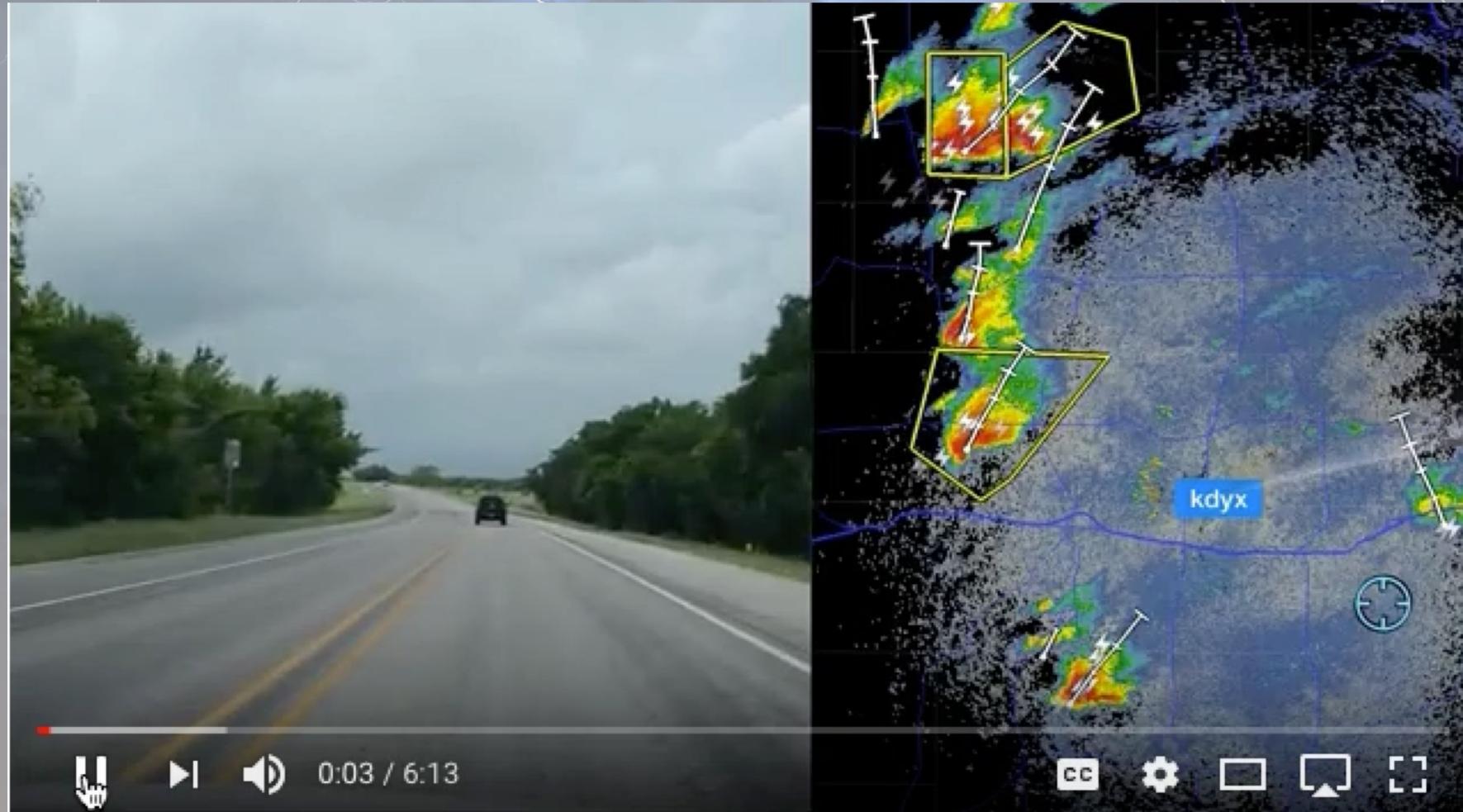


Major Types of Severe Storms

Thunderstorms

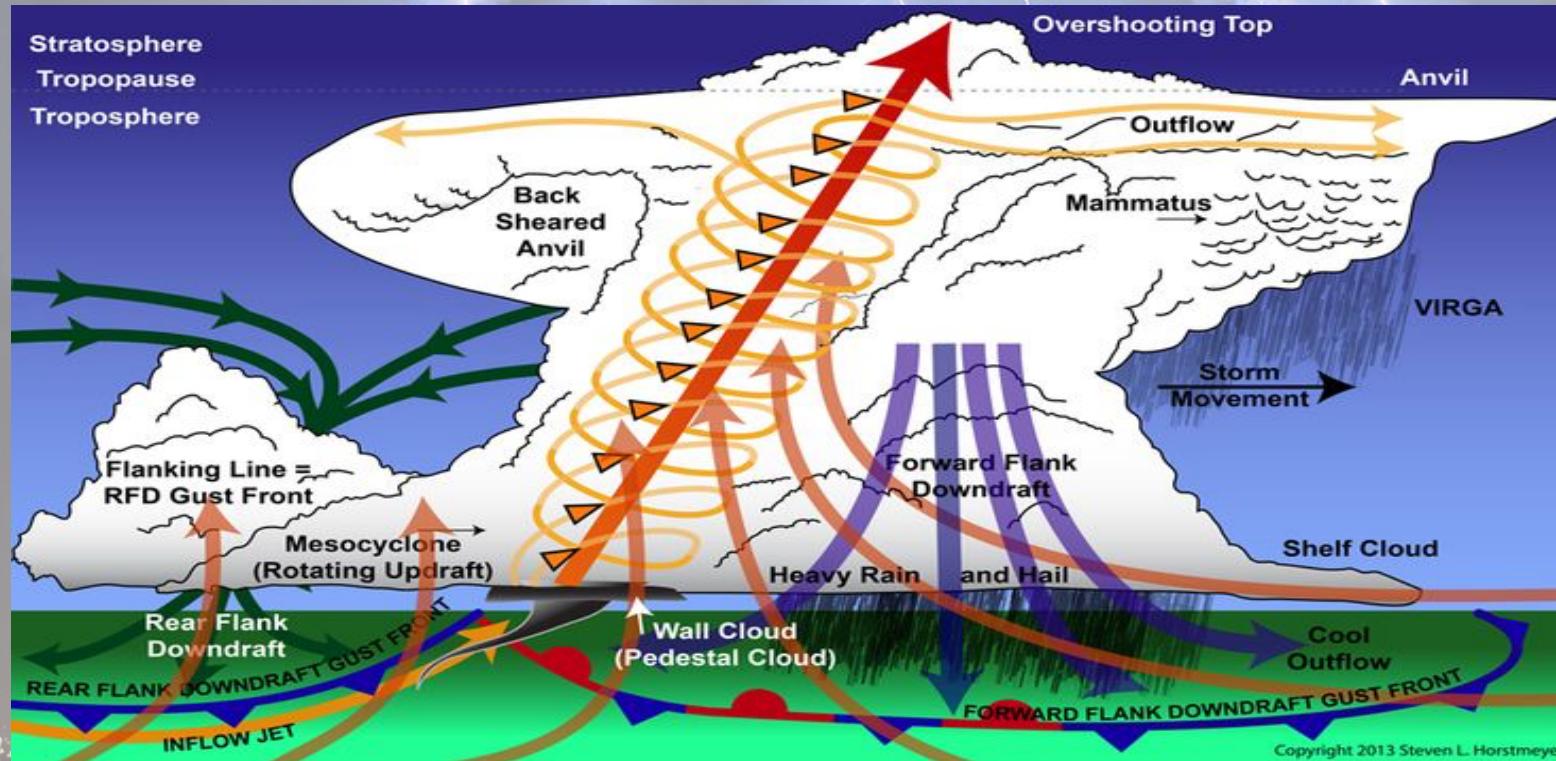
- A thunderstorm is a rain shower during which you hear thunder. Since thunder comes from lightning, all thunderstorms have lightning
- They usually are created by surface heating, convection is upward and this atmospheric motion that transports whatever is in the air along with it—especially any moisture available in the air. A thunderstorm is the result of convection
- A thunderstorm is classified as “severe” when it contains one or more of the following: hail one inch or greater, winds gusting in excess of 50 knots (57.5 mph), or a tornado
- The greatest chance for a severe thunderstorm threat in the U.S. extends from Texas to southern Minnesota. But, no place in the United States is completely safe from the threat of severe weather.

