Making Wx decisions in Spring & Summer

- Why Spring weather is different
- Show you what web info to use
- What web info to be cautious using
- How to evaluate risks
- Help with when to just say no

WHY WEATHER

- #1 Pilot Killer
- Pilot's generally, know the least about it
- The best sources of information are changing rapidly with Web based tools
- You shouldn't be surprised by what you see through the windscreen

WHY IS IT SO COMPLICATED?

- Lot's of variables
  - Varying pressures by altitude & latitude
  - Temperature
  - Moisture
  - Lapse rate
  - Jet stream
  - Air masses
  - Geography
- Meteorology is a complex science
- Requiring complex tools
- Probabilities – never certainties

Agenda

- High and Low Pressure Systems

- Long Range Wx models – GFS

- Short Range Wx tools – LAMP

- Instability Forecast Tools

- New ADDS tool

- Q & A

WHY WEATHER CHANGES IN SPRING

- More direct heating from the Sun
- The Polar Jet Stream moves southward – steers the weather (at 500mb ~ FL180)
- Cold air masses mixing with warmer air masses creating lot's of variables

ARE THESE YOUR PRIMARY TOOLS?

THE CWA FORECAST IS ONLY FORECAST 72 HOURS FORWARD

A TAF IS ONLY ACCURATE WITHIN 5NM OF THE TAF STATION. IT IS A POINT FORECAST

THIS IS BETTER...
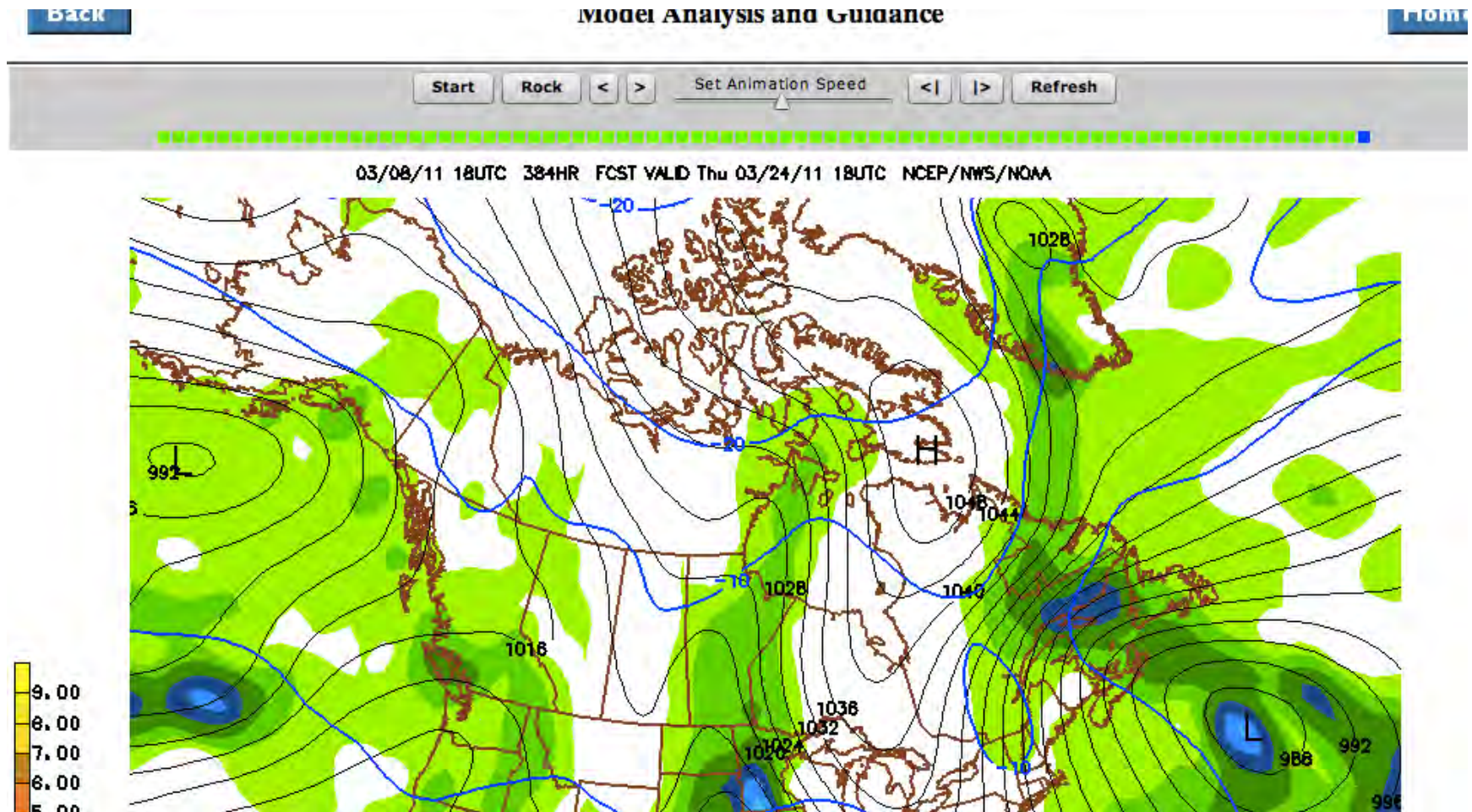
BUT FIRST, A FEW BASICS...

