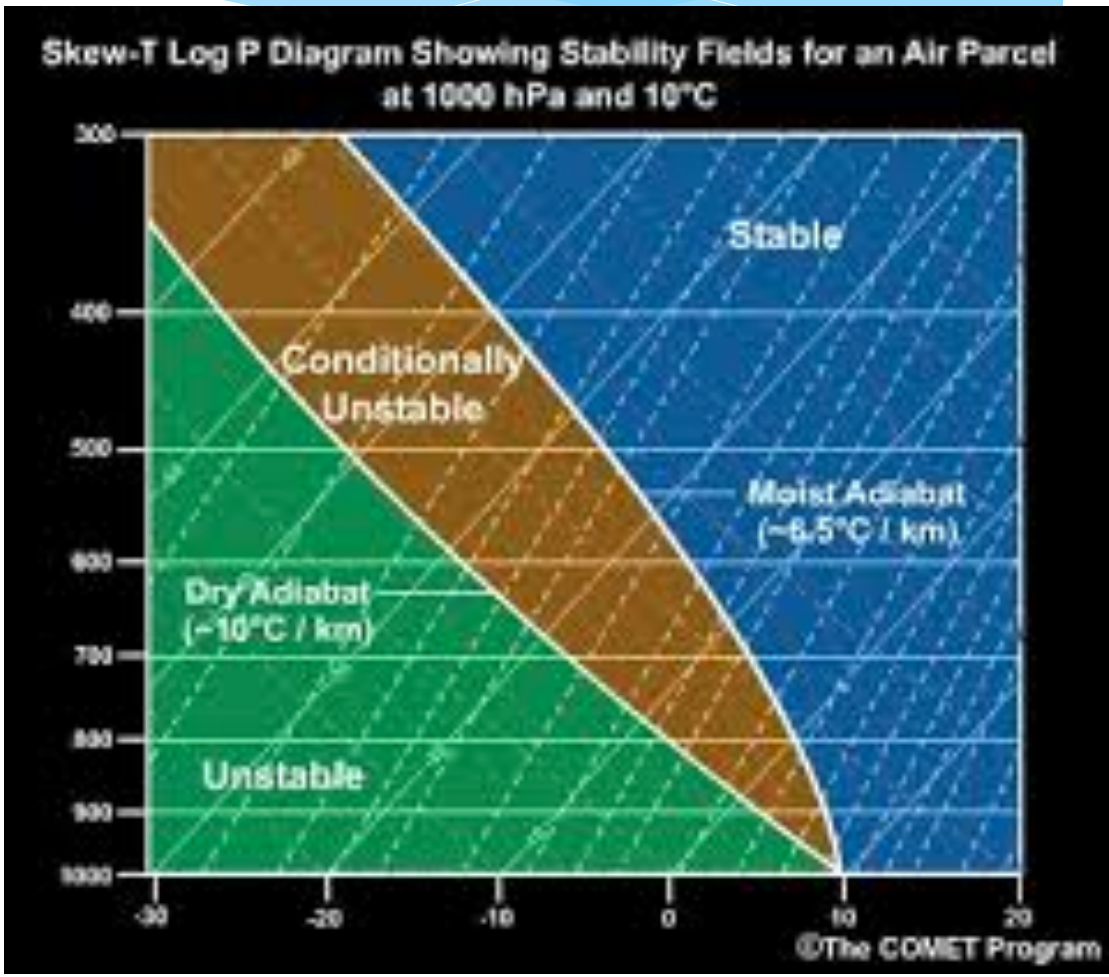




Stability

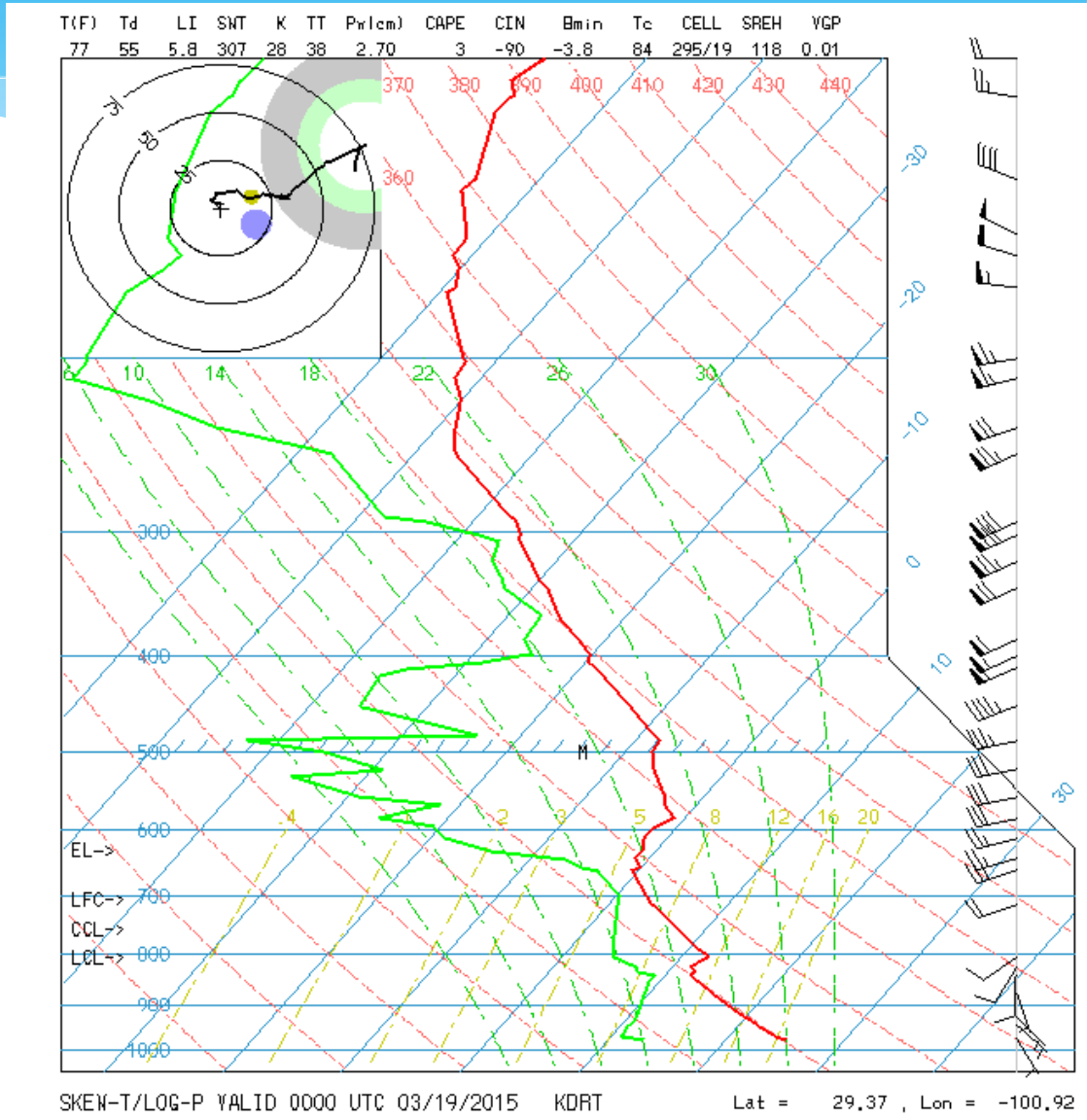
Meteorologists Consider ‘Lifting’ Against a ‘Real’ Profile