Thunderstorm Example



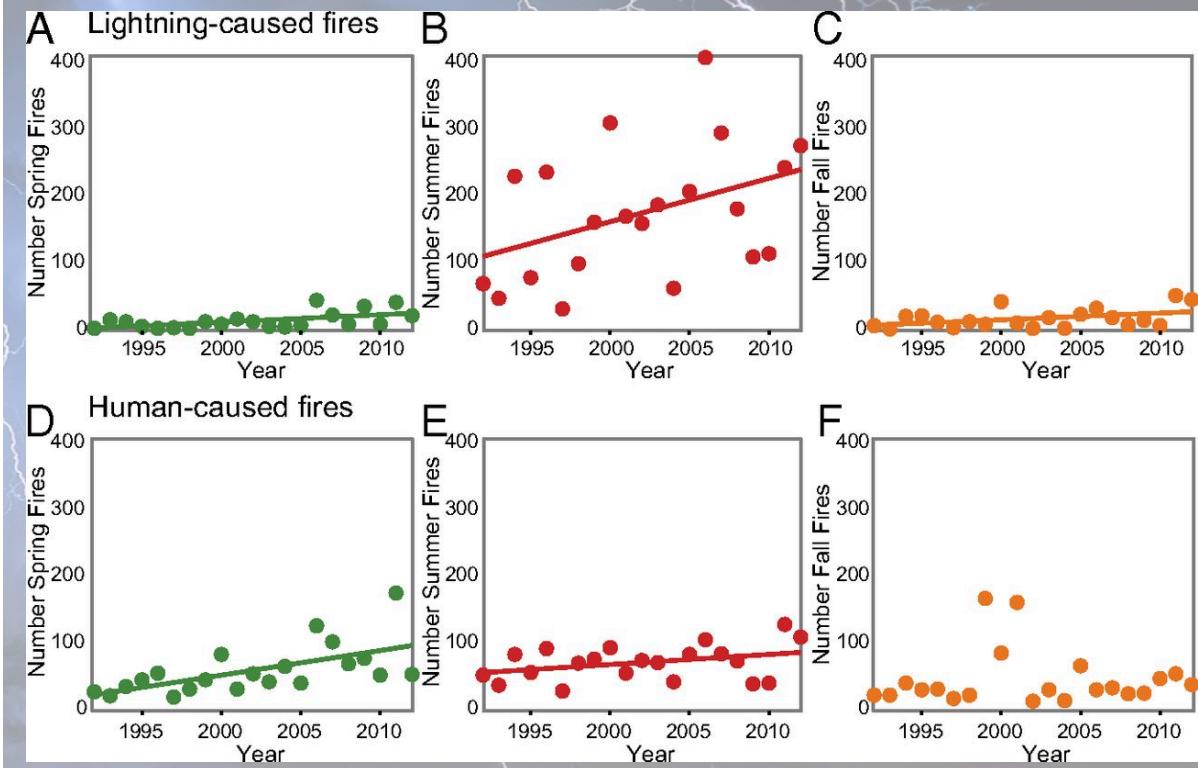
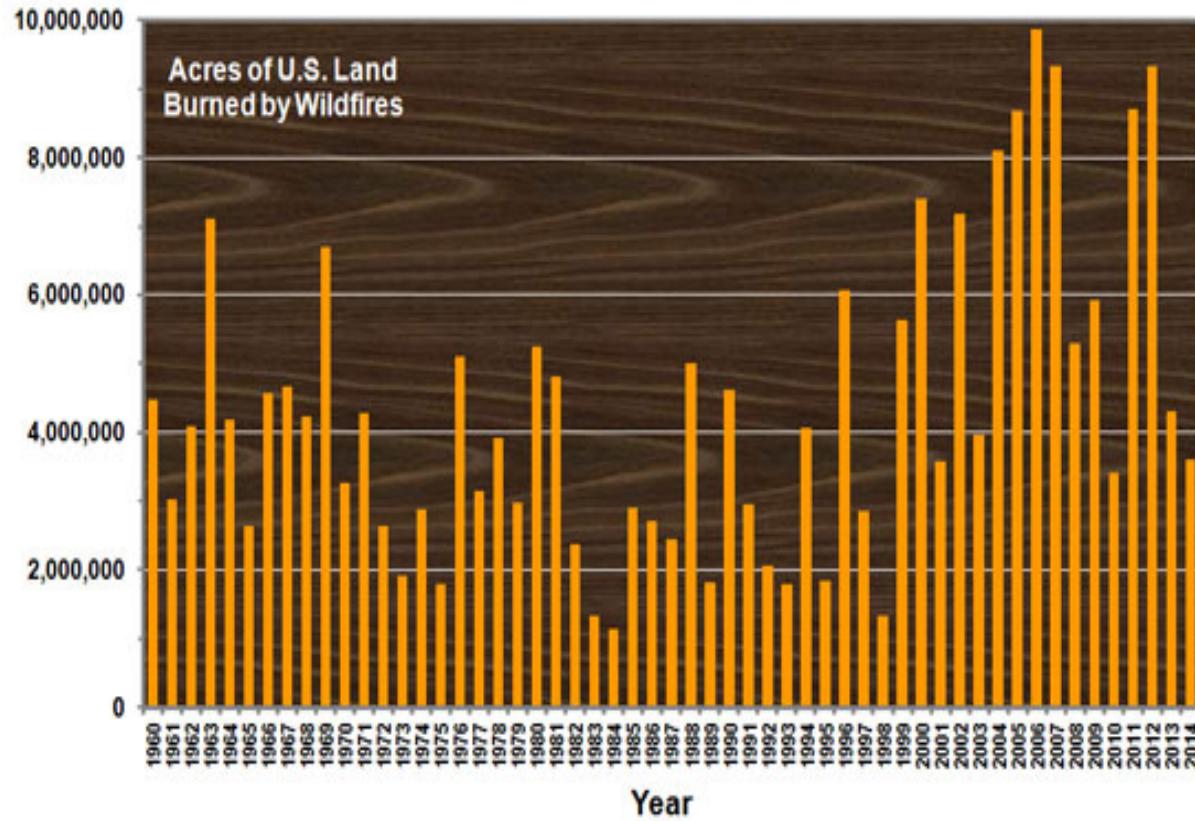
What Factors Determine Their Strength