High and Low Pressure

- Caused by the uneven heating and cooling of the atmosphere
- The Sun heats the Earth unevenly
- Cold air masses migrate toward the equator
- Warm air masses migrate toward the poles

Canadian record low:
940.2 mb (94.02 kPa)
Saint Anthony,
    Newfoundland
(51° N 56° W)
Jan. 1977

U.S. record low:
888 mb (26.23 in.)
Hurricane Gilbert
(Atlantic/Caribbean)
Sept. 1988

Earth's record low:
870 mb (25.69 in.)
Typhoon Tip
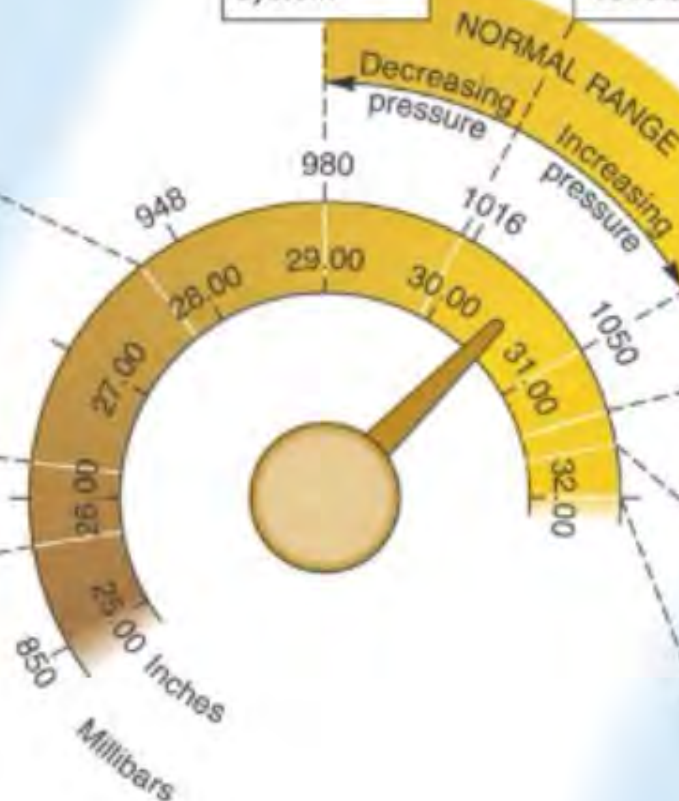(western Pacific)
Oct. 1979

Deep
low-pressure
system

Normal sea-level
pressure
1013.2 mb (29.92 in.)

