

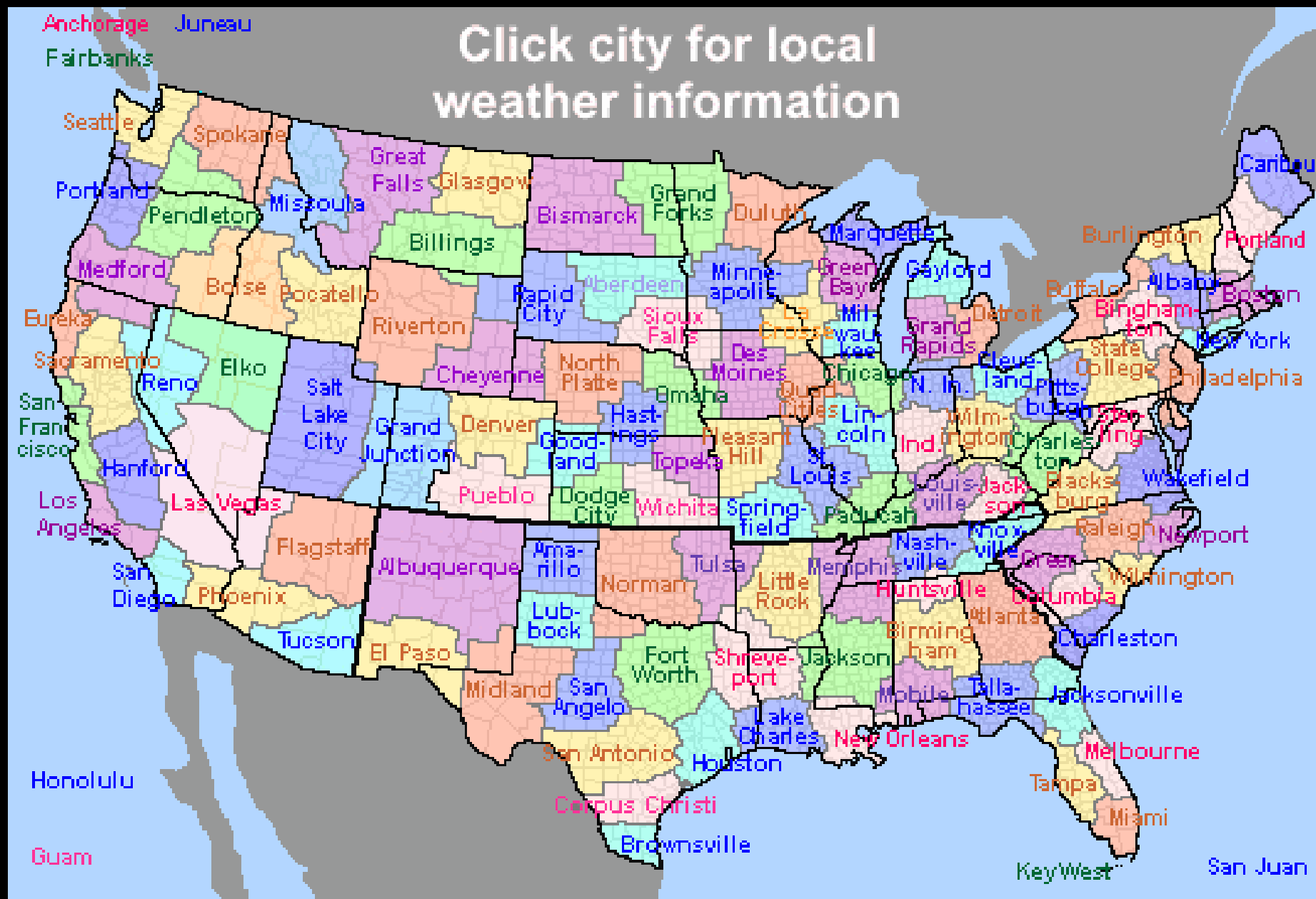
# **Master Naturalist Weather and Climate**



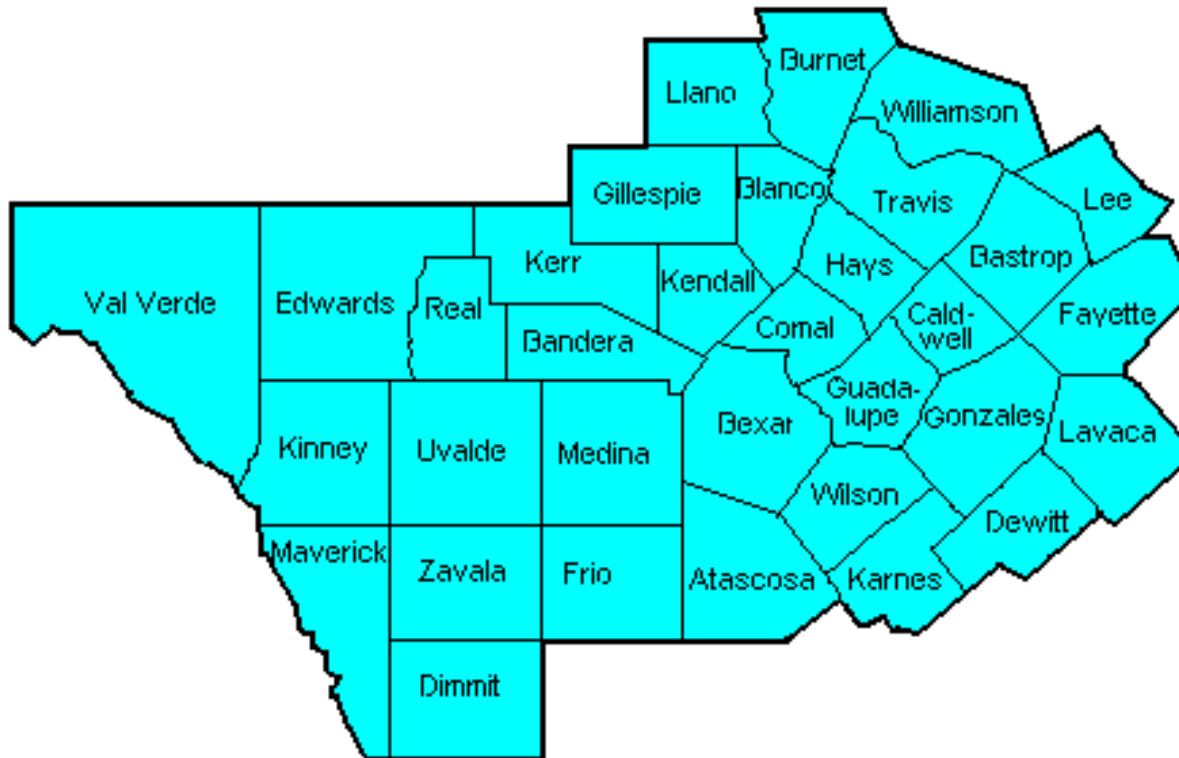
**Jon W. Zeitler**

**Science and Operations Officer  
NOAA/National Weather Service  
Austin-San Antonio TX**

# 122 NWS Offices



# NWS Austin/San Antonio County Warning Area





# NWS Office

- Severe Warnings
- Public Forecast
- River Forecast
- Aviation Forecast
- Air Quality/Hazmat
- Fire Weather





# Atmosphere Composition

Dry air in lowest 80 km of atmosphere

|                |           |
|----------------|-----------|
| Nitrogen       | 78.08%    |
| Oxygen         | 20.95%    |
| Argon          | 00.93%    |
| Carbon Dioxide | 00.035% ↑ |
| Neon           | 00.0018%  |
| Helium         | 00.00052% |

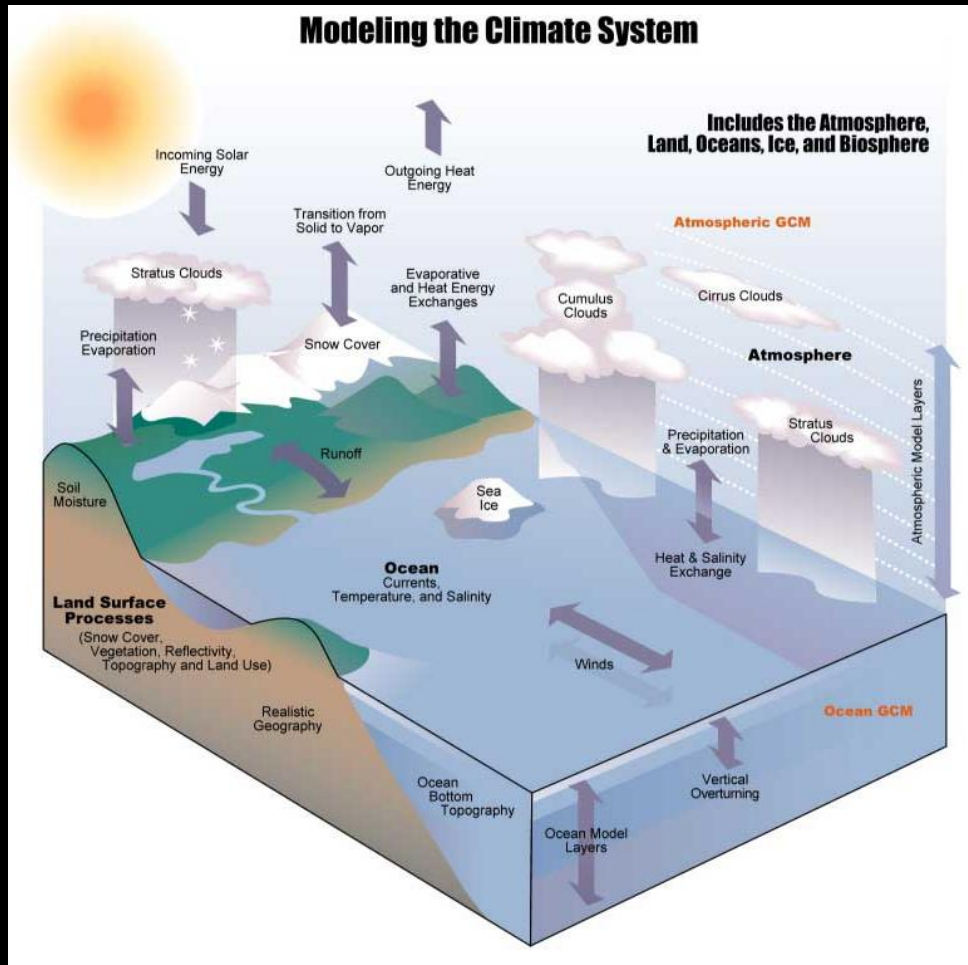
|               |             |
|---------------|-------------|
| Methane       | 00.00014% ↑ |
| Krypton       | 00.00010%   |
| Nitrous Oxide | 00.00005%   |
| Hydrogen      | 00.00005%   |
| Xenon         | 00.000009%  |
| Ozone         | 00.000007%  |

# Weather Defined



- The state of the atmosphere at some place and time, described in terms of such variables such as:
  - Temperature
  - Cloudiness
  - Precipitation
  - Wind speed and direction

# Climate Defined



- Weather conditions at some locality averaged over a specified time period.
  - Departures from long-term averages
  - Extremes in weather

**Meteorology** is the study of the atmosphere and the processes that cause weather.



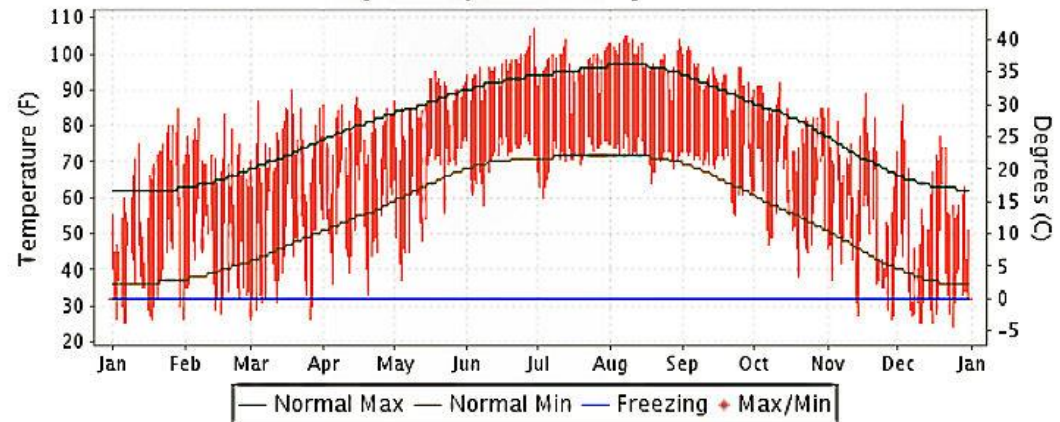


**Climatology** is  
the study of the  
climate, its  
controls and  
variability.

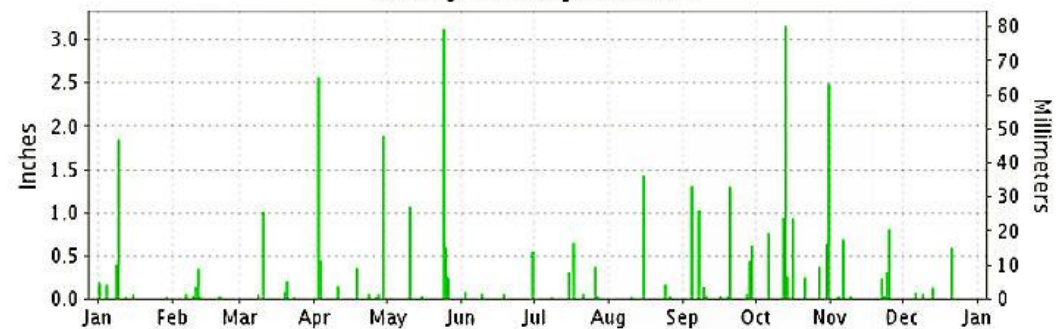
## ANNUAL SUMMARY WITH COMPARATIVE DATA

AUSTIN/BERGSTROM,  
TEXAS (KAUS)

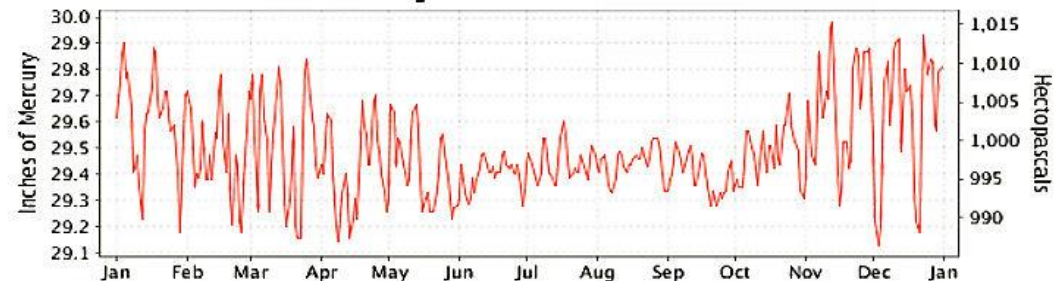
### Daily Max/Min Temperature



### Daily Precipitation



### Daily Station Pressure



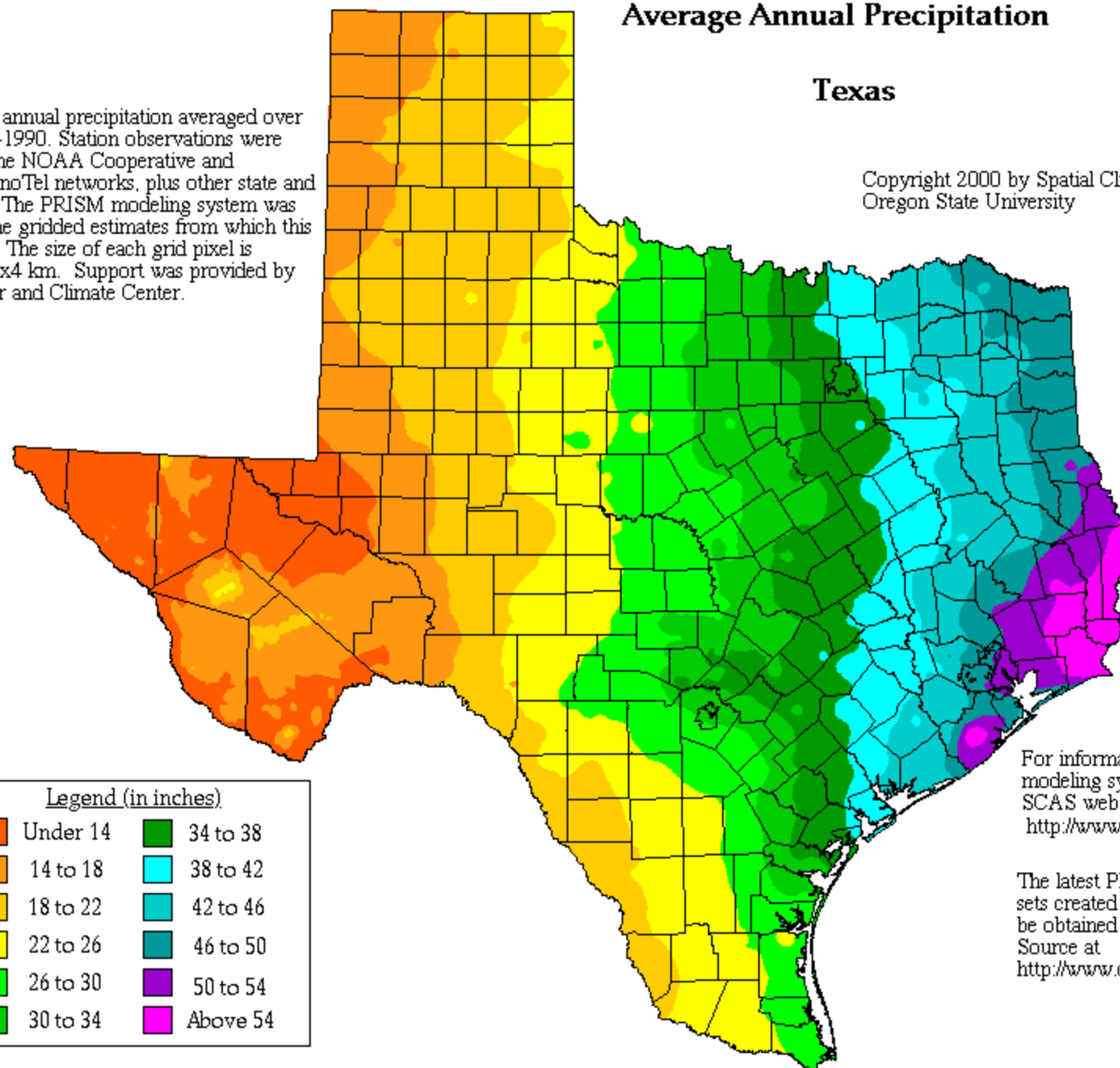


# Average Annual Precipitation

## Texas

Copyright 2000 by Spatial Climate Analysis Service,  
Oregon State University

This is a map of annual precipitation averaged over the period 1961-1990. Station observations were collected from the NOAA Cooperative and USDA-NRCS Snotel networks, plus other state and local networks. The PRISM modeling system was used to create the gridded estimates from which this map was made. The size of each grid pixel is approximately 4x4 km. Support was provided by the NRCS Water and Climate Center.



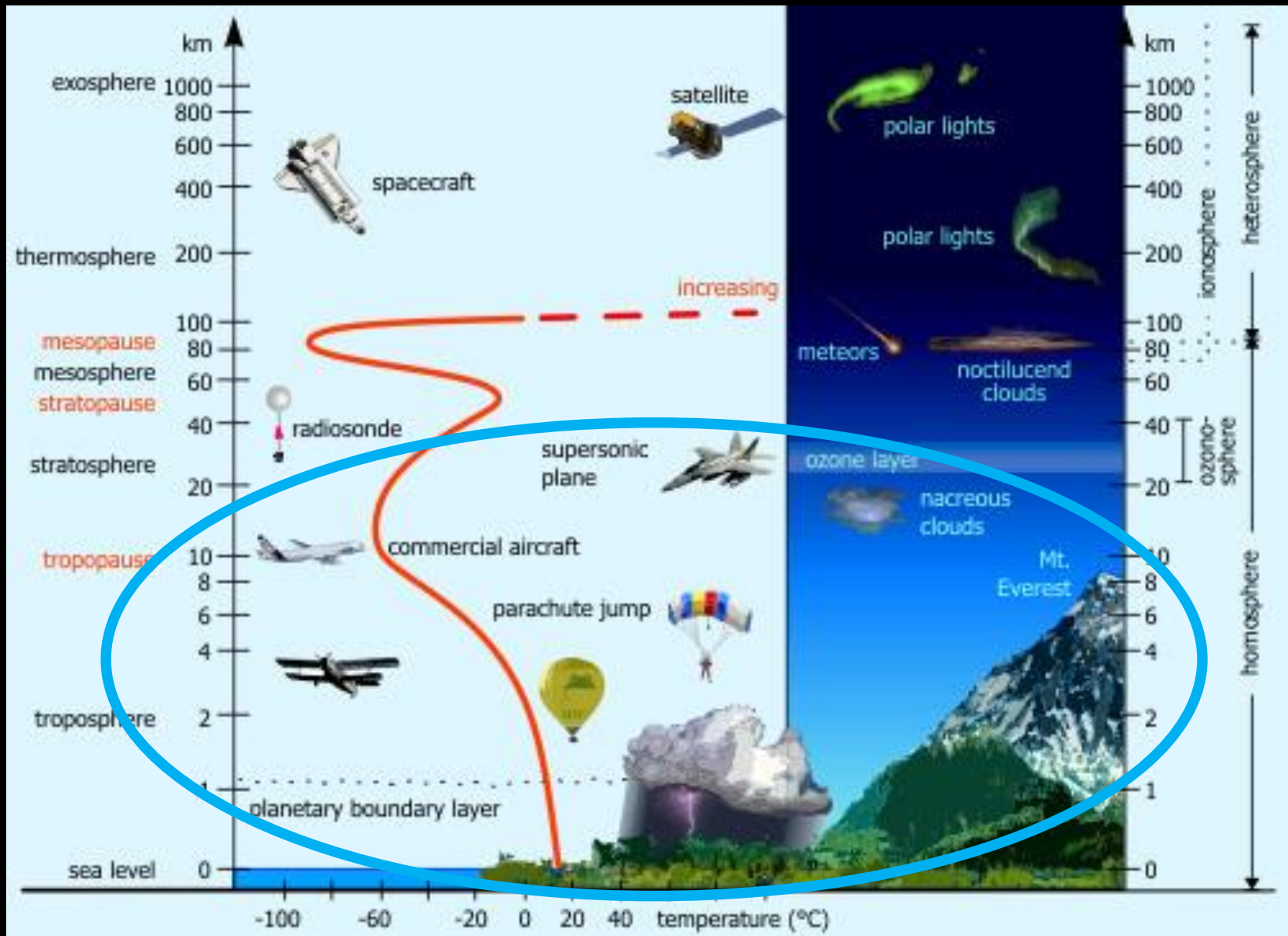
### Legend (in inches)

|          |          |
|----------|----------|
| Under 14 | 34 to 38 |
| 14 to 18 | 38 to 42 |
| 18 to 22 | 42 to 46 |
| 22 to 26 | 46 to 50 |
| 26 to 30 | 50 to 54 |
| 30 to 34 | Above 54 |

For information on the PRISM modeling system, visit the SCAS web site at <http://www.ocs.orst.edu/prism>

The latest PRISM digital data sets created by the SCAS can be obtained from the Climate Source at <http://www.climatesource.com>

# The Atmosphere



# Troposphere



- Lowest part of the atmosphere
- 4 miles deep North Pole
- 10 miles deep at equator
- **Most of the weather occurs**
- Strong wind circulations
- Temperature cools with height

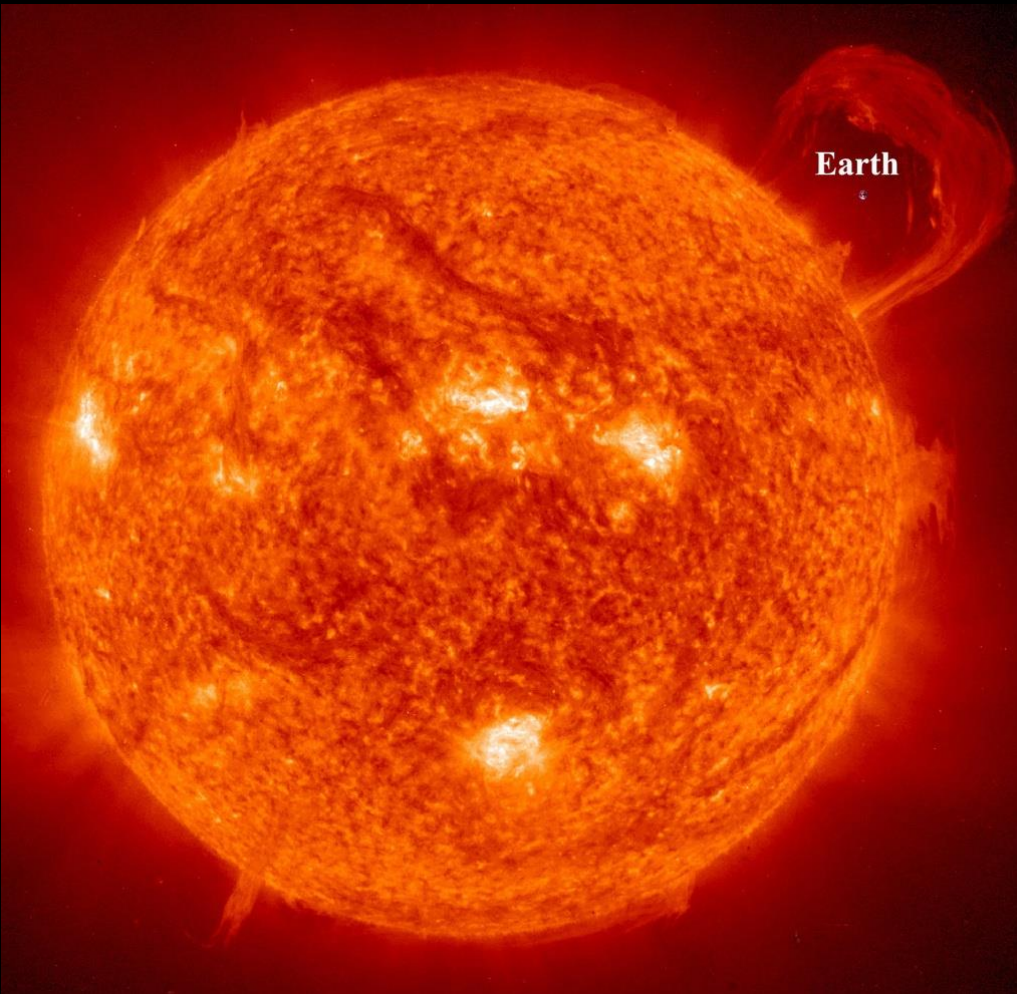
# Stratosphere



- Above the troposphere
- 6 - 30 miles above earth
- Ideal for jet aircrafts
- Temperatures warm with height
- Pollution worries
- **Ozone**



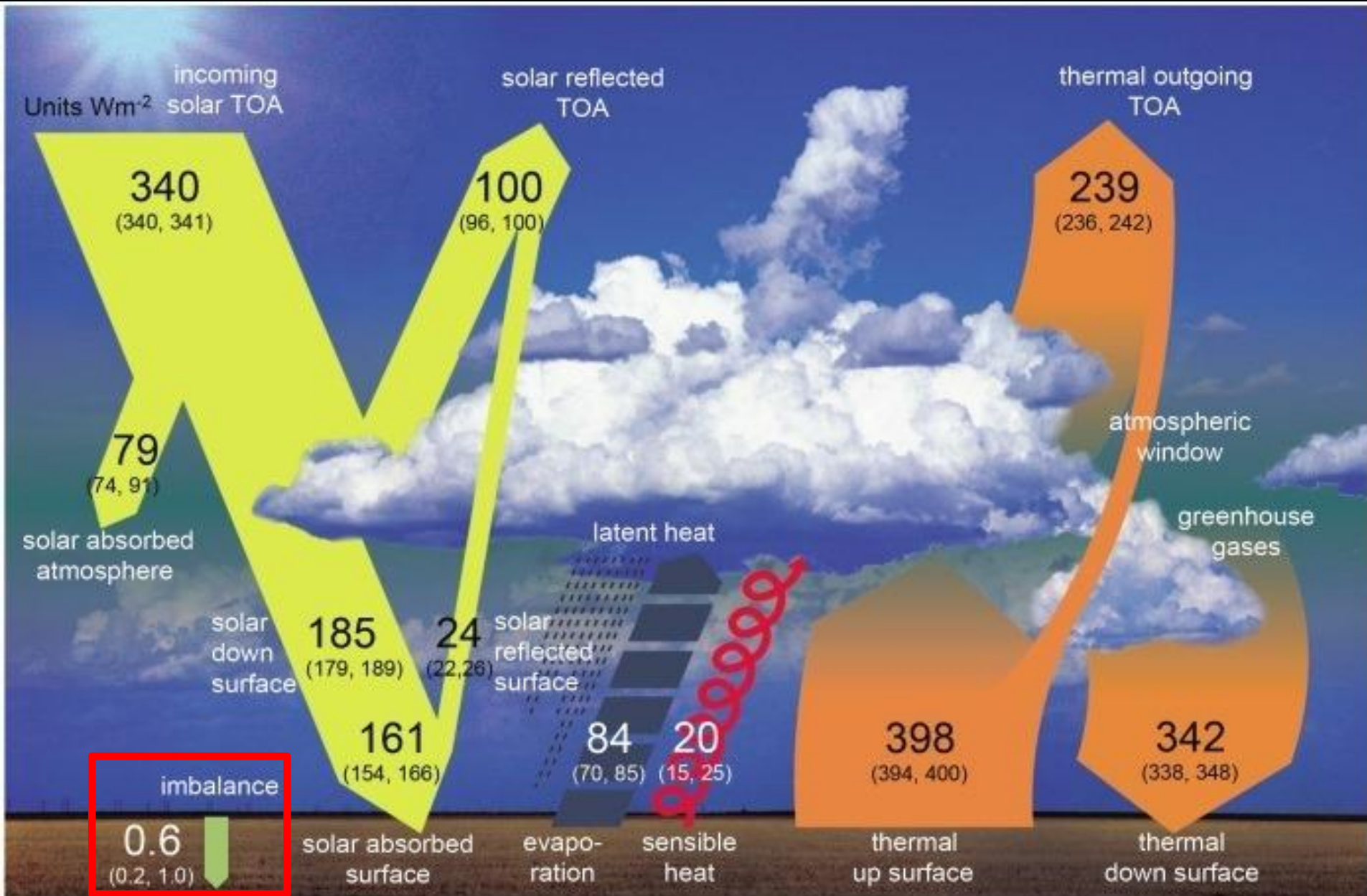
# What Causes The Weather?



