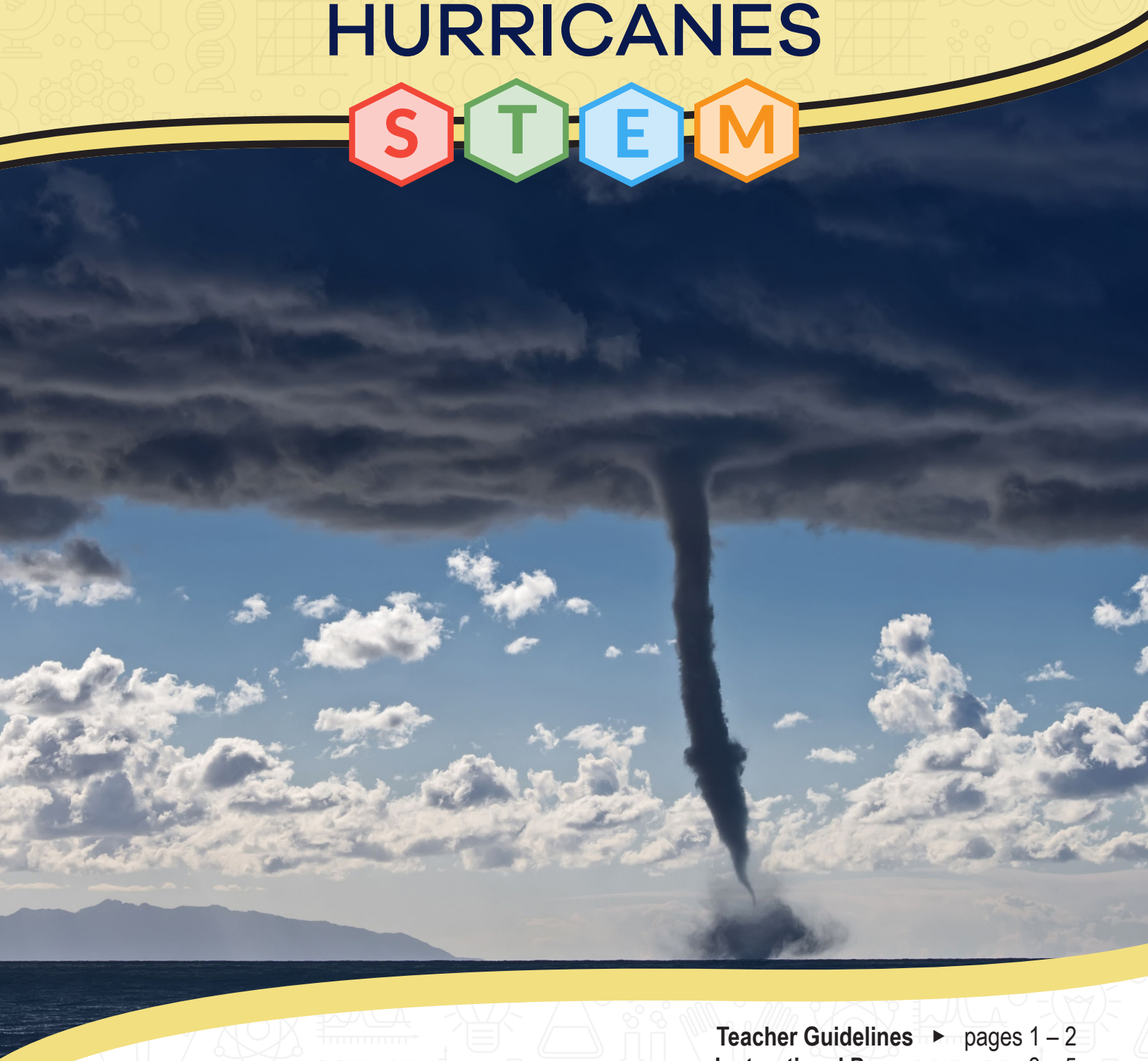
Learn BRIGHT

STORMS, TORNADOS, HURRICANES

S T E M



GRADE 4-6

Classroom Procedure:

1. Introduce the lesson by asking students to list different types of weather. Next, open a weather app and show students the various components of the app. Finally, ask students why it is important to know the weather.
2. Distribute Storms Tornados Hurricanes content pages.
3. Distribute the Activity Page. Students can work independently or in pairs.
4. Distribute the Practice Page. Students can work independently or in pairs.
5. Distribute the Homework Page. Have students share their paths and talk about the storms near your area.
6. In closing, ask students how information about the possibility of severe can help people be and stay safe in tornados and hurricanes. What information is most important to know if a storm/tornado/hurricane is coming? How are tornados different from storms? How are they alike? What type of storm is more likely to cause the most devastation and damage to an area? Why? Why are tornados challenging to predict?