NORMAL RANGE

Decreasing pressure

Increasing pressure

Strong
high-pressure
system

980

948

1016

1050

29.00

28.00

30.00

27.00

31.00

26.00

32.00

25.00 Inches

850

Millibars

U.S. record high:
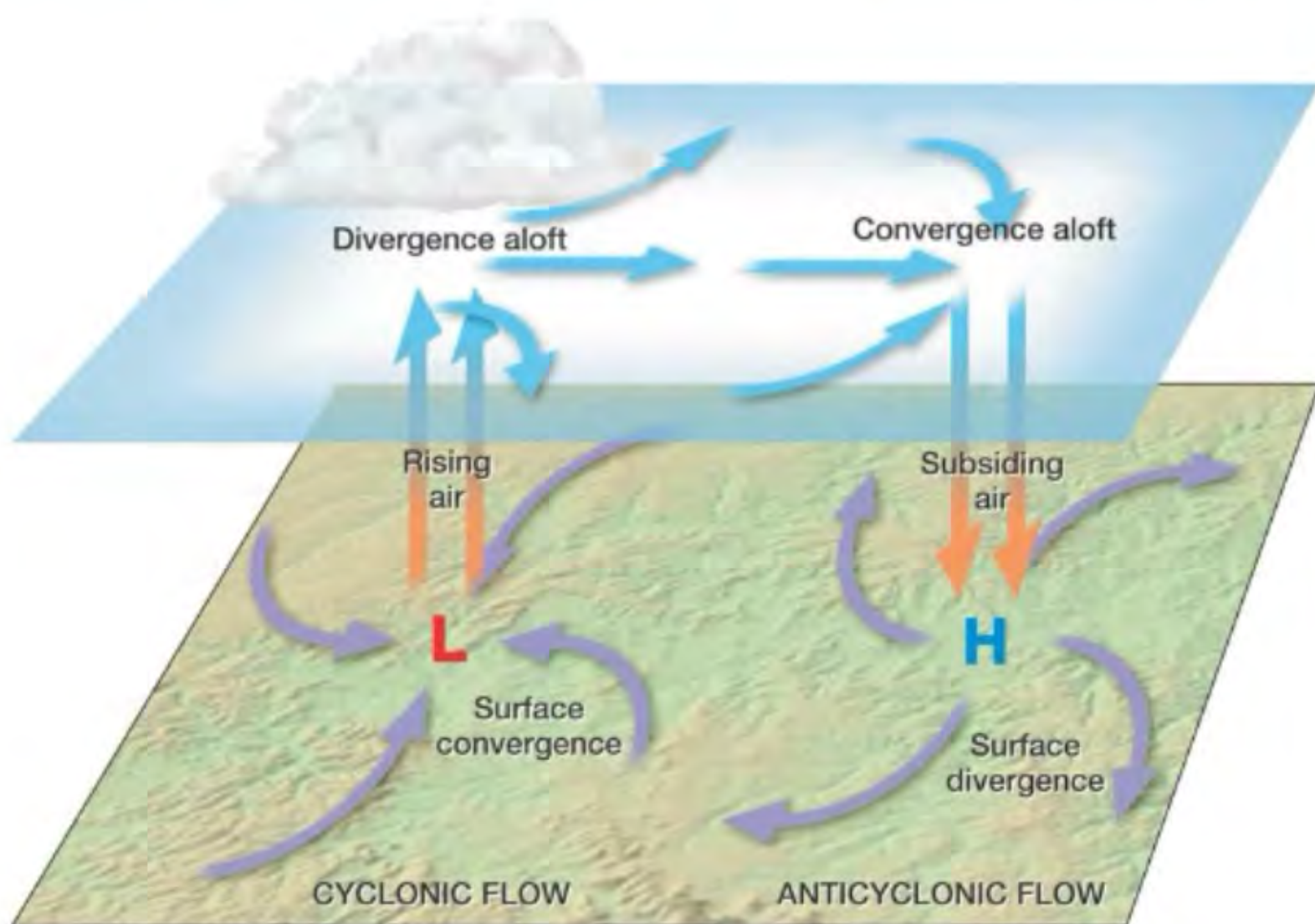1065 mb (31.43 in.)
Barrow, AK
(71° N 156° W)
Jan. 1970