- **The sun heats Earth unequally**
  - Only half the planet receives sun at one time
  - Amount of radiation varies from place to place
  - Earth tilts as it revolves around the sun



# Earth's Radiation Budget





Albedo values  
(% reflected)

Moon  
6%–8%

Water bodies  
10%–60%  
(varies with Sun altitude)

**Earth's albedo  
(average) 31%**

Fresh snow  
80%–95%

Forests  
10%–20%

Crops, grasslands  
10%–25%

Grass  
25–30%

Asphalt  
(black top)  
5%–10%

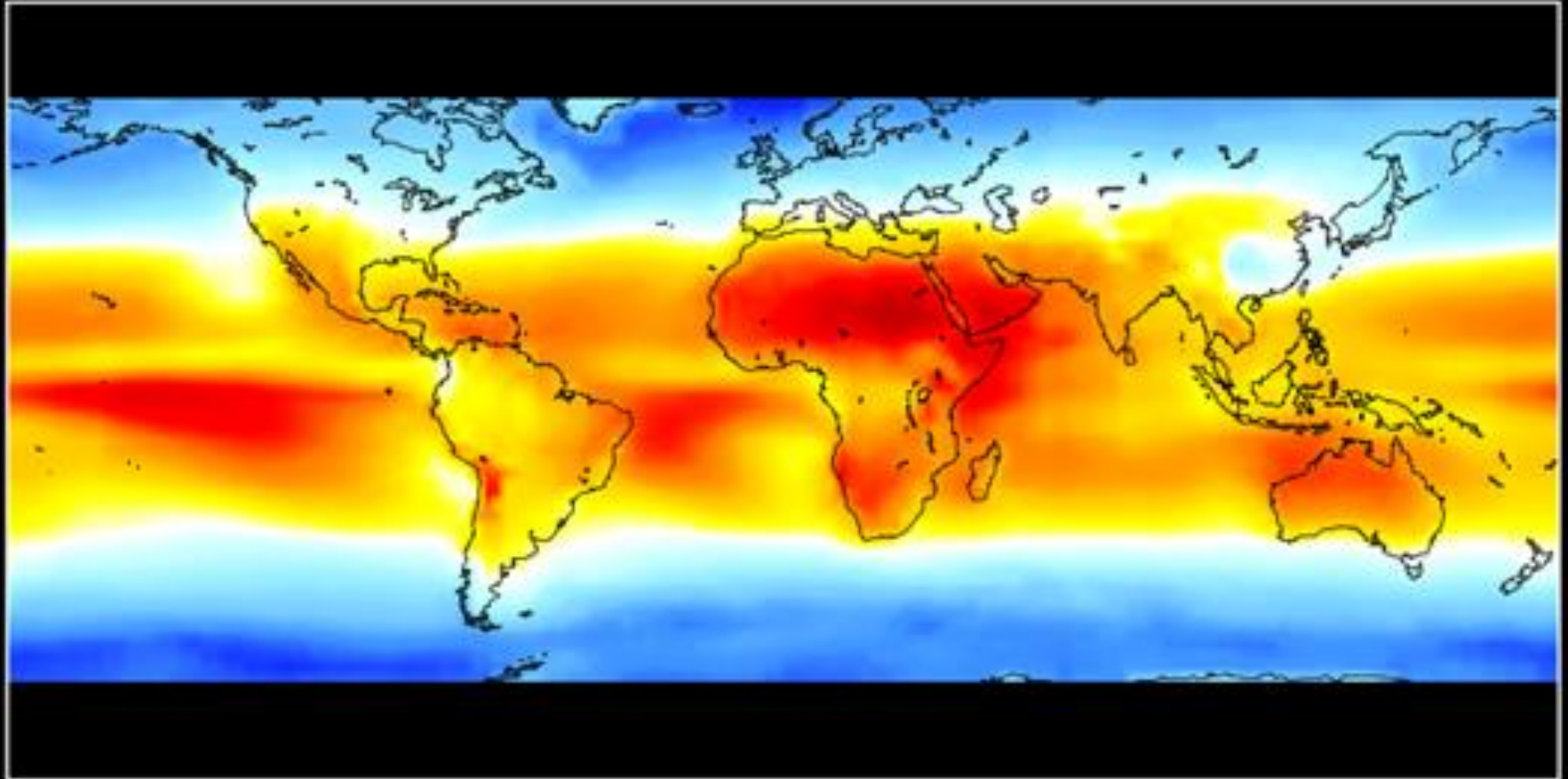
Concrete, dry  
17%–27%

Dark roof  
8%–18%

Light roof  
35%–50%

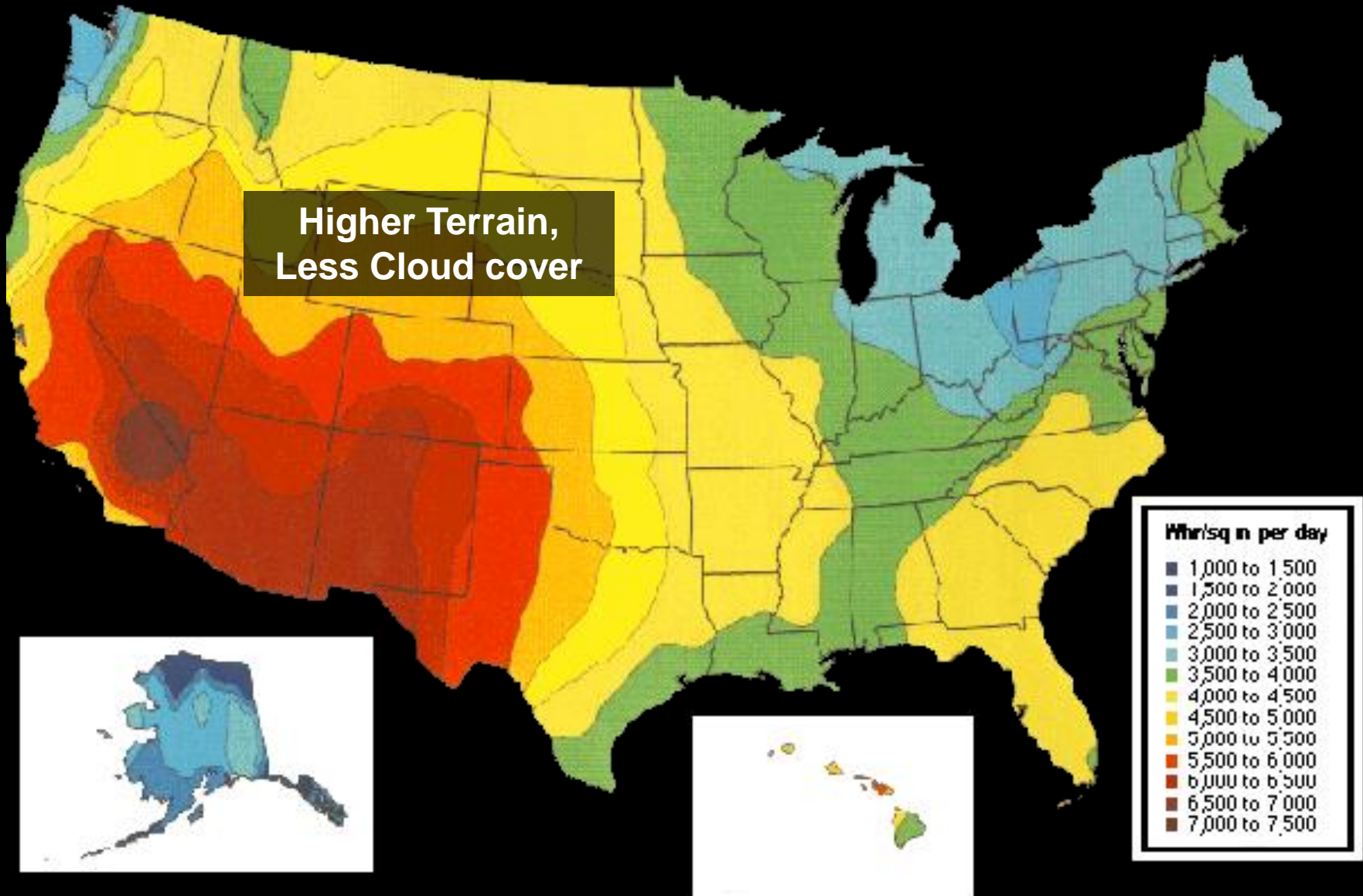
Brick, stone  
20%–40%

# World Solar Radiation

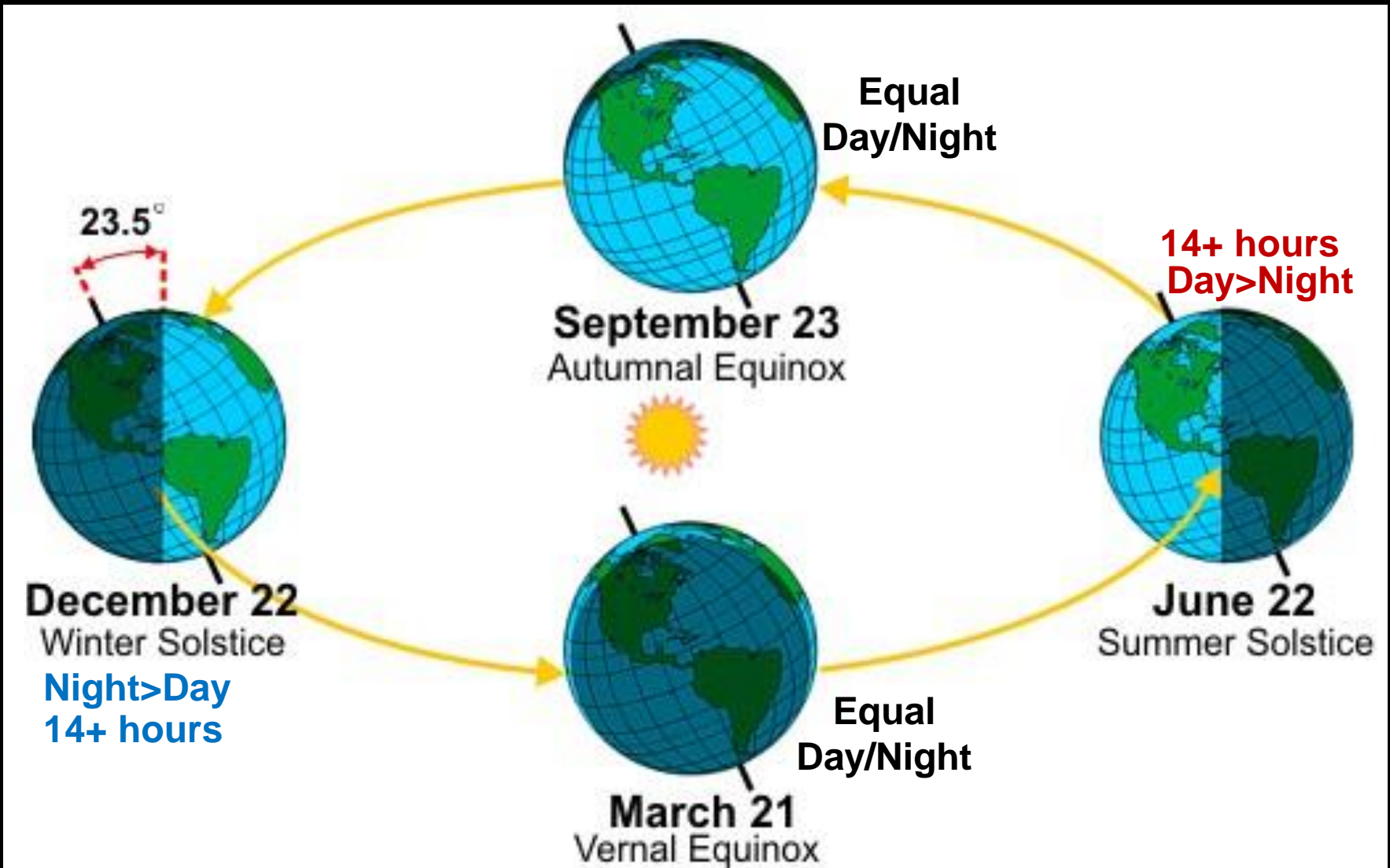




# U.S. Solar Radiation



# Seasons



Austin: **Max** 14 hours 7 minutes

**Min** 10 hours 12 minutes

San Antonio: **Max** 14 hours 2 minutes

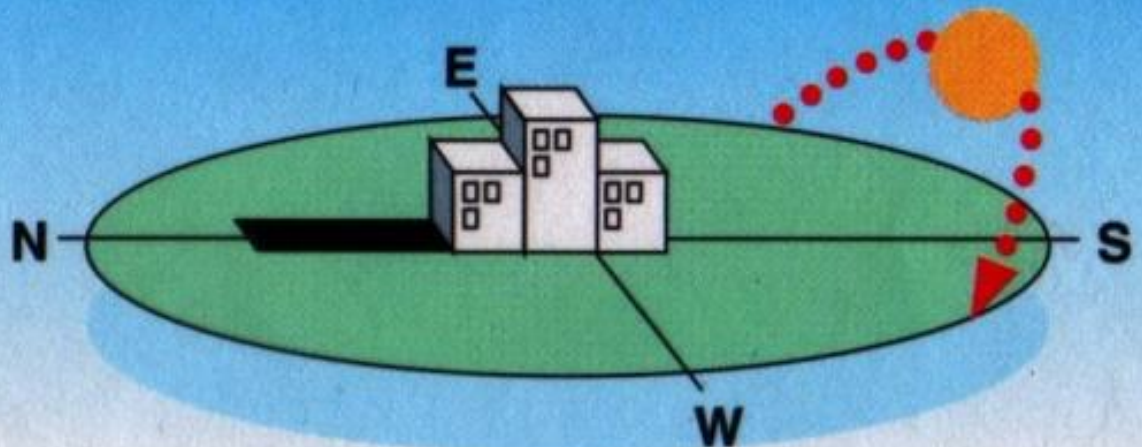
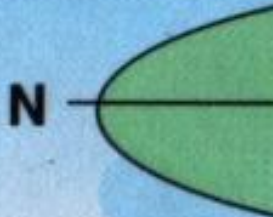
**Min** 10 hours 16 minutes



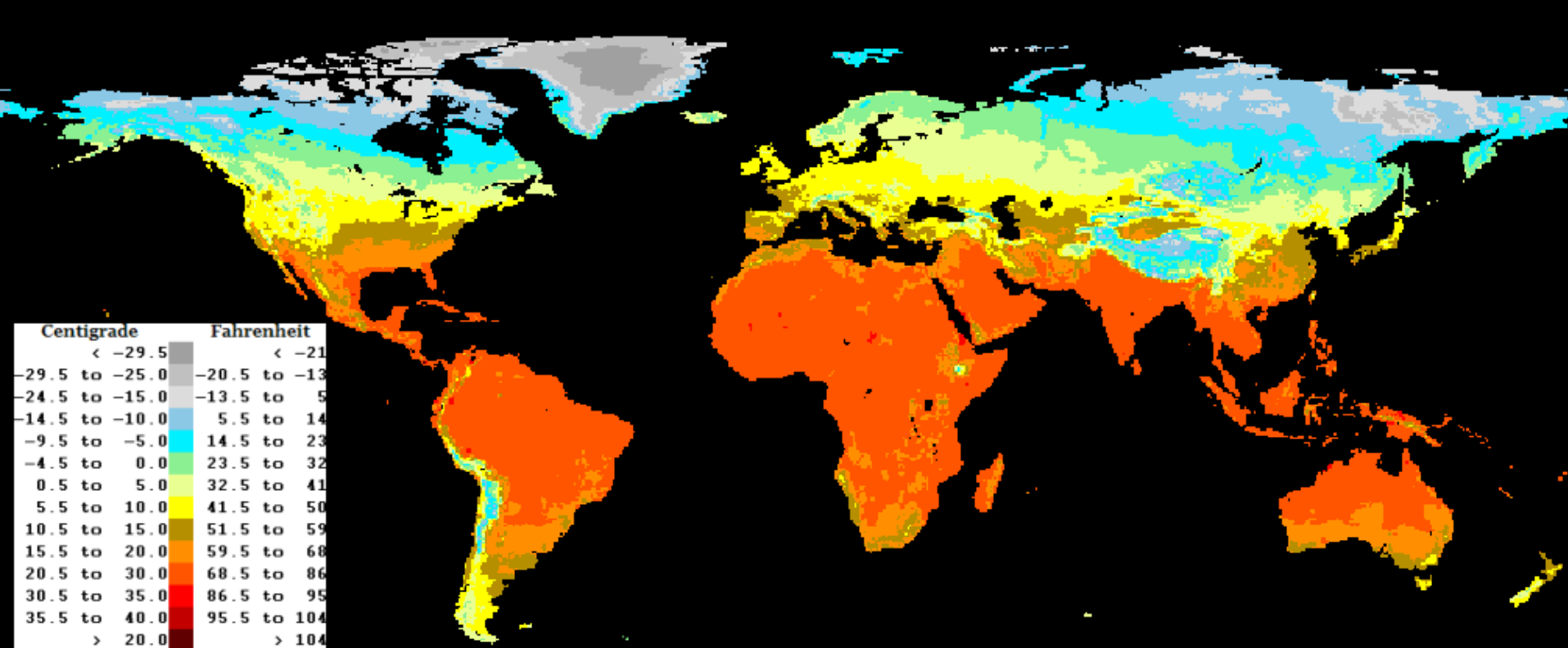
# Summer solstice

## Spring or Fall equinox

## Winter solstice



# Temperature

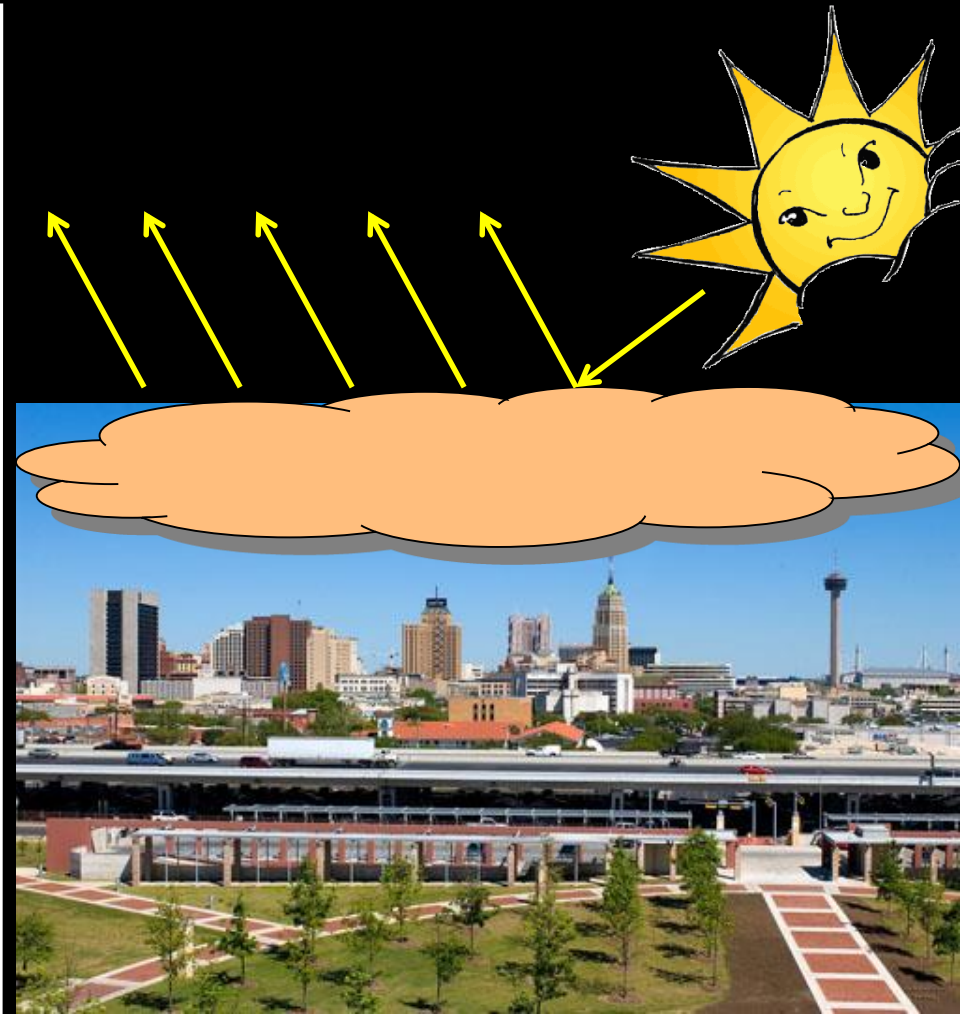


A measure of heat

# Effects of Clouds on Temperature in daytime

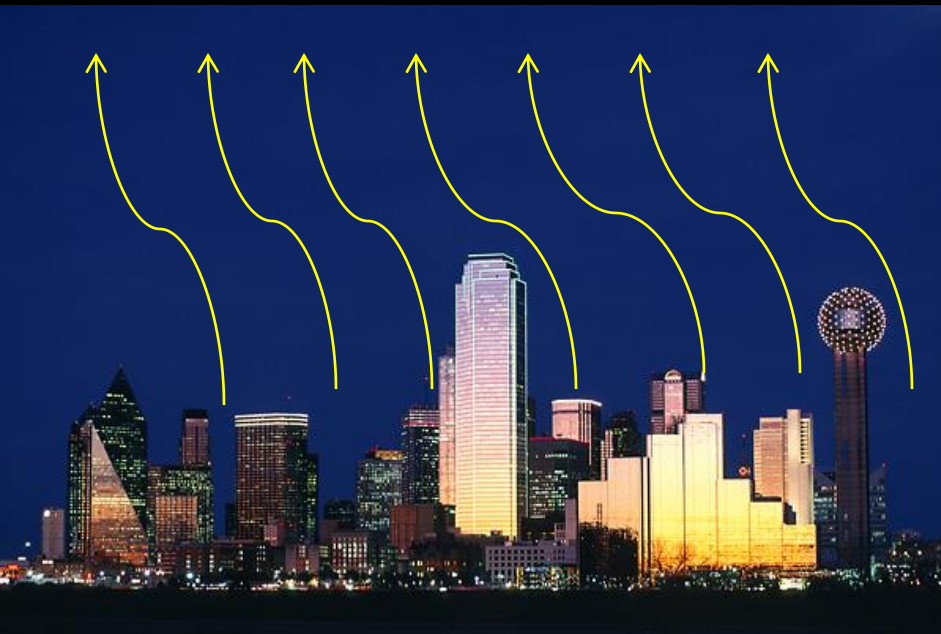


Clear skies = warmer temperatures

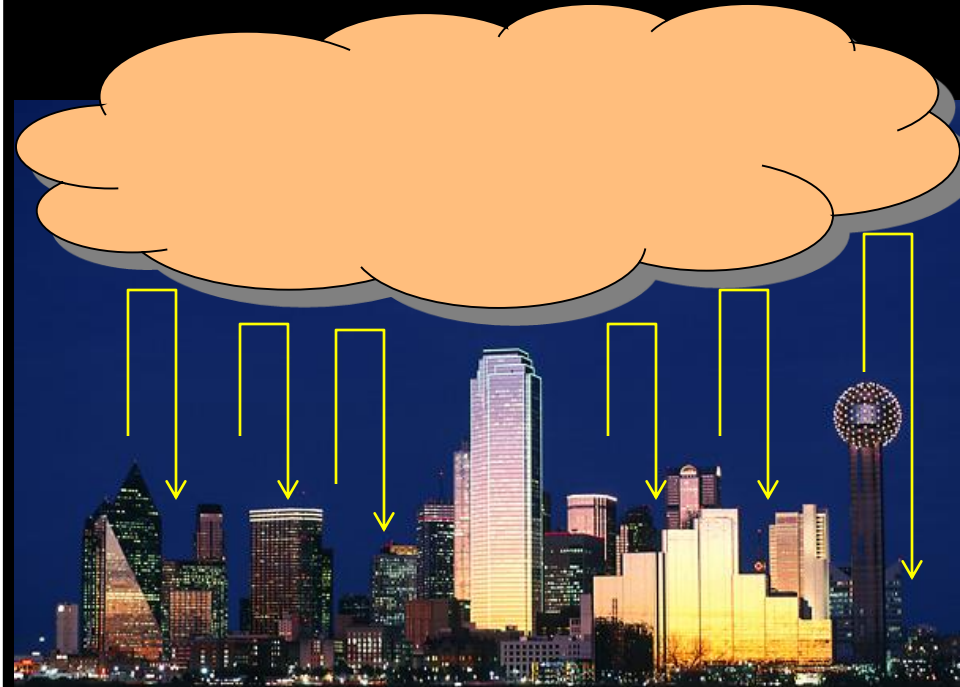


Cloudy skies = cooler temperatures

# Effects of Clouds on Temperature at night

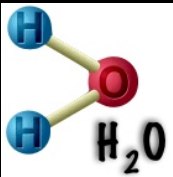


Clear skies = cooler temperatures

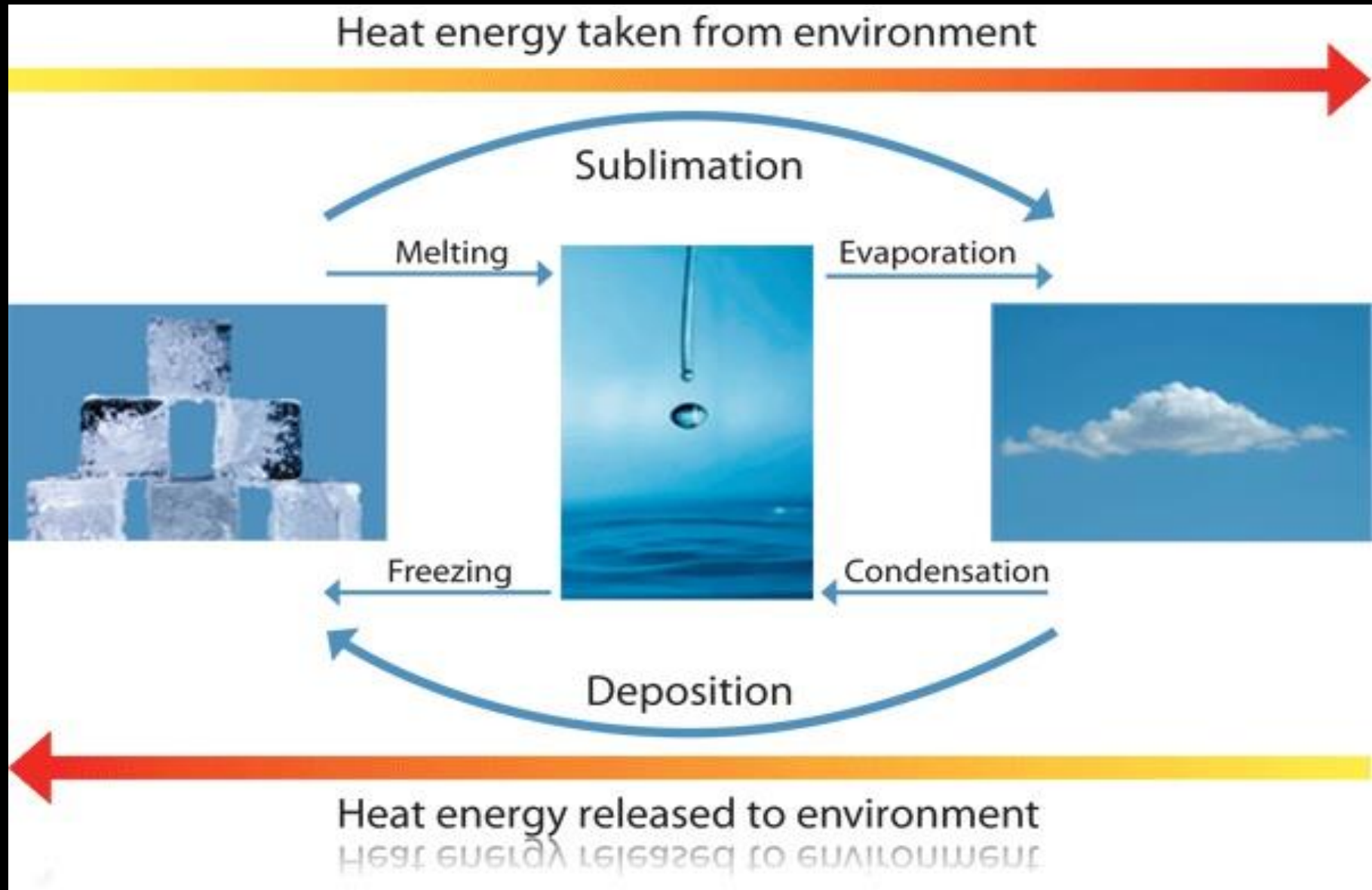


Cloudy skies = warmer temperatures

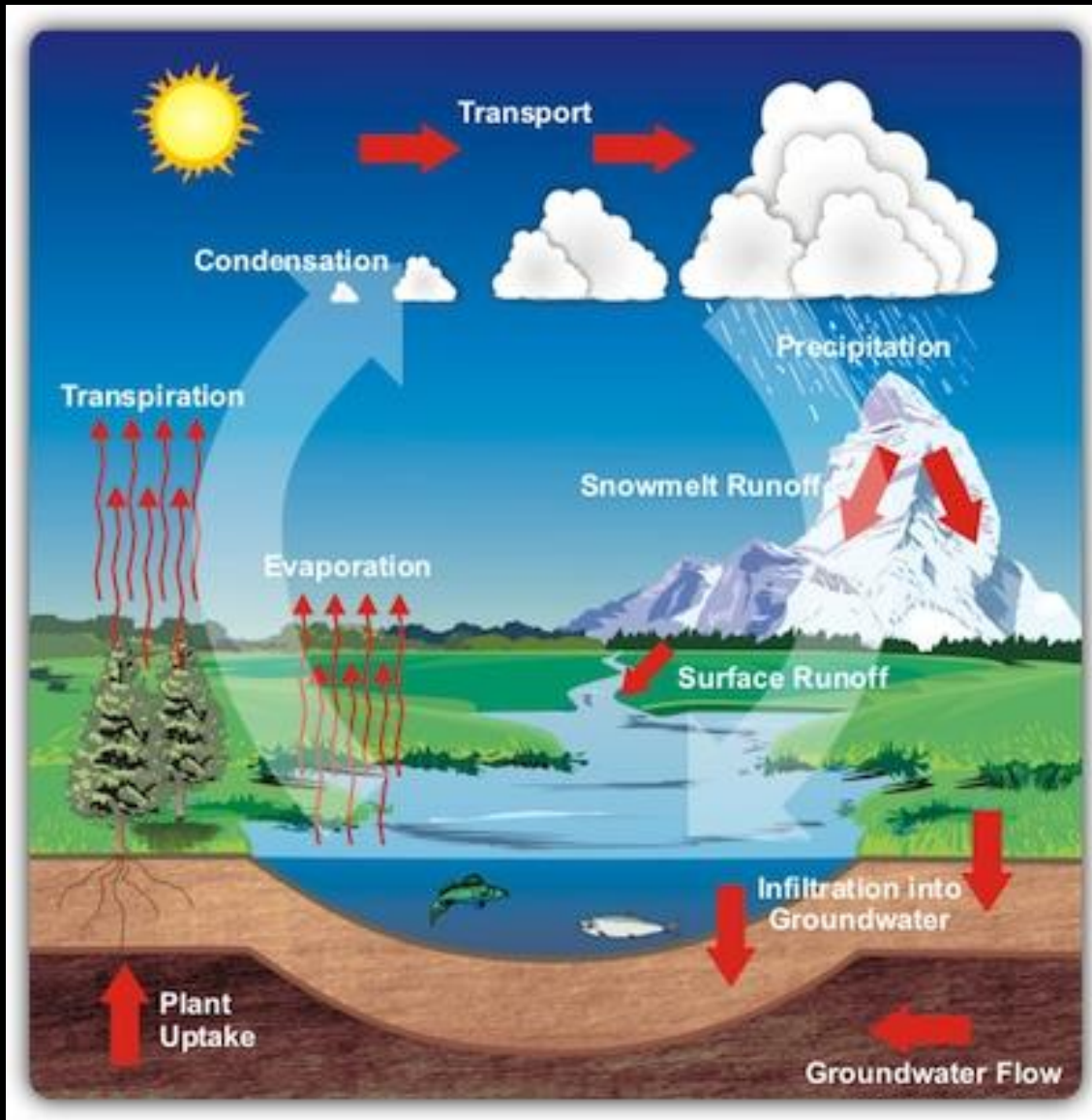




# Water and Phase Change

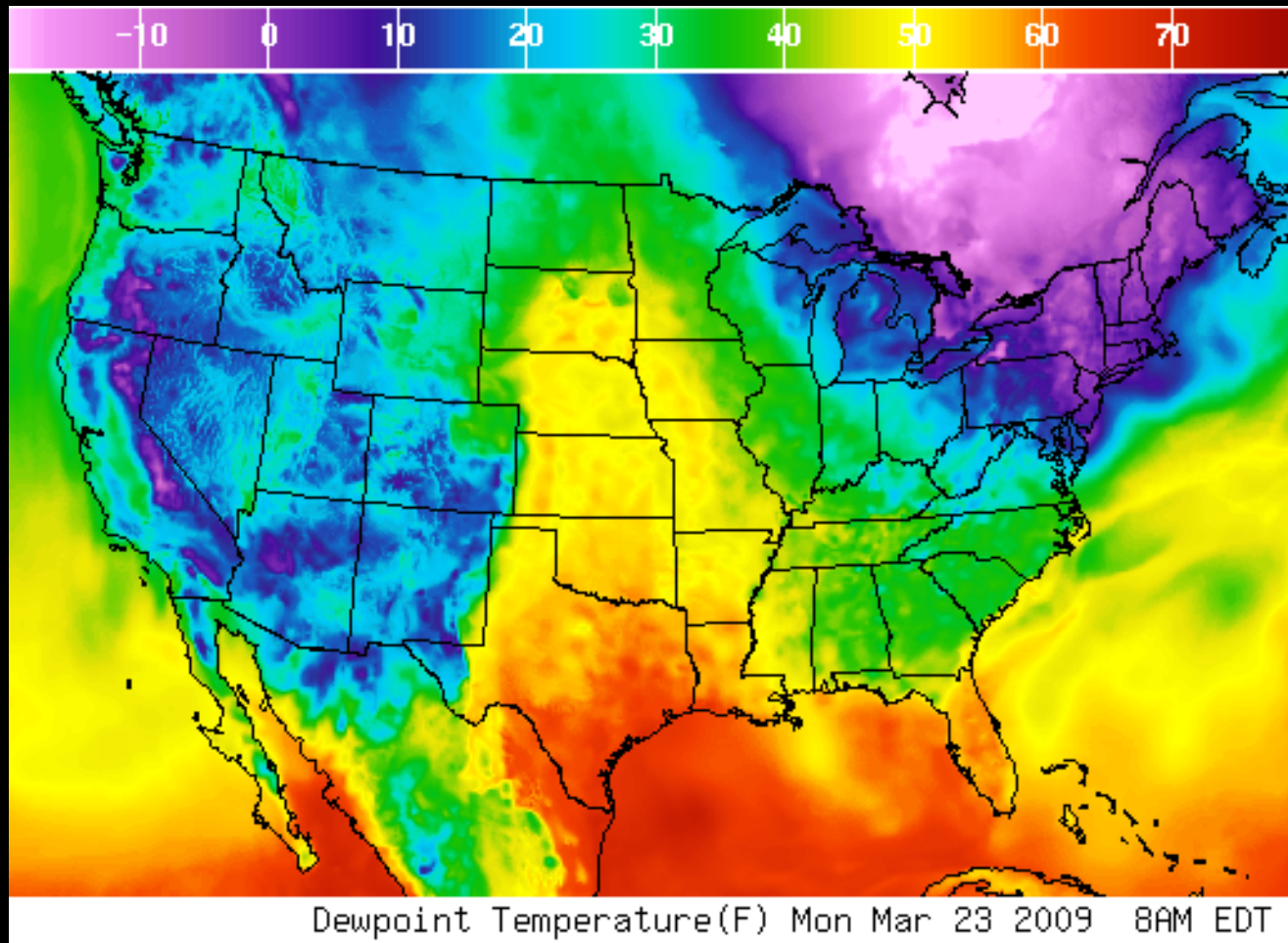






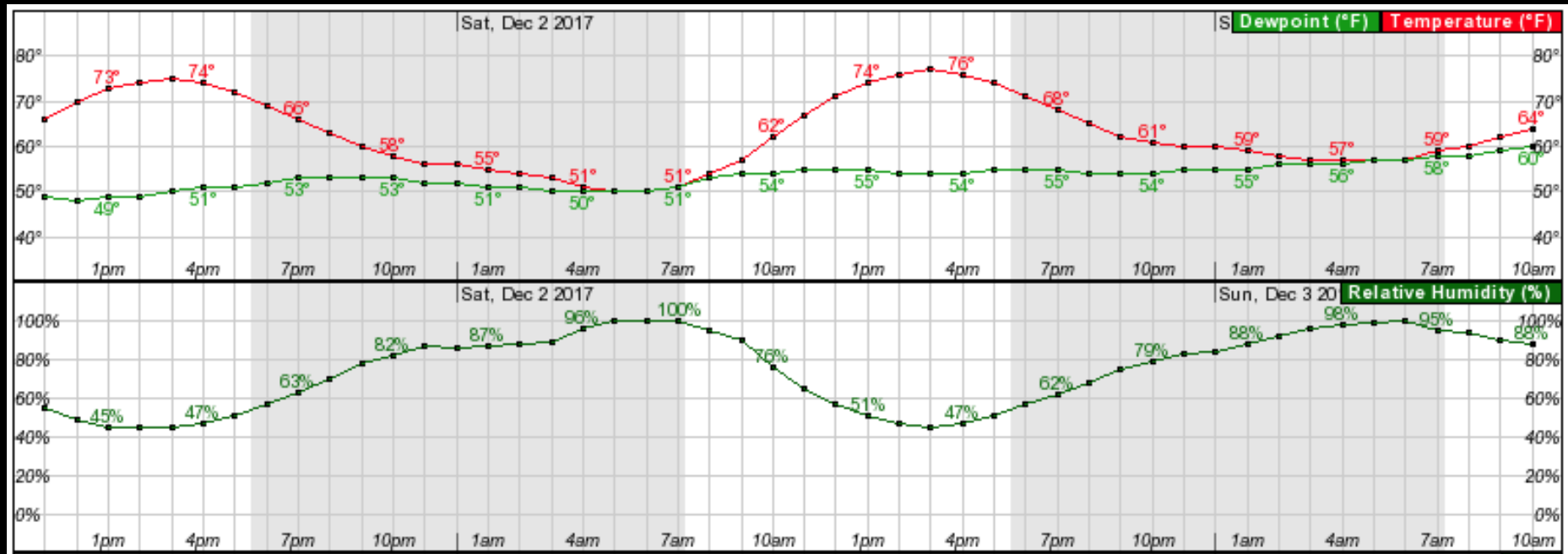
# Hydrologic Cycle

# Dew Point

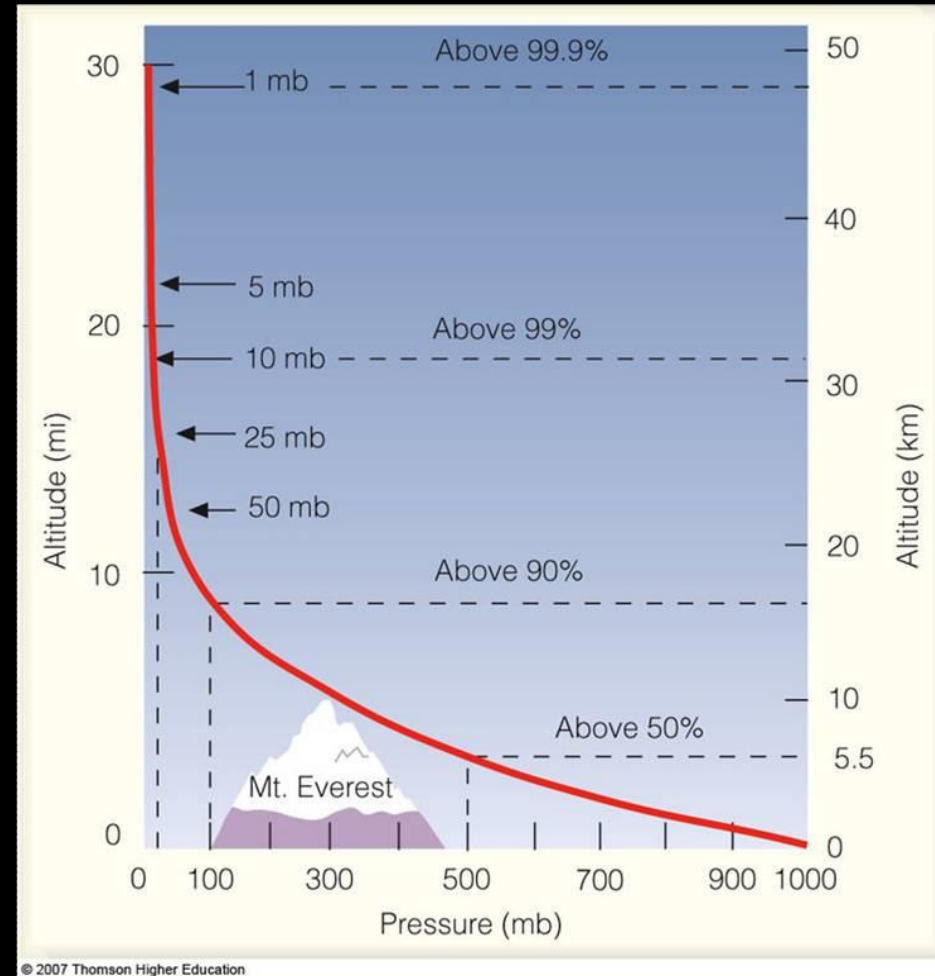
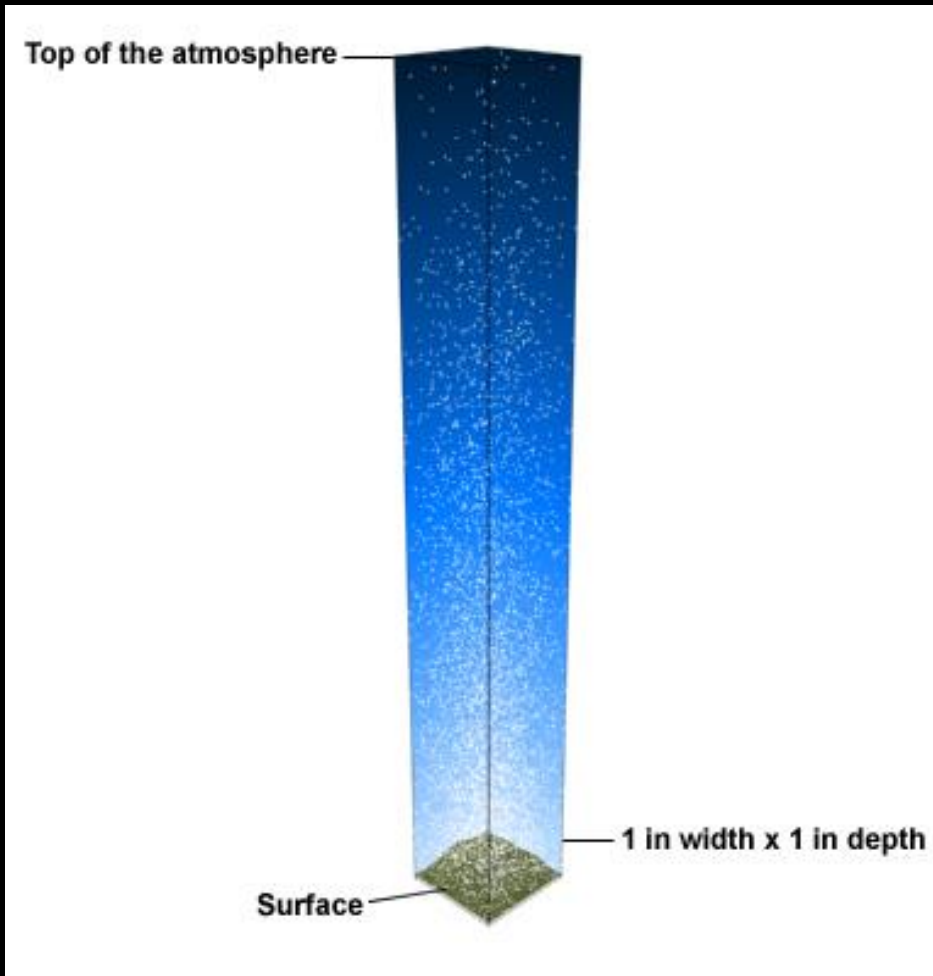