Note there are two lapse rates, Moist and Dry

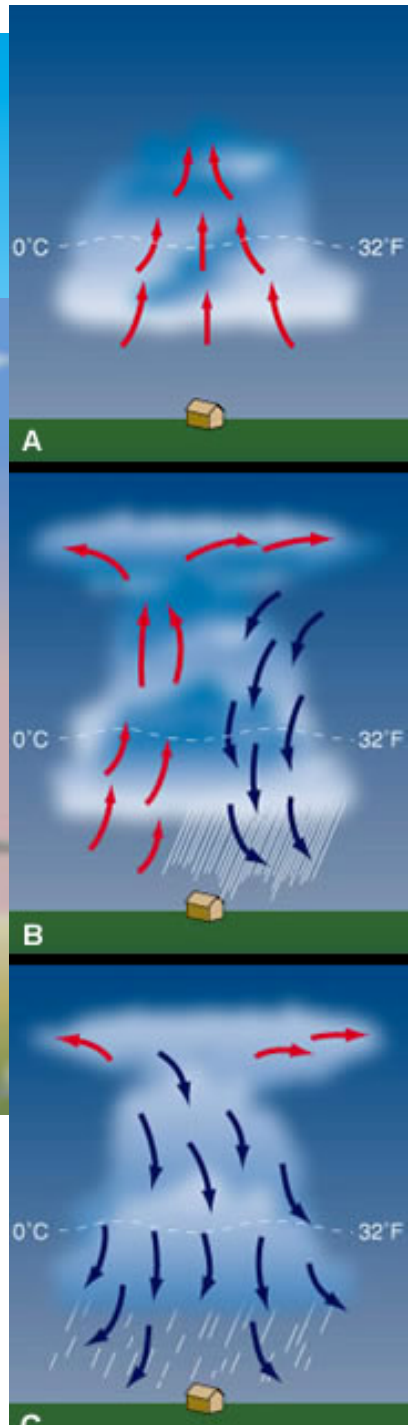


Example (Small Layer of Instability)