Lesson Title**: Storms, Tornados, Hurricanes: A STEM Activity**

Subject: **Science**

Approximate Grade Level: 4 – 6

Objectives: Students will compare and contrast storms, tornados, and hurricanes. Students will know the causes of storms, tornados, and hurricanes. Students will identify the most likely places tornados and hurricanes begin.

State Educational Standards*
NGSS.3-ESS2-1, NGSS.MS-ESS2-6, & NGSS.MS-ESS3-2

Class Sessions (45 minutes):
1-2 Class Sessions

Teaching Materials/Worksheets:
Content Pages (2), Activity Page (1), Practice Pages (2), Homework Pages (2)

Student Supplies: Activity: cup with a lid and straw hole, 2 straws, masking tape, permanent marker, scissors, cardstock, pin, water

Practice: cup with a lid and straw hole, 4 Dixie cups, 2 straws, permanent marker, single hole punch (optional), pin, water, timer

Prepare Ahead of Time:
Copies of worksheets

Options for Lesson: Print maps of the Pacific Ocean if needed using the website https://www.nhc.noaa.gov/tracking_charts.shtml. Record the number of turns as a class and mark on a chart. Connect this lesson with a math lesson on mean, median, mode, and range. Have students use the anemometer each day, keep track of the number of rotations, and then graph the data they have collected.

*Lessons are aligned to meet the education objectives and goals of most states. For more information on your state objectives, contact your local Board of Education or Department of Education in your state.

Teacher Notes

Students will learn about the similarities and differences in storms, tornados, and hurricanes in this lesson. In addition, students will be able to classify each weather condition by its unique characteristics. Two hands-on activities have students building their own weather instruments. The activities can easily be paired with math lessons on Mean, Median, Mode, Range, and graphing.

Storms, Tornados, Hurricanes

All around the world, there are different types of storms. However, the three main types of storms are thunderstorms, tornados, and hurricanes.

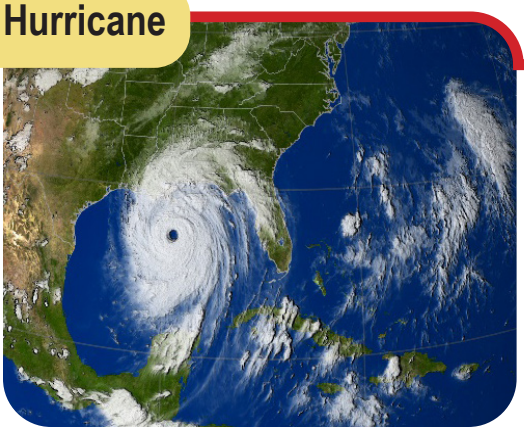
Thunderstorms

Thunderstorms are the most common type of storm. Most people have been in a thunderstorm. They can produce rain, thunder, lightning, sleet, hail, or even snow. They usually have high winds and heavy rain. But where do they come from? Thunderstorms form in cumulonimbus clouds called thunderheads. These clouds contain lightning which heats the air and produces a loud boom - thunder. Thunderstorms can occur anywhere on the planet.