- Factors that affect the strength of a Thunderstorm include Moisture, Instability, Lifting and wind shear
- Instability can be increased through daytime heating
- Lift is what gives a parcel of air the impetus to rise from the low levels of the atmosphere to the elevation where positive buoyancy is realized. It is lift that allows air in the low levels of the troposphere to overcome low level convective inhibition. Lift is often referred to as a trigger mechanism



Heat and Moisture drive the system. The warmer the lower air and colder the upper air the greater the lift, strength, and size of the storm. CO₂ in the atmosphere makes these type of storms more likely because of the additional heat energy supplied to the system.

Number of Thunderstorms per Year Using Wildfire Statistics



Major Types of Severe Storms

Nor'easters

- A nor'easter is a strong area of low pressure along the East Coast of the United States that typically features winds from the northeast off the Atlantic Ocean
- A nor'easter typically features winds from the northeast off the Atlantic Ocean
- These storms are most often associated with Northeast winter storms, but snow is not a requirement
- Nor'easters can happen any time of the year, but are most frequent and strongest September through April
- A nor'easter may bring heavy rain or snow, strong winds, coastal flooding and rough seas to the affected areas.

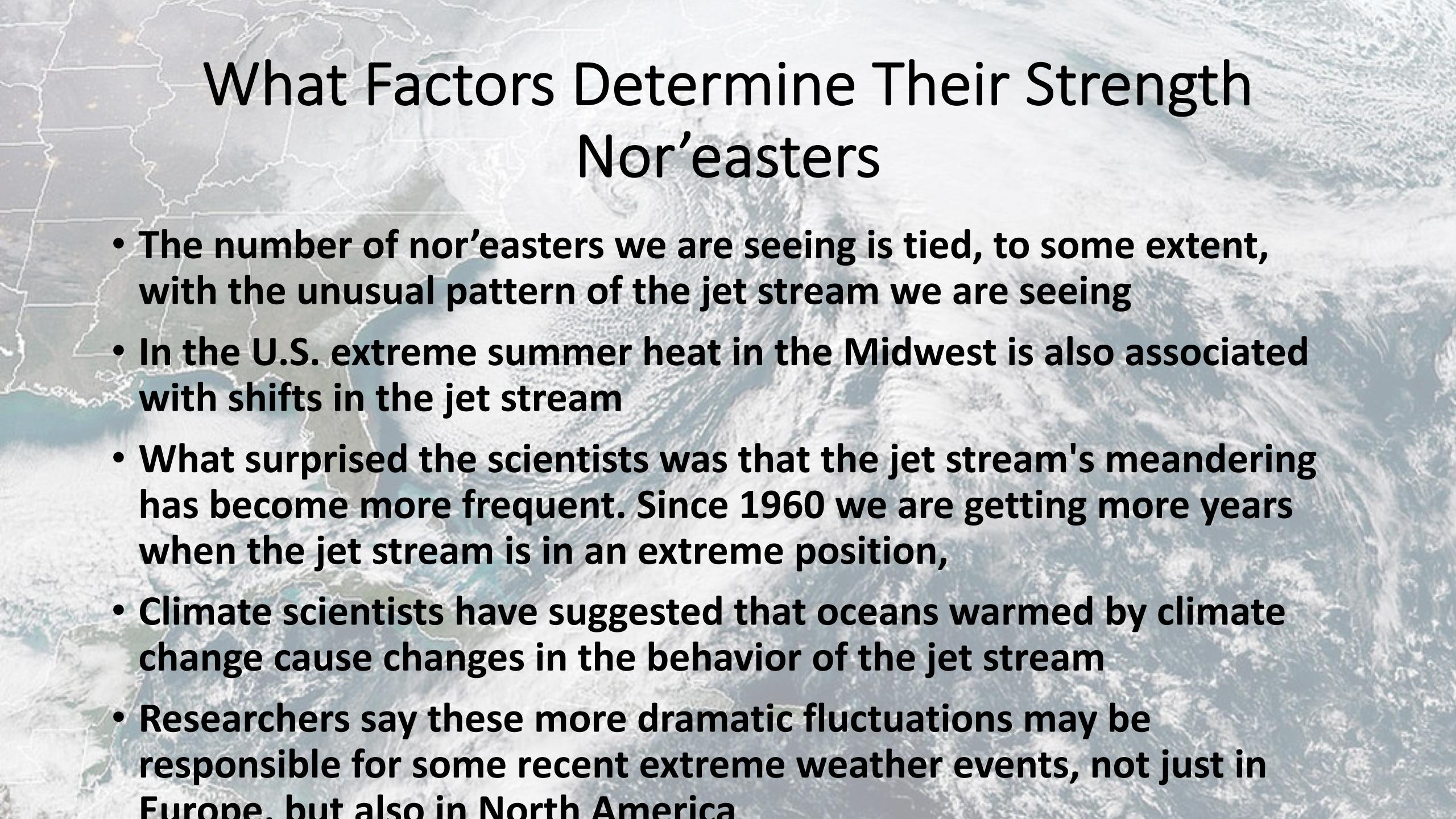
Example of a Nor'easter



A THIRD NOR'EASTER SLAMS A STORM-BATTERED NORTHEAST



MAN DRESSED AS ELSA RESCUES BOSTON POLICE WAGON FROM VERY...