* 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

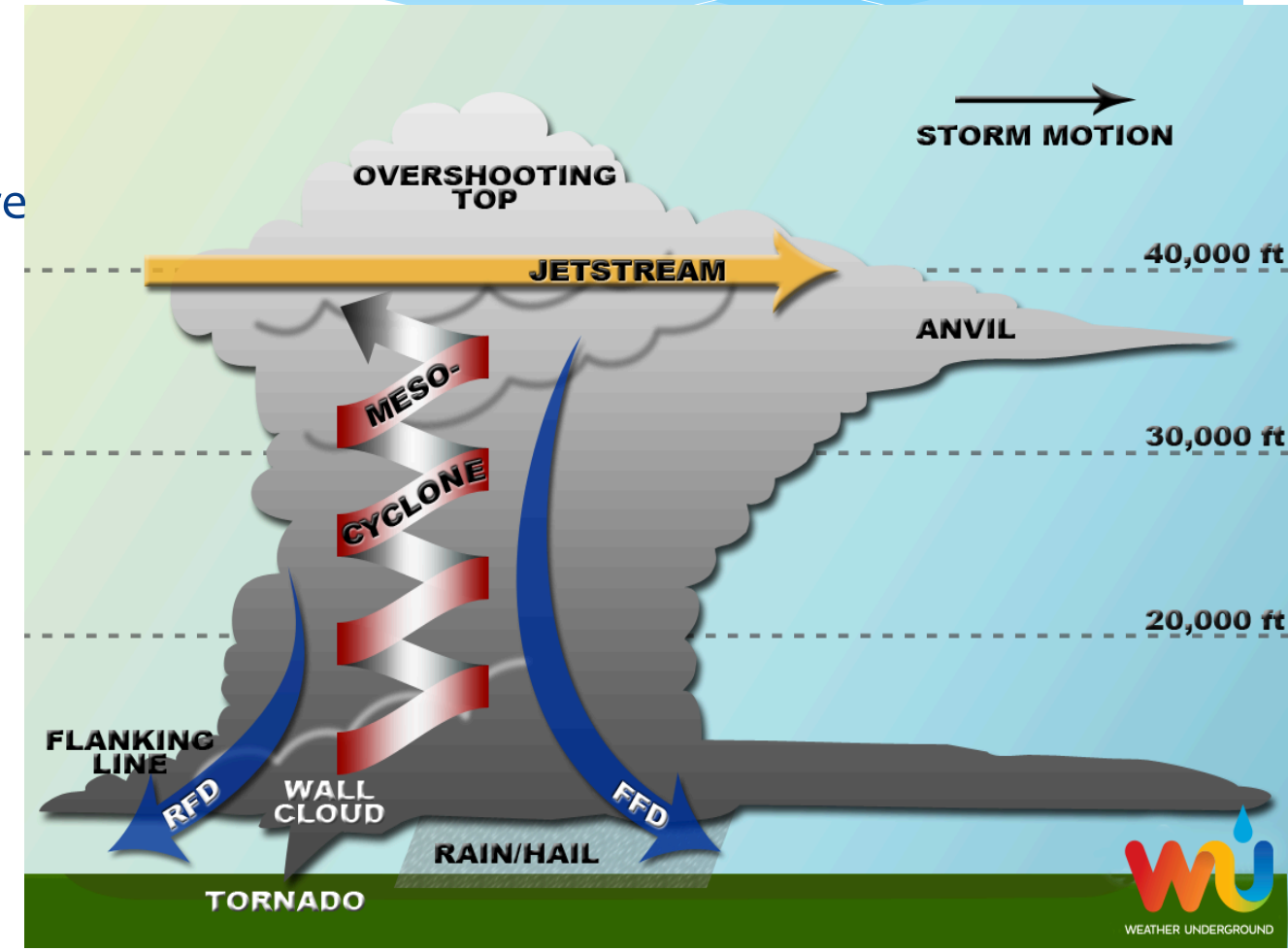


A. <u>Convective</u> or Cumulus Stage
B. Mature Stage
C. Dissipating Stage

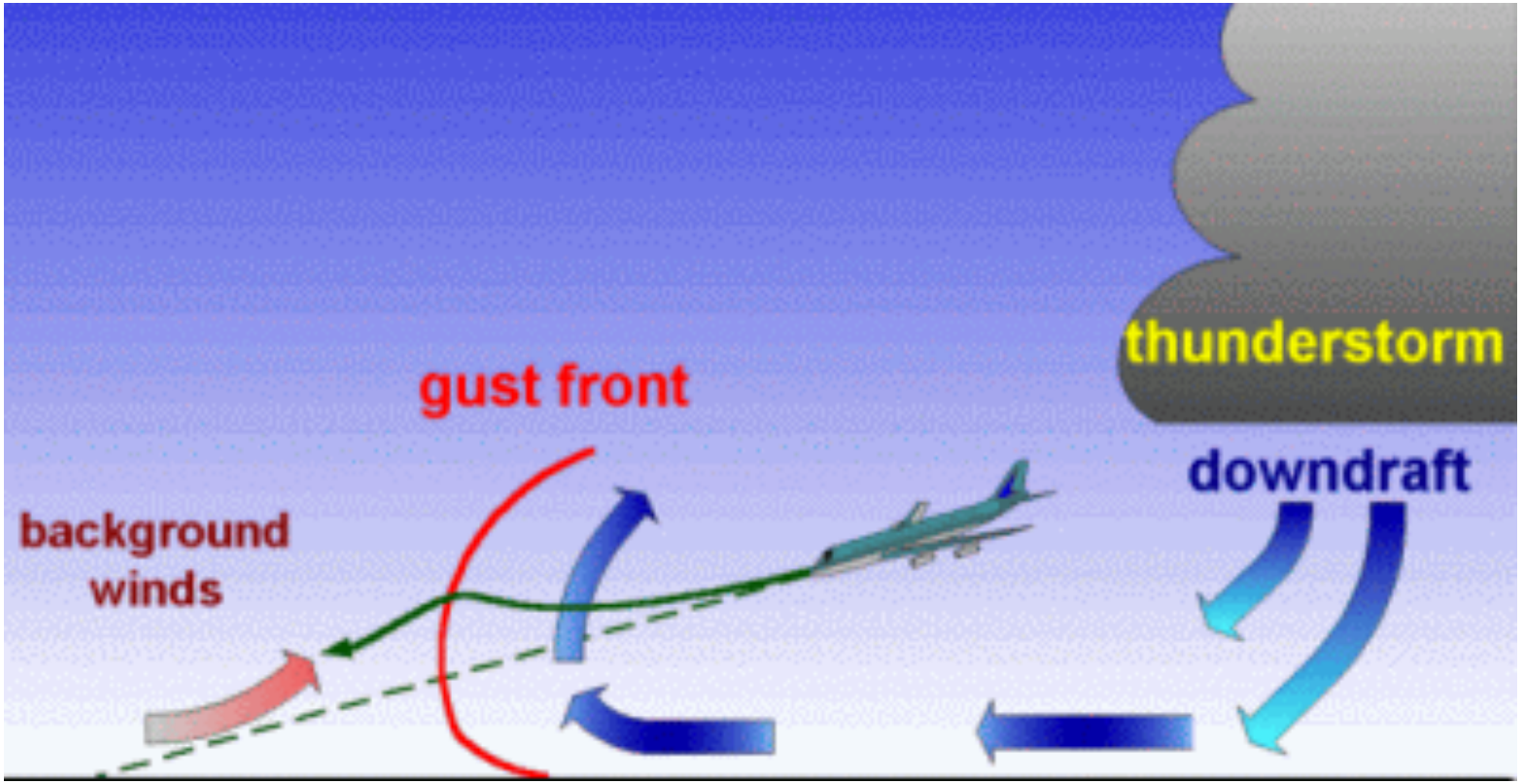
Thunderstorm Ingredients and By-Products

* Moisture
* Unstable Atmosphere
* Lifting Force

* Tornados
* Gust Fronts
* Wind Shear
* Hail
* Turbulence
* Squall Lines
* Lighting