Tornado

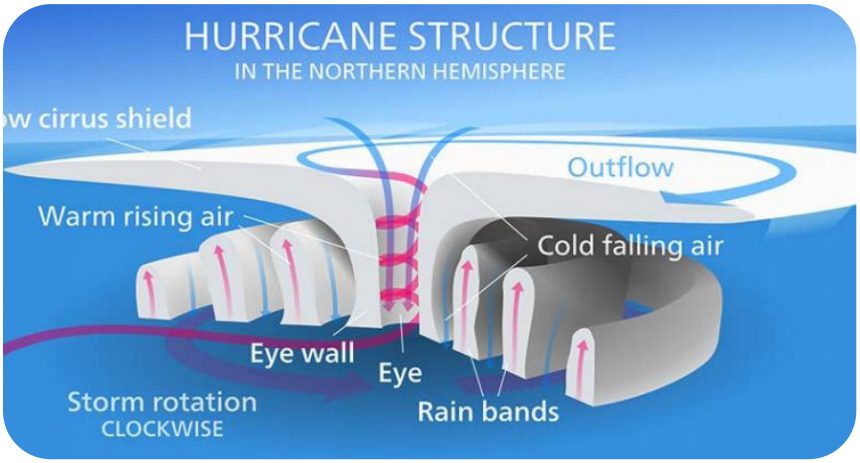
Sometimes a spring or summer thunderstorm will create a tornado. A tornado is a powerful spinning cone of wind. They move along the ground in a narrow but very destructive path. Sometimes tornados will form over the water, and then they are called a waterspout. How do tornadoes form? When the surface of the Earth is warm, warm air begins to rise. Warm air is powerful, and it rushes into the cooler air at high speeds. Usually, the air comes from many different directions, but sometimes the air starts to move all in the same direction. When this happens, a funnel will form. Most of the time, the funnel will touch the ground, but sometimes it does not. Winds can reach 300 miles per hour in the center of a tornado. Most tornados in the United States take place in Tornado Alley in the Midwest.

Hurricane



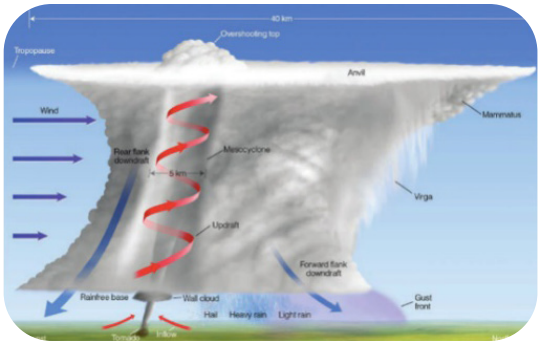
Hurricanes are large swirling storms that form over warm tropical oceans near the equator. They have very low pressure at the center but don't let that fool you. Hurricanes are powerful and can cause lots of damage to homes and businesses because they cause high waves and flooding along coastal cities. The center of the hurricane is called the 'eye,' and it is usually very calm. The eye ranges from 2 to 200 miles in diameter.

Storms, Tornados, Hurricanes



How do hurricanes form? Hurricanes move across the ocean as a clump of thunderstorms with high winds that rotate clockwise above the equator and counterclockwise below the equator. As the wind pulls up more water and begins spinning together, the hurricane gets stronger and stronger. Once they hit land, they begin to lose some of their power.

Tornados most often form over land though sometimes funnel clouds called water spouts do form over large bodies of water. When a low-pressure front collides with a high-pressure front, storms occur. Tornados form when cold and warm air meet, resulting in unpredictable spinning air currents. Unlike hurricanes which may last for several days, a tornado will only be on the ground for an average of fewer than 10 minutes.



How do scientists measure how powerful storms are?

Most storms like thunderstorms or snowstorms can be monitored by satellites in space and radar on the ground. It might surprise you to learn that when scientists want to know how large and powerful a hurricane is, they fly airplanes into the eye of the storm!

Category	Wind speed (km/h)	Description
1	119-153	Some damage
2	154-177	Extensive damage
3	178-208	Devastating damage
4	209-252	Catastrophic damage
5	≥ 252	Catastrophic damage

The eye of the storm of hurricanes is the area of calm where the outside of the hurricane has the spinning winds. Scientists use special instruments to measure how large and how fast the winds are churning from the inside.

Tornados happen really fast. So, when alerted by weather reports that conditions are right for a tornado, scientists will track the storm on radar. Storm chasers are scientists who follow fast-moving hurricanes and tornados in specially built vehicles to measure the strength and direction of the tornado. Most people have less than thirteen minutes of warning before a tornado hits the ground. Compare that with hurricanes where people on the coast are alerted many days before a hurricane actually is in danger of hitting land on the coast.