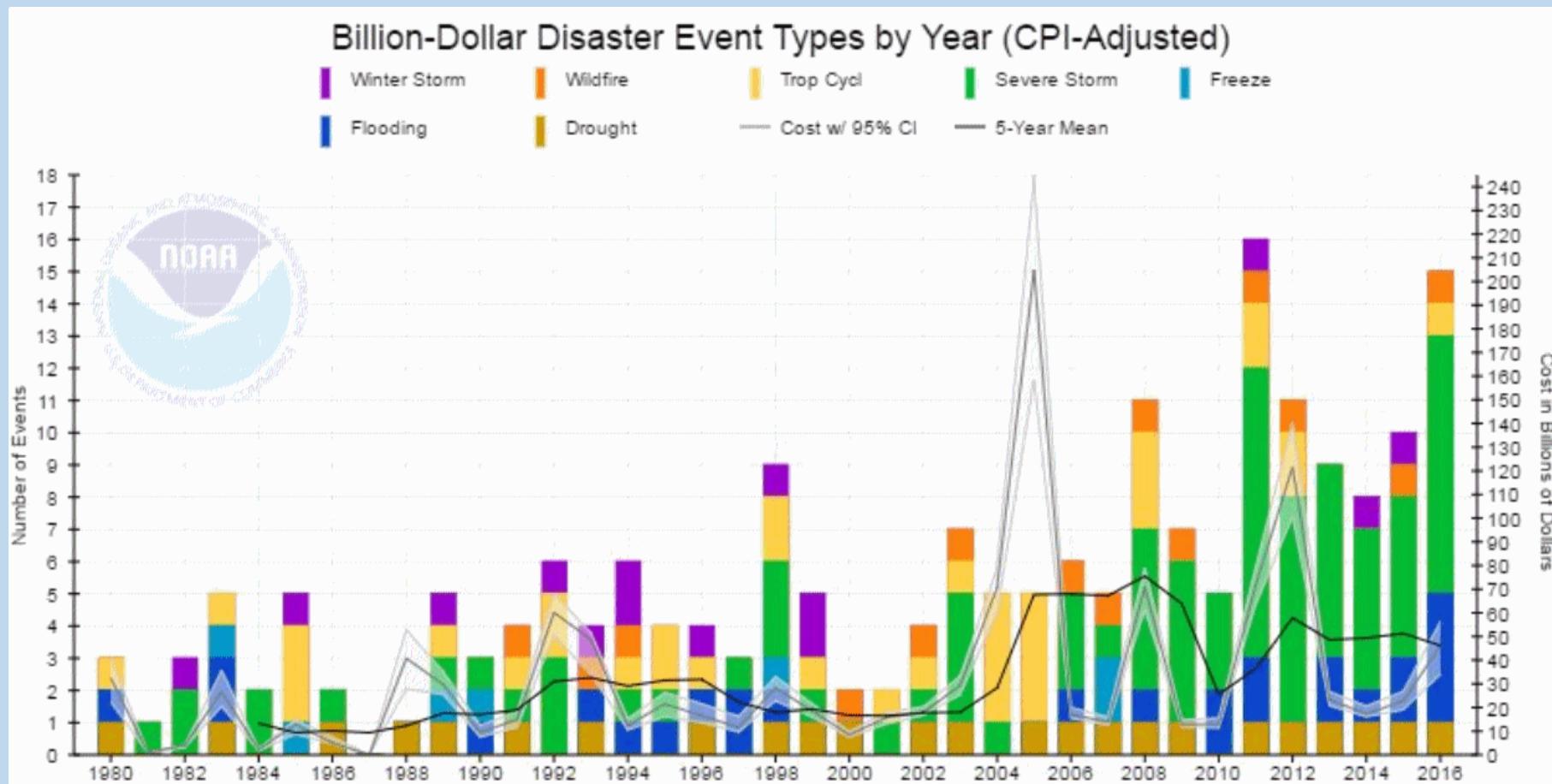
What Factors Determine Their Strength Nor'easters

- The number of nor'easters we are seeing is tied, to some extent, with the unusual pattern of the jet stream we are seeing
- In the U.S. extreme summer heat in the Midwest is also associated with shifts in the jet stream
- What surprised the scientists was that the jet stream's meandering has become more frequent. Since 1960 we are getting more years when the jet stream is in an extreme position,
- Climate scientists have suggested that oceans warmed by climate change cause changes in the behavior of the jet stream
- Researchers say these more dramatic fluctuations may be responsible for some recent extreme weather events, not just in Europe, but also in North America

Number of Nor'easters Per Year Trends

There is no real data that Has Been Collected Addressing increase in frequencies of Nor'easters in the US. However the Next Slide addresses all severe storms

Overall Trends in Severe Storms on a Yearly Basis



FIRST YEAR GROWTH

RAINY SEASON

DRY SEASON

SCARS FROM FOREST FIRE

SPRING/EARLY SUMMER GROWTH

LATE SUMMER/FALL GROWTH

What Factors Affect Tree Rings

- Dendrochronology is the dating and study of annual rings in trees. The word comes from these roots: ology = the study of chronos = time; more specifically, events and processes in the past dendros = using trees; more specifically, the growth rings of trees
- The study of tree rings is done for the following 3 reasons
 - to put the present in proper historical context
 - to better understand current environmental processes and conditions
 - To improve understanding of possible future environmental issues