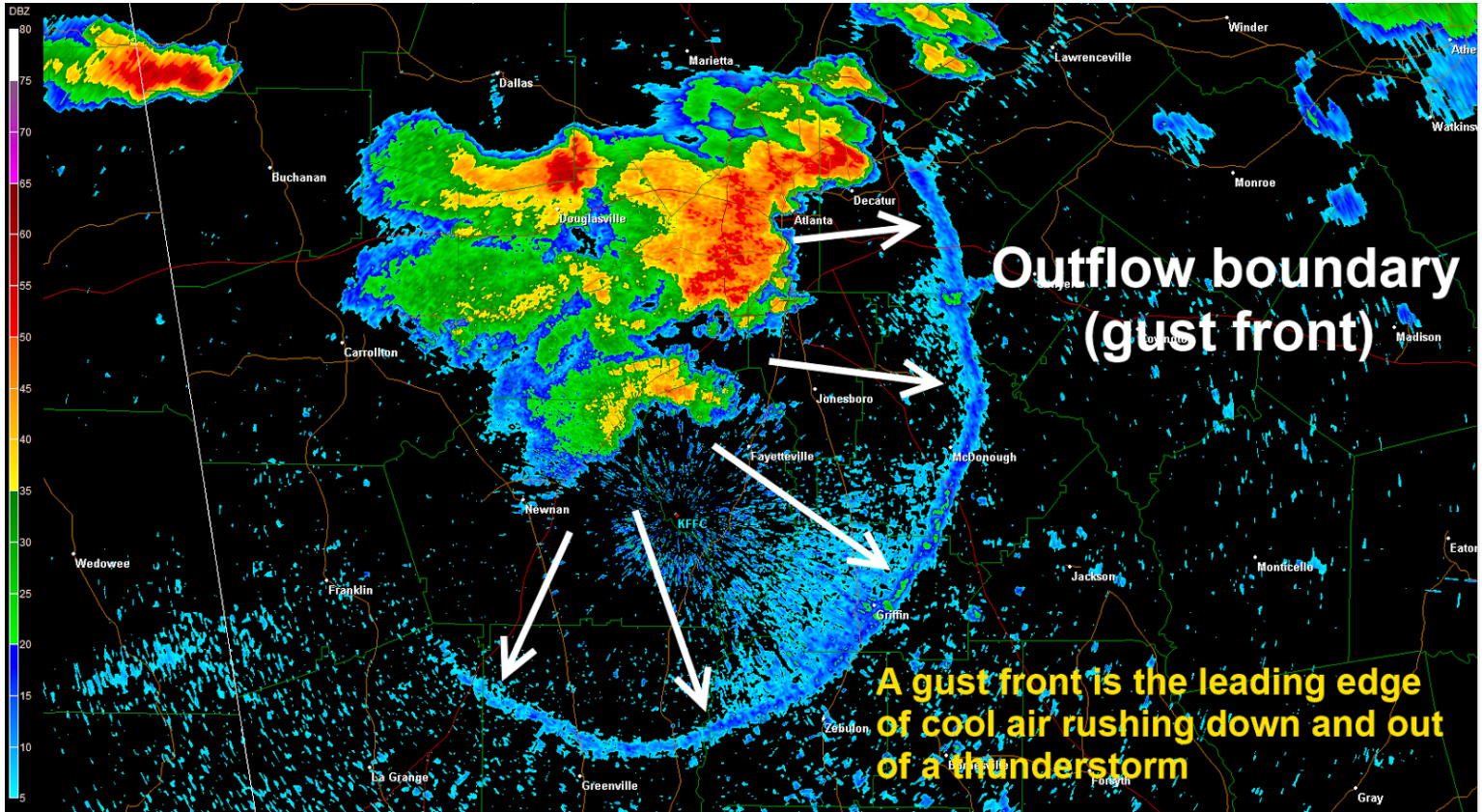


Gust Fronts

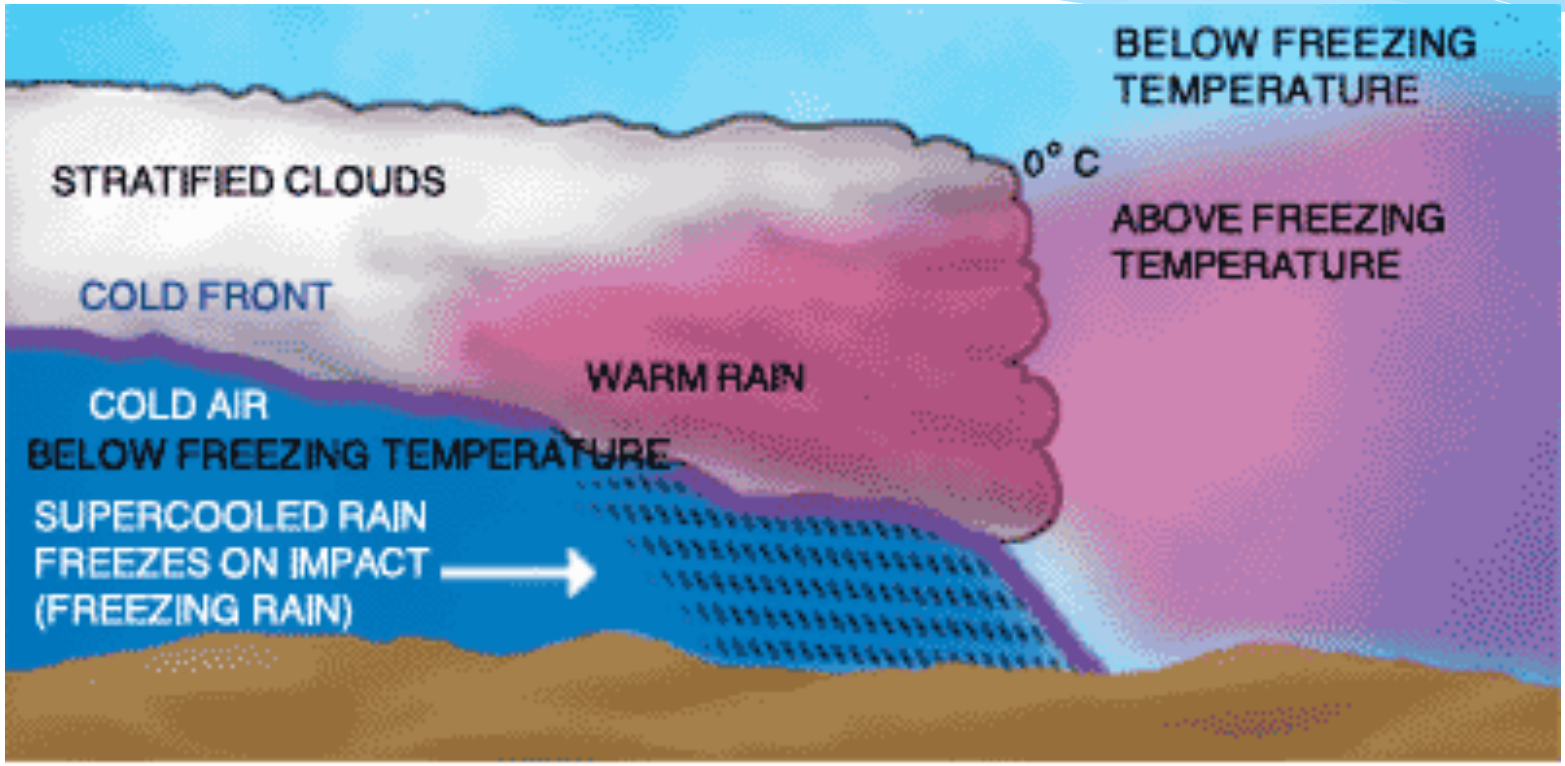


Gust Front (cont.)

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



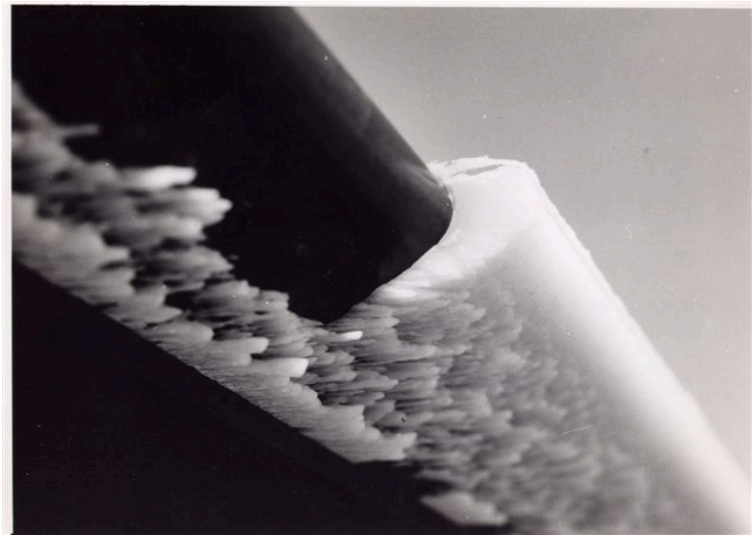
Icing
Rime, Clear, Mixed



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

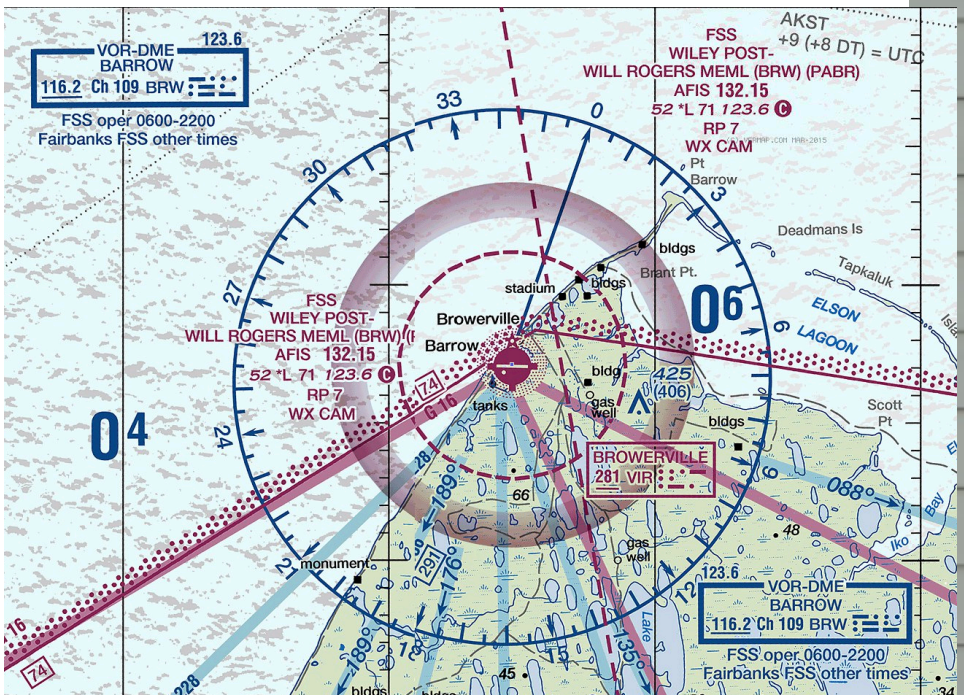
* Same Effects as Ice
* To Remove:
  * Prist (a de-ice solution)
  * Wipe Off
  * Park Plane in Sun
  * Wait 'til it Melts, Have a Cup of Coffee and Read Poetry