Canadian record high:
1079.6 mb (107.96 kPa)
Dawson, Y.T.
(64° N 139° W)
Feb. 1989

Earth's record high:
1084 mb (32.01 in.)
Agata, Siberia
(67° N 93° E)
Dec. 1968

Divergence aloft

Convergence aloft

Rising air

Subsiding air

L

H

Surface convergence

Surface divergence

CYCLONIC FLOW

ANTICYCLONIC FLOW

A Serious LOW

Low Pressure

- Low pressure = warm air rising
- Circulates counter-clockwise
- Winds are much stronger than a HIGH
- Warm air ahead of the front, cold air behind
- Circulates cold air from North, warm air from South (in our case)
- Humidity increases and dew point spread decreases on backside of low
- Often followed by a "dry slot"
- Trough vs full blown LOW
- Arrive with a "Cold Front" or a "Warm Front"

Cold Front

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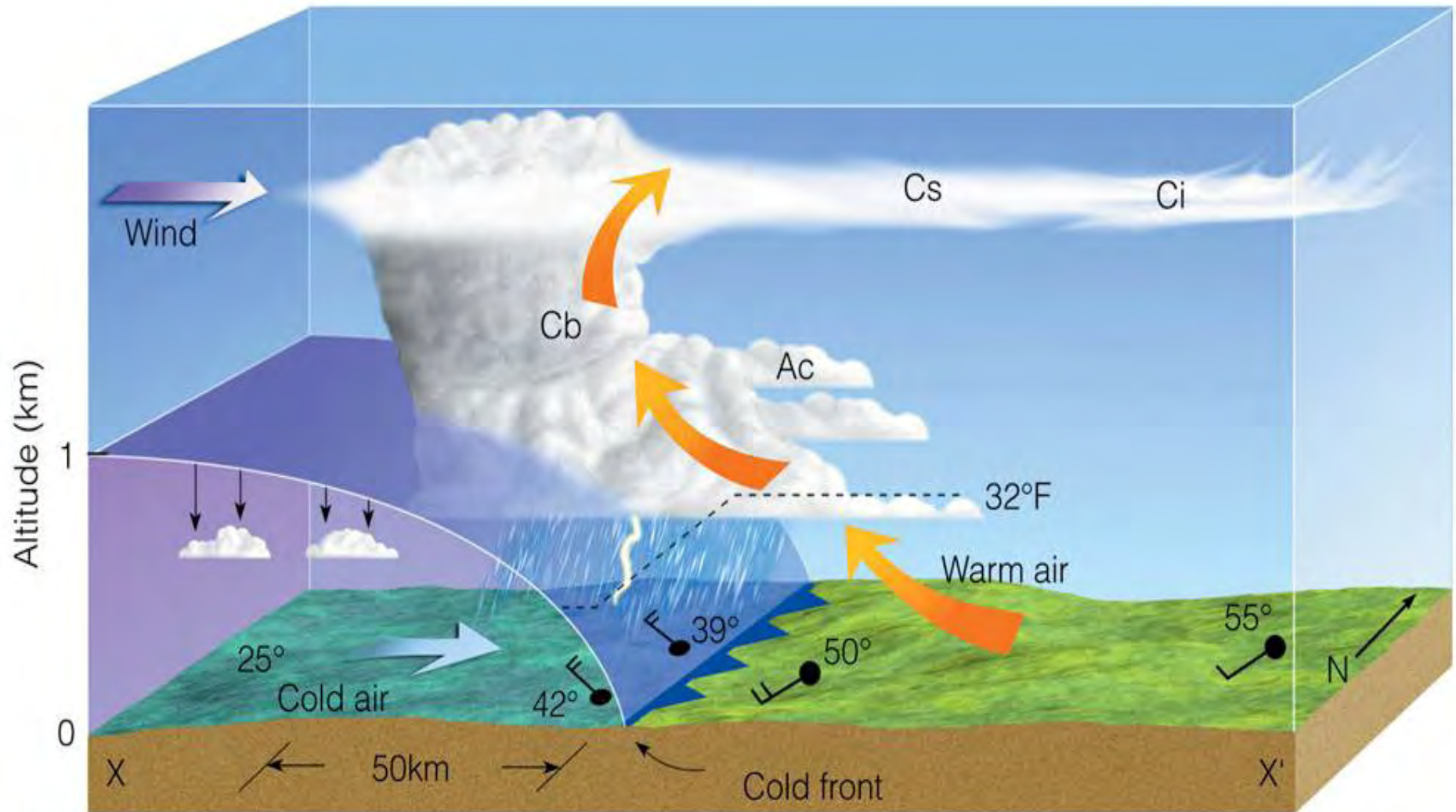
Warm Front
(slow moving)
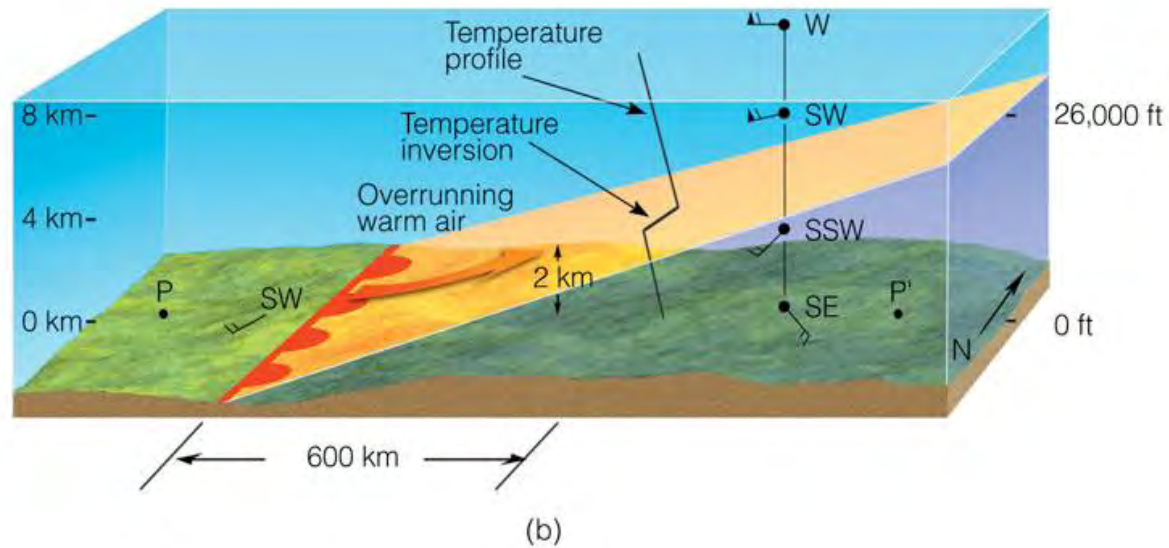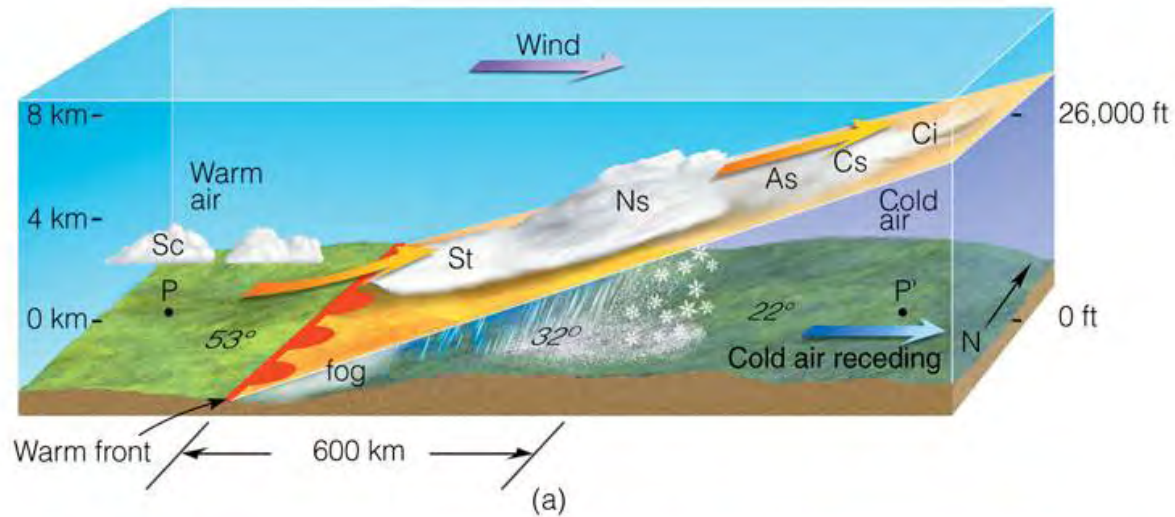
12 hours before incoming LOW