FIRST YEAR GROWTH

RAINY SEASON

DRY SEASON

SCAR FROM FOREST FIRE

Conifer Tree Ring

Earlywood - appears light in color cells have thin walls, large diameter

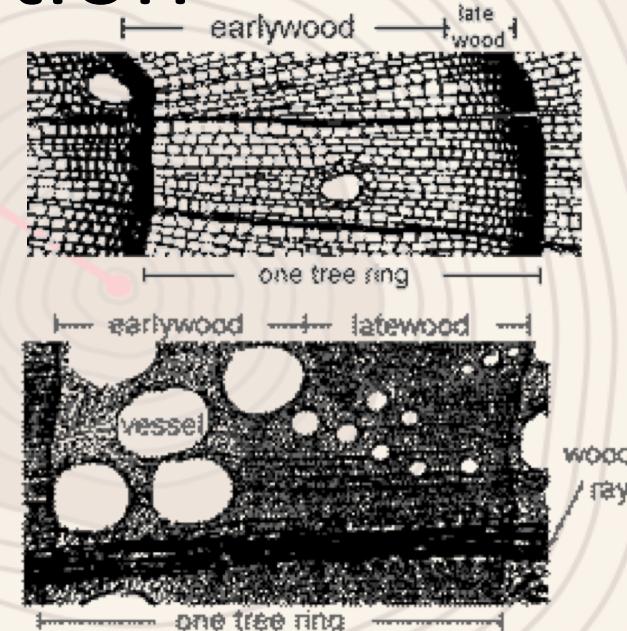
Latewood - appears dark in color cells have thick walls, small diameter

Tree Rings Basics of Ring Formation

Angiosperm Tree Ring

Earlywood cells - have large diameter vessels

Latewood cells - small diameter vessels



This picture of a conifer wood sample shows . The rings display much variation:

1. Variation in total ring width:

Light and a dark bands

2. Variation in late wood width:

Just the dark bands

3. Variation in latewood density:

darkness of dark band



FIRST YEAR GROWTH

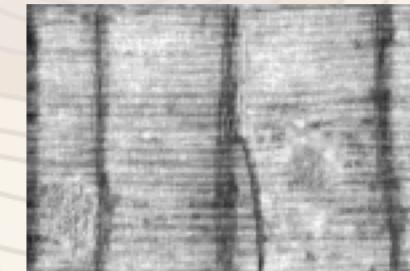
RAINY SEASON

DRY SEASON

SCAR FROM FOREST FIRE

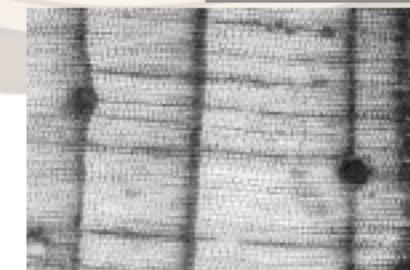
Locally Absent Rings

- Top part of this photo has 3 full rings.
- Lower part of this photo has 4 full rings.
- The wedge that is the 4th ring is "locally absent" from part of this tree.
- This sample is dateable, but NOT by mere ring counting.



False Bands/Rings

- This sample has 2 full rings; the right-most ring has a false band.
- The false band appears to go through a resin duct.
- False bands are differentiated from true rings by their cellular structure.
- This sample is dateable, but NOT by mere ring counting.



False Band

Full Ring

Tree Rings Basic of Ring Formation (Continued)

FIRST YEAR GROWTH

RAINY SEASON

DRY SEASON

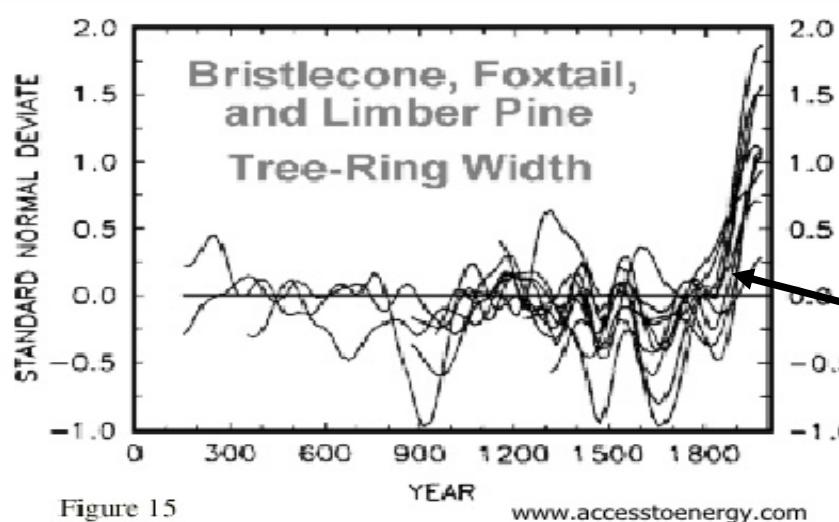
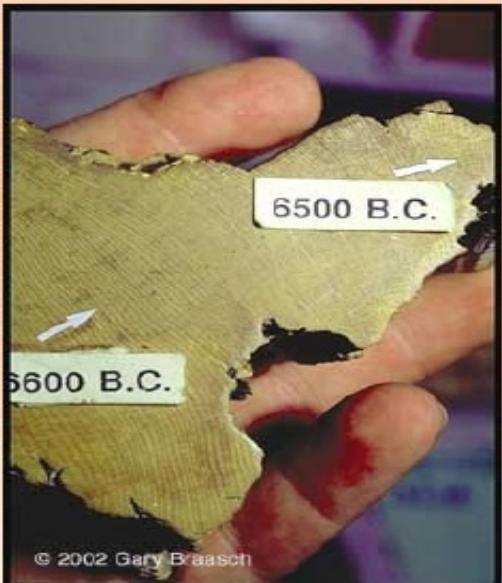
SCAR FROM FIRE