> 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

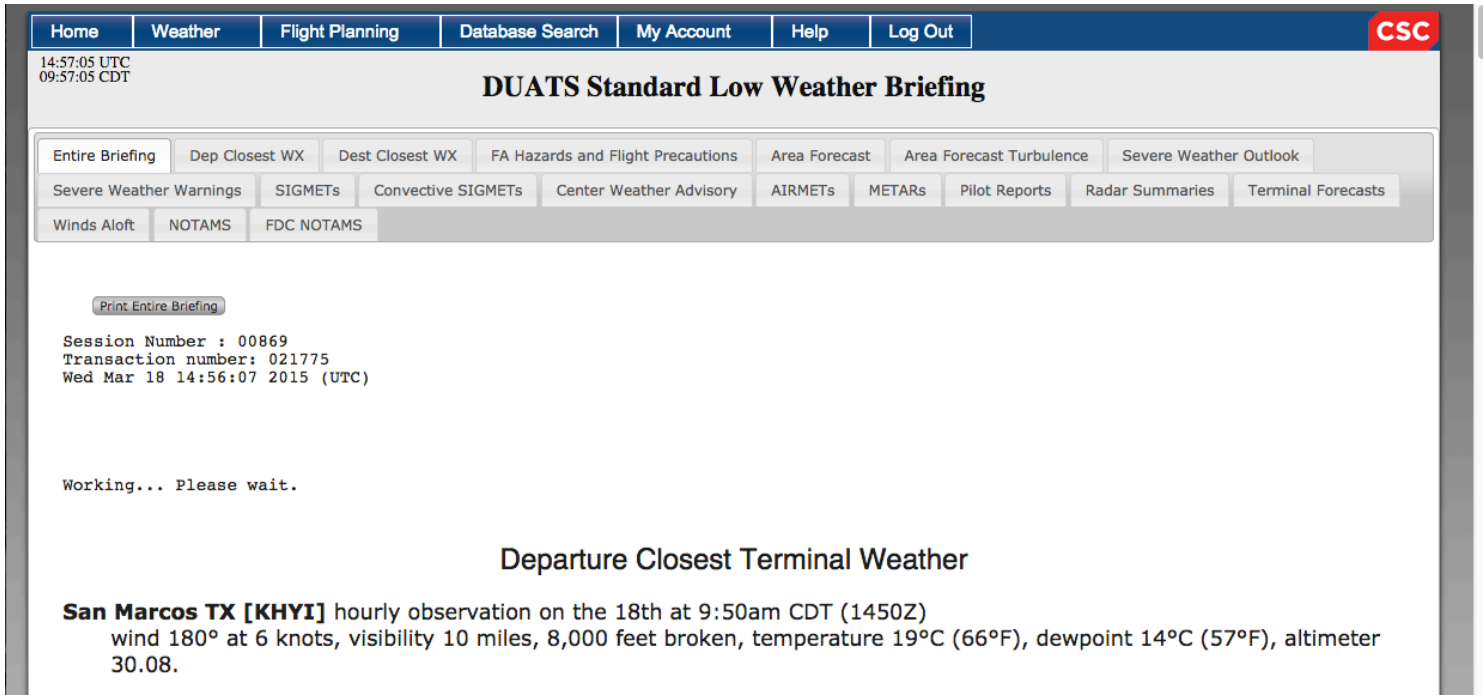


FSS (cont.)

* 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

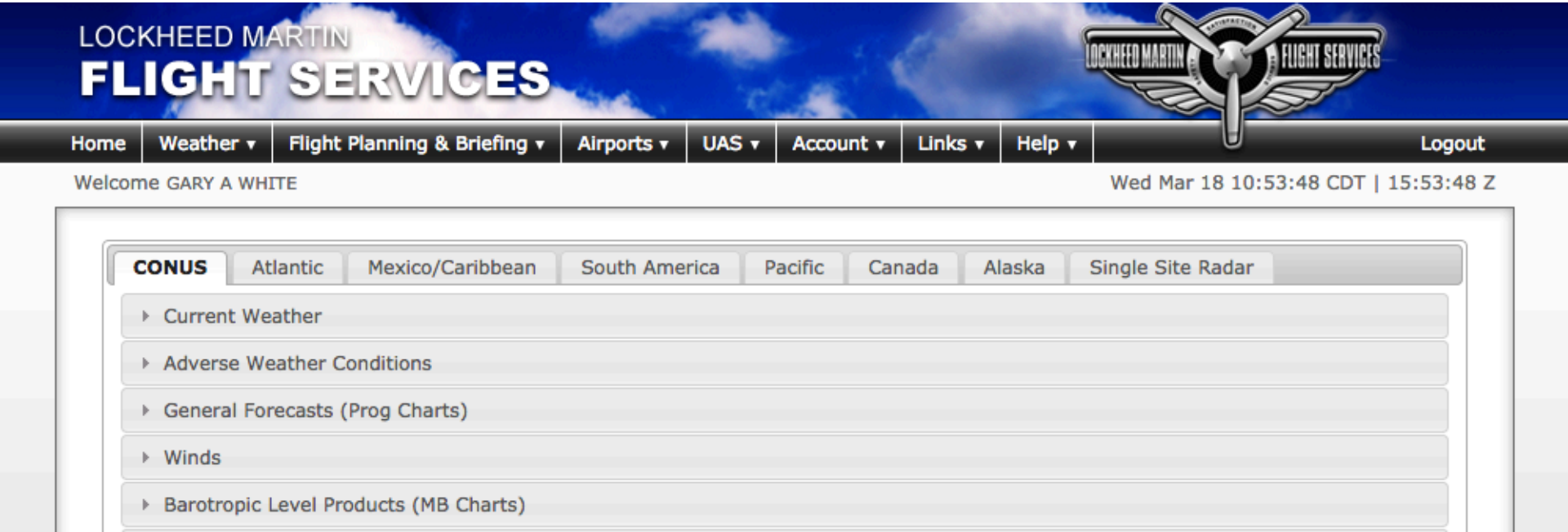
DUAT or DUATS

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



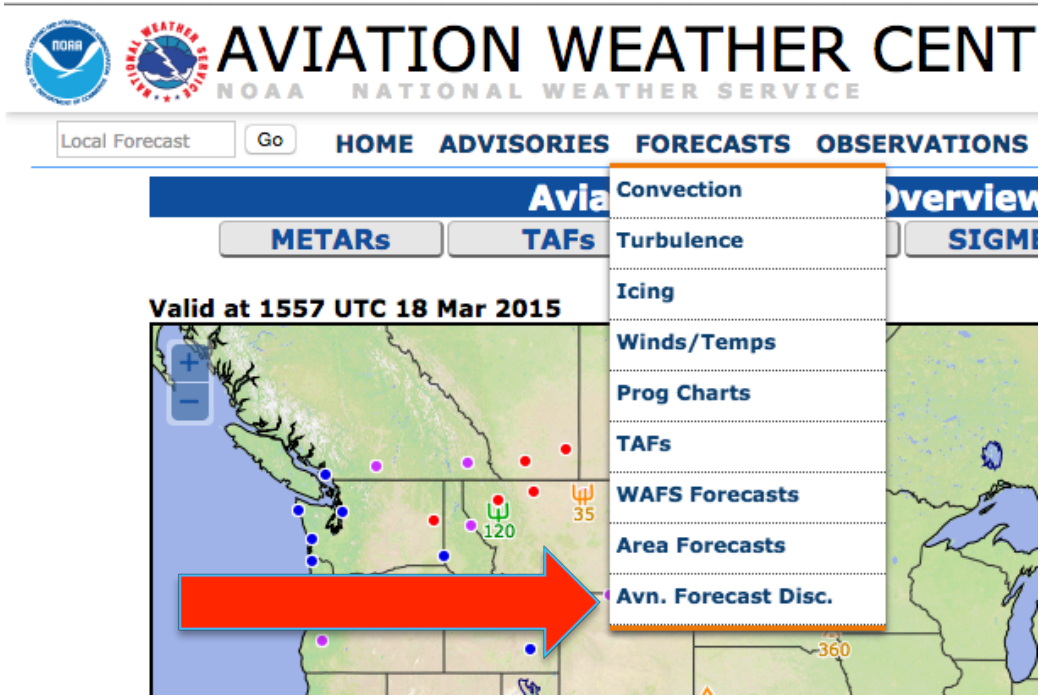
FSS Online (https://www.1800wxbrief.com)