Storms, Tornados, Hurricanes

Fujita scale

Scale	Wind speed estimate		Frequency	Potential damage
	mph	km/h		
F0	40–72	64–116	44.14%	**Light damage.** Small trees are blown down and bushes are uprooted. Shingles are ripped off roofs, windows in cars and buildings are blown out, medium to large branches snapped off of large trees, sheds are majorly damaged, and loose small items are tossed and blown away (i.e. lawn chairs, plastic tables, sports equipment, mattresses). Barns are damaged.
F1	73–112	117–180	34.24%	**Moderate damage.** Roofs stripped from shingles or planting. Small areas of roof may be blown off house. Doors and garage doors blown in, siding ripped off houses, mobile homes flipped or rolled onto their sides, small trees uprooted, large trees snapped or blown down, telephone poles snapped, outhouses and sheds blown away. Cars occasionally flipped or blown over, and moderate roof and side damage to barns. Corn stalks slightly bent and stripped of leaves.
F2	113–157	181–253	16.17%	**Significant damage.** Whole roofs ripped off frame houses, interiors of frame homes damaged, small and medium trees uprooted. Weak structures such as garages, barns, and mobile homes are completely destroyed.
F3	158–206	254–332	4.35%	**Severe damage.** Roofs and numerous outside walls blown away from frame homes, all trees in its path uprooted and/or lofted, two-story homes have their second floor destroyed, highrises have many windows blown out, radio towers blown down, metal buildings (i.e. factories, power plants, and construction sites) are heavily damaged, sometimes completely destroyed. Large vehicles such as tractors, buses, and forklifts are blown from their original positions.
F4	207–260	333–418	1.00%	**Devastating damage.** Trees partially debarked, cars are mangled and thrown in the air, frame homes are completely destroyed and some may be swept away, trains are blown off railroad tracks, and barns are leveled.
F5	261–318	419–512	0.10%	**Incredible damage.** Cars are mangled and thrown hundreds, possibly thousands of yards away. Frame homes, brick homes, and small businesses are swept away, trees debarked, corn stalks flattened or ripped out of the ground, skyscrapers sustain major structural damage, grass ripped out of the ground. Wood and any small solid material become dangerous projectiles.

Activity Name _____ Date _____

Instructions: Make a weathervane!

A weathervane tells which direction the wind is blowing *from.* Knowing the direction of the wind can help people know if the weather is likely to get warmer, cooler, wetter, or dryer. (In the northern hemisphere, north wind = colder, south = warmer, east = rain or snow is coming, west = may clear up)

1. Making the base

On the cup's lid, label the 4 cardinal directions (N, S, E, W) with a permanent marker.

Put the lid on the cup and insert the straw. Place masking tape over the top of the straw.

2. Making the vane

Cut a triangle for the arrow and a trapezoid for the back out of cardstock.

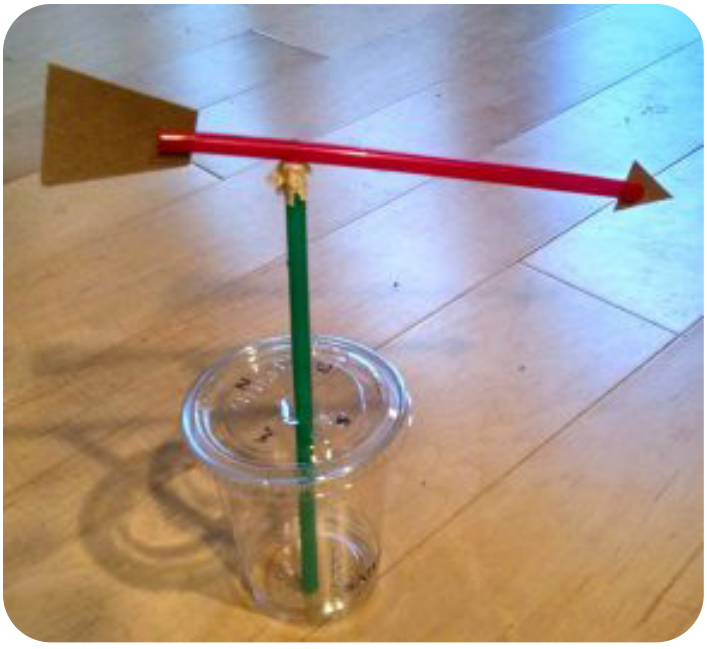
Cut slits in the second straw to insert the arrow and back.

Find the center of gravity by balancing the straw on your finger.

Push a pin through that point and then push the pin through the tape on the top of the straw.

Check to make sure it spins easily.

Before you use the weathervane, fill the cup with water to hold it down.



Which direction is the wind going right now? _____

Practice

Name _____ Date _____

Instructions: Make an anemometer!

An anemometer measures how fast the wind is blowing.

1. Making the base

On the cup's lid, label the 4 cardinal directions (N, S, E, W) with a permanent marker.

Put the lid on the cup and insert the straw. Place masking tape over the top of the straw.