Incoming Warm Front

10am

6pm
(light rain 2 hours later

12 hours after trough passing

Dry Slot

18 hours – Ridge rebuilding

High Pressure

- Cold air decending – pancakes on land
- Holds warm air, (or cold air), against ground – creates stability
- In the winter causes inversions with fog
- Circulates clockwise
- Winds are light
- Usually found over water – cooler air sinks
- Ridge vs full blown HIGH

Another lifting mechanism

Orographic Uplift

When air reaches the leeward side of the mountain much of the moisture has been lost
Air descends, warms adiabatically, condensation and precipitation not likely
Result: rain shadow, Sierra Nevada Mountain Range – Great Basin Desert (Western US), Patagonia Desert (Argentina)

Valley vs Mountain

Atmospheric Stability

ABSOLUTE INSTABILITY

Environmental lapse rate
12°C/1000 m

4000 m   −8°C
Wet rate
6°C/1000 m

3000 m   4°C

2000 m   16°C

Dry rate
10°C/1000 m
1000 m   28°C

Surface   40°C

(a)

Tendency

Rising air 16°
warmer than
environment

Rising air 10°
warmer than
environment

Rising air 4°
warmer than
environment

Rising air 2°
warmer than
environment

8°C

14°C

20°C

30°C

40°C

Solar
heating

Wet
adiabatic
rate

Condensation
level

Environmental
lapse rate

Dry
adiabatic
rate

−10 0 10 20 30 40 (°C)
(b)   Temperature
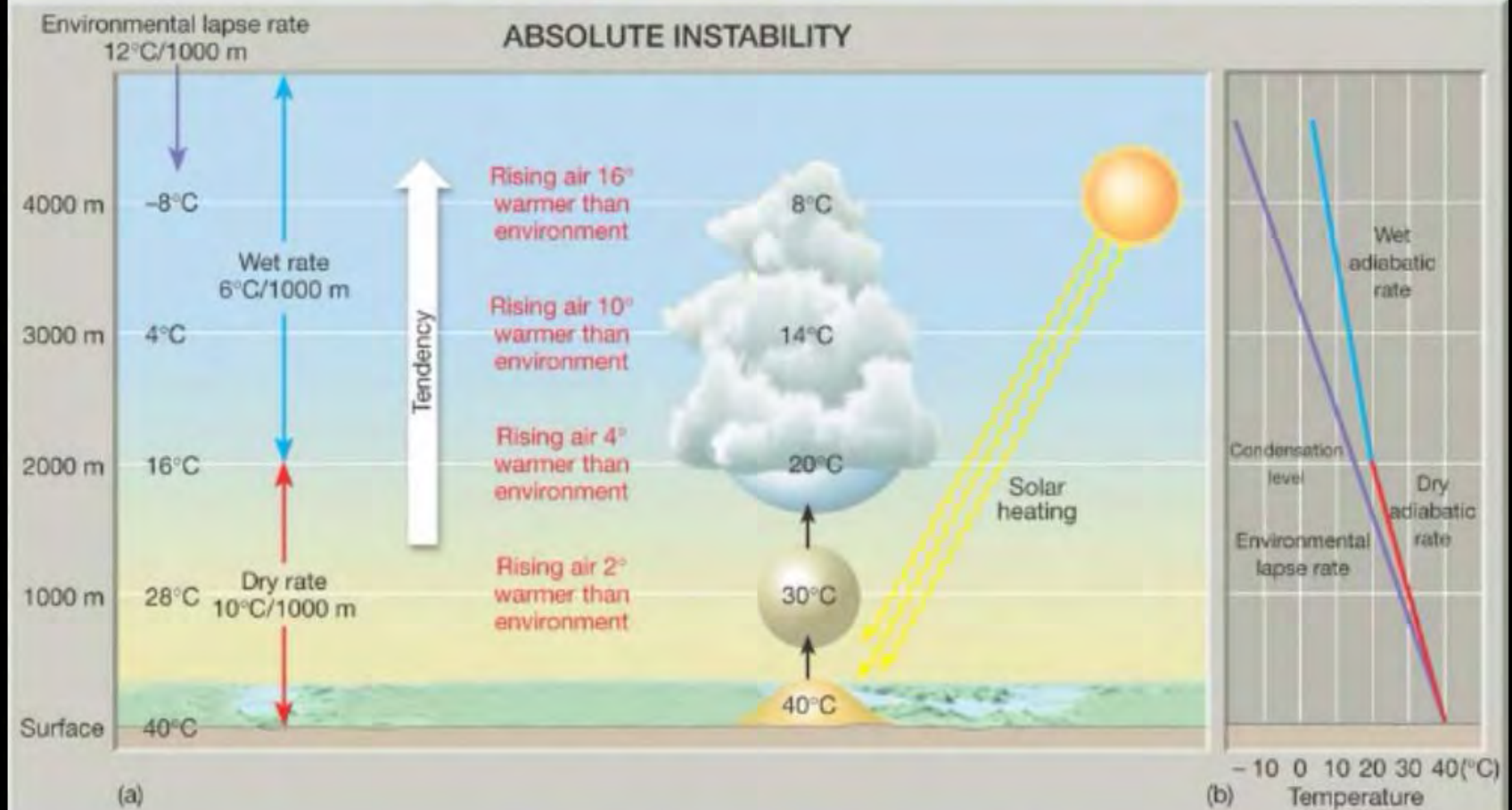
Absolute Instability