SPRING/E SUMMER

LATE SUM GROWTH

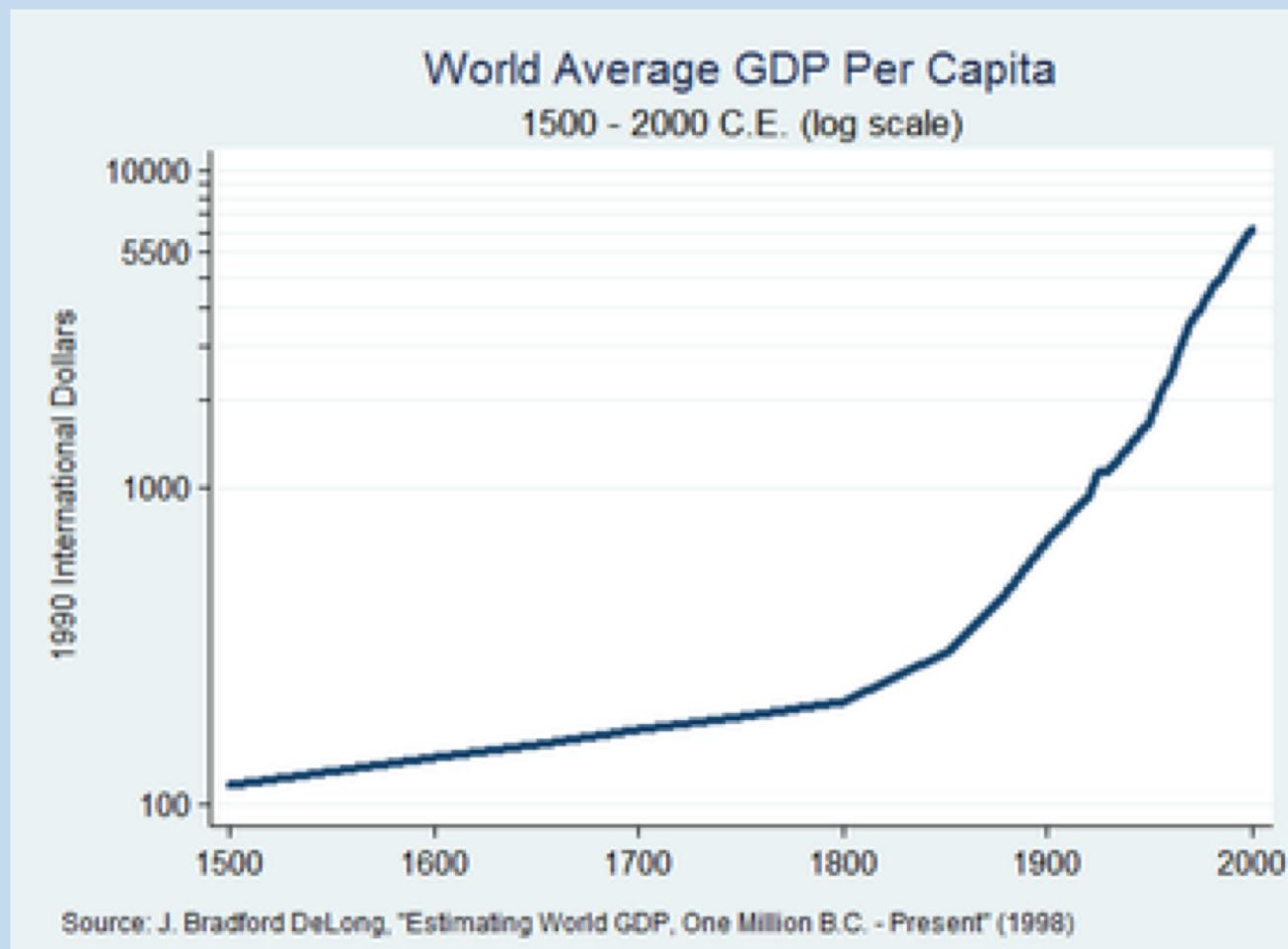
Tree Rings What Do The Rings Tells Us

Tree ring data show a warming trend

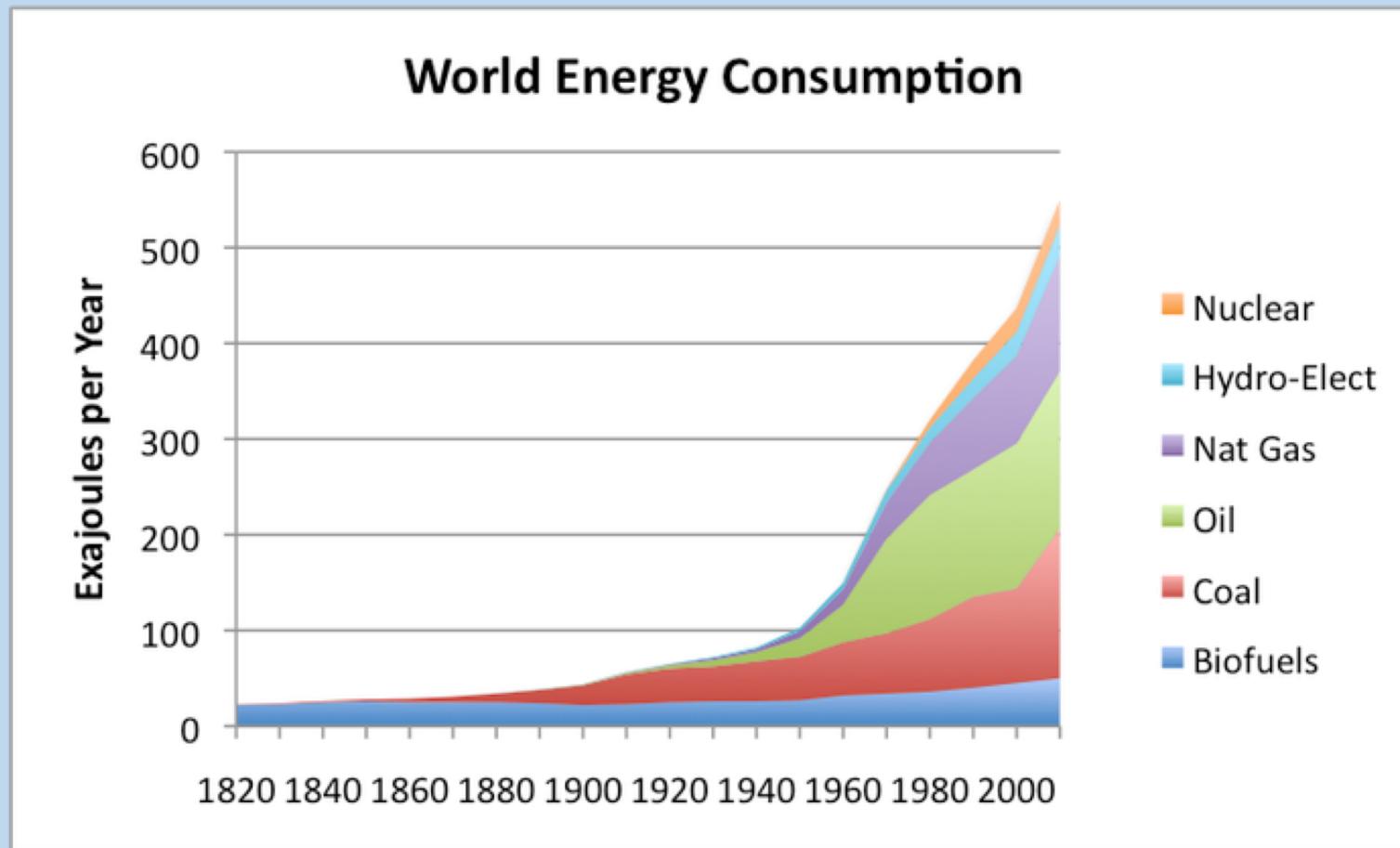