**The temperature at which water vapor begins to condense into liquid water**

# Temperature, Dew Point, and Relative Humidity Relationships



# Air Pressure



**A measure of the force or weight of air**



# Air Pressure Trends

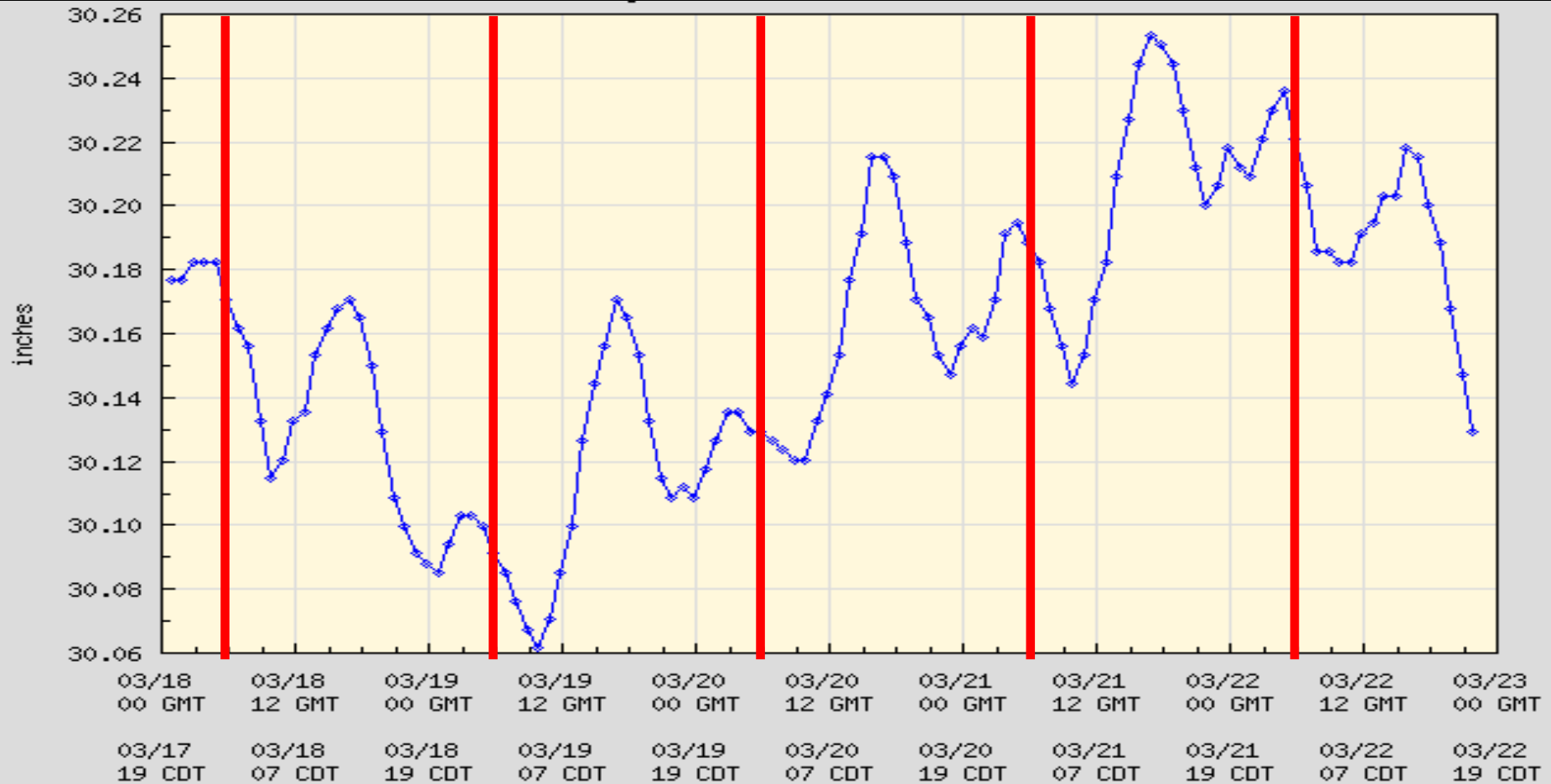
Wednesday

Thursday

Friday

Saturday

Sunday



**Air pressure rises and falls two times a day**

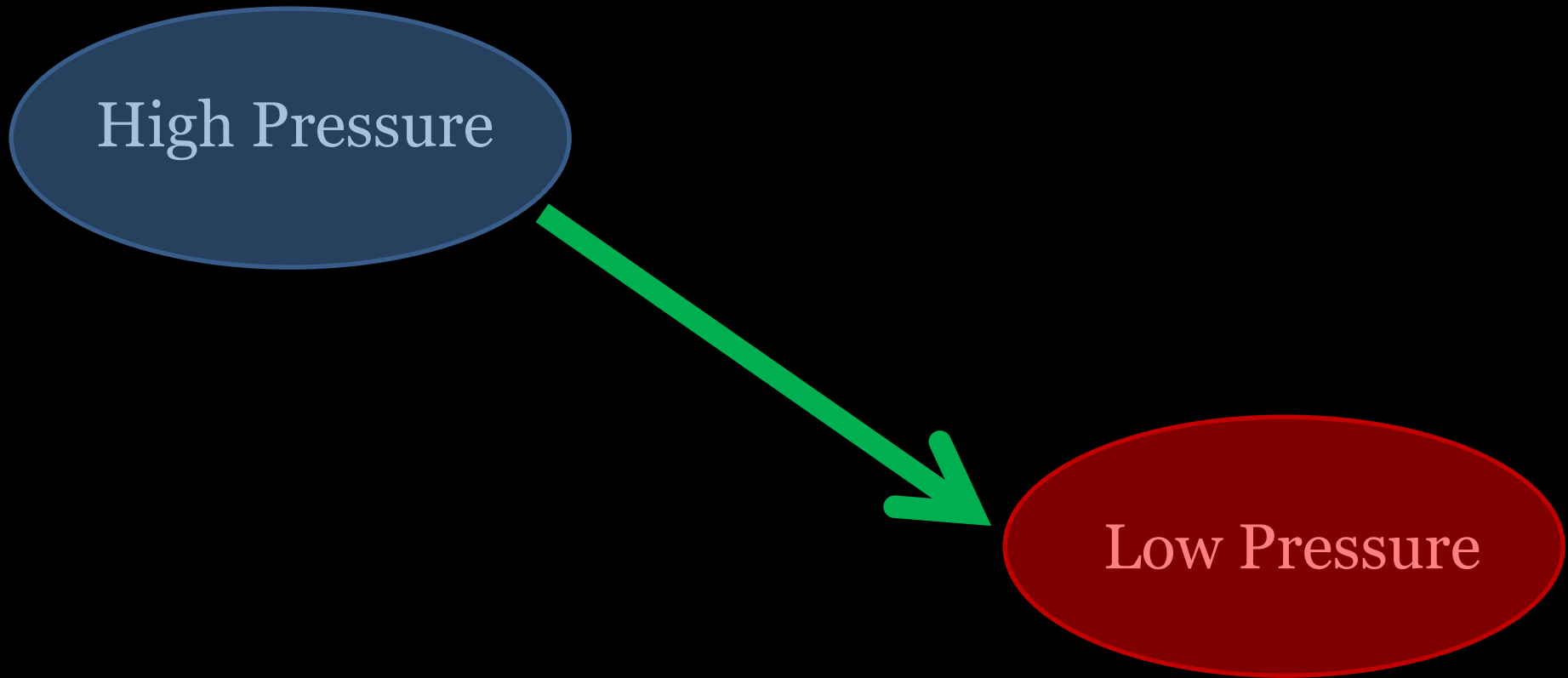
# Forces that affect Wind



- Air pressure
  - Temperature
  - humidity
- Centripetal
- Coriolis
- Friction
- Gravity

# Air Pressure Affect on Wind

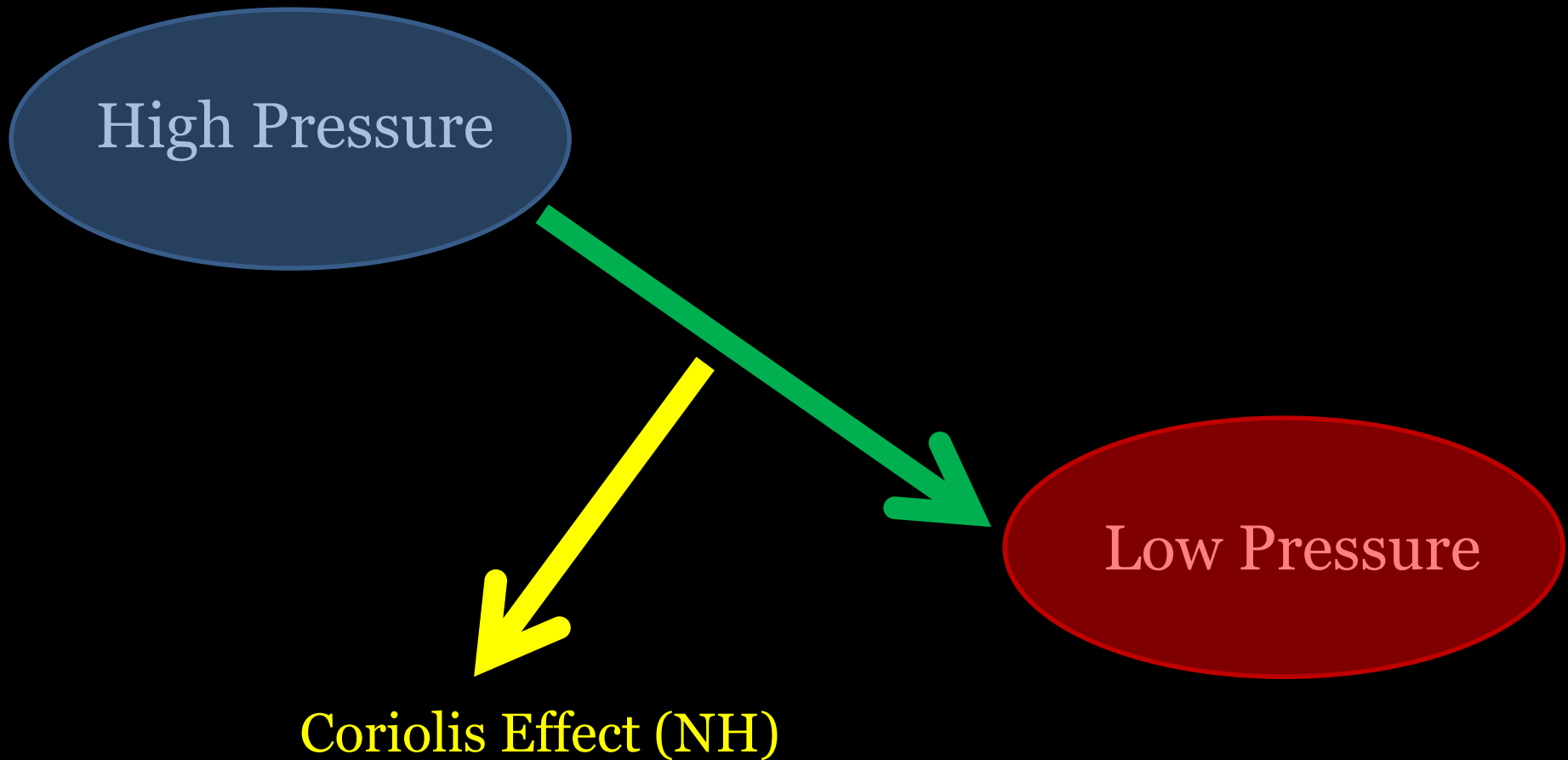
Wind flows from high pressure to low pressure





# Coriolis Effect on Wind

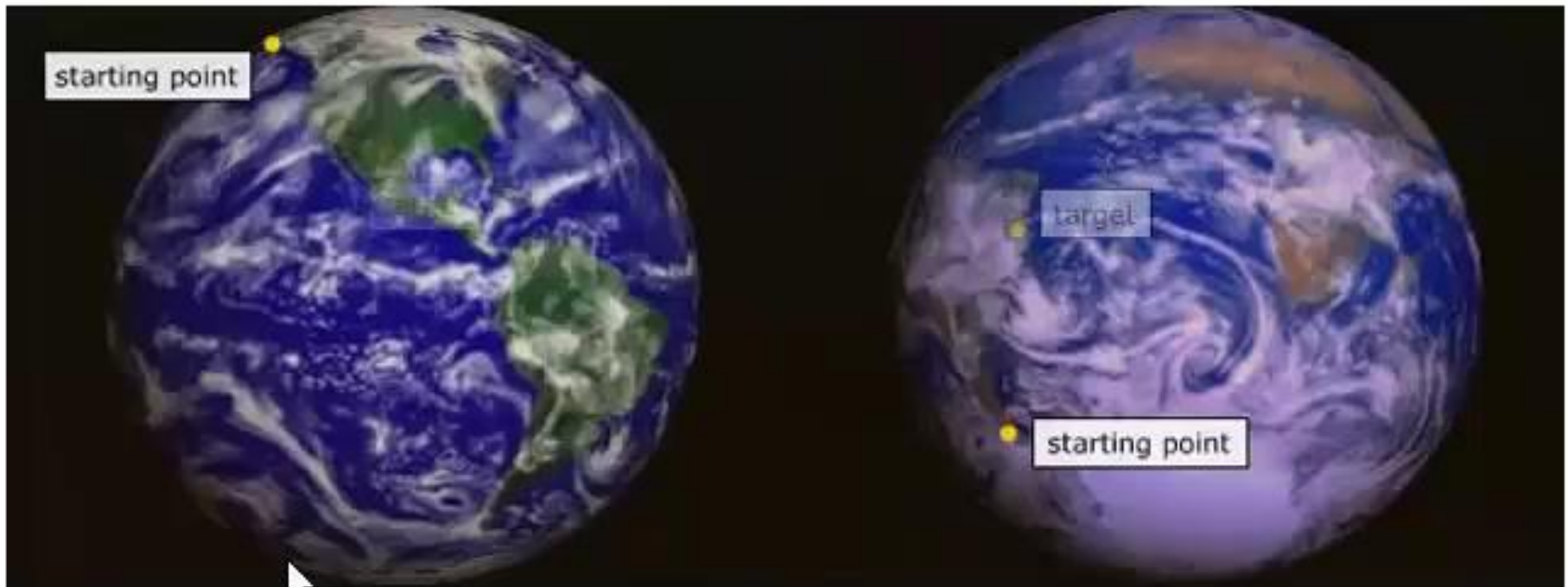
Because the Earth is rotating, it is not a direct path



# Coriolis Effect on Wind

Northern Hemisphere

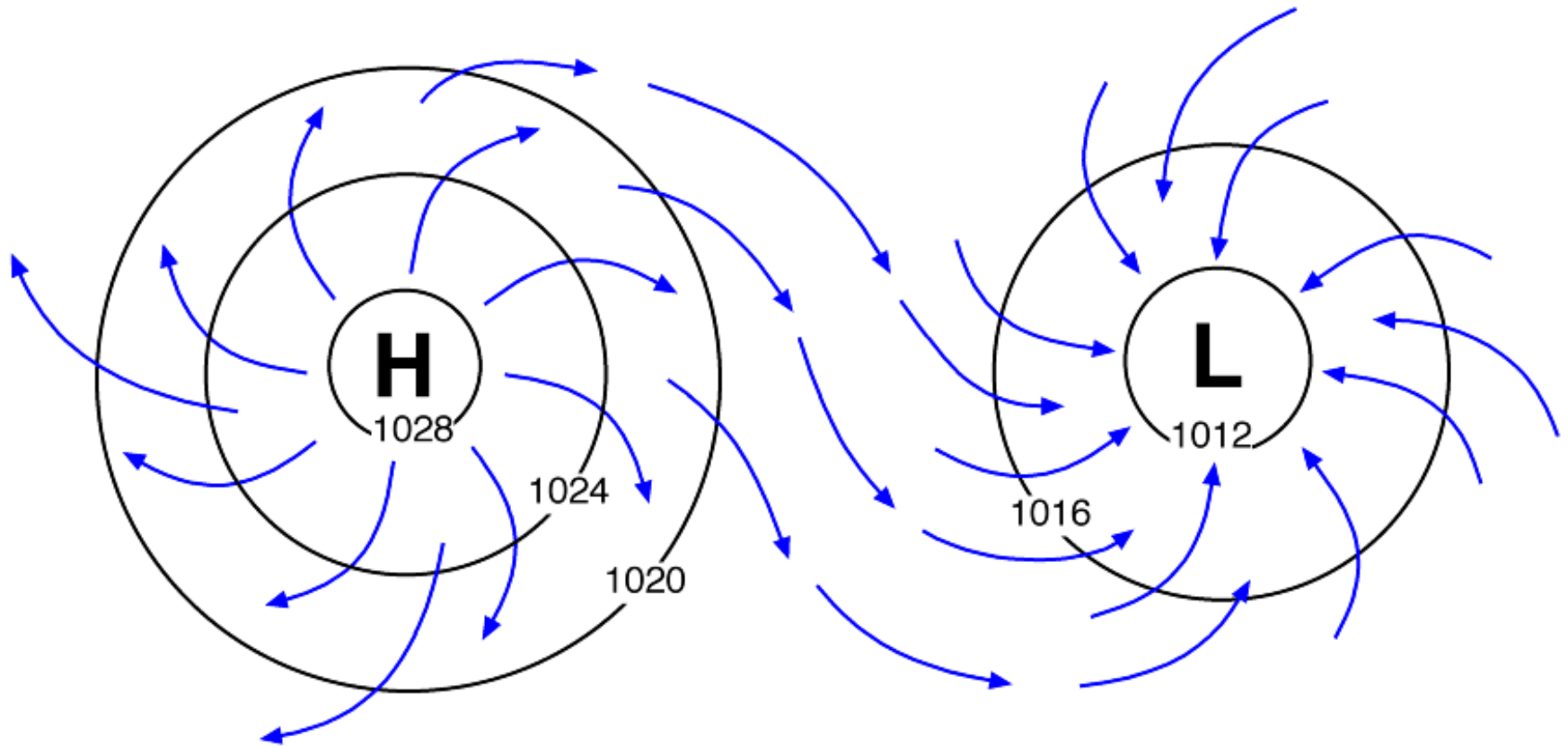
Southern Hemisphere



Courtesy of NASA

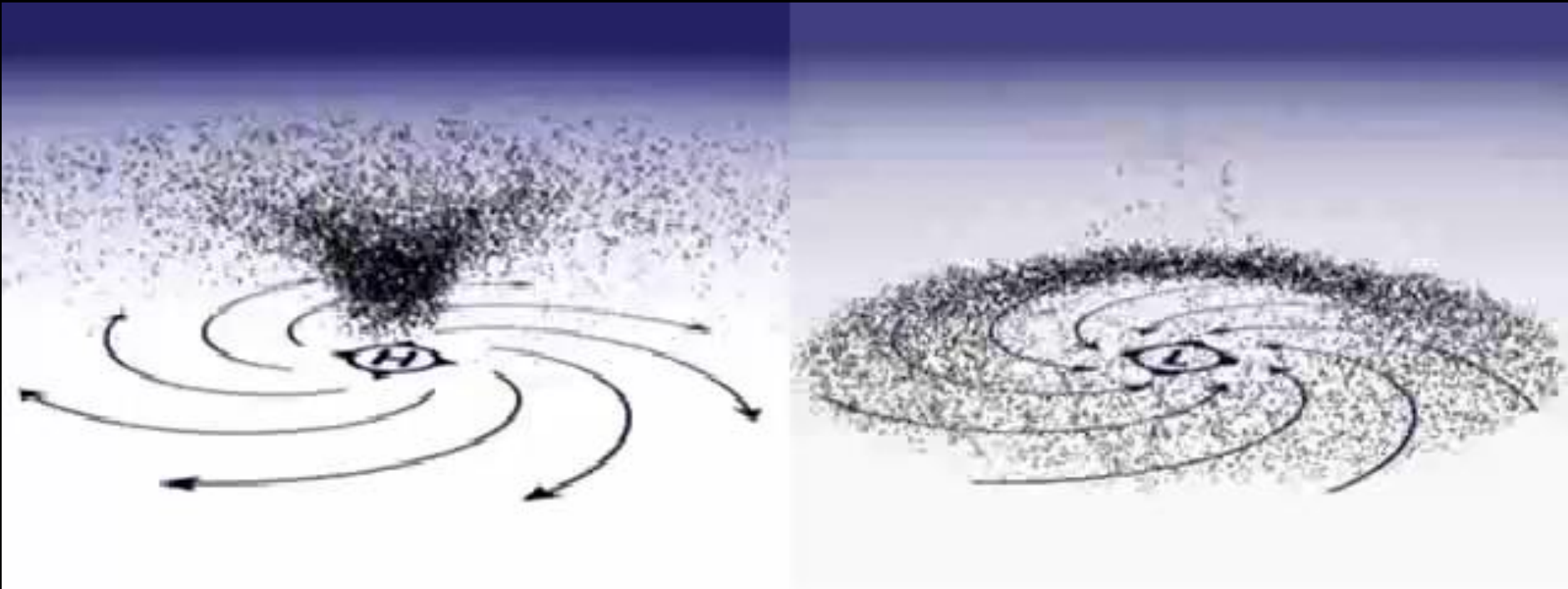
*While one perceives it traveling straight over short or long distances, in atmospheric dimensions, there is always some degree of curving taking place.*

# Coriolis Effect on Wind



A high pressure and a low pressure center with wind directions (northern hemisphere).  
Circles are isobars with pressure in mb.

# Coriolis Effect on Wind



Courtesy of NASA

*Animation displays air flow with a High Pressure System (Left) and Low Pressure System (Right)*



# Air Pressure Trends

**Rising air pressure=clearing or continued fair weather**

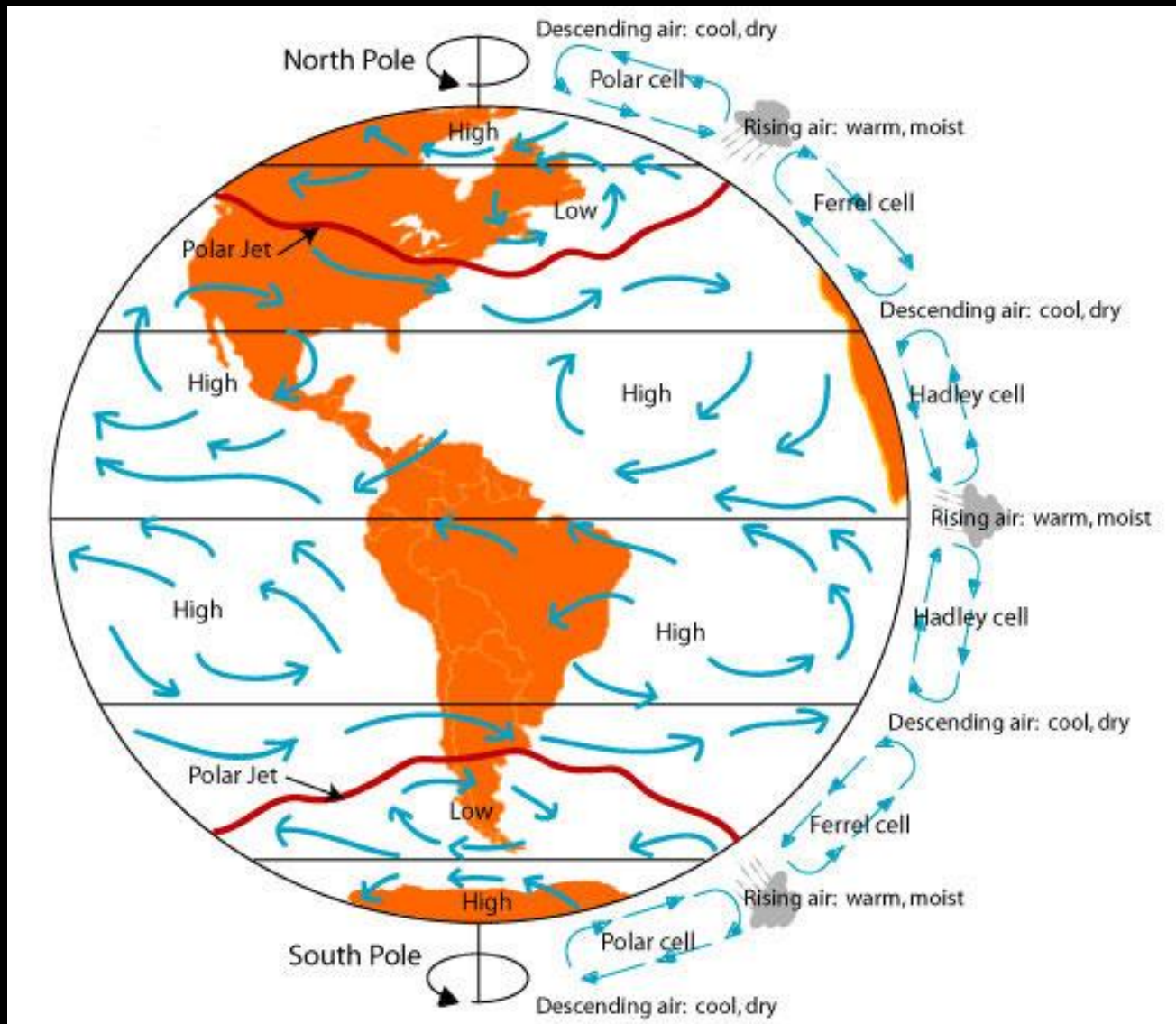


# Air Pressure Trends

Falling air pressure=stormy weather

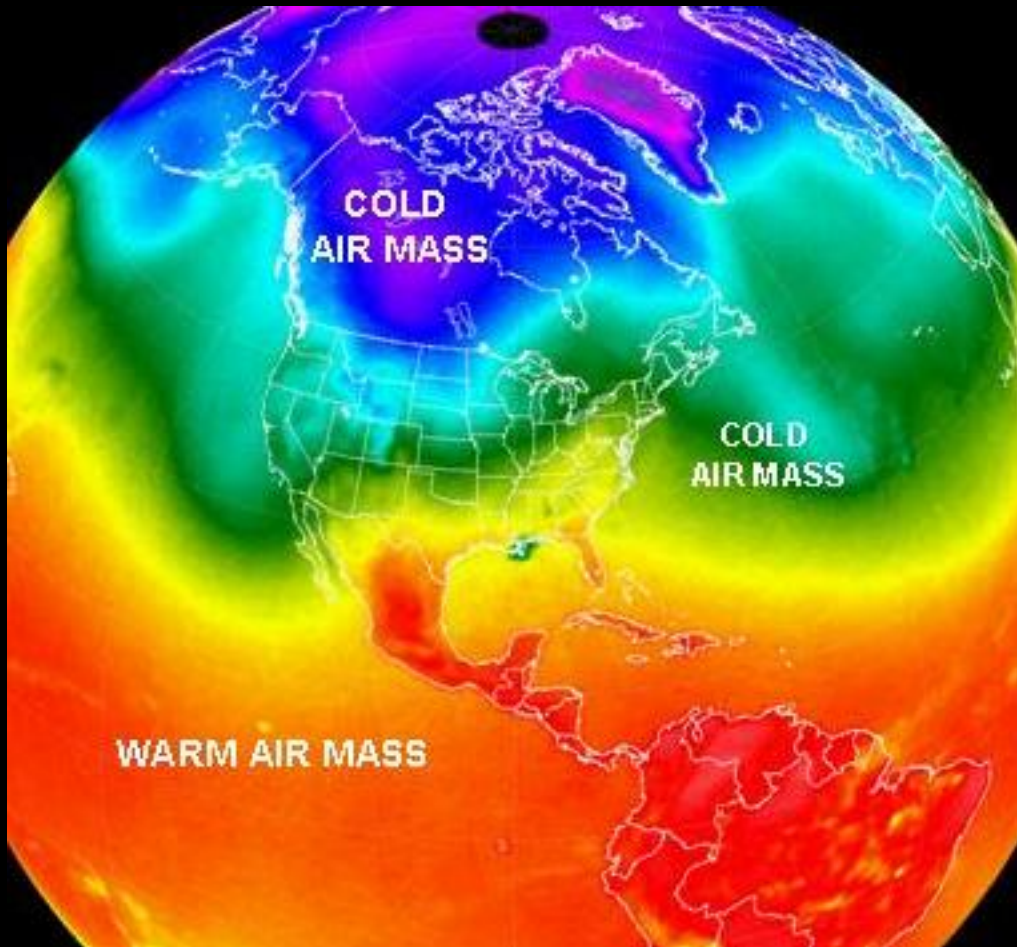


# Adding it all Together...





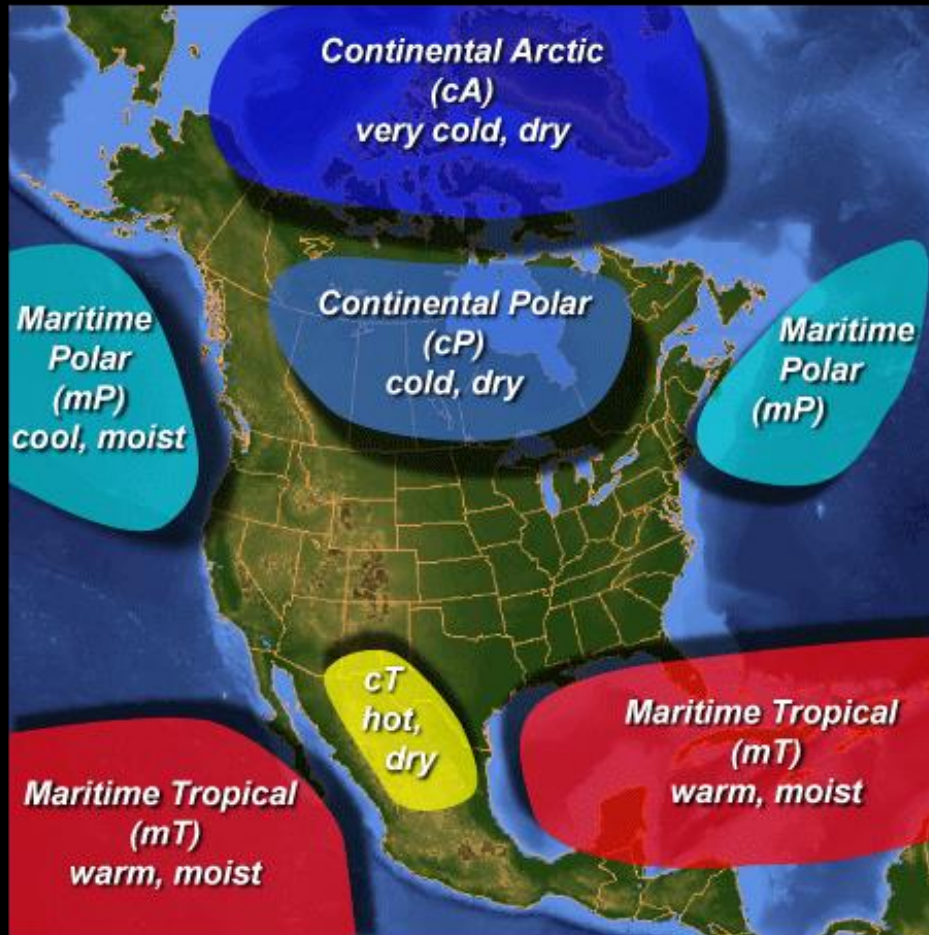
# Air Mass



**Large body of air with similar temperature and moisture characteristics in any horizontal direction**



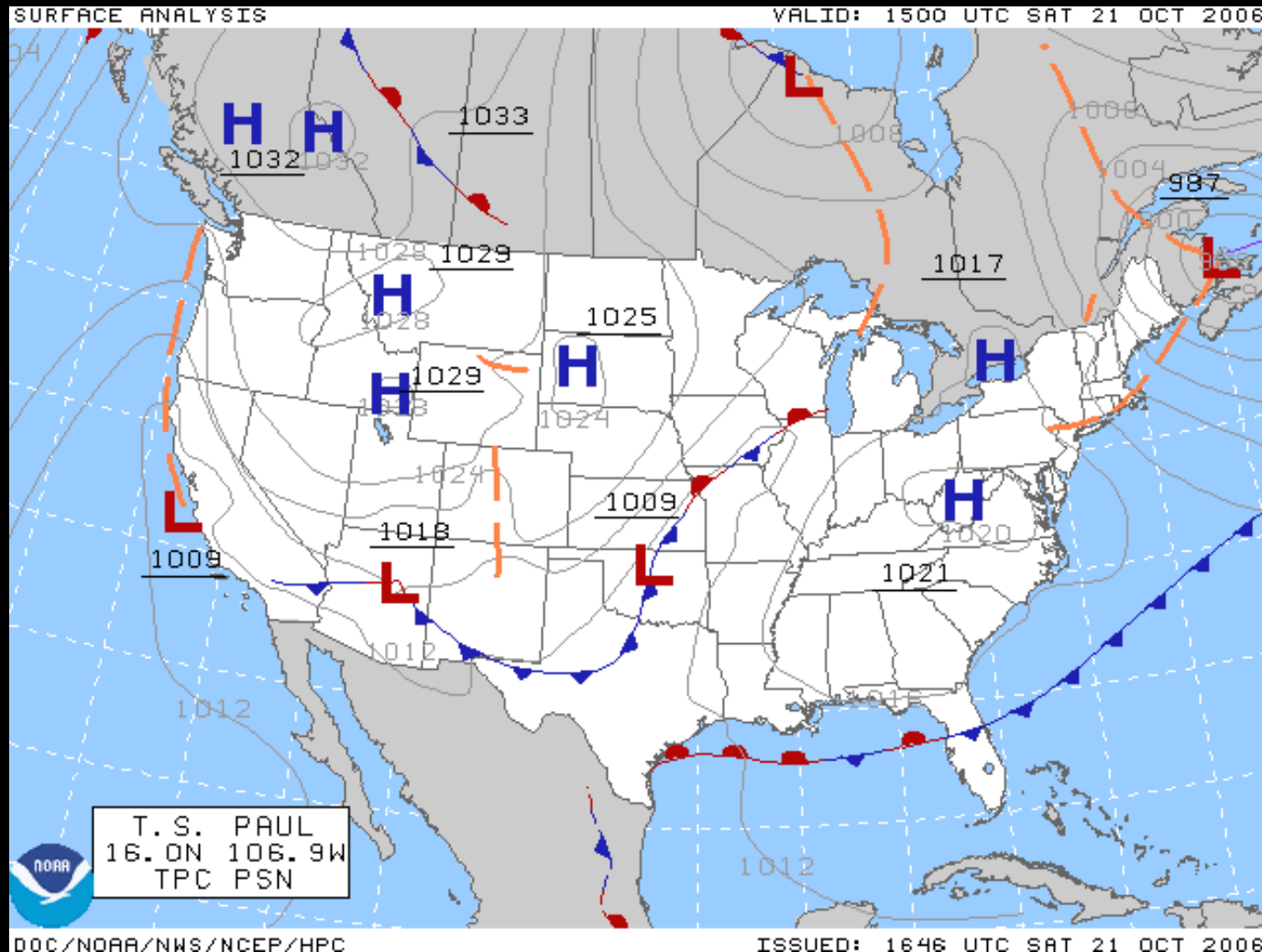
# Types of Air Masses



| Air mass             | Winter              | Summer         |
|----------------------|---------------------|----------------|
| Continental Arctic   | Bitter cold and dry | n/a            |
| Continental Polar    | Very cold and dry   | Cool and dry   |
| Continental Tropical | Warm and dry        | Hot and dry    |
| Maritime Polar       | Mild and humid      | Mild and humid |
| Maritime Tropical    | Warm and humid      | Warm and humid |