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



aviationweather.gov

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



Aviation Forecast Discussion

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

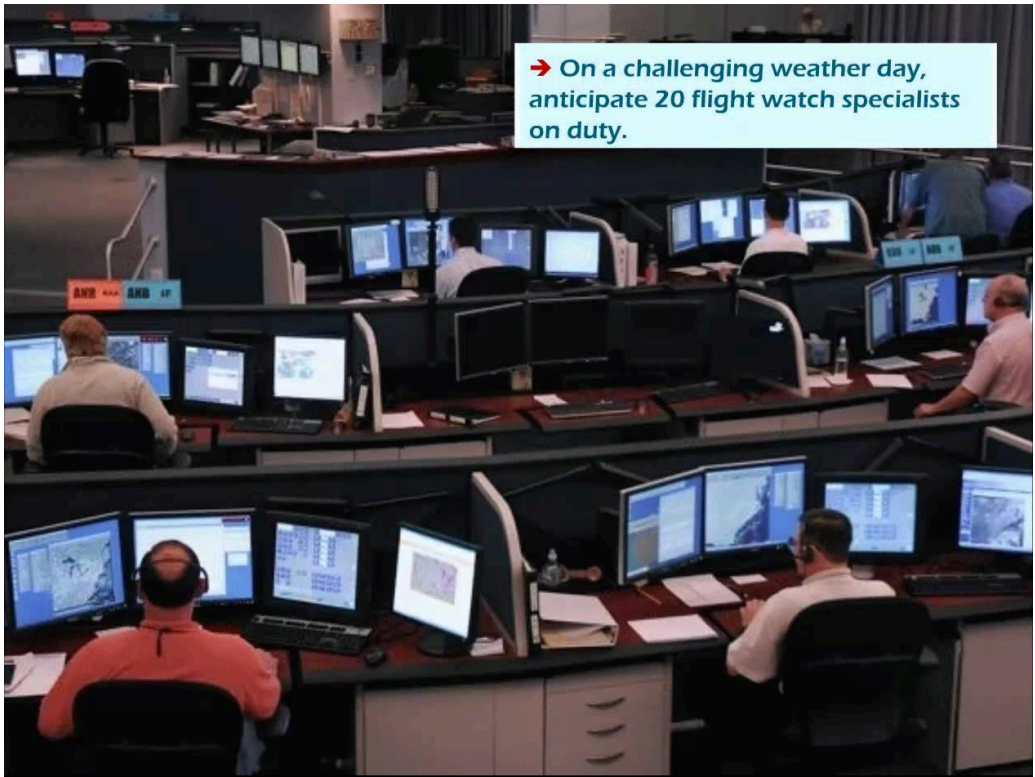
(EXTRACTED FROM FXUS64 KEWX 181155)
NATIONAL WEATHER SERVICE AUSTIN/SAN ANTONIO TX
655 AM CDT WED MAR 18 2015

/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.

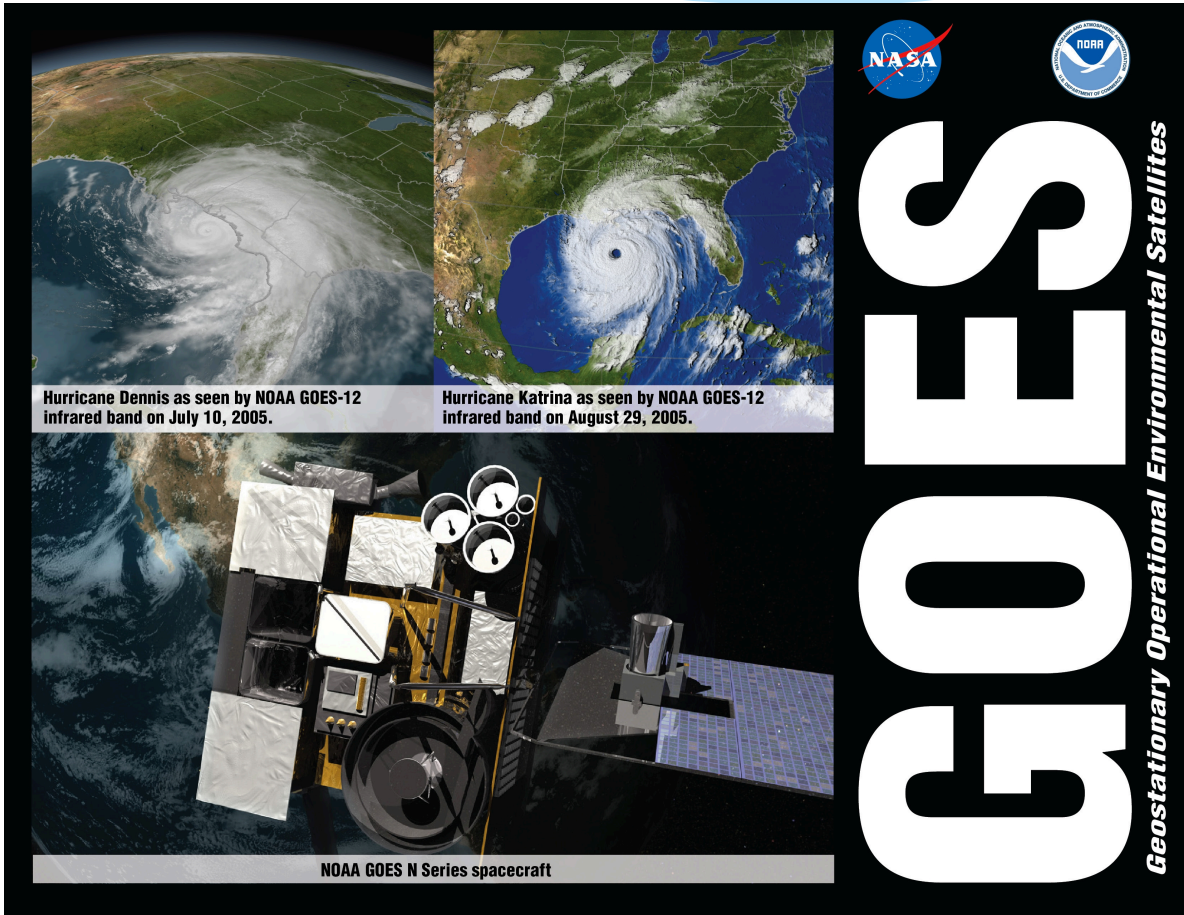
Flight Watch (EFAS 122.0)