Roughly 1880
The Trees Talk
and are all
saying the
same thing

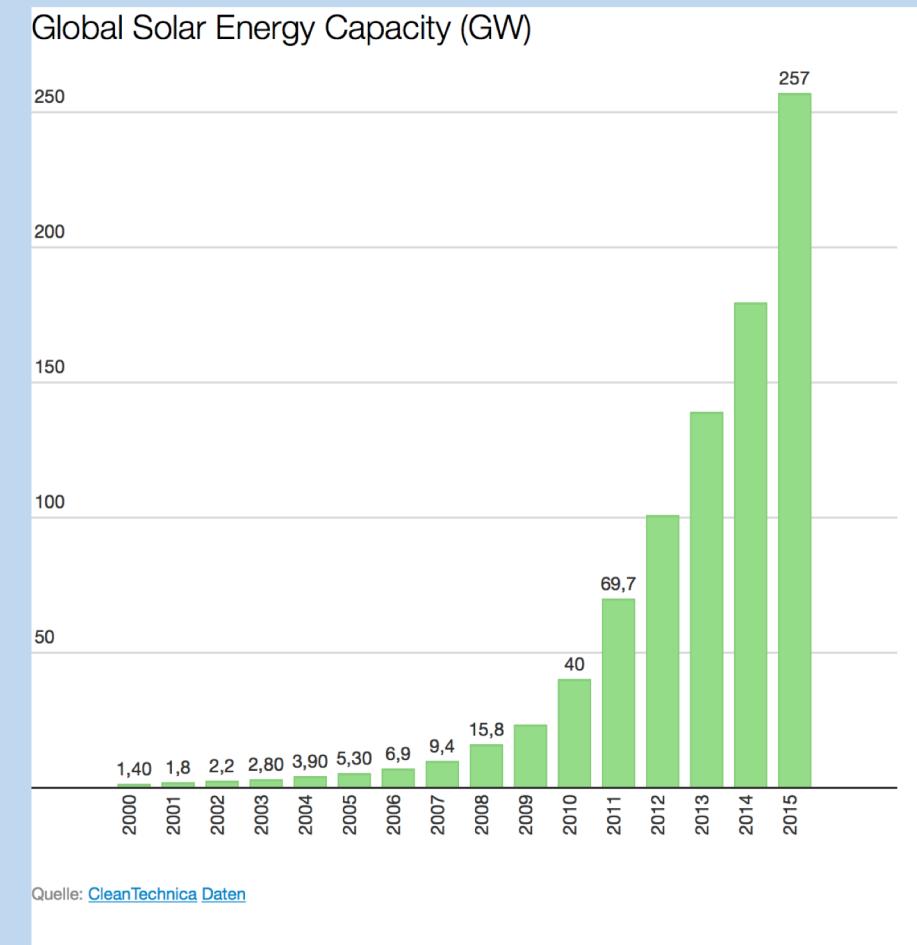
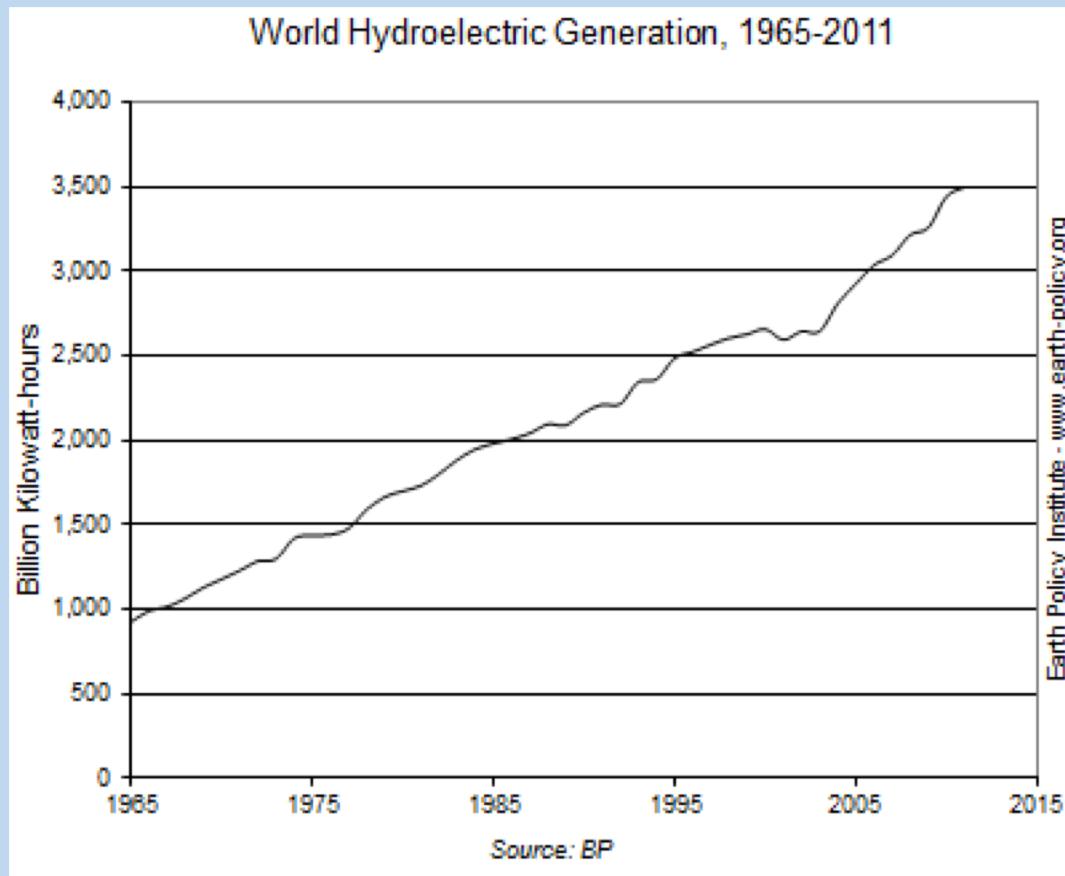
Industry Growth World Wide