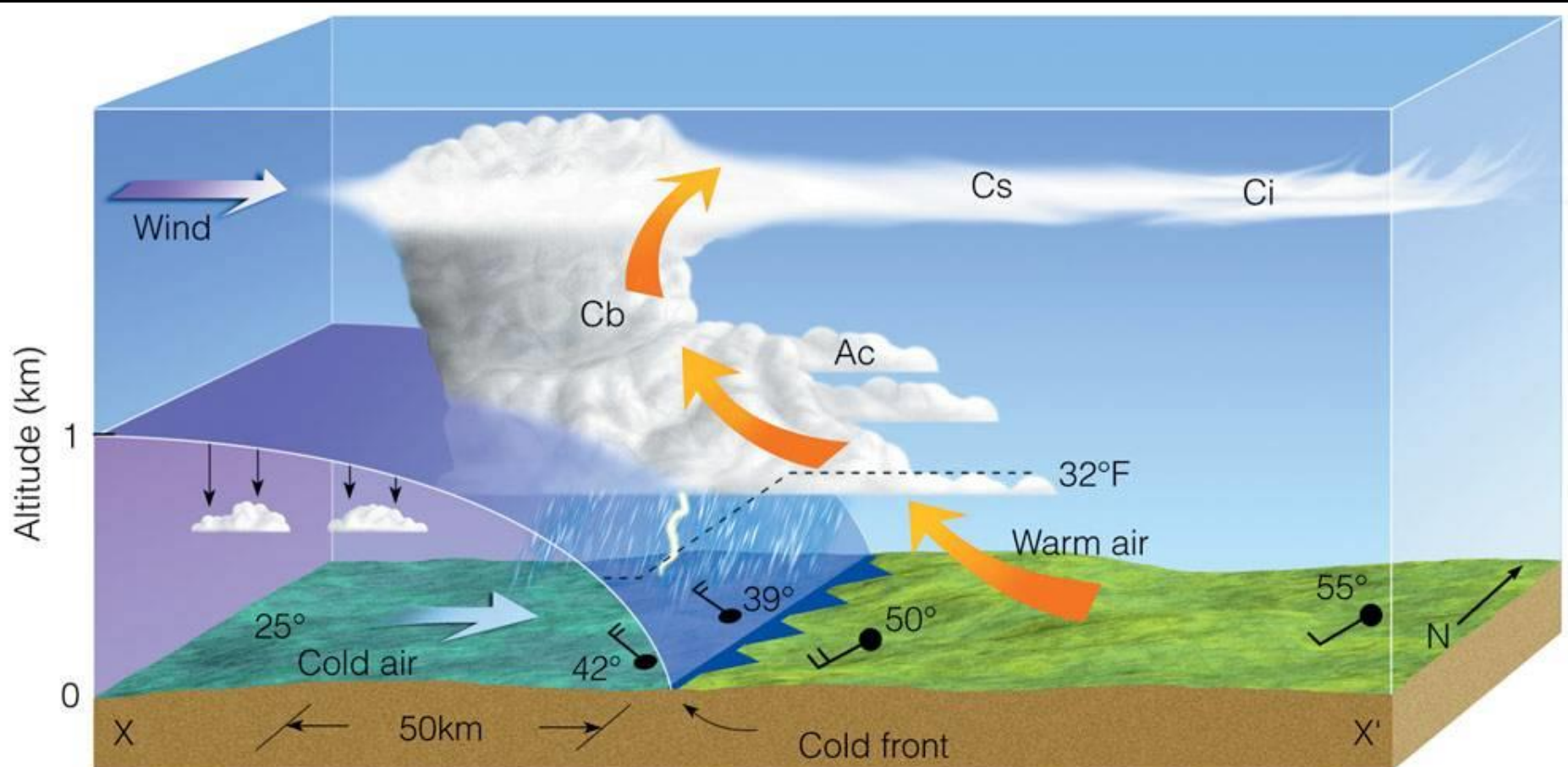
# Fronts

Fronts are boundaries between different air masses



# Cold Front

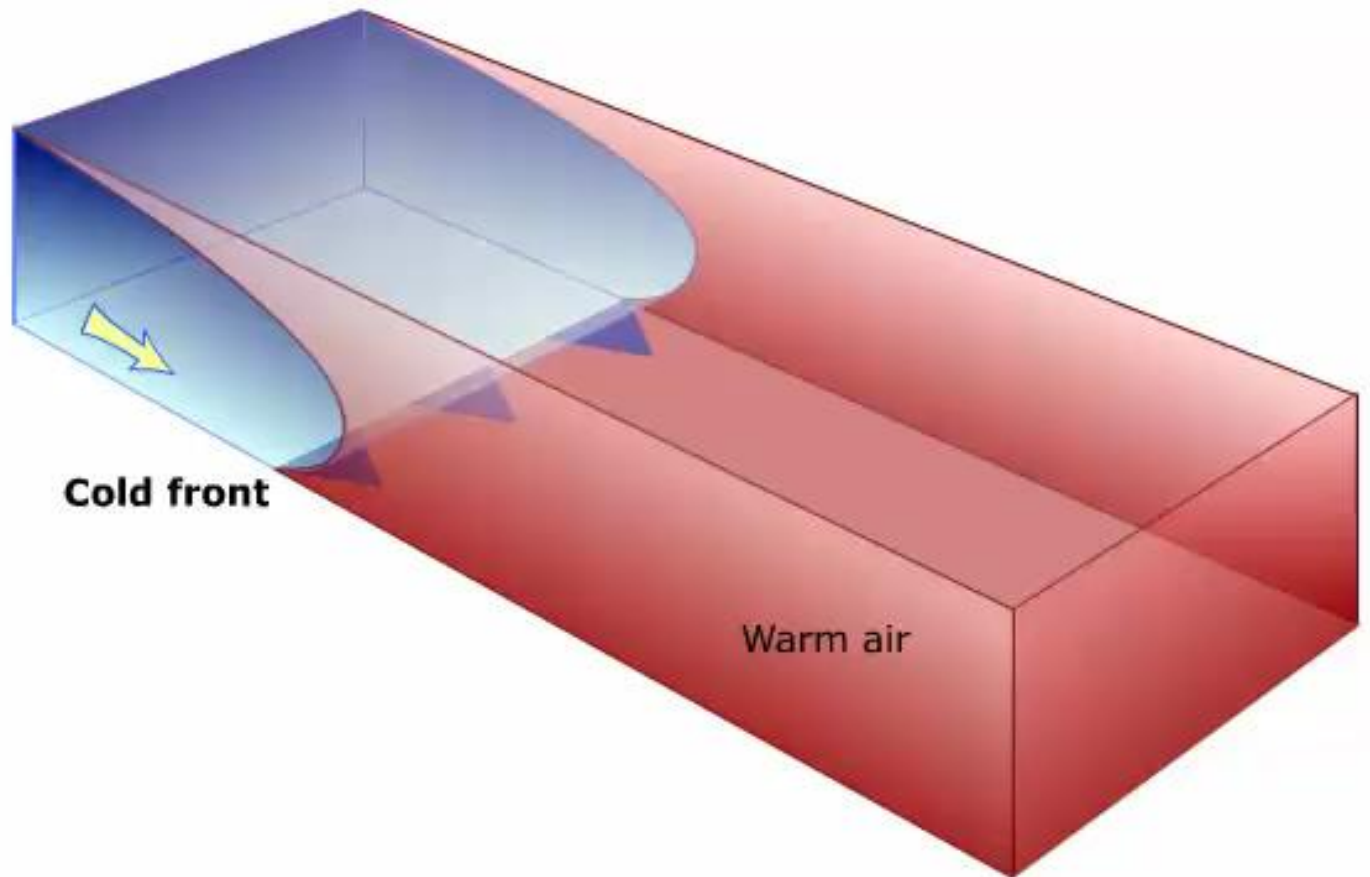
Cooler, denser air is advancing to replace warm air



# Cold Front

Cooler, denser air is advancing to replace warm air

**Cold  
Front**  
Animation



Lenni Armstrong, informmotion/Martos Hoffman, TERC

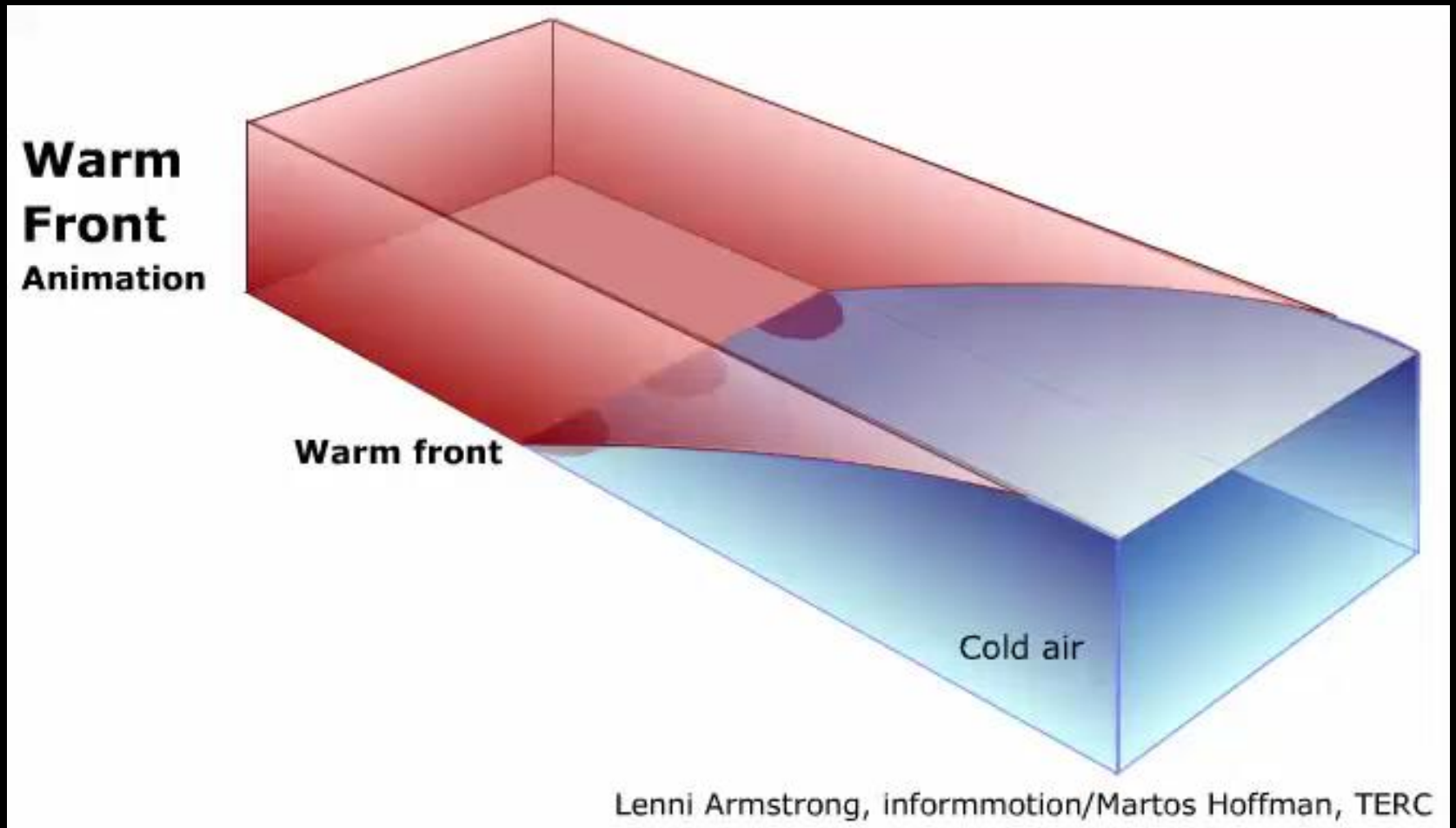


## Transition between warm air and colder air



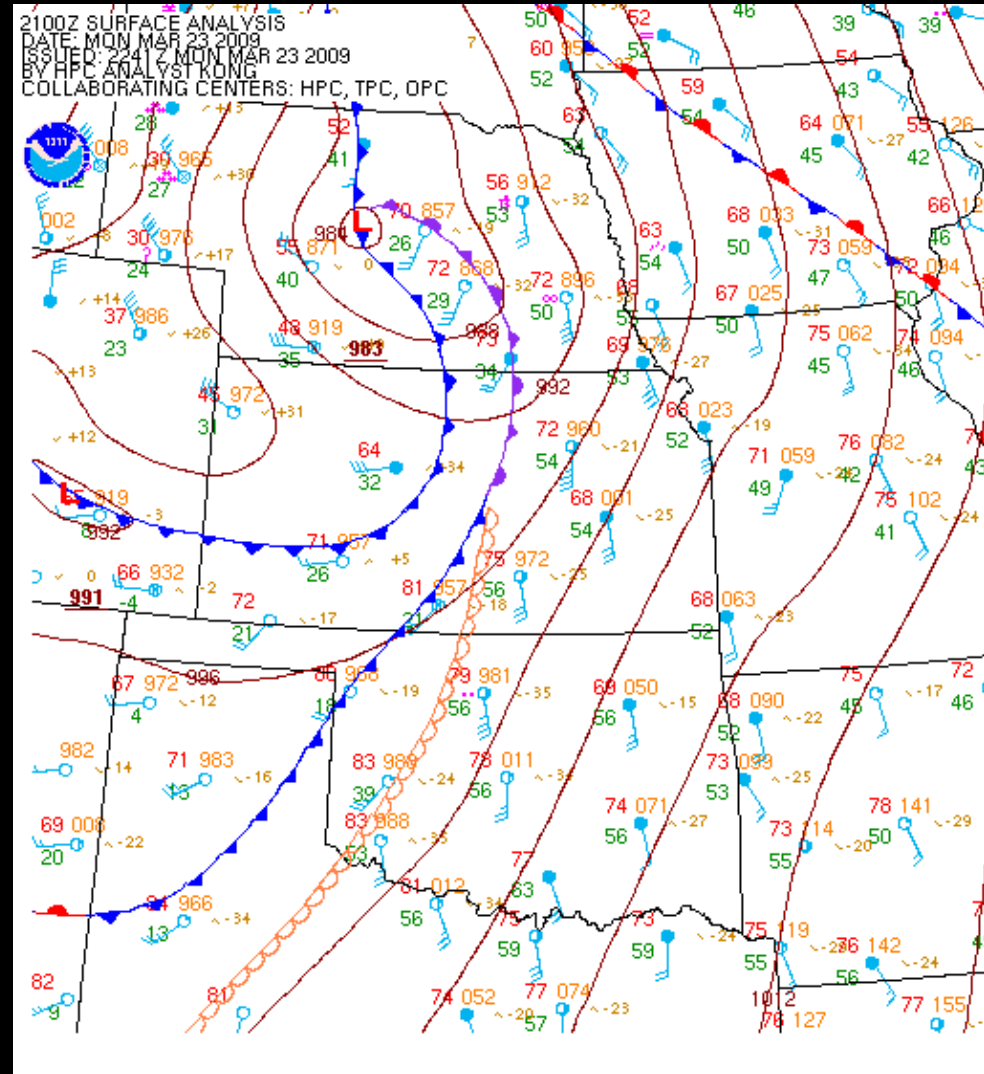
# Warm Front

Transition between warm air and colder air



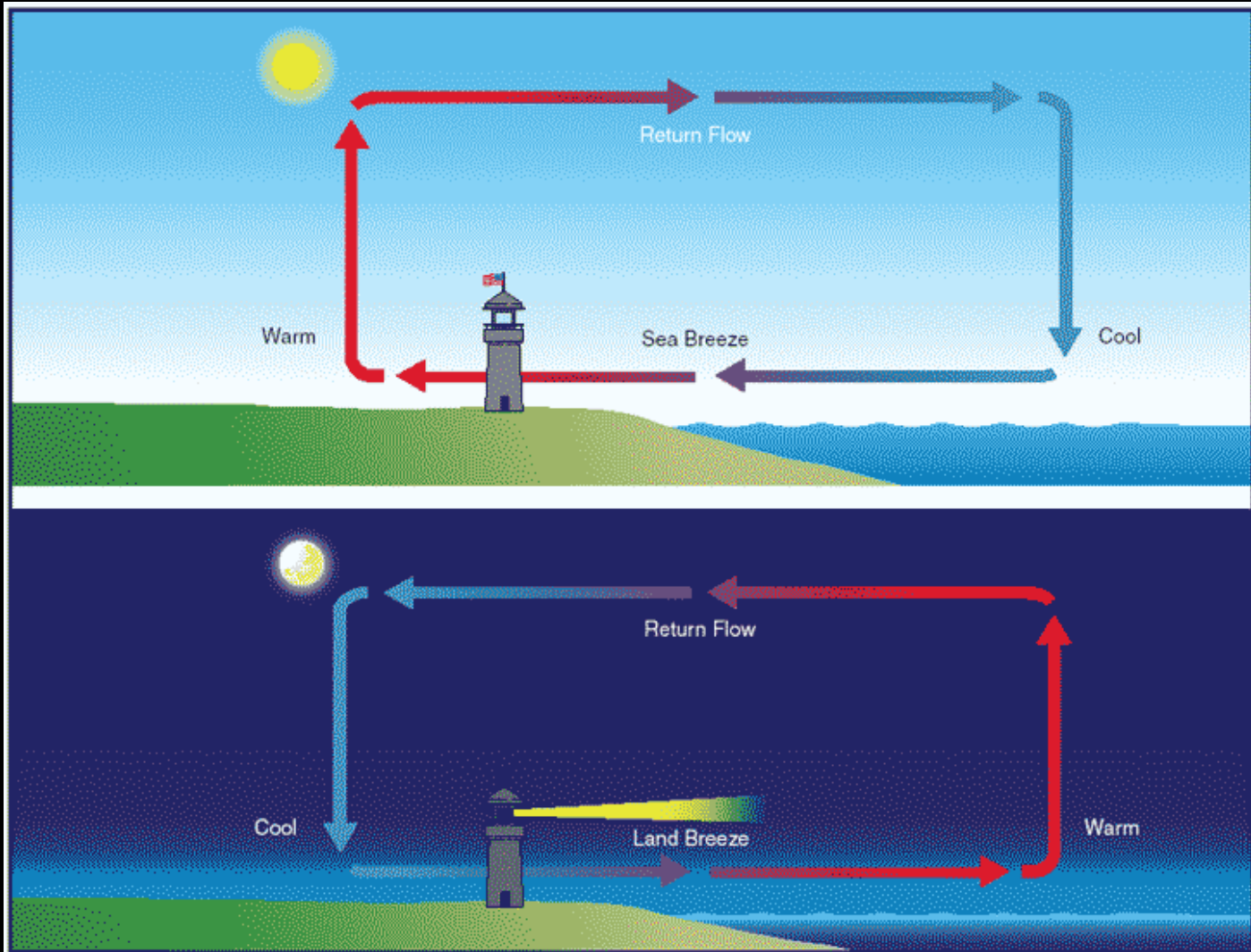
# Other Fronts

- **Stationary front**
  - Little movement
- **Occluded front**
  - Two fronts overlayed on each other
- **Squall line**
  - Line of thunderstorms
- **Dry line**
  - Boundary between dry and moist air



# Other Boundaries

## Sea breeze and land breeze





# Other Boundaries

## Sea breeze and land breeze



Courtesy of [www.classzone.com](http://www.classzone.com)

*Animation of Differential heating between land and water*

# What are clouds?



**A bunch of tiny droplets of water or ice**

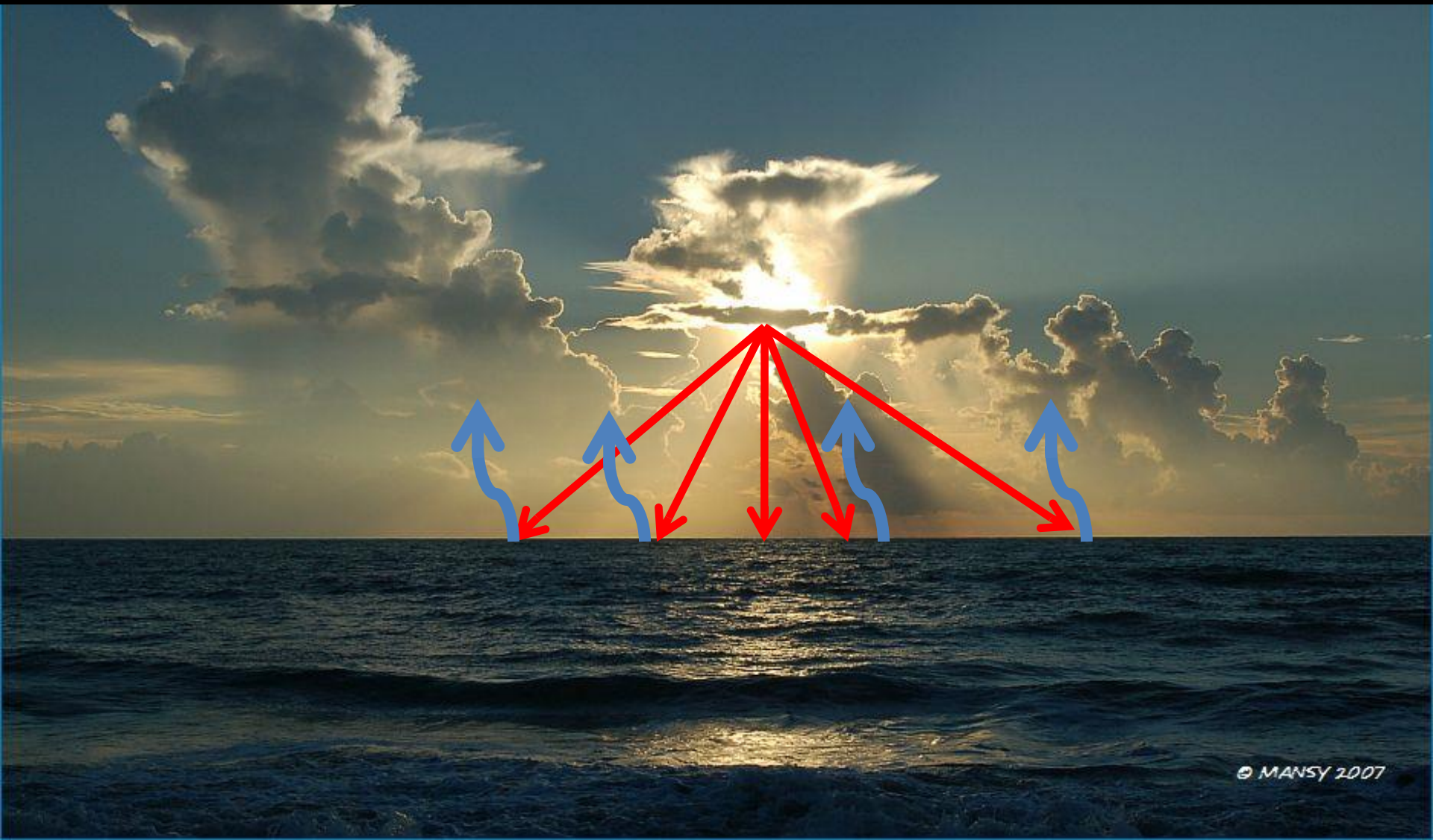


**Clouds cover 50 percent of the earth at any given time**



# 4 Ways To Make A Cloud

## 1. Surface Heating - evaporation





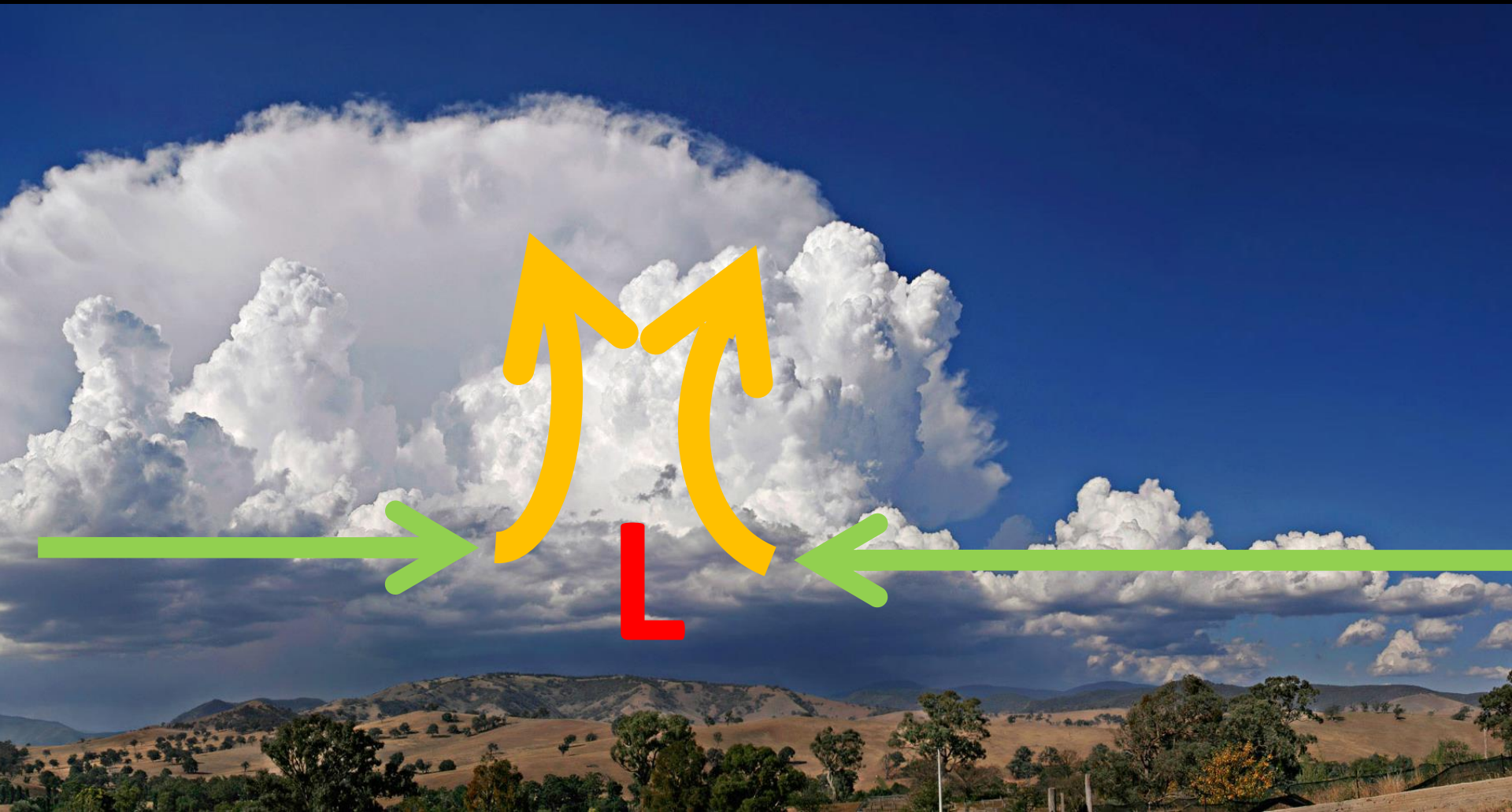
# 4 Ways To Make A Cloud

## 2. Mountains – orographic lift



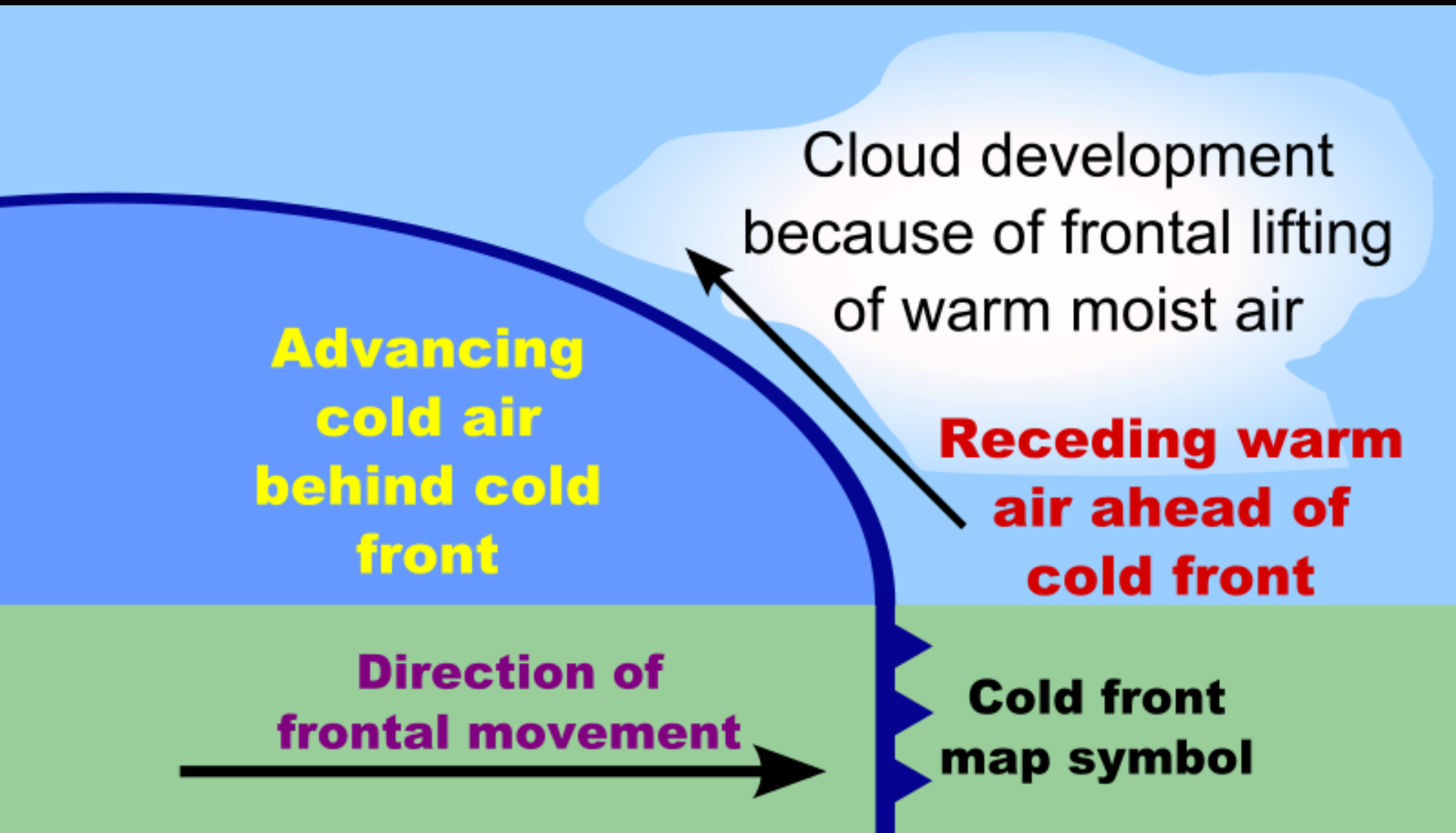
# 4 Ways To Make A Cloud

## 3. Air Pressure



# 4 Ways To Make A Cloud

## 4. Cold or Warm Front





# Cirrus Clouds

Highest clouds – above 18,000 ft





# 3 Types Of Clouds

## 2. Cumulus



# Cumulus Clouds

**Mid-level heights – 5000 to 12000 ft**



# Cumulonimbus Clouds

Can produce lightning





# Stratus Clouds

**Very low – sometimes touch the Earth**





# Weird Clouds

## Mammatus



# Ways to Monitor Clouds

## Weather Satellites





# Two Main Types of Weather Satellites

## Polar Orbiting

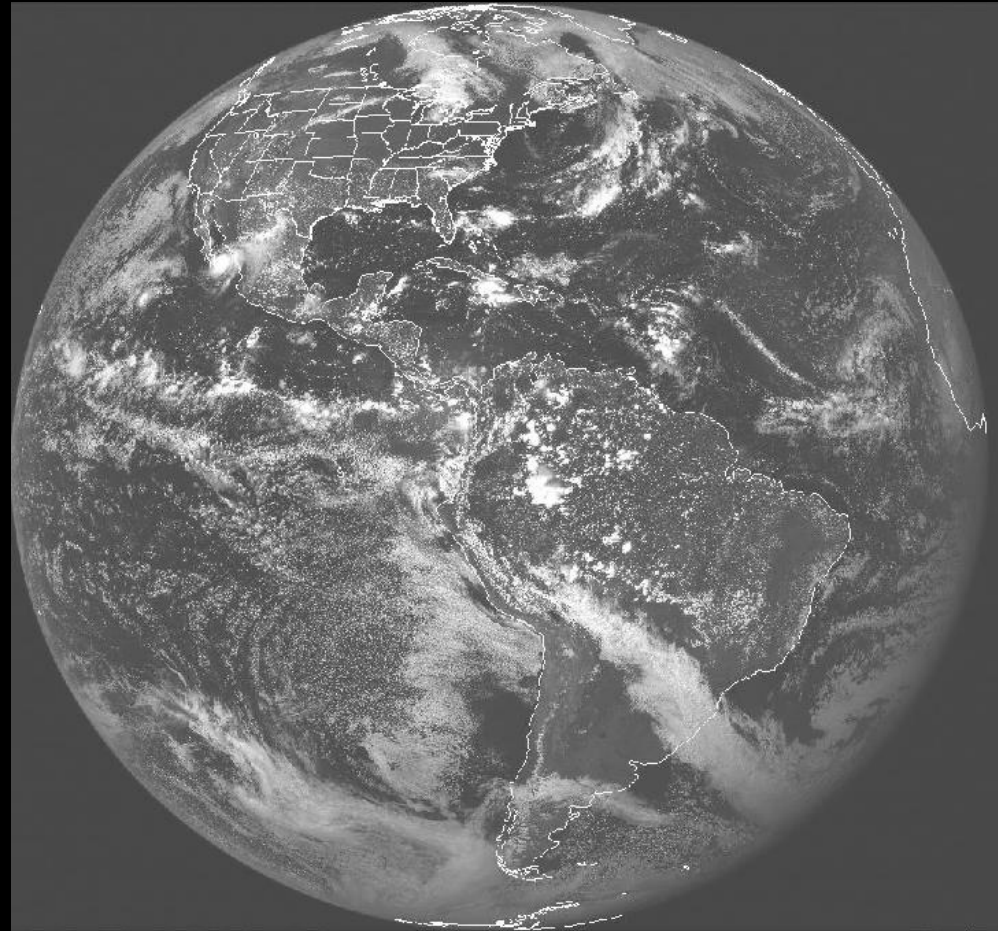
- Travel pole to pole
- Every 12 hours
- 530 miles above earth
- High resolution