* 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

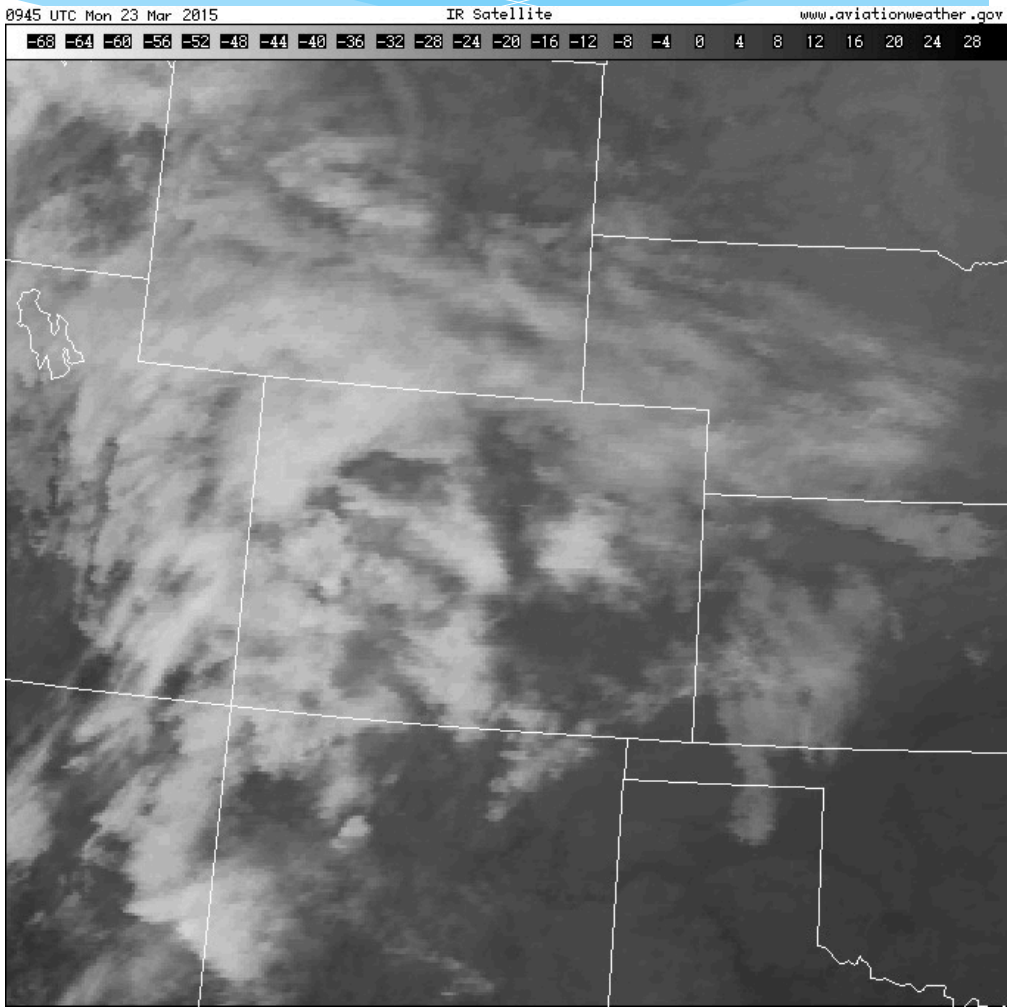


Visual

* Kodak in the Sky
* Only During Daylight Hours

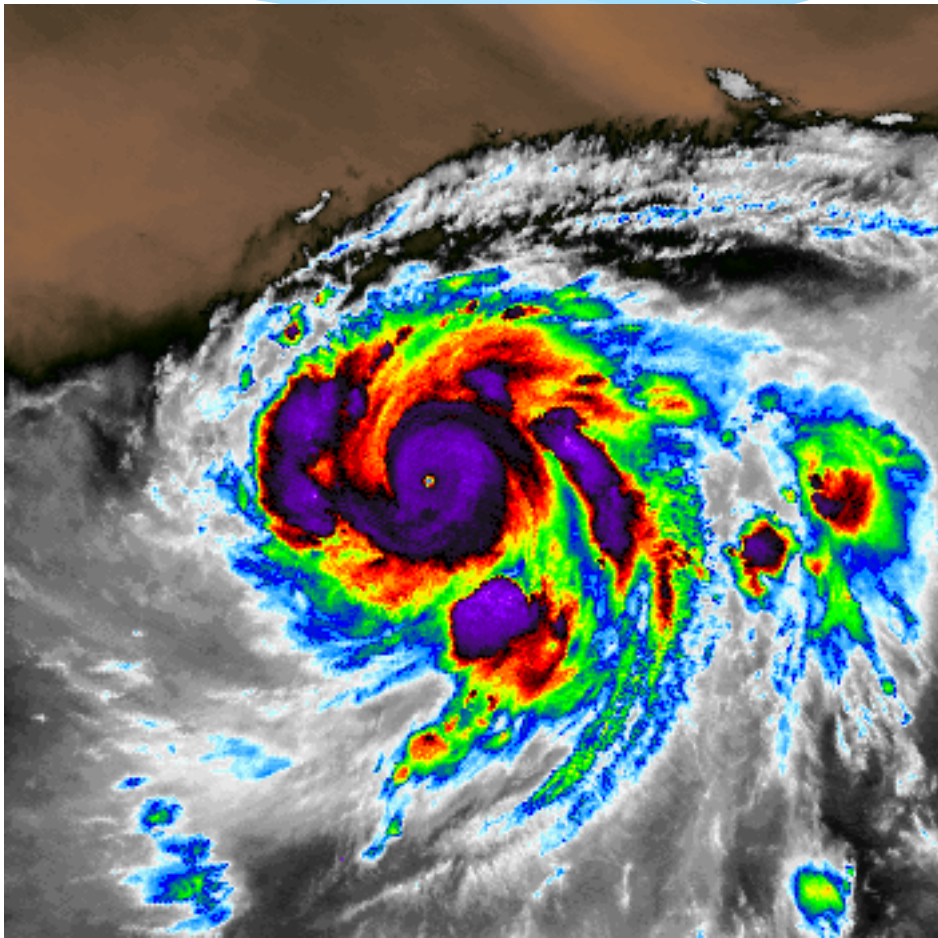
Infrared (IR)