2. Making the top

In each of the 4 Dixie cups, punch two holes across from each other. Then, place an 'X' on one of the cups with the permanent marker.

Make a plus sign with 2 straws and poke a pin through the middle.

Put a cup on each straw end, all facing the same way.

3. How to Use

Fill the cup with water to hold it down.

Place the anemometer outside in the wind.

Set a timer for one minute.

Count the number of times the cup with the x passes you.

- Record the number of rotations in three trials, each one minute long.

Trial 1	Trial 2	Trial 3

Practice Name Answer Key Date _____

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Trial 1	Trial 2	Trial 3
	Answers will vary	

Homework

Name _____ Date _____

Instructions: Be a hurricane tracker!

Track a storm/hurricane or one from a previous year using the chart below. First, go to the website https://www.nhc.noaa.gov/ to find a current storm/hurricane. Then, plot it on the map below.

Storm/hurricane information: _____

_____

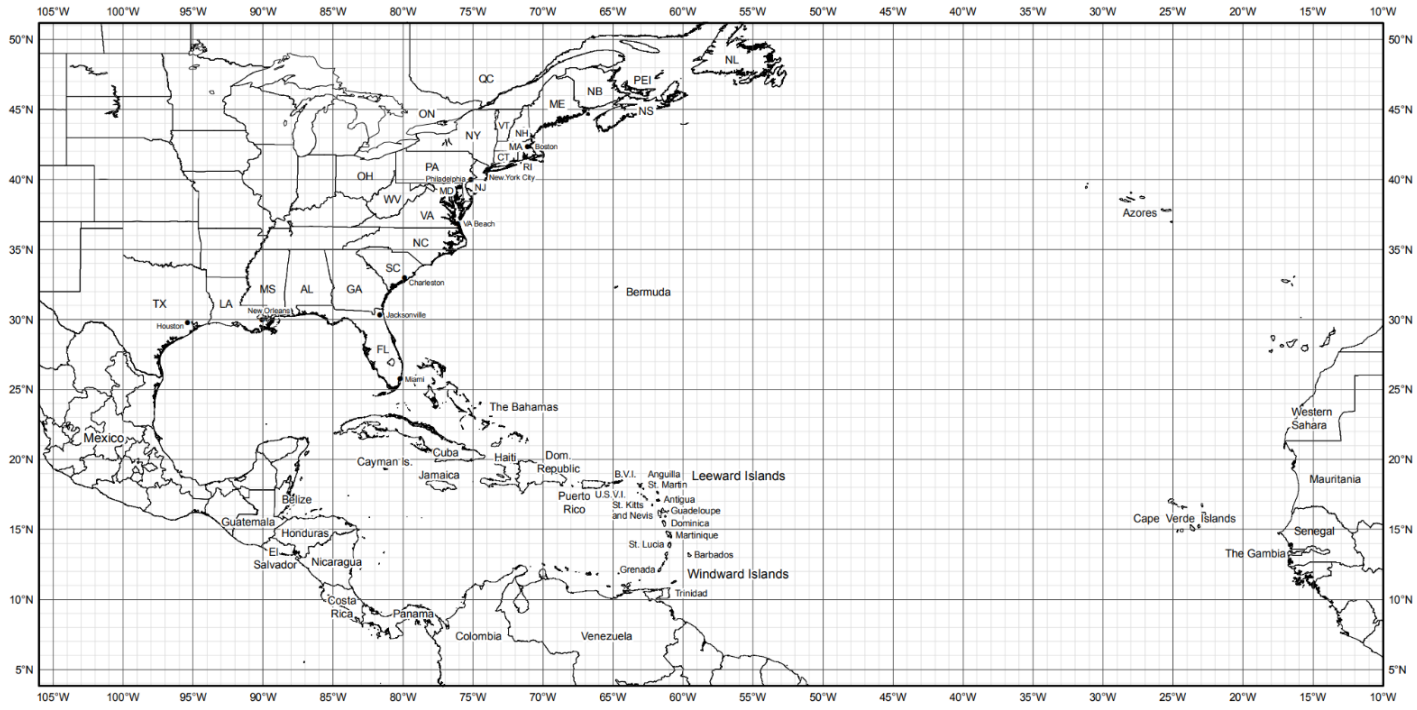
_____

_____

_____

Atlantic Basin Hurricane Tracking Chart

National Hurricane Center, Miami, Florida



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