# Two Main Types of Weather Satellites

## Geostationary

- Stationary over the equator
- Every 15 minutes
- 22,300 miles above earth
- High resolution

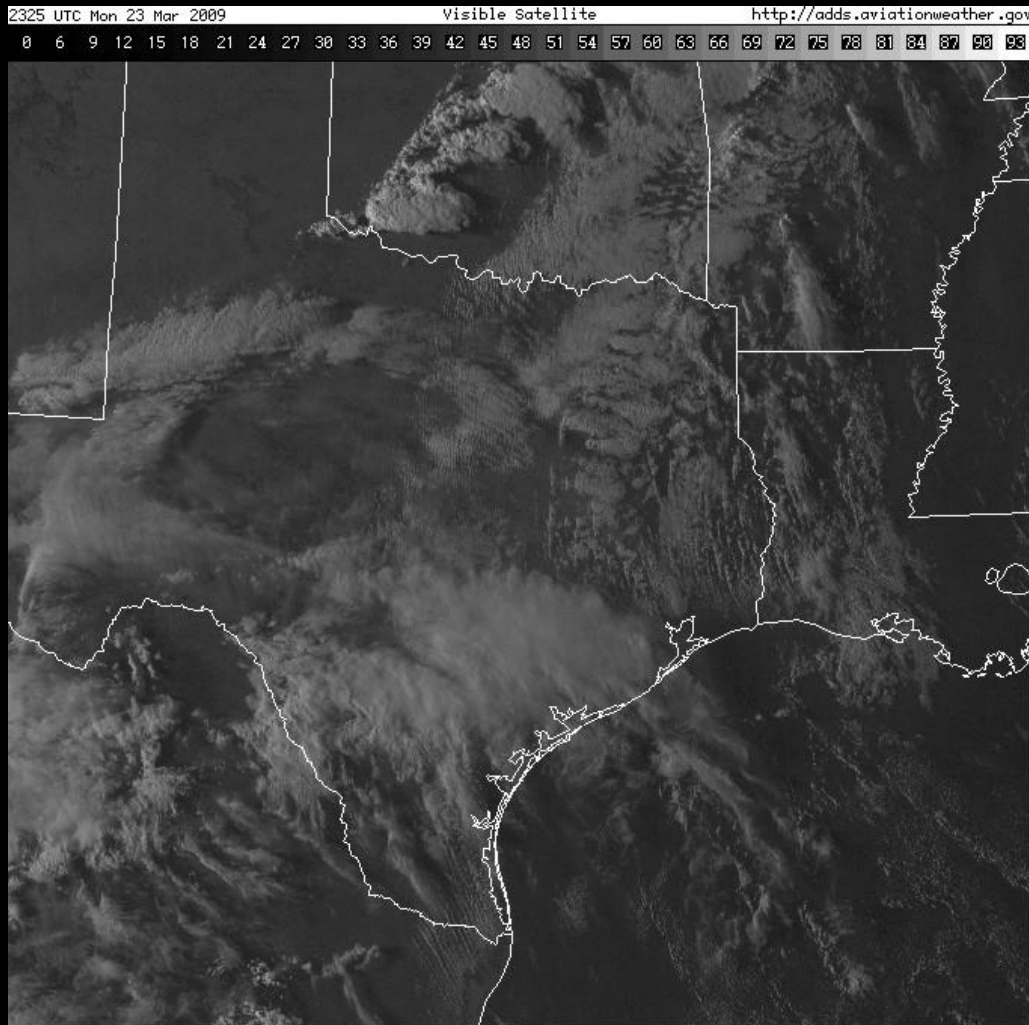


24 Aug 2003 17:45:14Z 0.65 um GOES 12

CIRA/NOAA

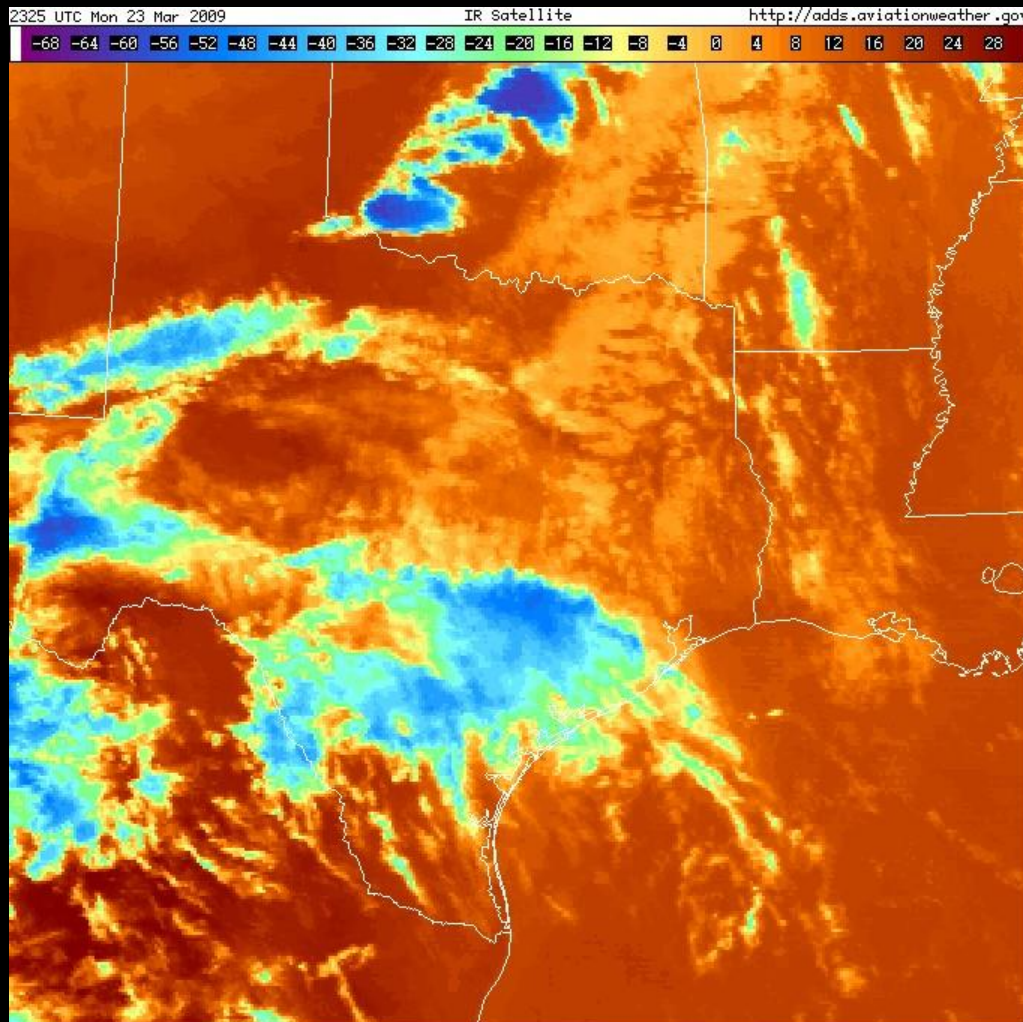


# Satellite Imagery



- Visible
- Black and white photo of Earth from space
- Resolution of 0.6 mi
- Can locate storm centers, fronts, fog banks, thunderstorms
- Also sees dust storms and snow and ice cover

# Satellite Imagery



- Infrared
- Measures the surface temperature of all objects
- Distinguish low and high clouds
- Available day or night



# Cool Texas Satellite Pictures

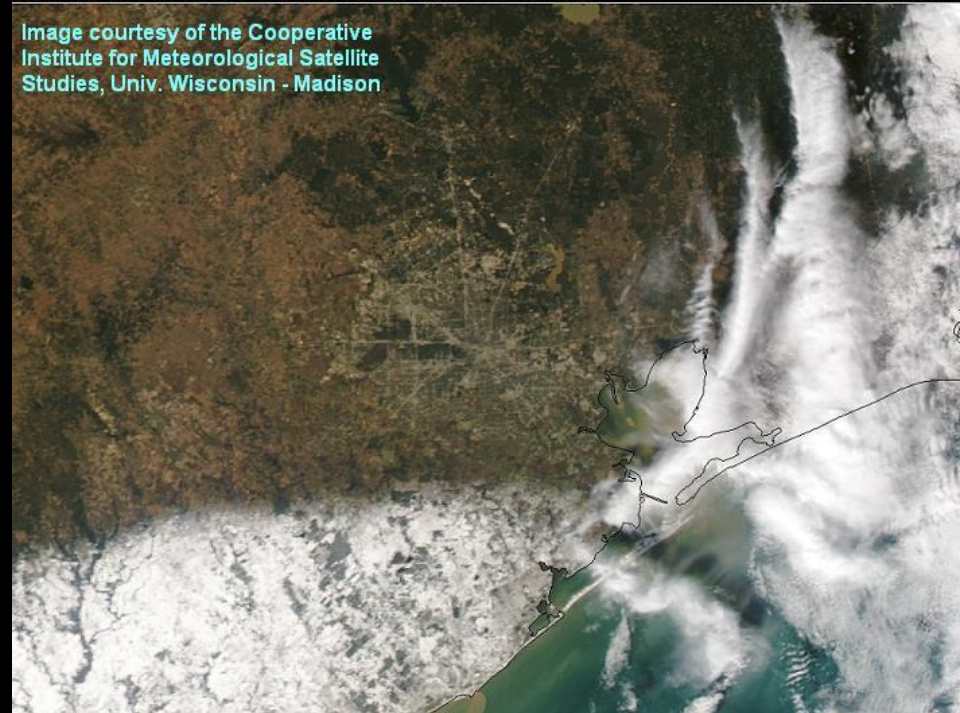
December 2004 snow



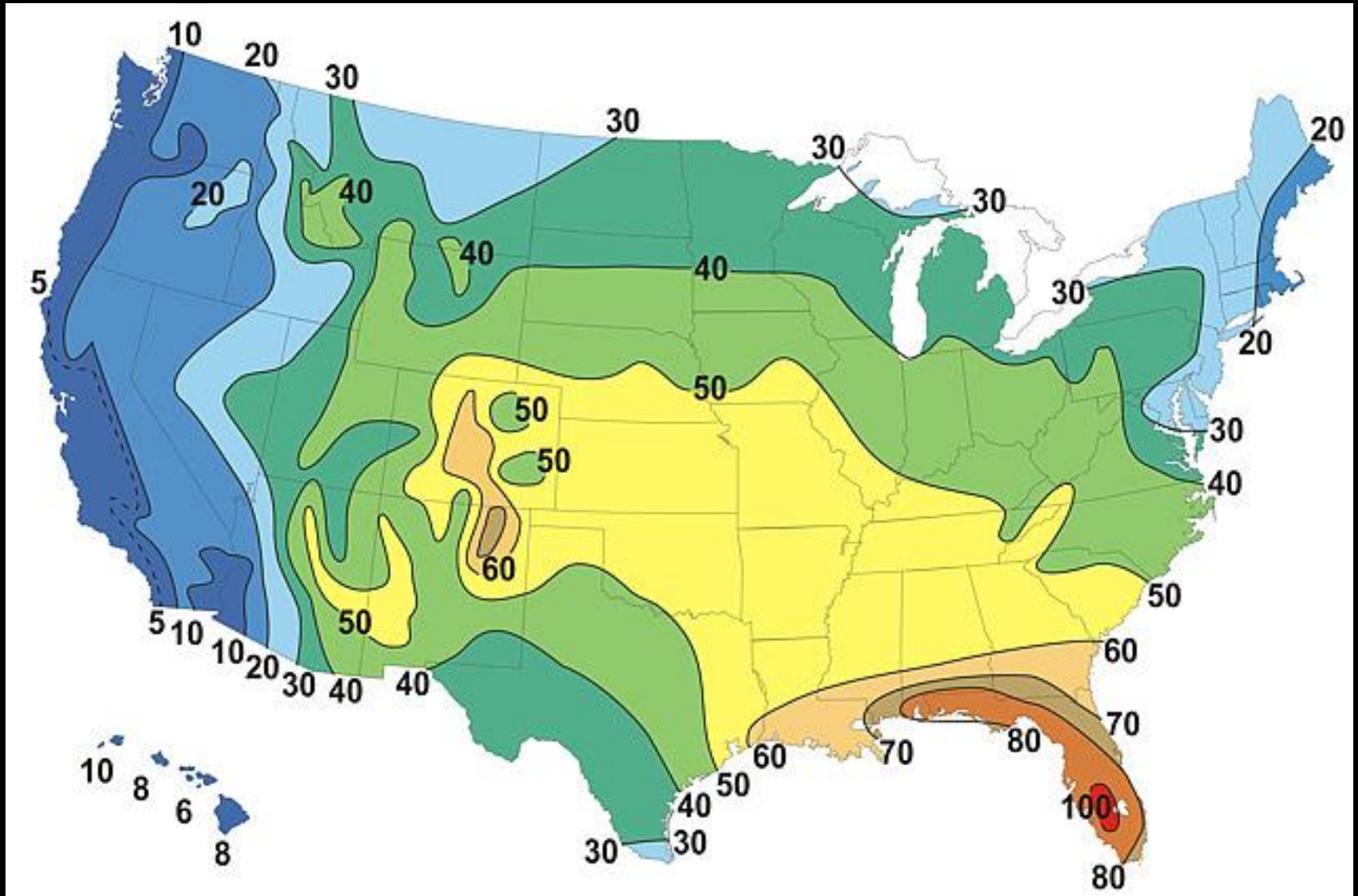
AQUA MODIS 2004-12-25 1907-1919 UTC Bands 010403: Houston TX hi-res

SSC UW-MADISON DIRECT BROADCAST

Image courtesy of the Cooperative  
Institute for Meteorological Satellite  
Studies, Univ. Wisconsin - Madison

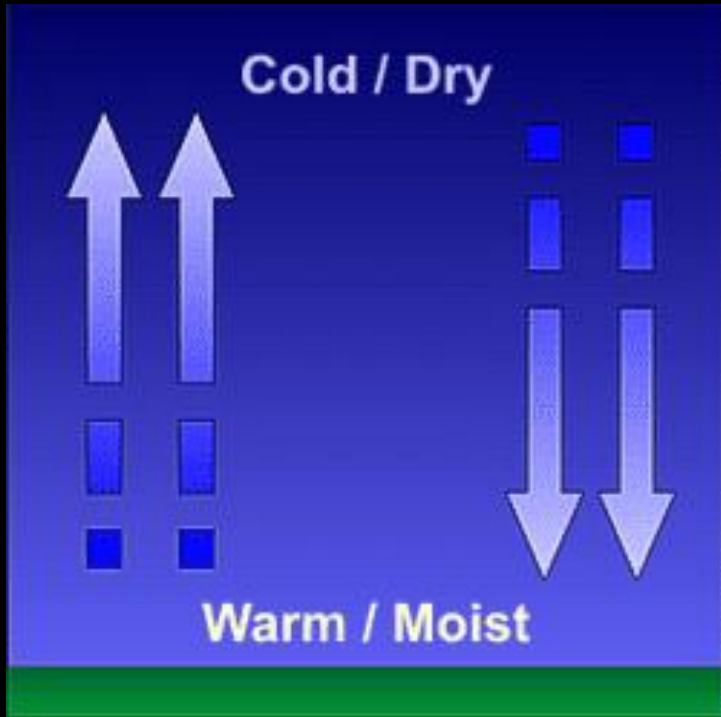


# Thunderstorm Climatology

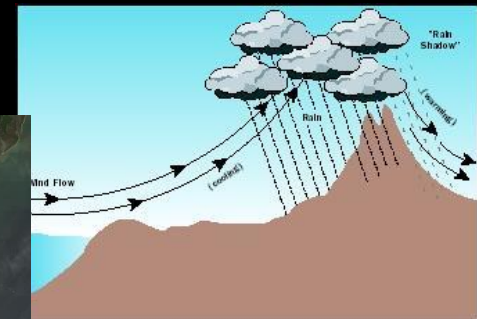
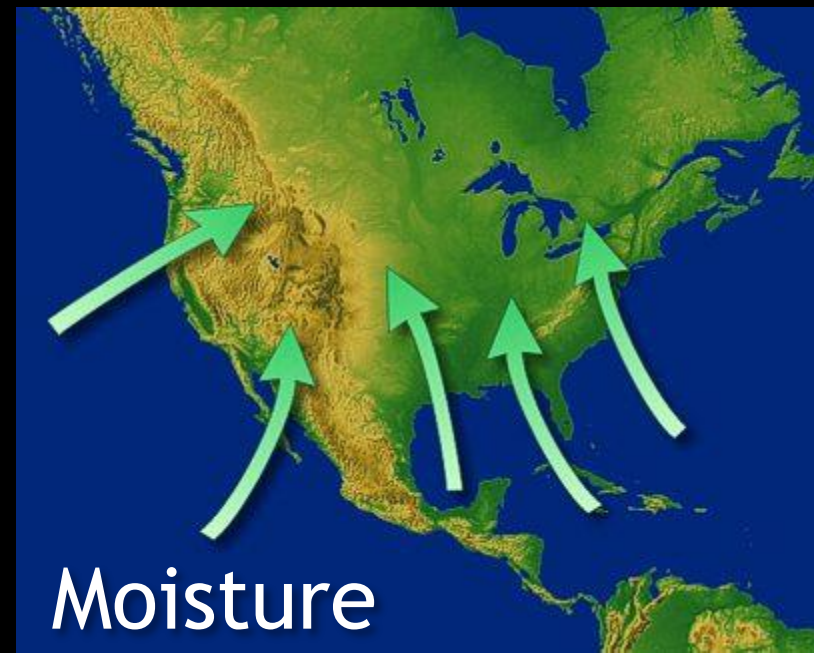




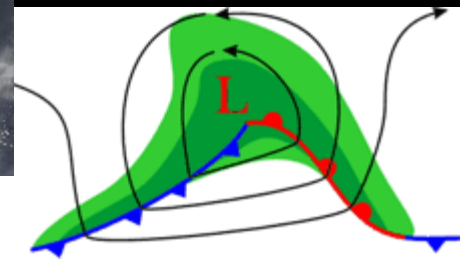
# Thunderstorm Ingredients



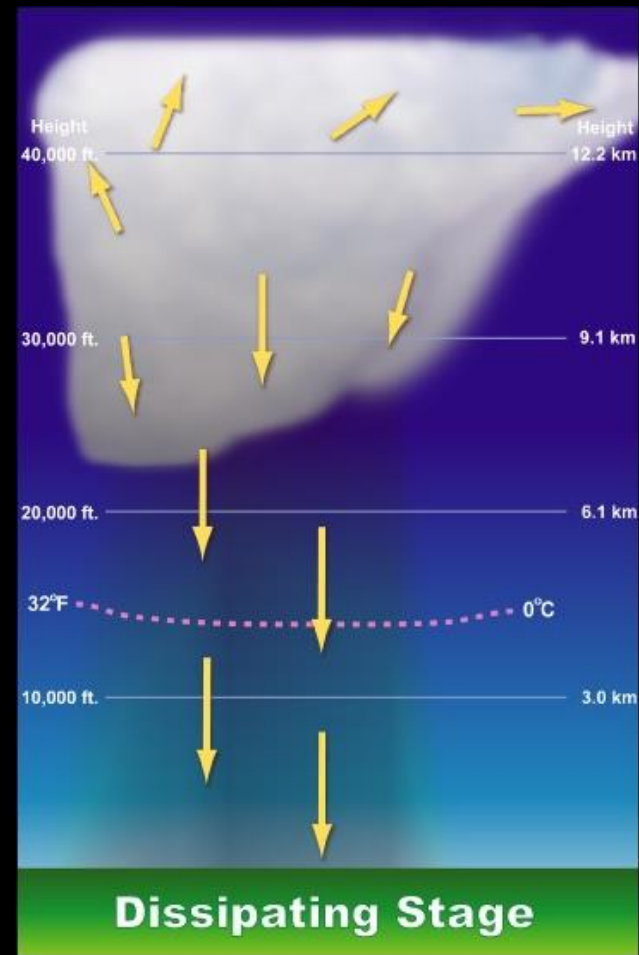
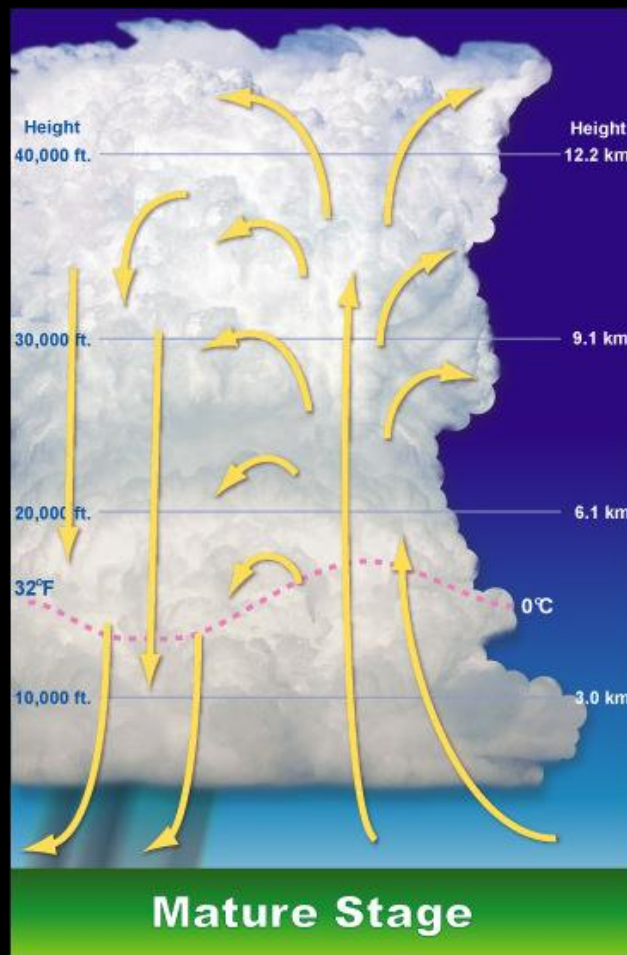
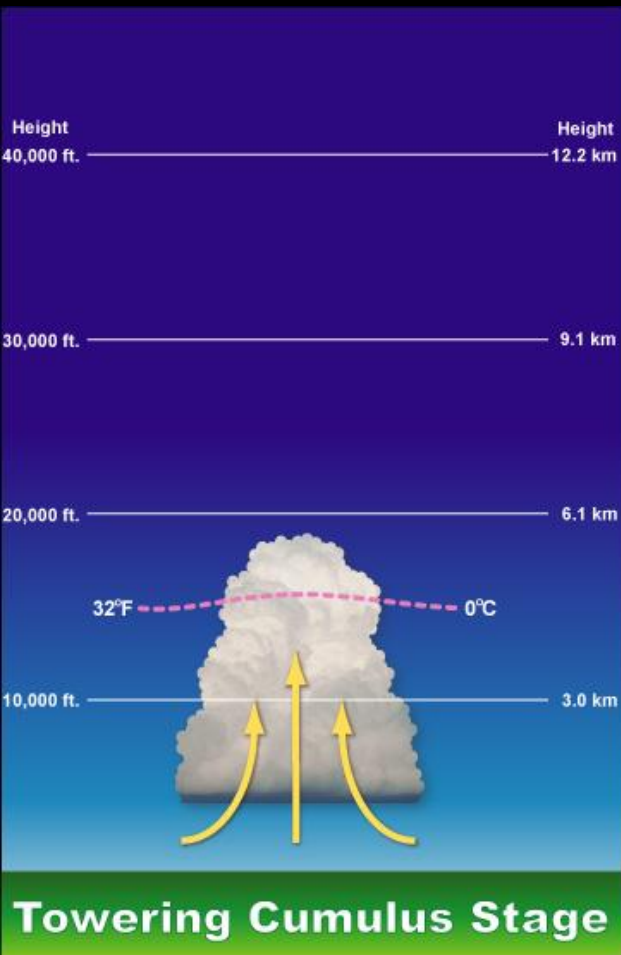
Instability



Lift



# Thunderstorm Life Cycle



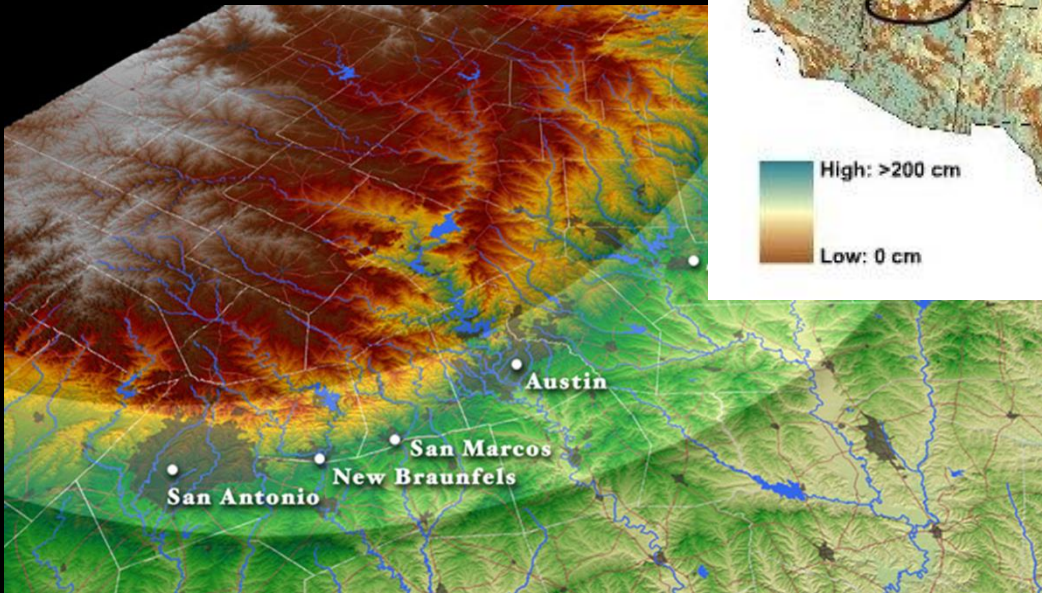
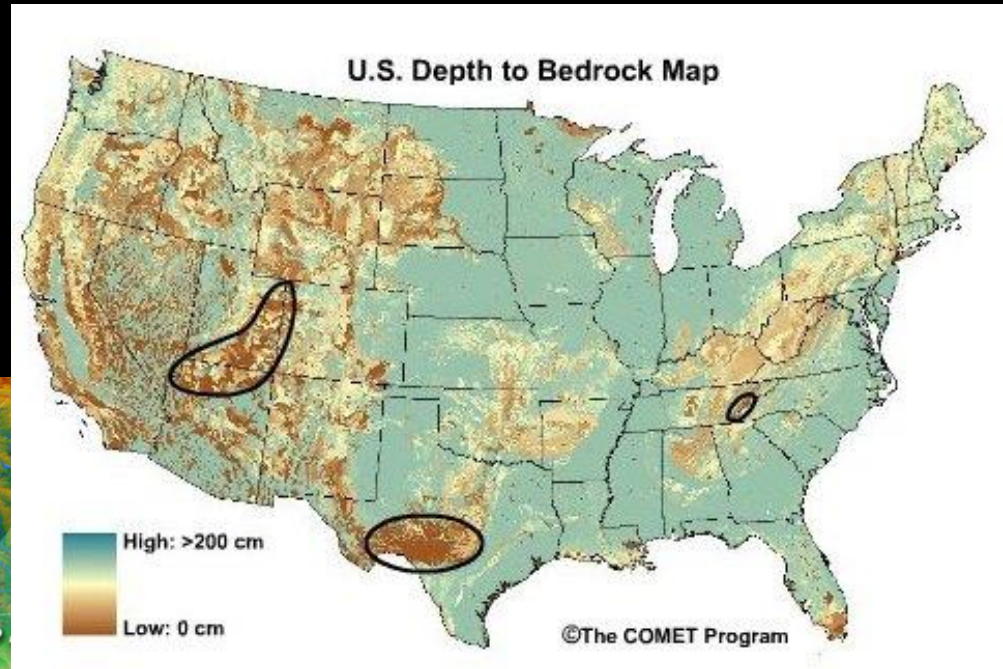


# Thunderstorm Hazards

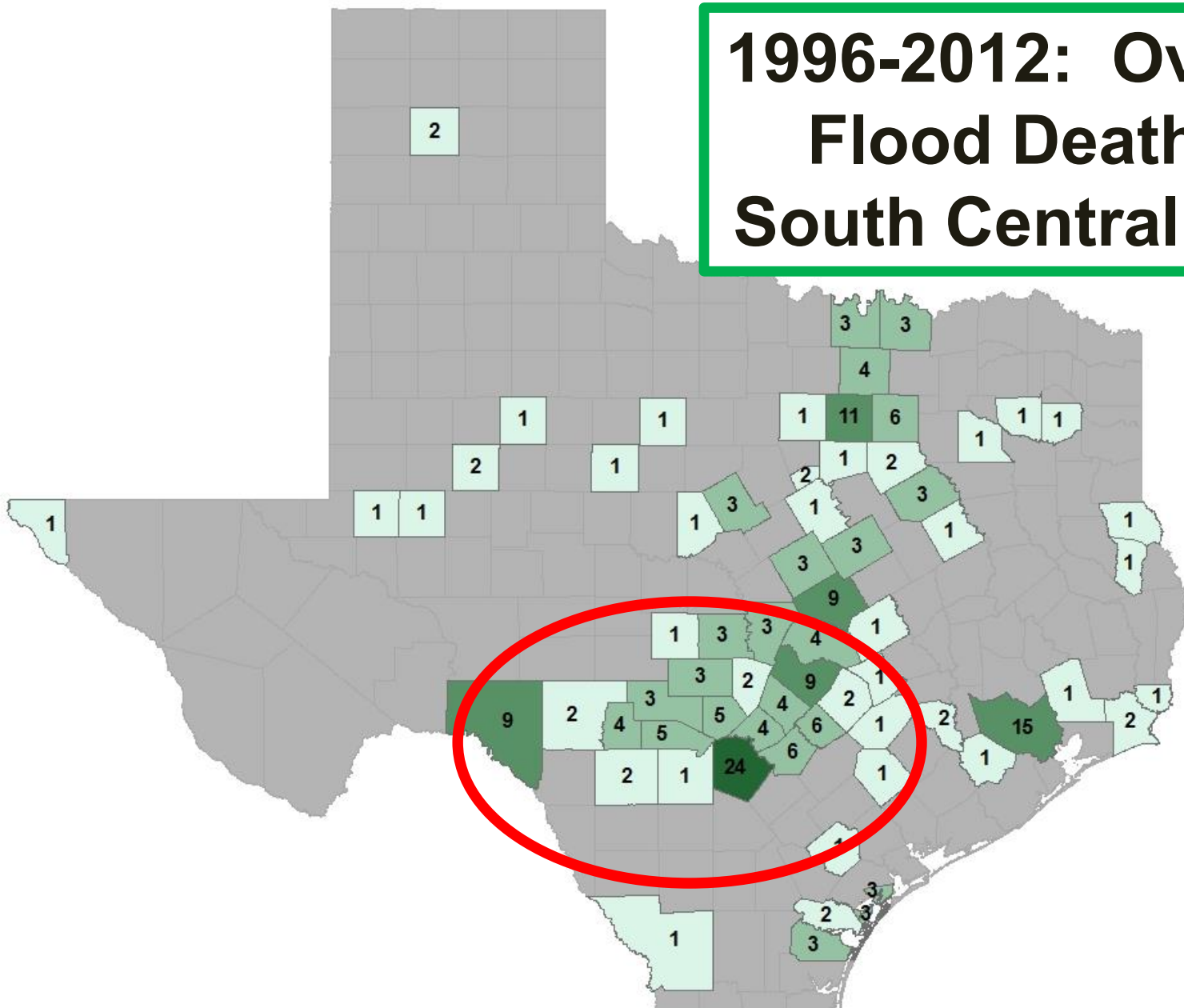




# Why South Central Texas is “Flash Flood Alley”



# 1996-2012: Over 100 Flood Deaths in South Central Texas



**Why Does This Happen?**

# Winter 2017-18 Outlook





# What goes into long range forecasts?

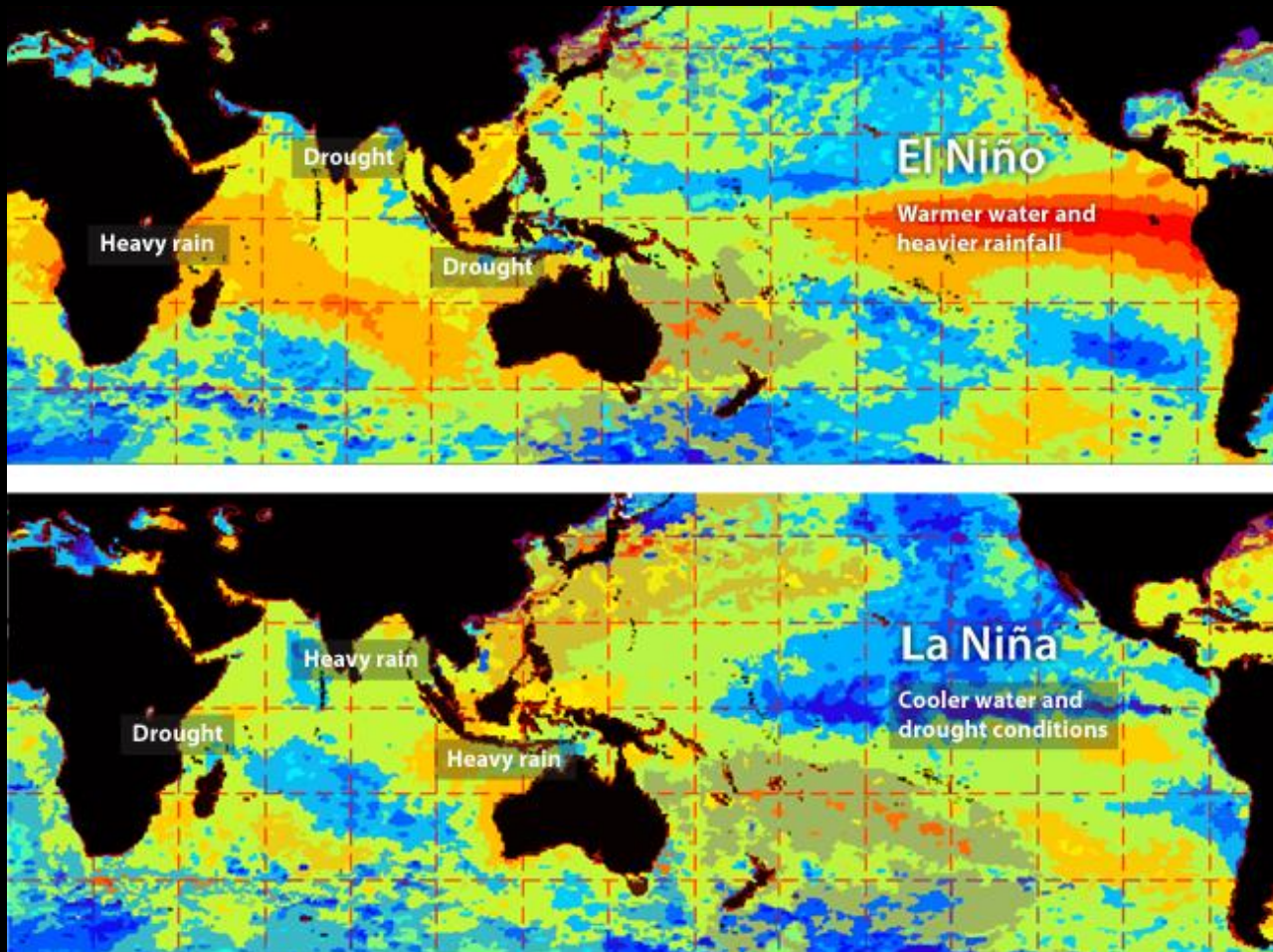
1. El Niño/La Niña
2. Trends
3. Tropical Oscillation
4. NAO
5. Pacific Decadal Oscillation (like ENSO but longer time scale)
6. Wet or Dry Soils
7. Statistical Tools
8. Dynamic Models
9. Consolidation (first guess based on models)