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



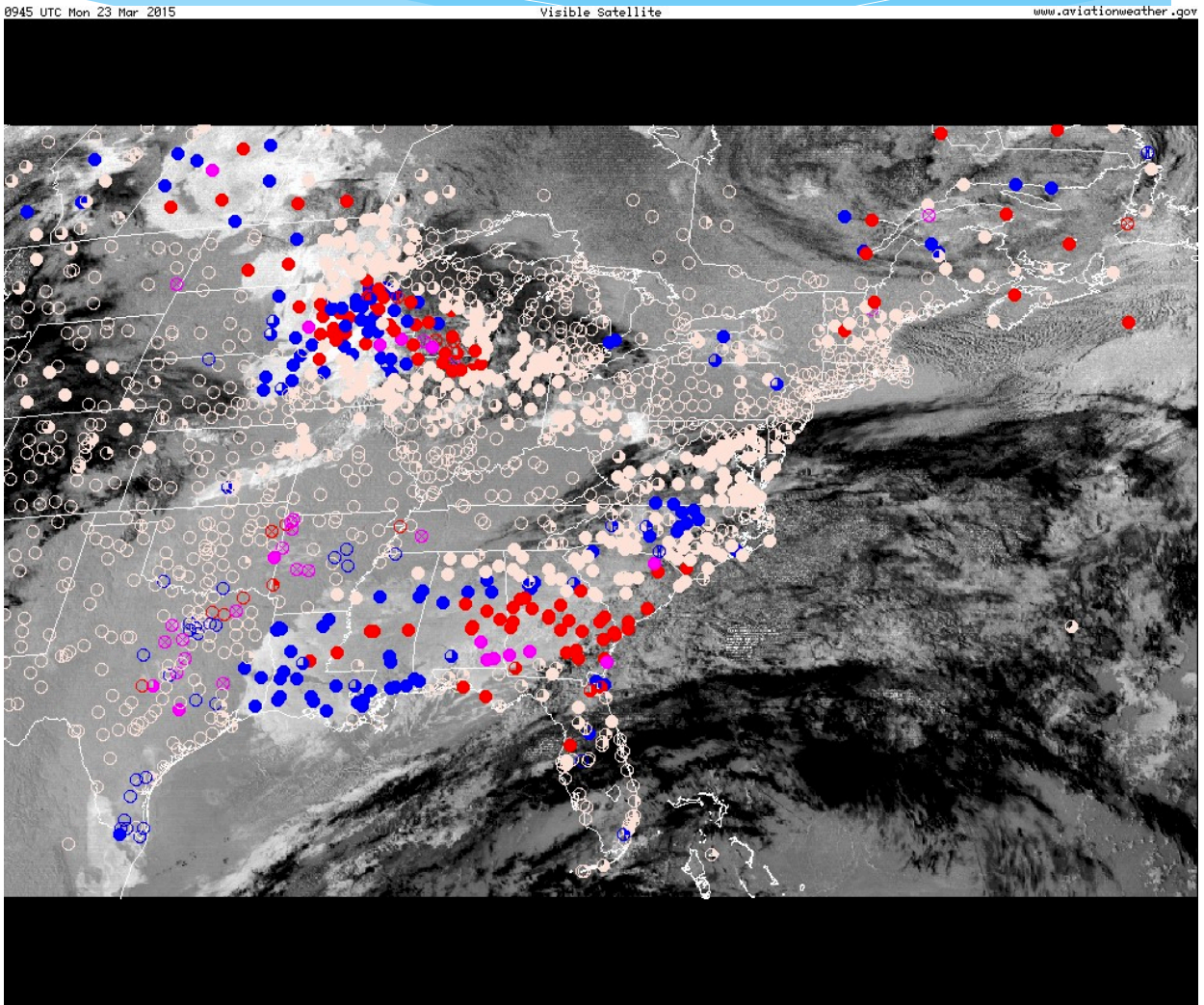
Water Vapor

* 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



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

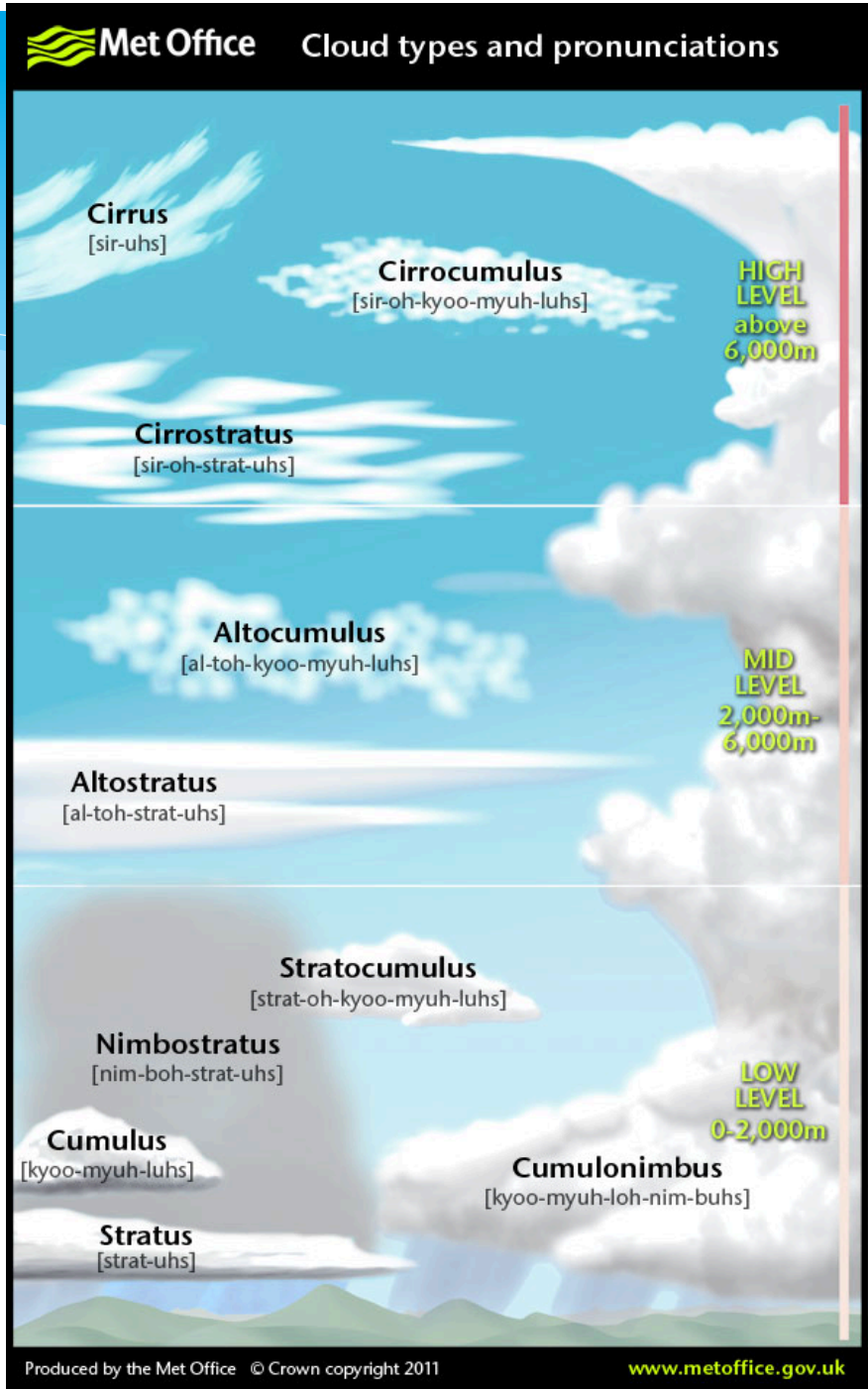
* Develop Personal Set of WX Minimums
  * E.g. Winds less than 25 knots, Min Ceiling 3,000' AGL, Visibility Greater than 7 Miles
* Stay 20 Miles Away from Convective Activity
* Know Your Clouds and the WX and Risks They Produce
* Become Adapt at Interpreting METARs and TAFs

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