Atmospheric Stability

ABSOLUTE STABILITY

Environmental lapse rate 5°C/1000 m

5000 m −5°C
4000 m 0°C
3000 m 5°C
2000 m 10°C
1000 m 15°C
Surface 20°C

Wet rate 6°C/1000 m

Dry rate 10°C/1000 m

Tendency

Rising air 5° cooler 20°C 10°C
Rising air 10° cooler 0°C
Rising air 11° cooler −6°C
Rising air 12° cooler −12°C
Rising air 13° cooler −18°C

Cold air

(a)

Environmental lapse rate

Wet adiabatic rate

Condensation level

Dry adiabatic rate

−20 −10 0 10 20 (°C)

(b) Temperature

Absolute Stability

Predicting Instability

- Lifted Index - http://www.emc.ncep.noaa.gov/mmb/namsvrfcst/

Predicting Ceilings and Clouds

- LAMP – Localized Aviation MOS Program

- Several websites that use MOS data to project weather conditions - http://www.usairnet.com/cgi-bin/launch/code.cgi?state=ID&sta=KBOI

- Similar to data available for TAF sites but twice as many locations - http://www.nws.noaa.gov/mdl/forecast/graphics/MAV/

- New ADDS tool – http://weather.aero/tools/desktopapps/hemstool

- Experimental tool – 850mb RH HT depiction - http://mag.ncep.noaa.gov/NCOMAGWEB/appcontroller

Area Forecast

7.1.1.1.1 Height Reference
All heights are referenced to Mean Sea Level (MSL) except when prefaced by AGL, CIG or CEILING. Tops are always referenced to MSL.

Verify with webcams

Verify with webcams

Date/Time: 11/01/2011 14:28 ▶ Loop

Verify with webcams