-.5 -.4 -.3 -.2 -.1 .0 .1 .2 .3 .4 .5

# What's the Driving Force?

**El Niño – Warming of Pacific waters**

**La Niña – Cooling of Pacific waters**

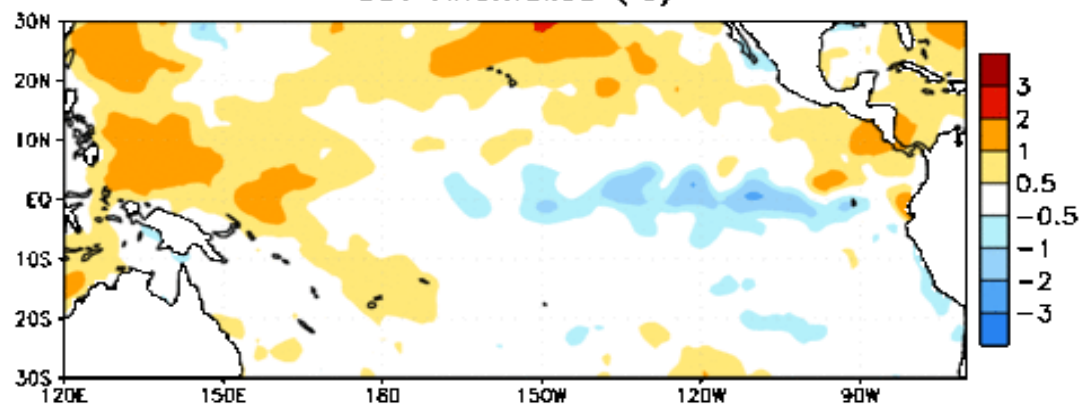


**Main Focus Area**



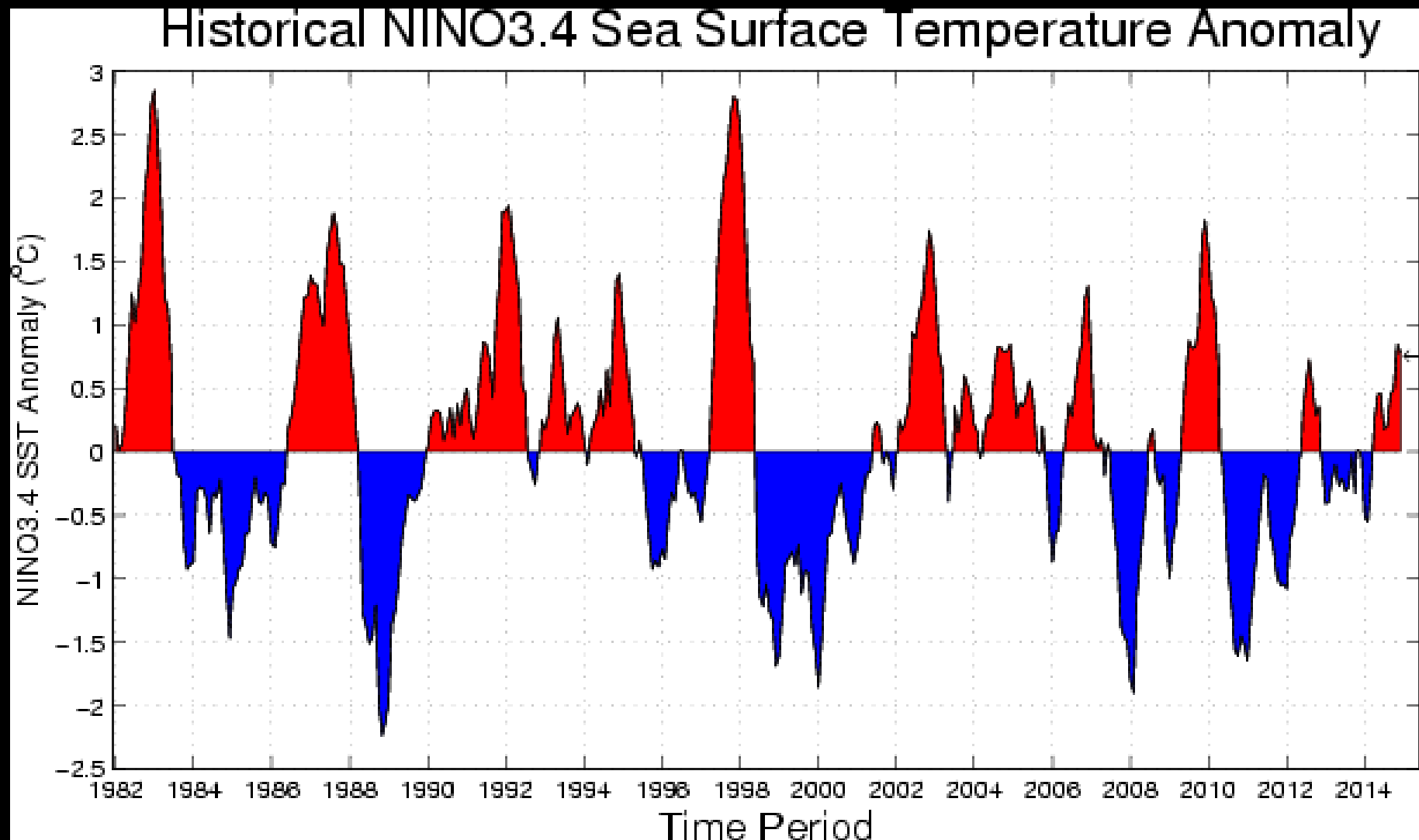
**Niño 3.4 Region**

Week centered on 06 SEP 2017  
SST Anomalies (°C)

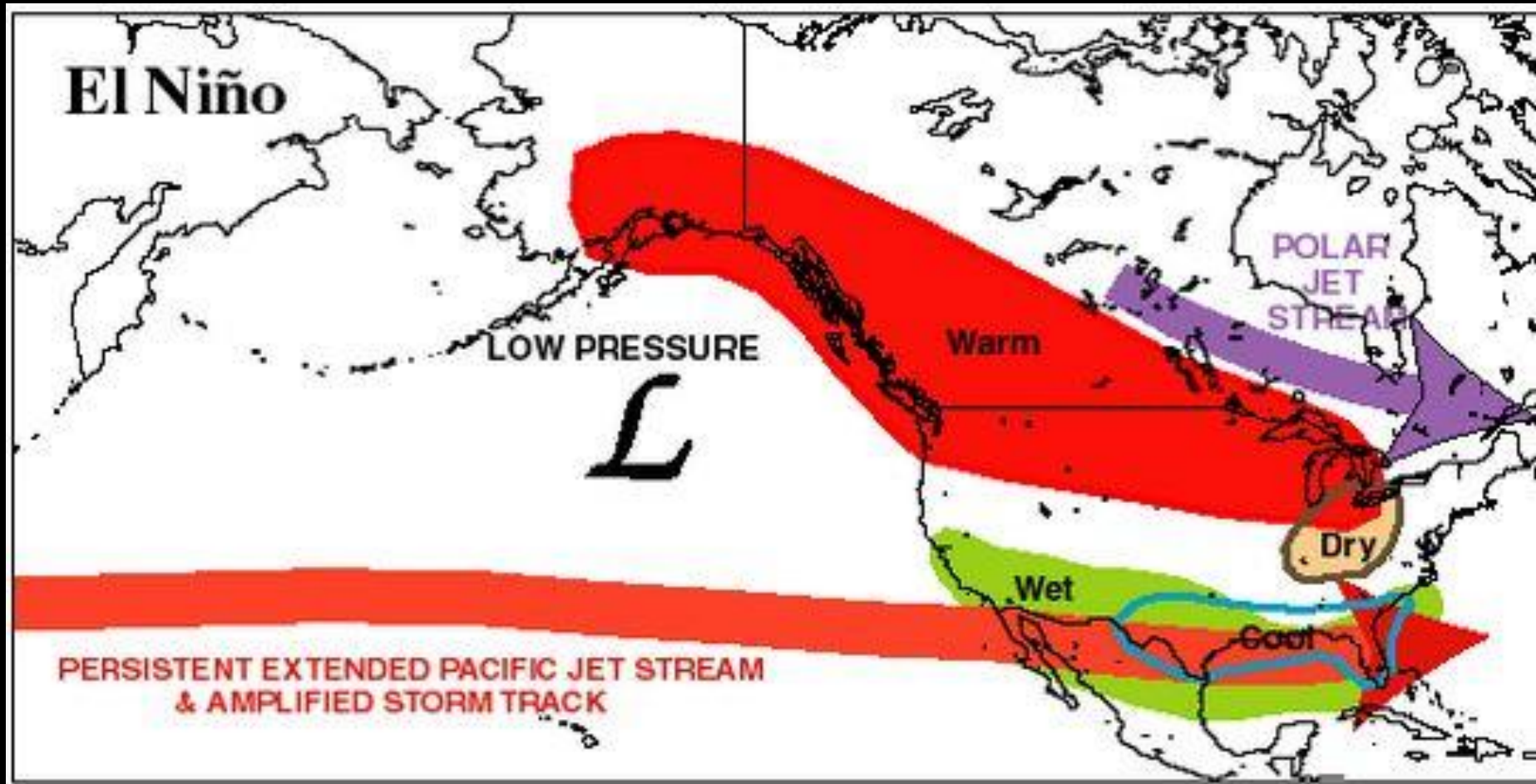




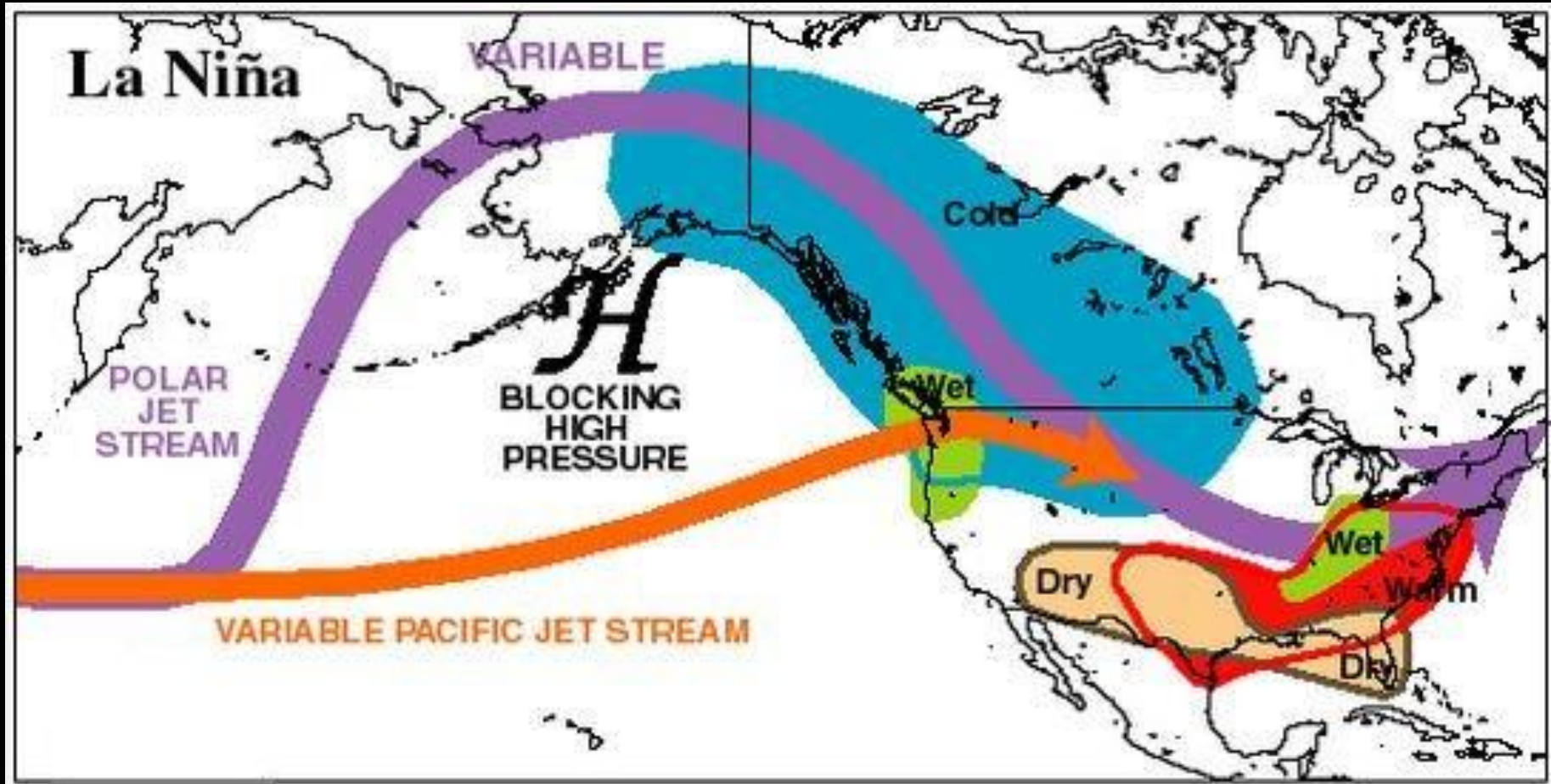
# Modern Historical Cycles



# Typical Wintertime El Niño Impacts

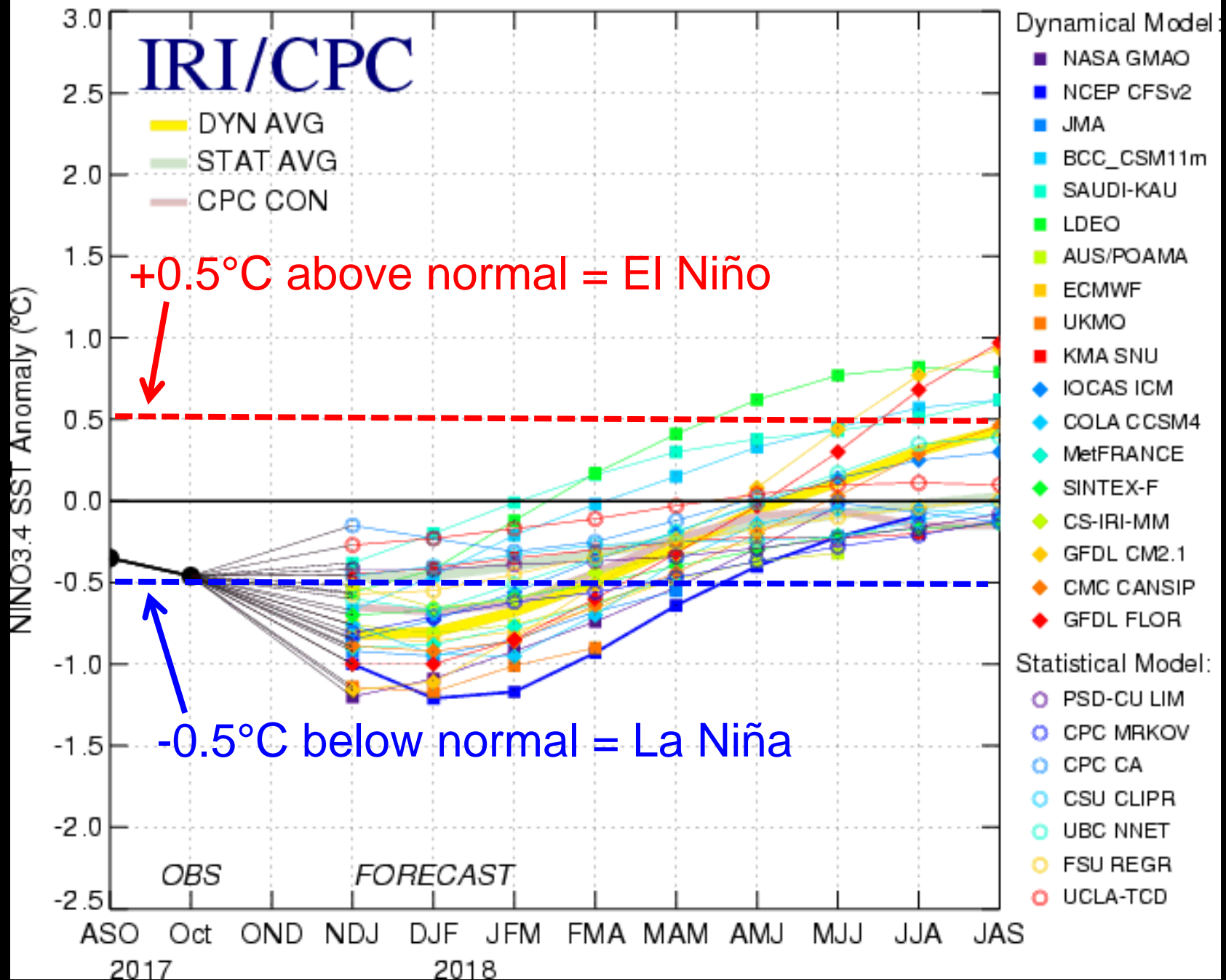


# Typical Wintertime La Nina Impacts



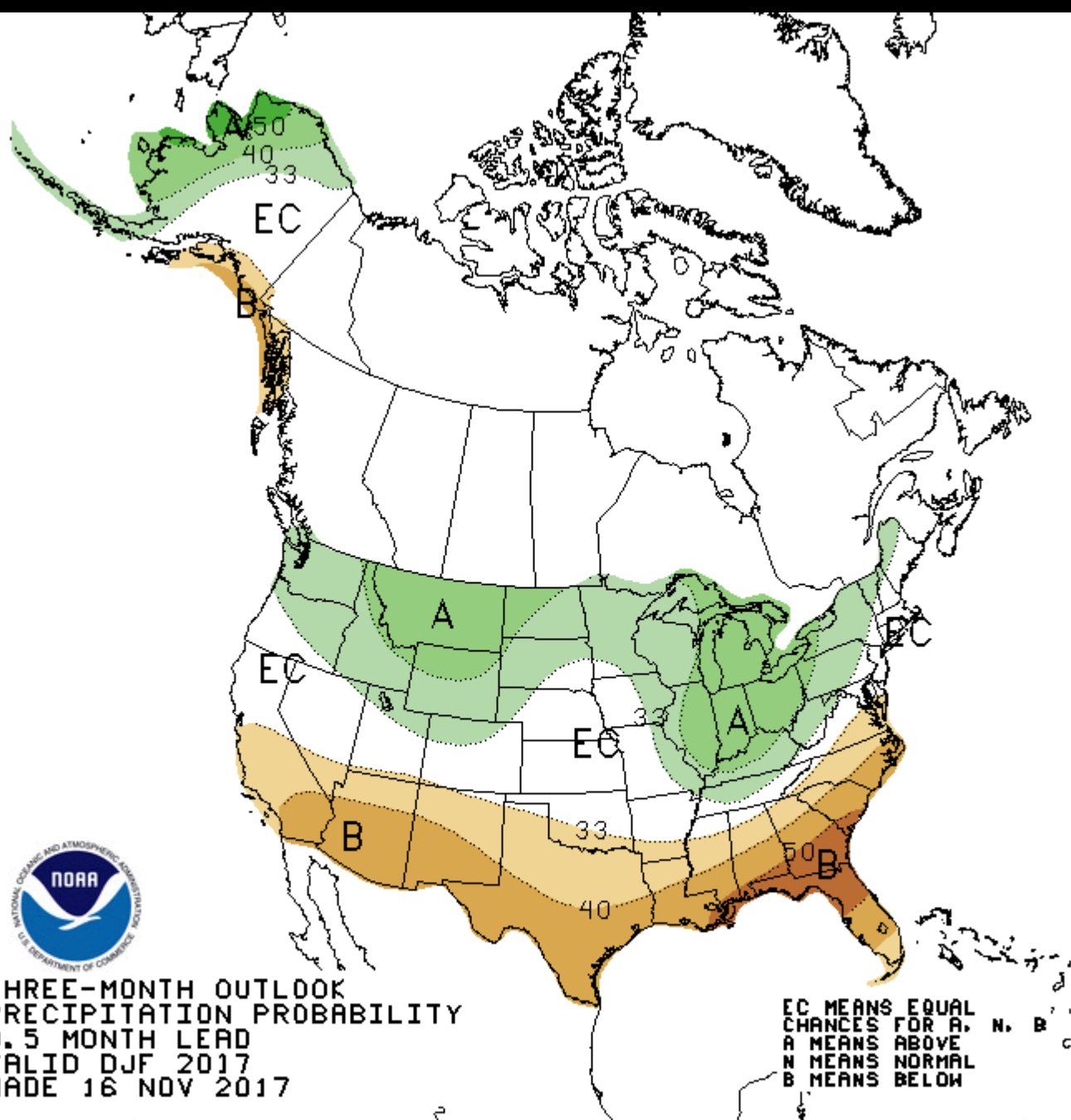
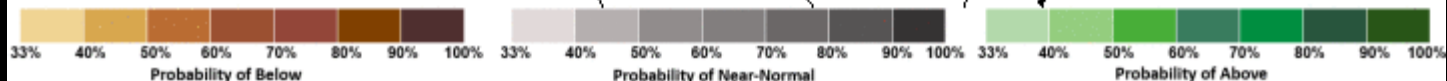


# Mid-Nov 2017 Plume of Model ENSO Predictions





THREE-MONTH OUTLOOK  
PRECIPITATION PROBABILITY  
0.5 MONTH LEAD  
VALID DJF 2017  
MADE 16 NOV 2017



# Cycles? Million \$ Question...Is Weather Getting Worse?

Drought



Flood



Tornadoes





# Is the Reporting Getting Better?



# Drought Severity Cycle

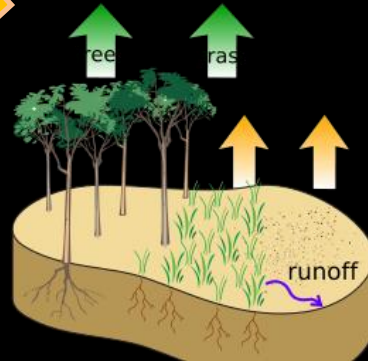
**No Rain**



**Dry Soil**



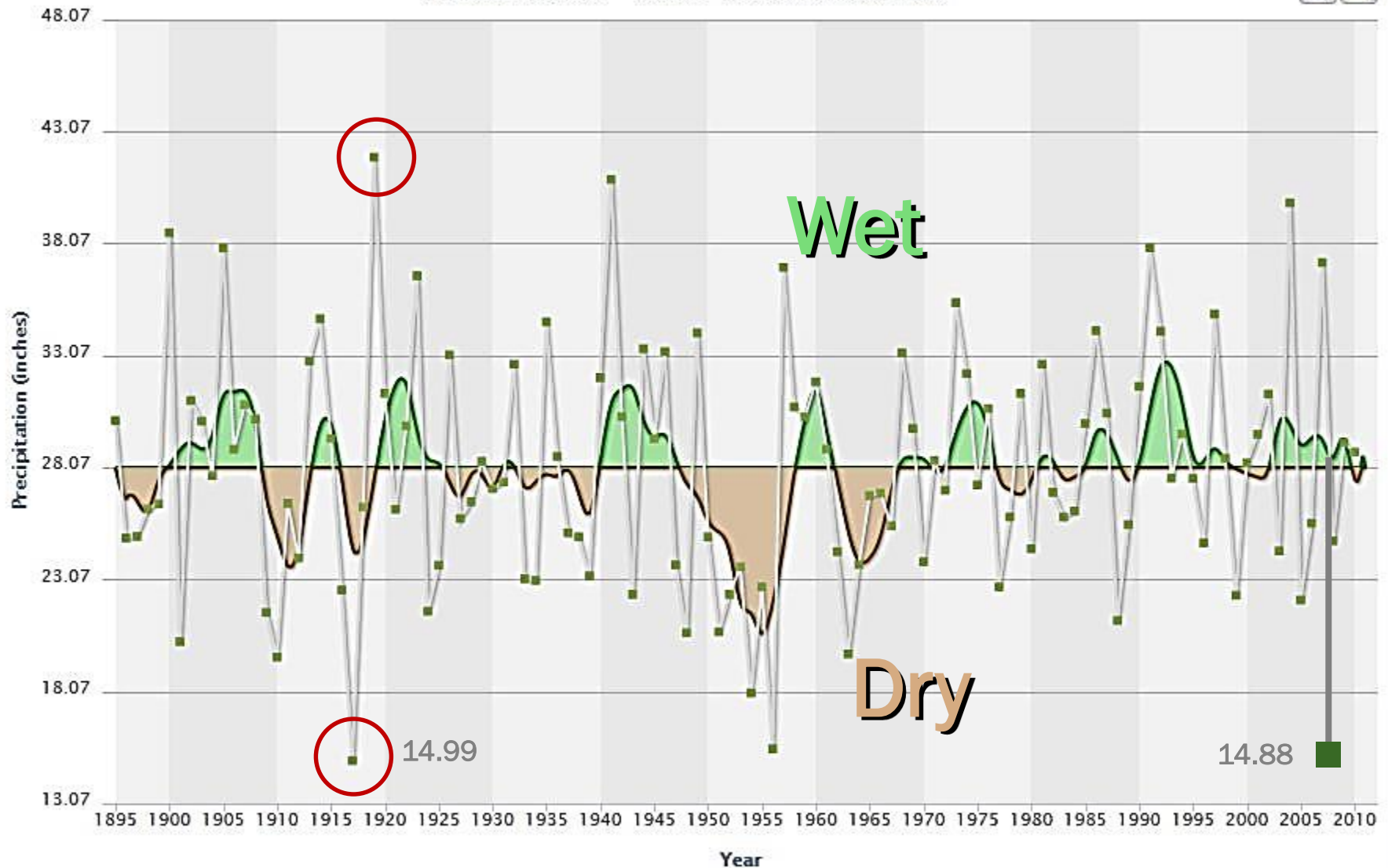
**Dry Plants**



**Low  
Moisture,  
Low  
Humidity**

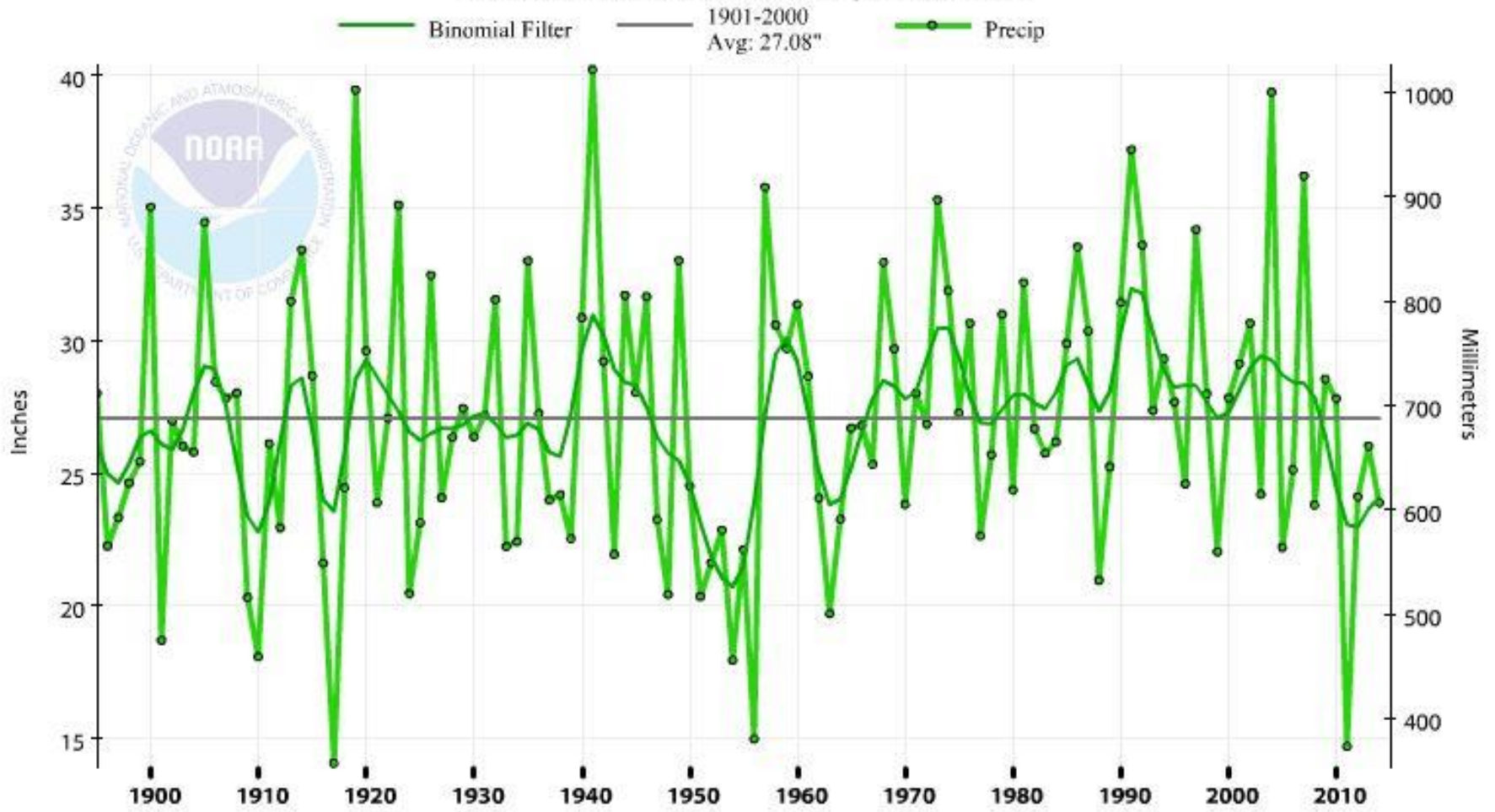
# Is Drought Unexpected?