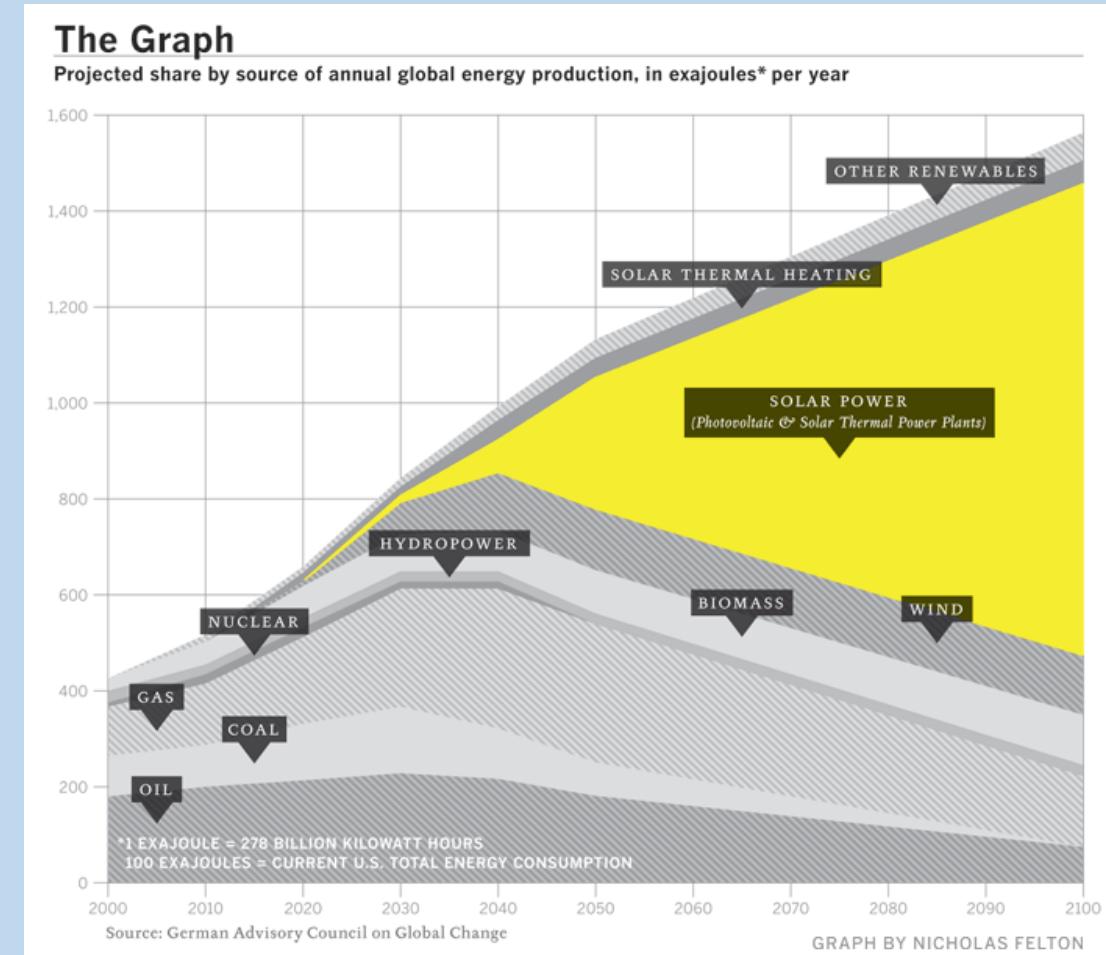
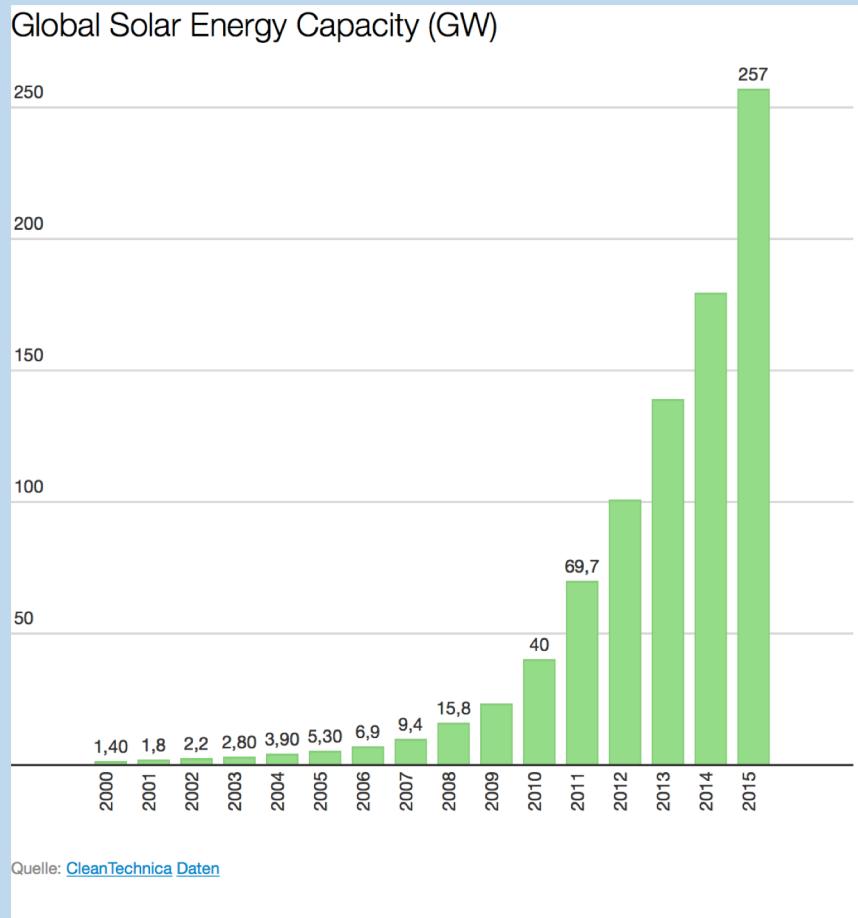
Types of Power Generation and Their Trends



Types of Power Generation and Their Trends



Good News is That This is the Direction of Change



Summary and Conclusions

- There are numerous storms that seem to be related to changes in the climate
- The climate is getting warmer or weather systems have become supersensitive to changes in the environment
- There is movement away from fossil fuels to power our world
- If we are lucky, we will continue down the path of reducing our dependence upon fossil fuels for power and slow or reverse the warming of the climate.