Weather Basics

with Tim Brice
The **Sun** is where it all starts...
The Sun Heats the Earth...
The Earth Heats the Air

Incoming Solar Radiation passes through the atmosphere and is absorbed by the Earth’s surface.

Outgoing Terrestrial Radiation is absorbed by the atmosphere.
Uneven Heating of the Earth

Oblique Rays (Less Radiation Received)

Vertical Rays (More Radiation Received)

Oblique Rays (Less Radiation Received)

Equatorial Regions are Warmer (Higher Sun Angles)
Polar Regions are Colder (Lower Sun Angles)
Seasonal Differences (Due to Earth’s Axial Tilt)

Sun’s Rays

- Sun Angle 23.5°
- Sun Angle 66.5°
- Sun Angle 90°
- Sun Angle 66.5°
- Sun Angle 23.5°

Tropic of Cancer
Equator
Tropic of Capricorn

Autumnal & Vernal Equinox
Seasonal Differences (Due to Earth's Axial Tilt)

Sun's Rays

- Sun Angle 23.5°
- Sun Angle 66.5°
- Sun Angle 90°
- Sun Angle 66.5°
- Sun Angle 23.5°

Tropic of Cancer
Equator
Tropic of Capricorn

Summer Solstice
Seasonal Differences (Due to Earth’s Axial Tilt)

Sun’s Rays

- Sun Angle 23.5°
- Sun Angle 66.5°
- Sun Angle 90°
- Sun Angle 66.5°
- Sun Angle 23.5°

Winter Solstice
Seasons Change as Earth Revolves Around the Sun
Land & Water Heat Differently

- Land heats faster and to higher temperatures than water
- Land also cools faster and to lower temperatures than water
Uneven Heating = Uneven Pressure Distribution
Pressure & Wind

Air moves from High to Low Pressure

Moving air is called “WIND”

High Pressure → Low Pressure

COOL  →  WARM
Question:

Because of the Earth’s 23.5° tilt we get what?

1) Day & Night
2) Gravity
3) Winter, Spring, Summer, & Fall
4) The Lunar Cycle
Question:

When it is Summer in the northern Hemisphere, what season is it in the Southern Hemisphere?

1) Summer
2) Winter
3) Fall
4) Spring

Answer: 2) Winter
High Pressure

Air Diverges

Low Pressure

Air Converges
High Pressure

H stands for "High Pressure" which brings...
Happy Weather!

- Clear Skies
- Calm Conditions
- Dry Weather
- High Day Temps
- Low Night Temps

Cold Air Sinks

Surface Winds Flow Outwards
Low Pressure

L stands for “Low Pressure” which brings... Lousy Weather!

- Cloudy Skies
- Windy Conditions
- Wet Weather
- Followed by colder weather

Surface Winds Flow Inwards

Warm Air Rises
Typical Weather Map

High Pressure
Low Pressure
Cold Fronts
Warm Fronts
Warm and Cold Fronts

Cold Front

Cold Air Displaces Warm Air At The Surface

Moves More Rapidly

Warm Front

Warm Air Displaces Cold Air At The Surface

Moves More Slowly
Tuesday
Wednesday
Question:

The most common type of weather associated with “High” pressure is __________.

1) Cloudy skies
2) Gusty winds
3) Sunny skies
4) Thunderstorms
Question:

The most vigorous weather (ie, thunderstorms) occur with what kind of front?

1) Warm front
2) Cold front
3) Occluded front
4) None of the above
WATER... An Amazing Molecule!

Solid, Liquid, & Gas
WATER... An Amazing Molecule!

- Evaporation
- Condensation
- Sublimation
- Deposition
- Freezing
- Melting
Tornado...

Strongest winds on Earth
How a tornado forms

- Stronger west winds aloft
- Southeast wind near ground
Tornado Safety - Outside

- People in open rural areas may be able to drive away from a distant approaching tornado.
- If tornado is unavoidable, seek shelter in strong building or ditch.
- Do not ride out tornado in auto!

Arlington, TX April 2012
Tornado Safety – Inside *(best by far!)*

- Seek shelter in a strong building
- *Underground shelter* & “safe room” by far the best if “up to code”.
- Otherwise small interior room on lowest floor for most twisters (bathroom or closet, cover yourself)
- Stay away from windows!!!
- Abandon mobile homes!

Jarrell, TX May 1997
Hurricane...
The Greatest Storm on Earth!
Hurricane Names Around The World

- Atlantic Ocean
- Central & Eastern Pacific Oceans
- Indian Ocean
- Western Pacific

- "Hurricane" in the Atlantic and Central & Eastern Pacific Oceans
- "Cyclone" in the Indian Ocean
- "Typhoon" in the Western Pacific
- "Willy-Willy" along the Coast of Australia
Light winds aloft steer the storm

Moist air rises & condenses

Warm moist air converges near storms center

Hurricanes are fueled by warm ocean waters (more than 80°F)
Anatomy of a Hurricane

**Eye:** Light winds, mostly sunny, very low surface pressure

**Eye Wall:** Strongest winds, heaviest rain

**Spiral Rain Bands:** Rotate around the storm, moderate to heavy rain, strong winds, possible weak tornadoes
Weather consists of the short-term (minutes to days) variations in the atmosphere. Weather is expressed in terms of temperature, humidity, precipitation, cloudiness, visibility and wind.
Climate is the average weather in a place over many years. While the weather can change in just a few hours, climate takes hundreds, thousands, even millions of years to change.
Weather vs. Climate

Weather happens at a particular time and place.

Climate is regional and long-term.

Is it news (weather) or history (climate)?
Climate is what you expect... Weather is what you get!
Question:

What is the fuel source for a hurricane?

1) Warm ocean water
2) Peanut butter & jelly sandwich
3) Rotation of the Earth
4) Cold ocean water
Question:

*True or False*

Tornadoes can form in any state of the United States

1) True
2) False
Question:

*True or False...*

Climate is the average weather in a region over many years.

1) True
2) False
Questions?

The End!