Climate Trends – State: TX, Season: Annual



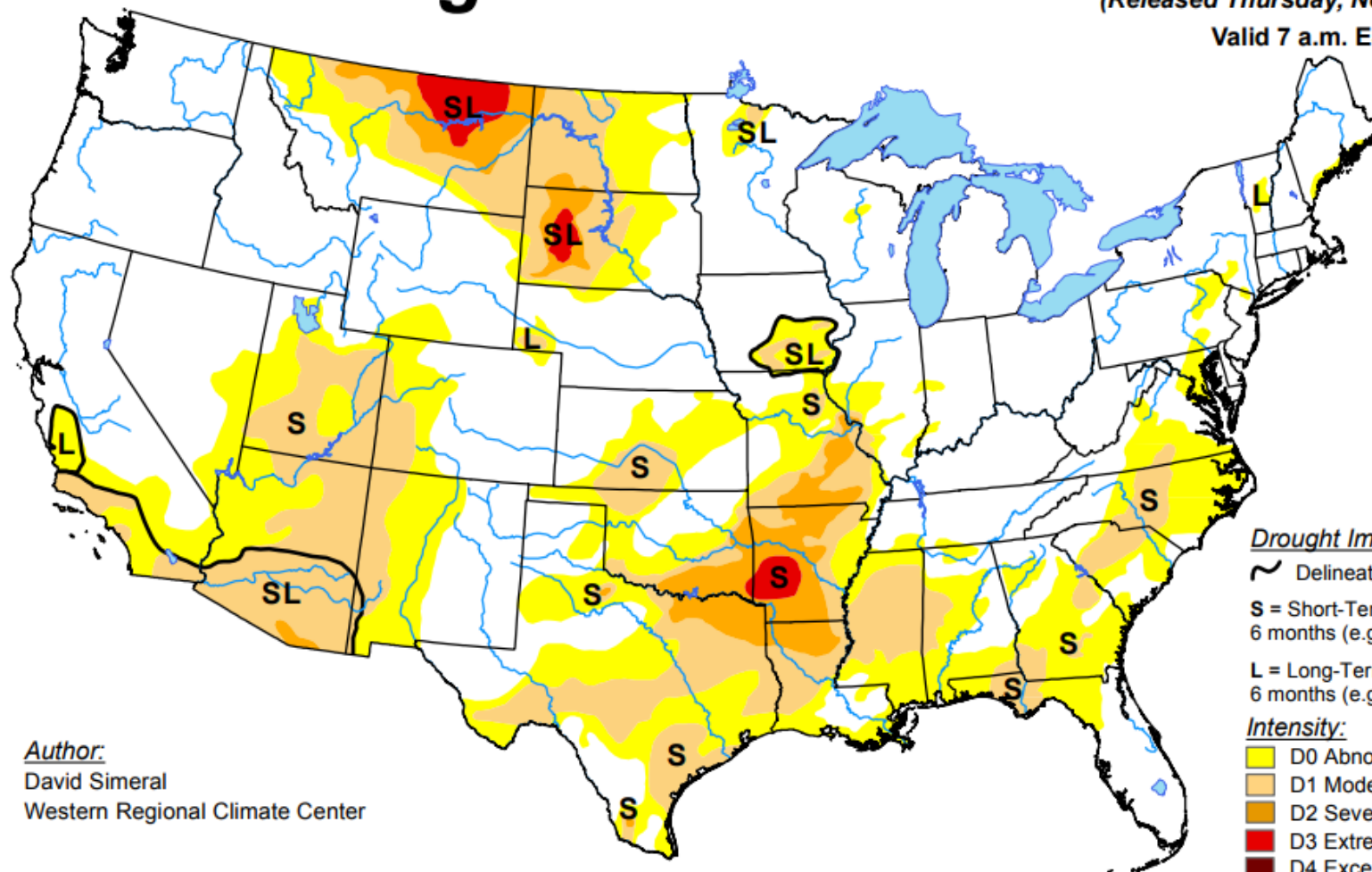


## Texas, Precipitation, January-December



# U.S. Drought Monitor

November 28, 2017  
(Released Thursday, Nov. 30, 2017)  
Valid 7 a.m. EST



## Author:

David Simeral  
Western Regional Climate Center

## Drought Impact Types:

~ Delineates dominant impacts

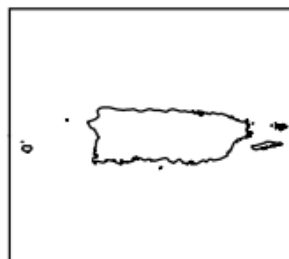
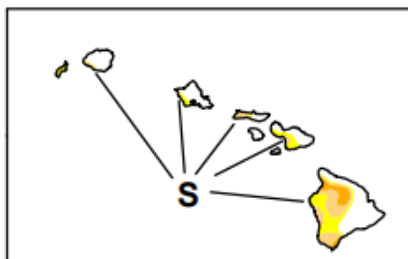
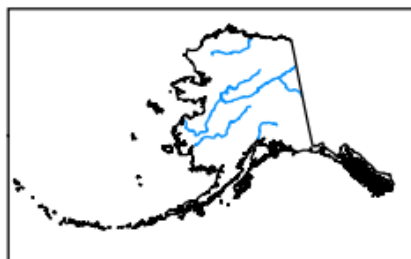
S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)

L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

## Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

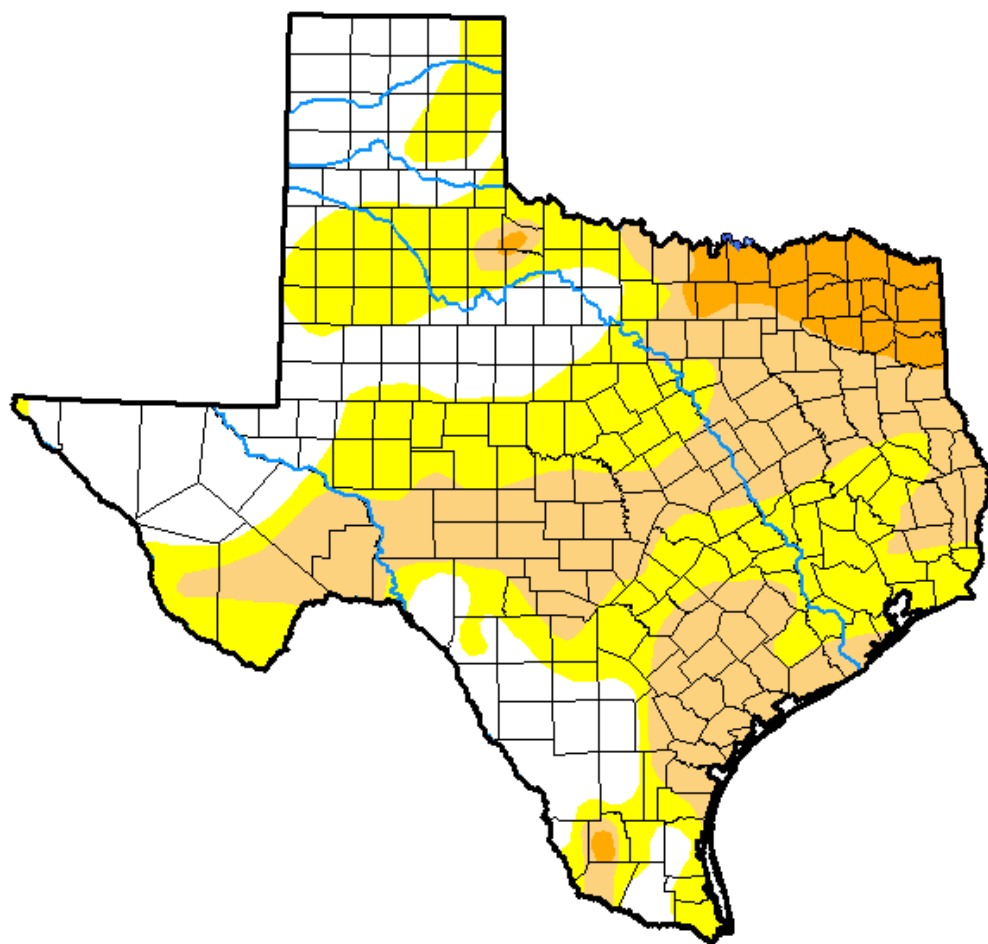
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.



<http://droughtmonitor.unl.edu/>

# U.S. Drought Monitor Texas

**November 28, 2017**  
(Released Thursday, Nov. 30, 2017)  
Valid 7 a.m. EST



*Drought Conditions (Percent Area)*

|   | None  | D0-D4 | D1-D4 | D2-D4 | D3-D4 | D4   |
|---|-------|-------|-------|-------|-------|------|
| <b>Current</b>                              | 28.73 | 71.27 | 35.11 | 5.50  | 0.00  | 0.00 |
| <b>Last Week</b><br>11-21-2017              | 40.02 | 59.98 | 20.23 | 3.25  | 0.00  | 0.00 |
| <b>3 Months Ago</b><br>08-29-2017           | 96.14 | 3.86  | 0.87  | 0.00  | 0.00  | 0.00 |
| <b>Start of Calendar Year</b><br>01-03-2017 | 81.50 | 18.50 | 6.29  | 1.97  | 0.04  | 0.00 |
| <b>Start of Water Year</b><br>09-26-2017    | 70.54 | 29.46 | 4.17  | 0.04  | 0.00  | 0.00 |
| <b>One Year Ago</b><br>11-29-2016           | 66.37 | 33.63 | 14.18 | 3.27  | 0.08  | 0.00 |

## Intensity:

|                     |                        |
|---------------------|------------------------|
| D0 Abnormally Dry   | D3 Extreme Drought     |
| D1 Moderate Drought | D4 Exceptional Drought |
| D2 Severe Drought   |                        |

*The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.*

## Author:

David Simeral  
Western Regional Climate Center



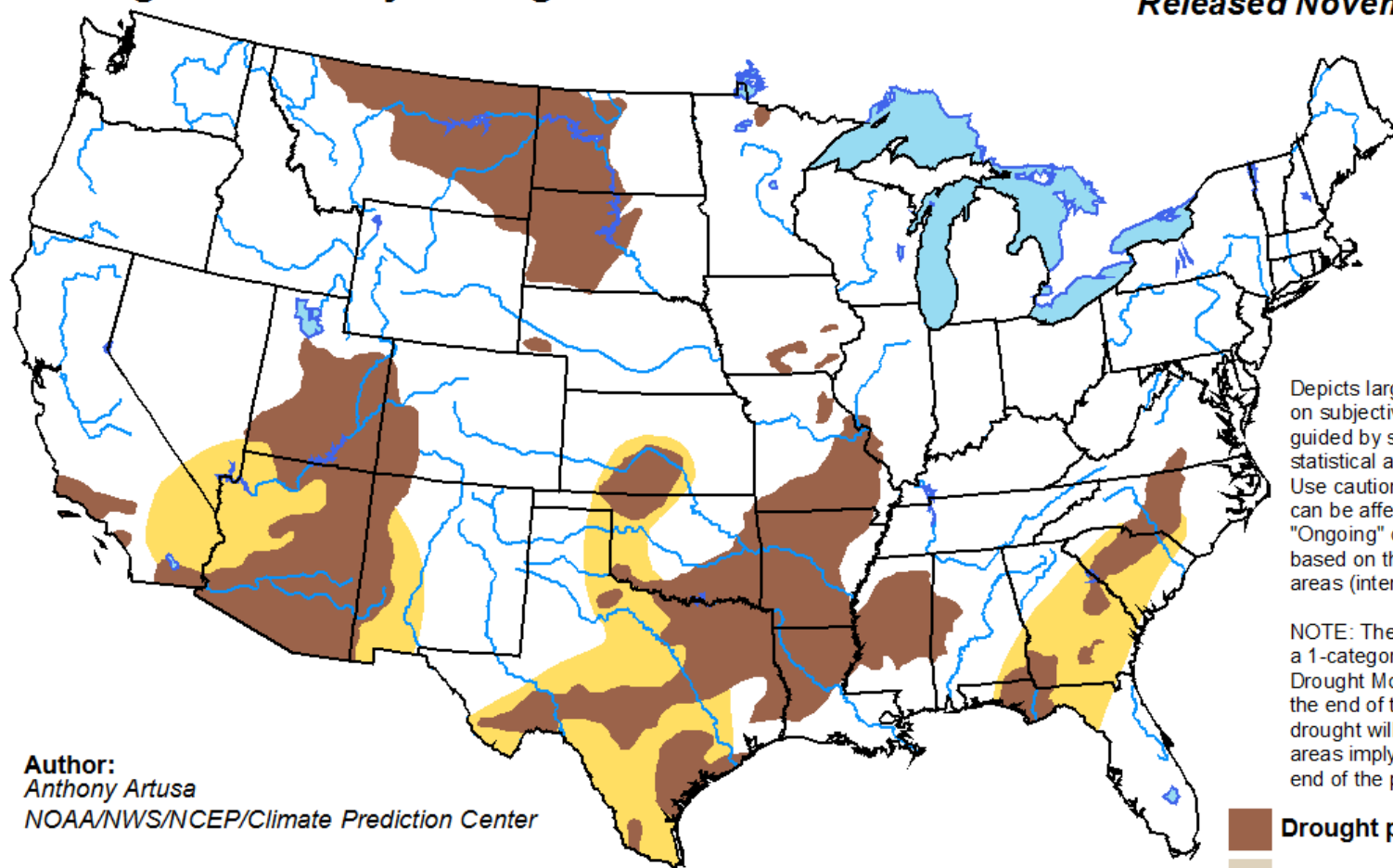
<http://droughtmonitor.unl.edu/>



# U.S. Monthly Drought Outlook

## Drought Tendency During the Valid Period





Valid for December 2017  
Released November 30, 2017

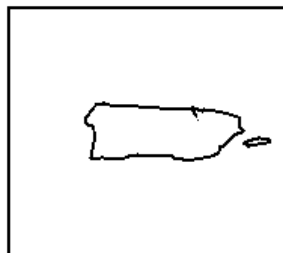
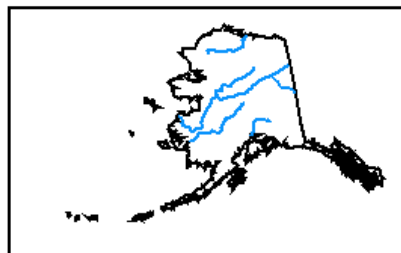


**Author:**  
Anthony Artusa  
NOAA/NWS/NCEP/Climate Prediction Center

Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Use caution for applications that can be affected by short lived events. "Ongoing" drought areas are based on the U.S. Drought Monitor areas (intensities of D1 to D4).

NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none).

-  Drought persists
-  Drought remains but improves
-  Drought removal likely
-  Drought development likely



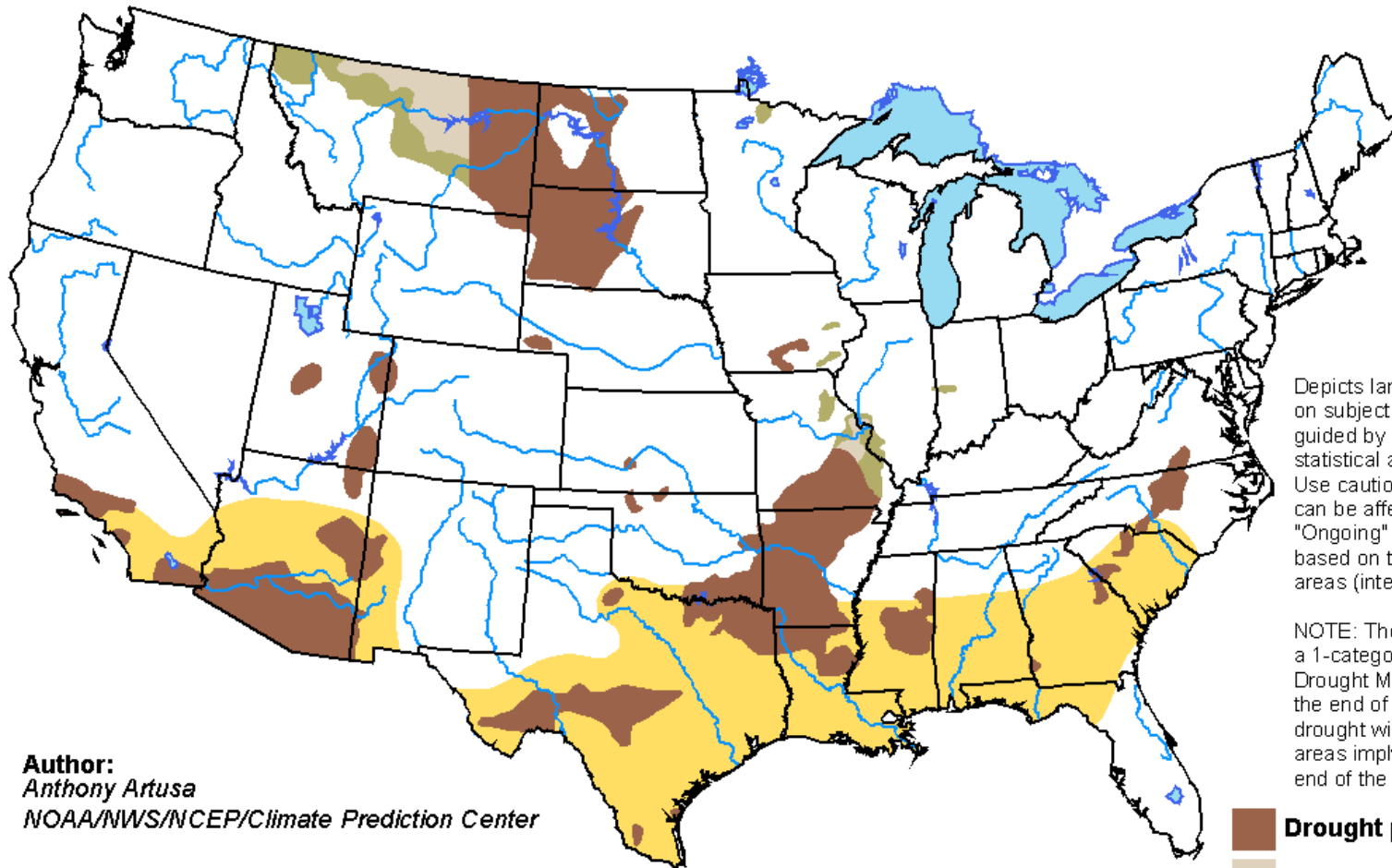
<http://go.usa.gov/3eZGd>

# U.S. Seasonal Drought Outlook

Valid for November 16 - February 28, 2018

Drought Tendency During the Valid Period

Released November 16, 2017



Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Use caution for applications that can be affected by short lived events. "Ongoing" drought areas are based on the U.S. Drought Monitor areas (intensities of D1 to D4).

NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none).

## Author:

Anthony Artusa

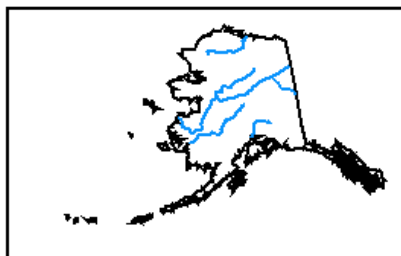
NOAA/NWS/NCEP/Climate Prediction Center

**Drought persists**

**Drought remains but improves**

**Drought removal likely**

**Drought development likely**



<http://go.usa.gov/3eZ73>

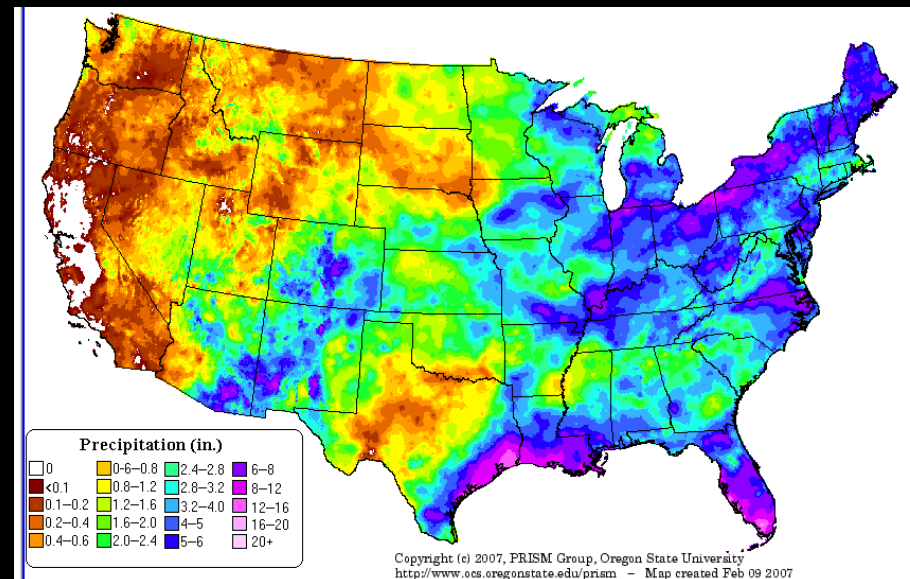
# CoCoRaHS



**Precipitation is important  
and highly variable**



**Data sources are few and  
rain gauges are far apart**





Once trained,  
volunteers collect  
data using low-cost  
measurement tools . . .



4-inch diameter high  
capacity rain gauges



Aluminum foil-wrapped  
Styrofoam hail pads

Training is important to assure  
accurate, high quality data

**“CoCoRaHS is a national  
grassroots, non-profit community  
based, high-density precipitation  
network”** →



**made up of volunteers of all  
backgrounds and ages . . .**



**. . . who take daily measurements of  
“just precipitation” right in their own backyards”**



## View Data

### View Data

- [Daily Precip Reports](#)
- [Daily Comments Reports](#)
- [Significant Weather Reports](#)
- [Multiple Day Reports](#)
- [Condition Monitoring Reports](#)
- [Condition Monitoring Charts](#)
- [Soil Moisture](#)

- [Days with Hail](#)
- [Search Hail Reports](#)
- [Station Hail Reports](#)
- [Station Precip Summary](#)

- [Water Year Summary](#)
- [Station Precip Summary](#)
- [Station Snow Summary](#)
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### FROST Data

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- [Snowflake](#)
- [Thunder](#)

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### CoCoRaHS Data Reports

- [Daily Precipitation Reports](#) Searchable list of all daily precipitation reports.
- [Daily Comments Reports](#) List of all daily reports with comments for a given day.
- [Significant Weather Reports](#) Searchable list of all significant weather reports.
- [Multiple Day Accumulation Reports](#) Searchable list of all multiple day accumulation reports.
- [Condition Monitoring Reports](#) Searchable list of all condition monitoring reports.
- [Condition Monitoring Summary Charts](#) The summary charts display information provided in condition monitoring reports to document changing on-the-ground conditions that are affected by precipitation, or a lack thereof. The data in the

### Evapotranspiration Reports

### Soil Moisture Reports

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### Days With Hail Reports

### Search Hail Reports

### Station Hail Reports

### Summary Reports

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### Station Precipitation Summary Report

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### Station Water Balance Chart

### Total Precipitation Summary

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### Resources

[www.cocorahs.org](http://www.cocorahs.org)

## View Data : List Daily Precipitation Reports US Units ▼

### Search Daily Precipitation Reports

Station Fields:  ☐ Station Number ☐ Station Name

Location:    ALL COUNTIES ▼

Date Range:

Start Date:  End Date:

Precip Value:  Operator

Searched: Stations in Texas. Report date on 10/31/2015.

Showing 1 - 50 of 1400 Records.

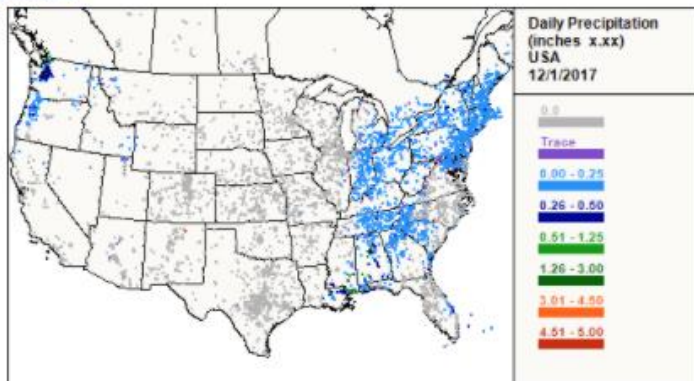
<Back Page 1 ▼ Next>

| Date       | Time    | Station Number | Station Name            | Total Precip in. ▲ | New Snow in. ❄️💧 | Total Snow in. ❄️💧 | State | County     | View | Maps  |
|------------|---------|----------------|-------------------------|--------------------|------------------|--------------------|-------|------------|------|---|
| 10/31/2015 | 7:00 AM | TX-HYS-1       | San Marcos 5.8 N        | 15.63              | NA   NA          | NA   NA            | TX    | Hays       |      | <a href="#">Classic</a>   <a href="#">New</a> |
| 10/31/2015 | 7:00 AM | TX-TV-175      | San Leanna 0.1 SSE      | 12.62              | NA   NA          | NA   NA            | TX    | Travis     |      | <a href="#">Classic</a>   <a href="#">New</a> |
| 10/31/2015 | 6:00 AM | TX-HYS-154     | Kyle 2.1 NNW            | 12.32              | 0.0   NA         | NA   NA            | TX    | Hays       |      | <a href="#">Classic</a>   <a href="#">New</a> |
| 10/31/2015 | 7:00 AM | TX-HYS-124     | San Marcos 2.3 WNW      | 11.50              | 0.0   NA         | NA   NA            | TX    | Hays       |      | <a href="#">Classic</a>   <a href="#">New</a> |
| 10/31/2015 | 7:00 AM | TX-HYS-61      | San Marcos 8.1 W        | 11.45              | NA   NA          | NA   NA            | TX    | Hays       |      | <a href="#">Classic</a>   <a href="#">New</a> |
| 10/31/2015 | 7:00 AM | TX-TV-217      | Tanglewood Forest 2.7 E | 10.97              | NA   NA          | NA   NA            | TX    | Travis     |      | <a href="#">Classic</a>   <a href="#">New</a> |
| 10/31/2015 | 7:00 AM | TX-TV-125      | Manor 5.5 SSE           | 10.47              | NA   NA          | NA   NA            | TX    | Travis     |      | <a href="#">Classic</a>   <a href="#">New</a> |
| 10/31/2015 | 7:00 AM | TX-TV-165      | Austin 5.7 SSW          | 10.04              | NA   NA          | NA   NA            | TX    | Travis     |      | <a href="#">Classic</a>   <a href="#">New</a> |
| 10/31/2015 | 6:00 AM | TX-HYS-65      | San Marcos 6.3 WSW      | 9.89               | NA   NA          | NA   NA            | TX    | Hays       |      | <a href="#">Classic</a>   <a href="#">New</a> |
| 10/31/2015 | 7:00 AM | TX-TV-256      | Tanglewood Forest 1.1 S | 9.77               | NA   NA          | NA   NA            | TX    | Travis     |      | <a href="#">Classic</a>   <a href="#">New</a> |
| 10/31/2015 | 8:00 AM | TX-HYS-42      | San Marcos 3.1 WSW      | 9.73               | NA   NA          | NA   NA            | TX    | Hays       |      | <a href="#">Classic</a>   <a href="#">New</a> |
| 10/31/2015 | 7:00 AM | TX-BST-97      | Elgin 4.3 E             | 9.70               | NA   NA          | NA   NA            | TX    | Bastrop    |      | <a href="#">Classic</a>   <a href="#">New</a> |
| 10/31/2015 | 8:00 AM | TX-HYS-77      | Wimberley 3.8 E         | 9.47               | NA   NA          | NA   NA            | TX    | Hays       |      | <a href="#">Classic</a>   <a href="#">New</a> |
| 10/31/2015 | 7:00 AM | TX-HYS-28      | Manchaca 2.1 ENE        | 9.33               | 0.0   NA         | NA   NA            | TX    | Hays       |      | <a href="#">Classic</a>   <a href="#">New</a> |
| 10/31/2015 | 7:00 AM | TX-BEL-16      | Temple 4.7 S            | 9.10               | NA   NA          | NA   NA            | TX    | Bell       |      | <a href="#">Classic</a>   <a href="#">New</a> |
| 10/31/2015 | 7:00 AM | TX-HYS-133     | Wimberley 3.6 ENE       | 9.07               | NA   NA          | NA   NA            | TX    | Hays       |      | <a href="#">Classic</a>   <a href="#">New</a> |
| 10/31/2015 | 6:00 AM | TX-WM-149      | Coupland 6.5 ESE        | 8.72               | NA   NA          | NA   NA            | TX    | Williamson |      | <a href="#">Classic</a>   <a href="#">New</a> |



- **Precipitation Maps**

### Classic

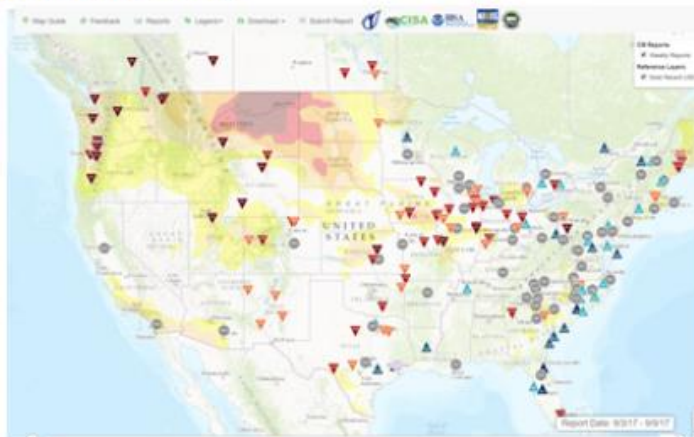


[www.cocorahs.org](http://www.cocorahs.org)

### New



### Condition Monitoring



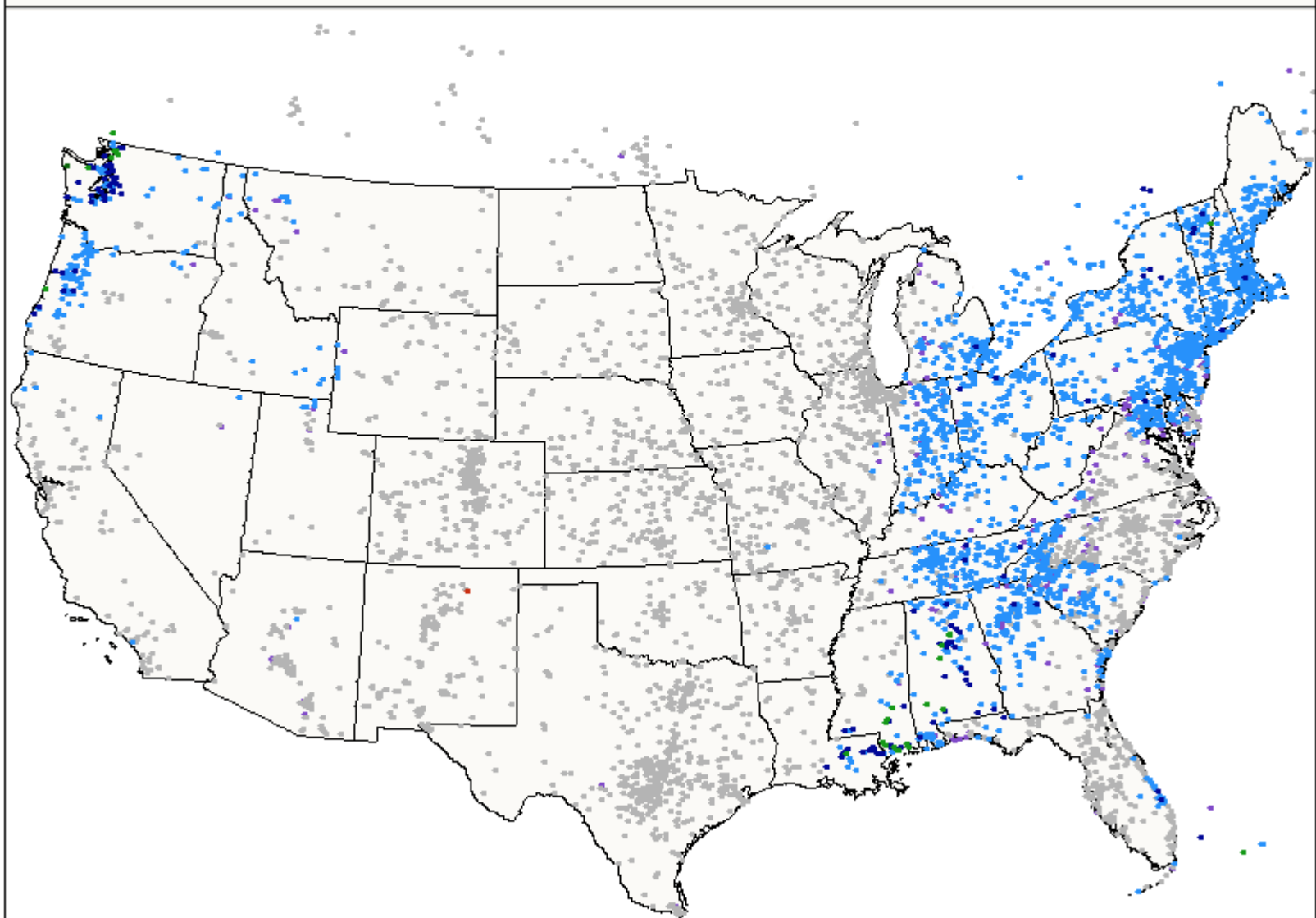
- [Snow Maps](#)
- [Total Snow Depth Maps](#)
- [Hail Maps](#)
- [Station Number Maps](#)

| Map Type        |            | Map Location        |           | Date       | Colors  |  |
|-----------------|------------|---------------------|-----------|------------|---------|--|
| Precipitation ▾ | National ▾ | No State Selected ▾ | 12/1/2017 | Standard ▾ | Get Map |  |

Daily Precipitation (inches x.xx), for the 24 hour period ending ~7:00 am

USA 12/1/2017

0.0 Trace 0.01 - 0.25 0.26 - 0.50 0.51 - 1.25 1.26 - 3.00 3.01 - 4.50 4.51 - 5.00



## Map Type

## Map Location

## Date

## Colors

Precipitation ▼

Texas ▼

Cities / Counties ▼

10/31/2015

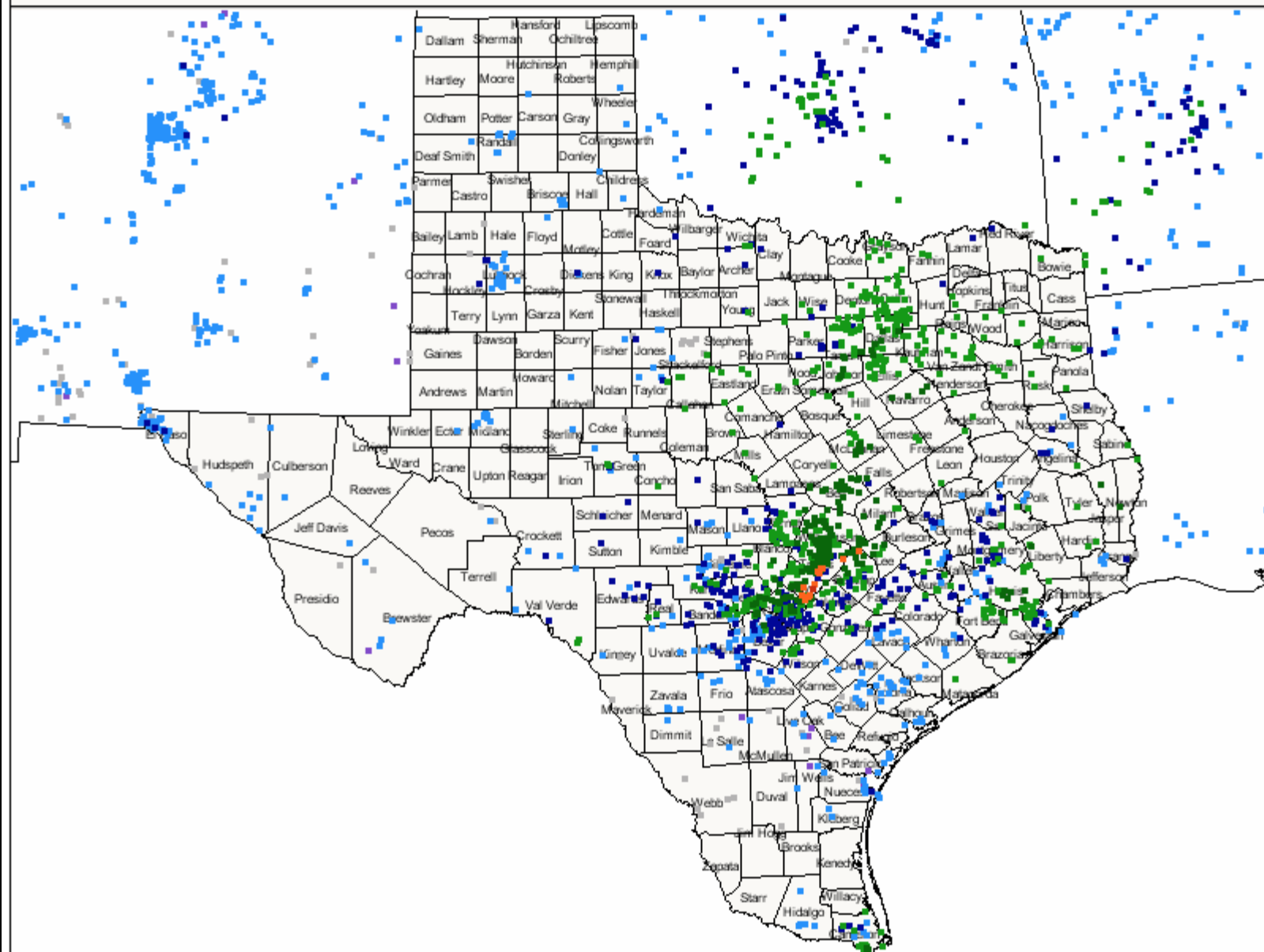
Standard ▼

Get Map

Daily Precipitation (inches x.xx), for the 24 hour period ending ~7:00 am

Texas 10/31/2015

0.0 Trace 0.01 - 0.78 0.79 - 1.56 1.57 - 3.90 3.91 - 9.37 9.38 - 14.06 14.07 - 15.63





Map Type

Precipitation

Map Location

Texas

Date

10/31/2015

Colors

Standard

Get Map

Daily Precipitation (inches x.xx), for the 24 hour period ending ~7:00 am  
Austin/San Antonio/Del Rio Region, Texas 10/31/2015

0.0

Trace

0.01 - 0.78

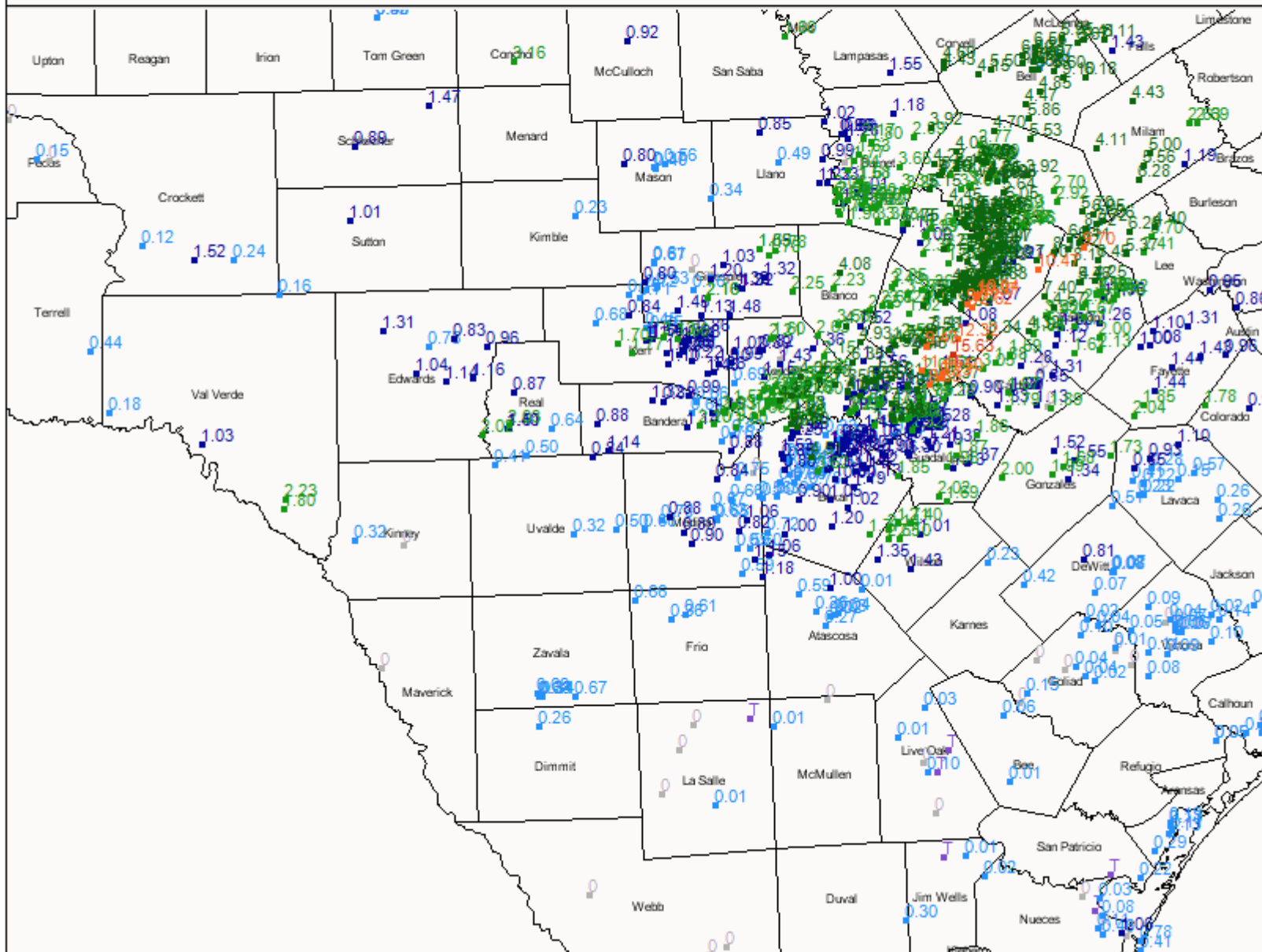
0.79 - 1.56

1.57 - 3.90

3.91 - 9.37

9.38 - 14.06

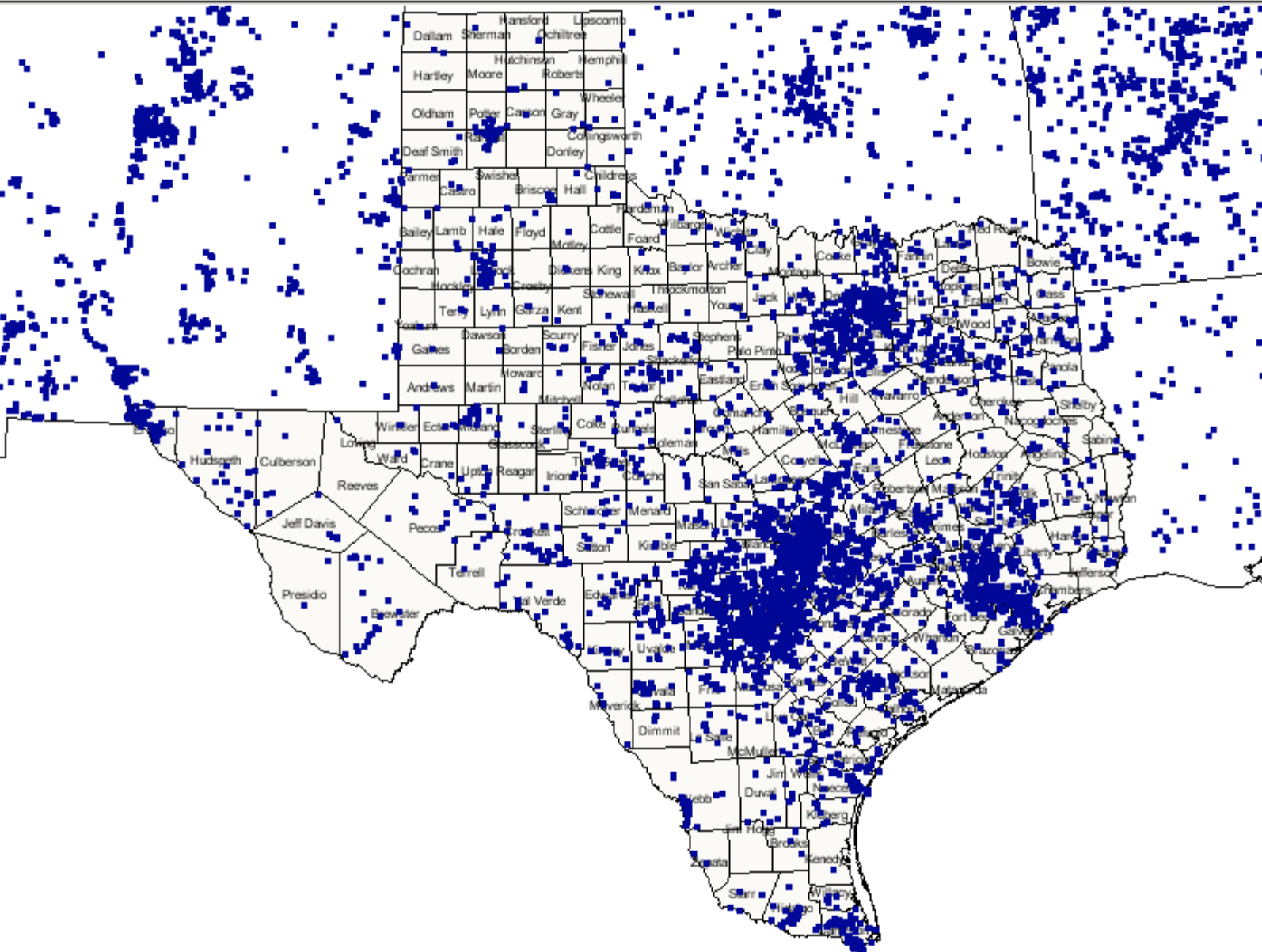
14.07 - 15.63



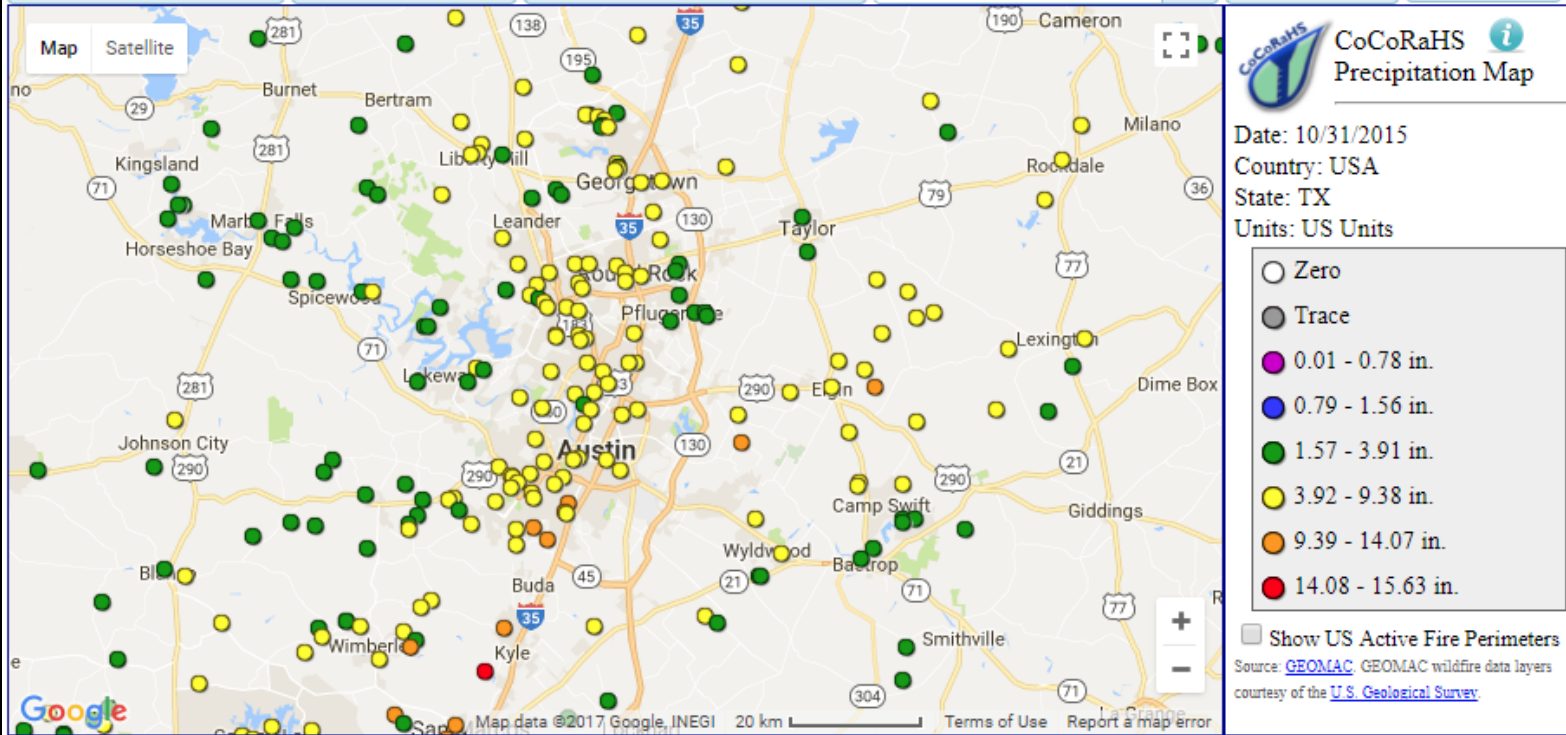


| Map Type |       | Map Location      |           | Date     | Colors  |
|----------|-------|-------------------|-----------|----------|---------|
| Stations | Texas | Cities / Counties | 12/1/2017 | Standard | Get Map |

Active Stations  
Texas







| Obs Date   | Obs Time | Station Number | Station Name            | Precip (in.) | Snowfall (in.) | Snow Depth (in.) | Snow Depth SWE (in.) |
|------------|----------|----------------|-------------------------|--------------|----------------|------------------|----------------------|
| 2015-10-31 | 06:00 AM | TX-HYS-65      | San Marcos 6.3 WSW      | 9.89         | NA             | NA               | NA                   |
| 2015-10-31 | 07:00 AM | TX-TV-256      | Tanglewood Forest 1.1 S | 9.77         | NA             | NA               | NA                   |
| 2015-10-31 | 08:00 AM | TX-HYS-42      | San Marcos 3.1 WSW      | 9.73         | NA             | NA               | NA                   |
| 2015-10-31 | 07:00 AM | TX-BST-97      | Elgin 4.3 E             | 9.70         | NA             | NA               | NA                   |
| 2015-10-31 | 08:00 AM | TX-HYS-77      | Wimberley 3.8 E         | 9.47         | NA             | NA               | NA                   |
| 2015-10-31 | 07:00 AM | TX-HYS-28      | Manchaca 2.1 ENE        | 9.33         | 0.0            | NA               | NA                   |
| 2015-10-31 | 07:00 AM | TX-BEL-16      | Temple 4.7 S            | 9.10         | NA             | NA               | NA                   |
| 2015-10-31 | 07:00 AM | TX-HYS-133     | Wimberley 3.6 ENE       | 9.07         | NA             | NA               | NA                   |
| 2015-10-31 | 06:00 AM | TX-WM-149      | Coupland 6.5 ESE        | 8.72         | NA             | NA               | NA                   |
| 2015-10-31 | 07:00 AM | TX-CML-124     | New Braunfels 8.8 NNE   | 8.61         | NA             | NA               | NA                   |
| 2015-10-31 | 07:00 AM | TX-HYS-136     | Wimberley 1.3 SE        | 8.45         | NA             | NA               | NA                   |

Precipitation

USA

Texas

10/31/2015



US Units

Update

Central

Map

Satellite

Station Number: TX-TV-142  
Station Name: Austin 6.5 NE  
Report Date: 2015-10-31 07:00 AM  
Precipitation: 4.21 in.  
Snowfall: NA  
Snowfall SWE: NA  
Snow Depth: NA  
Snow Depth SWE: NA  
[Go to report details](#)



CoCoRaHS  
Precipitation Map

Date: 10/31/2015

Country: USA

State: TX

Units: US Units

- ☐ Zero
- ☐ Trace
- ☐ 0.01 - 0.78 in.
- ☐ 0.79 - 1.56 in.
- ☐ 1.57 - 3.91 in.
- ☐ 3.92 - 9.38 in.
- ☐ 9.39 - 14.07 in.
- ☐ 14.08 - 15.63 in.

☐ Show US Active Fire Perimeters

Source: [GEOMAC](#) GEOMAC wildfire data layers  
courtesy of the [U.S. Geological Survey](#)

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## Heavy rain, strong winds expected across Pacific Northwest and northern California

A weather system tapping into subtropical moisture will bring abundant rainfall to the Pacific Northwest and northern California through the weekend. The heaviest rainfall is expected Thursday night into Friday. Rainfall amounts in excess of 5 in. are possible through Saturday evening, especially across northern Calif. This system will also bring high winds to the region, with gusts up to 60 mph.

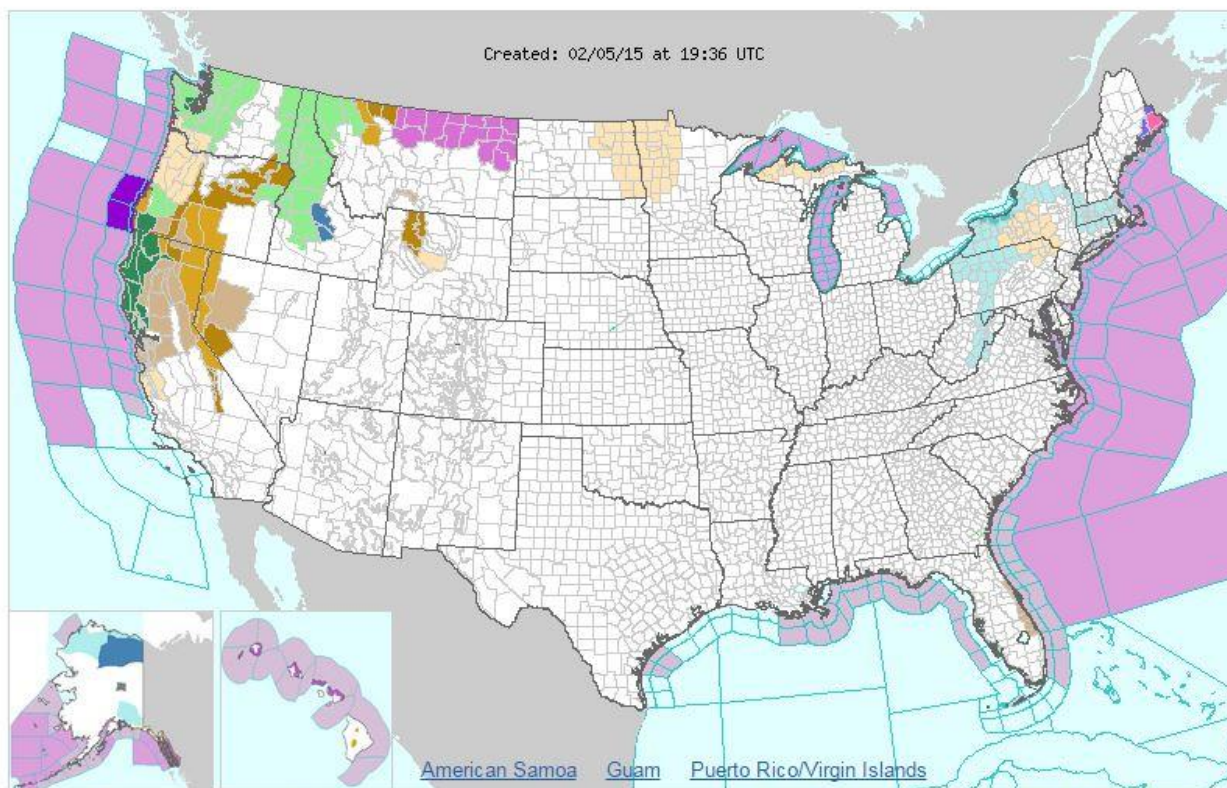
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National Weather Service Weather Forecast Office

# Austin/San Antonio, TX

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Radar Imagery

Nationwide

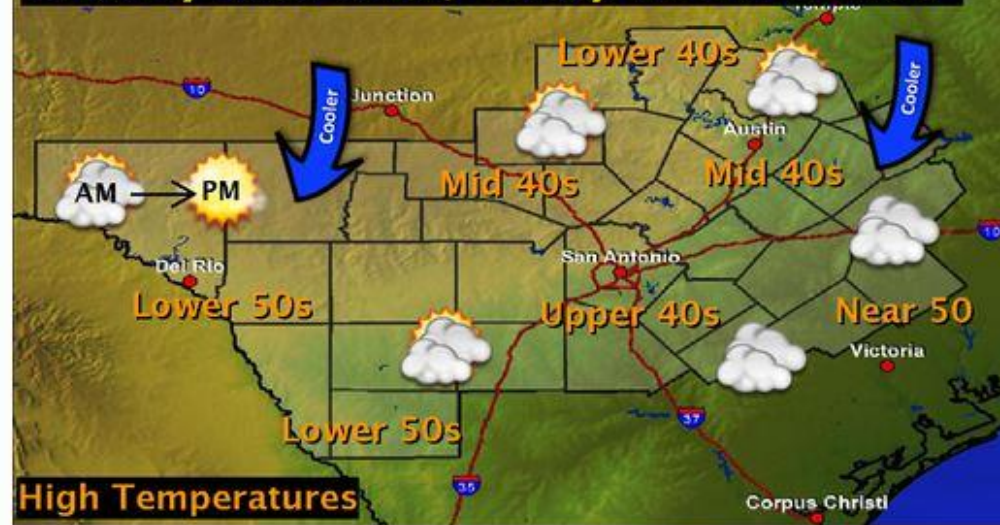
## Top News of the Day

- [Check out our Winter Newsletter, A New Beginning...](#)
- [2015 Skywarn Training Schedule...More Classes to be Added](#)

Today

5 Day  
Planner

## Cloudy and Cool; Gusty North Winds



High Temperatures



[weather.gov/ewx](http://weather.gov/ewx)  
[Twitter.com/NWSSanAntonio](https://twitter.com/NWSSanAntonio)  
[Youtube.com/NWSSanAntonio](https://youtube.com/NWSSanAntonio)  
[Facebook.com/NWSSanAntonio](https://facebook.com/NWSSanAntonio)



429 AM CST  
Thu Feb 5 2015  
National Weather Service  
Austin/San Antonio, TX

[Show Descriptions](#)

[weather.gov/austin](http://weather.gov/austin)

# Tombstone Forecast

## Current Conditions

[En Español](#)

[Share](#) | [f](#) [t](#) [e](#) [g](#) [M](#)



Partly Cloudy

**73°F**

23°C

Humidity 53%  
Wind Speed E 5 mph  
Barometer 30.05 in  
Dewpoint 55°F (13°C)  
Visibility 10.00 mi

Last Update on 24 Feb 2:50 pm CST

Current conditions at

**San Marcos Municipal Airport (KHYI)**

Lat: 29.9°N Lon: 97.87°W Elev: 597ft.

[More Local Wx](#) | [3 Day History](#) | [Mobile Weather](#)

## 2 Miles SSW Lockhart TX

7 Day Forecast

[Austin/San Antonio, TX](#)

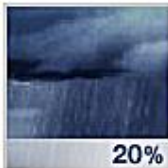
NWS Weather Forecast Office

THIS  
AFTERNOON



Mostly  
Cloudy  
High: 73 °F

TONIGHT



Isolated  
Sprinkles  
Low: 63 °F

TUESDAY



Chance  
Showers  
High: 73 °F

TUESDAY  
NIGHT



Chance  
Showers  
Low: 44 °F

WEDNESDAY



Showers  
Likely  
High: 45 °F

WEDNESDAY  
NIGHT



Slight Chc  
Showers  
Low: 35 °F

THURSDAY



Mostly  
Cloudy  
High: 60 °F

THURSDAY  
NIGHT



Mostly  
Cloudy  
Low: 46 °F

FRIDAY



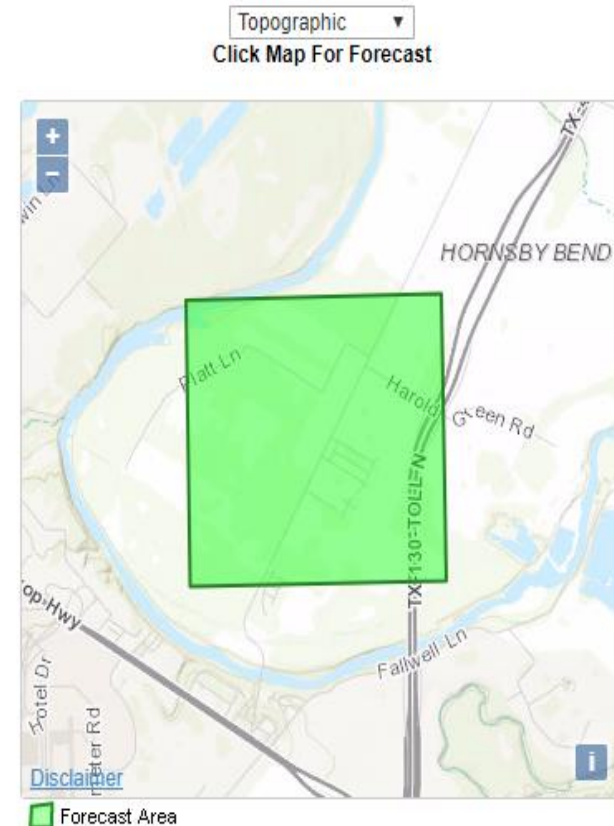
Partly  
Sunny  
High: 77 °F



# Text Forecast

## Detailed Forecast

|                        |   |
|------------------------|---|
| <b>This Afternoon</b>  | Mostly sunny, with a high near 75. South southeast wind around 5 mph.   |
| <b>Tonight</b>         | Mostly clear, with a low around 50. Southeast wind around 5 mph becoming calm after midnight.   |
| <b>Saturday</b>        | Mostly sunny, with a high near 77. Calm wind becoming south around 5 mph in the afternoon.  |
| <b>Saturday Night</b>  | Increasing clouds, with a low around 57. South southeast wind around 5 mph.   |
| <b>Sunday</b>          | A 30 percent chance of showers. Mostly cloudy, with a high near 73. Southeast wind 5 to 10 mph.   |
| <b>Sunday Night</b>    | Mostly cloudy, with a low around 64. Southeast wind around 10 mph.  |
| <b>Monday</b>          | A 20 percent chance of showers. Partly sunny, with a high near 80. South wind 10 to 15 mph.   |
| <b>Monday Night</b>    | A 30 percent chance of showers and thunderstorms. Mostly cloudy, with a low around 63. South wind 5 to 10 mph.  |
| <b>Tuesday</b>         | A 50 percent chance of showers. Mostly cloudy, with a high near 66. South wind 5 to 15 mph becoming north in the afternoon. Winds could gust as high as 20 mph. |
| <b>Tuesday Night</b>   | Mostly cloudy, with a low around 42.  |
| <b>Wednesday</b>       | Partly sunny, with a high near 57.  |
| <b>Wednesday Night</b> | Mostly cloudy, with a low around 36.  |
| <b>Thursday</b>        | Mostly sunny, with a high near 61.  |





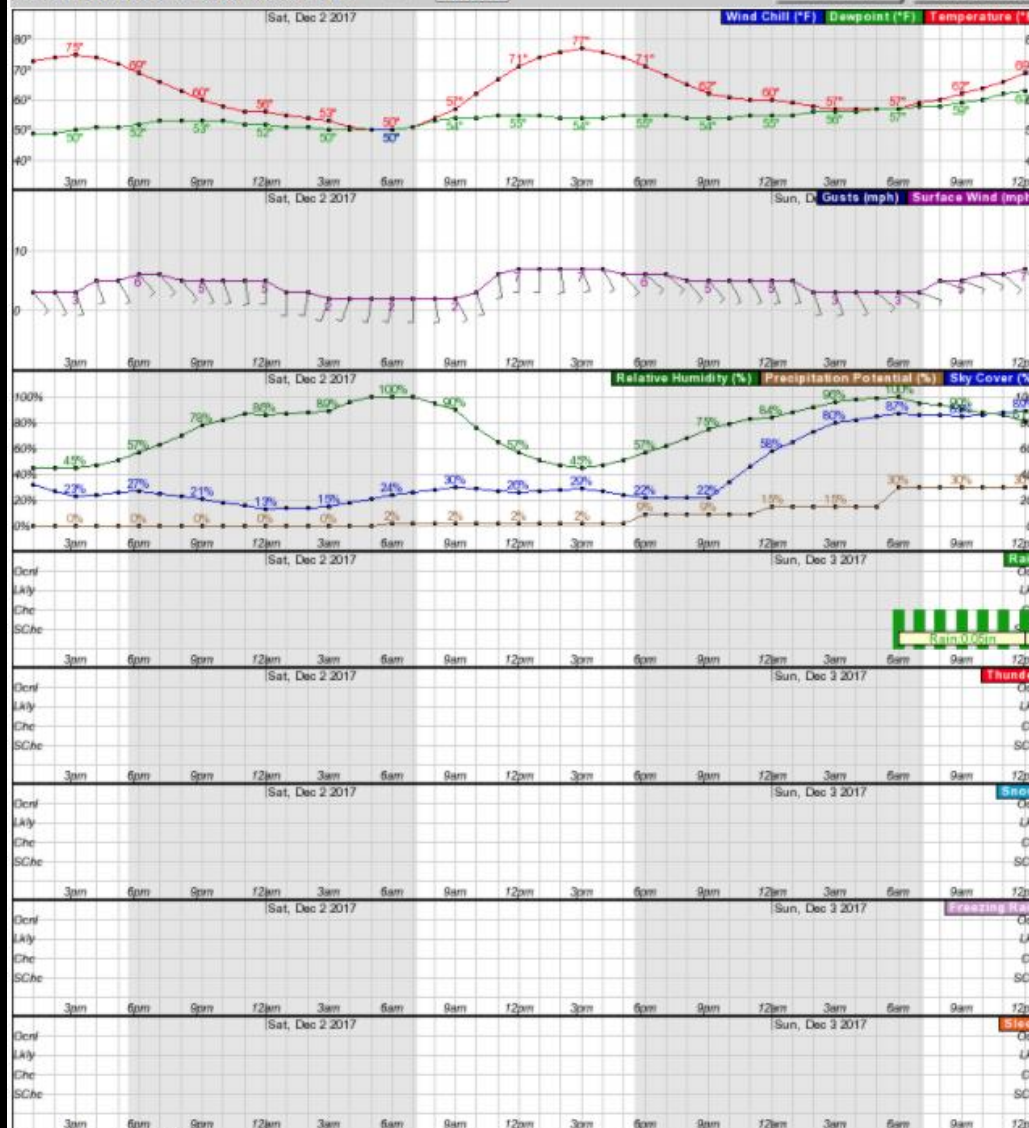
|   |   |  |
|---|---|--|
| <b>Weather Elements</b><br><input checked="" type="checkbox"/> Temperature (°F)<br><input checked="" type="checkbox"/> Dewpoint (°F)<br><input checked="" type="checkbox"/> Wind Chill (°F)<br><br><input checked="" type="checkbox"/> Surface Wind <b>mph</b> ▾<br><input checked="" type="checkbox"/> Sky Cover (%)<br><input checked="" type="checkbox"/> Precipitation Potential (%)<br><input checked="" type="checkbox"/> Relative Humidity (%) | <b>Weather/Precipitation</b><br><input checked="" type="checkbox"/> Rain<br><input checked="" type="checkbox"/> Thunder<br><input checked="" type="checkbox"/> Snow<br><input checked="" type="checkbox"/> Freezing Rain<br><input checked="" type="checkbox"/> Sleet<br><input type="checkbox"/> Fog | <b>Fire Weather</b><br><input type="checkbox"/> Mixing Height <b>x100ft</b> ▾<br><input type="checkbox"/> Haines Index<br><input type="checkbox"/> Lightning Activity Level<br><input type="checkbox"/> Trans. Wind <b>mph</b> ▾<br><input type="checkbox"/> 20ft Wind <b>mph</b> ▾<br><input type="checkbox"/> Dispersion Index<br><input type="checkbox"/> Red Flag Threat Index |
|---|---|--|

 48-Hour Period Starting: **1pm Fri, Dec 1 2017** ▾

Submit

Back 2 Days

Forward 2 Days



Friday, December 1 at 5pm

# Hourly Graph

## Major to Record Flooding Expected along the Mississippi and Atchafalaya Rivers

Warnings &  
Forecasts

Graphical  
Forecasts

National  
Maps

Radar

Water

Air Quality

Satellite

Climate

River Observations

River Forecasts

Precipitation

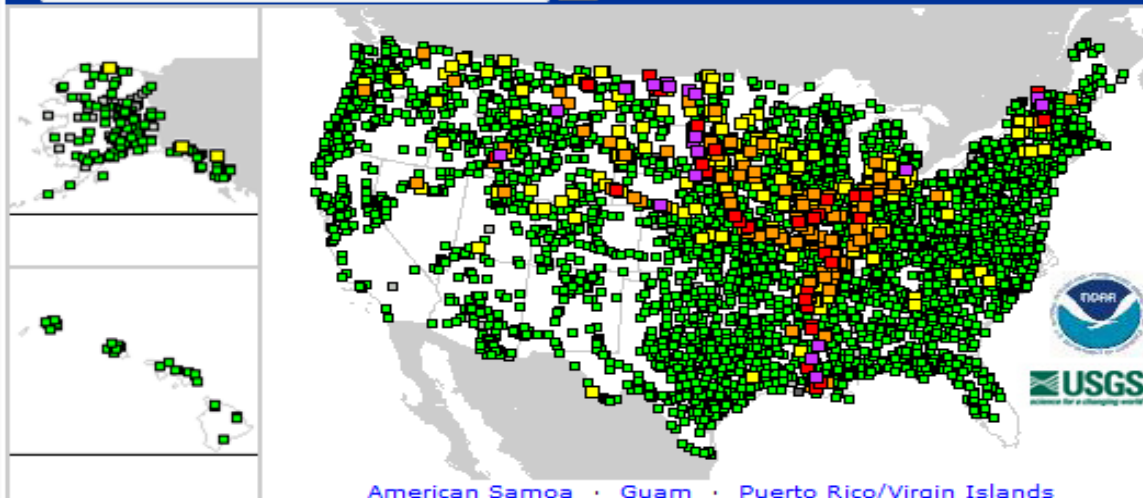
River Download

Other Information

All Locations

Go

Click The Map To Zoom In.



4867 Total Gauges

182 Locations in Flood

- 247 Gauges: Observations older than 24 hours
- 7 Gauges: Out of Service

- 20 Gauges: Major Flooding
- 42 Gauges: Moderate Flooding
- 120 Gauges: Minor Flooding
- 192 Gauges: Near Flood Stage
- 4239 Gauges: No Flooding

Last map update: 06/01/2011 at 08:02:30 am EDT / 06/01/2011 12:02:30 UTC

### Hydrologic Resources


- ▶ Text Products
- ▶ River Forecast Centers
- ▶ About AHPS
- ▶ Partners
- ▶ AHPS Feedback
- ▶ AHPS RSS **RSS**
- ▶ Automated Flood Warning Systems
- ▶ Hydrometeorological Automated Data System
- ▶ Inundation Mapping Locations

### Additional Resources

- ▶ National Significant River Flood Outlook
- ▶ U.S. Geological Survey Streamflow Information
- ▶ Snow Information
- ▶ NWS Precipitation and River Forecasting
- ▶ Water Resources Outlook
- ▶ Hourly Precipitation Analysis
- ▶ Guide to Hydrologic Information on the Web

# River Data


# mobile.weather.gov

 National Weather Service

Austin TX

### Current Conditions

Austin City, Austin Camp Mabry  
Updated: 1 Dec 08:51 am CST



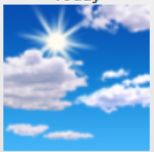
Overcast

60 °F  
Wind Calm MPH  
Dew Point 47 °F  
(62% RH)

### Forecast

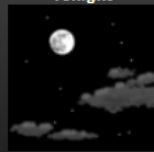
1 Dec 08:51 am CST

Today



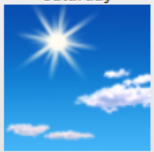
Mostly Sunny  
Hi 75°F

Tonight



Mostly Clear  
Lo 52°F

Saturday



Sunny  
Hi 77°F

Detailed Forecast

Radar

Satellite

Forecast Discussion

Forecast Graphics

Rivers/Lakes



**Questions? Comments?**

**Thank You!**

**Jon W. Zeitler**

***Science and Operations Officer***

**National Weather Service**

**Austin-San Antonio Forecast Office**

**2090 Airport Road**

**New Braunfels, TX 78130**

**Office: 830-310-3159 Cell: 830-822-0566**

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**Web: weather.gov**