

Earth Science

Chapter 24

Section 4 – Forecasting the Weather

E.Q.: *How is weather data communicated and what are types of weather that meteorologists have attempted to control?*

STANDARDS:

SES5. Students will investigate the interaction of insolation and Earth systems to produce weather and climate.

- b. Explain the relationship between air masses and the surfaces over which they form.**
- c. Relate weather patterns to interactions among ocean currents, air masses, and topography.**
- e. Describe the hazards associated with extreme weather events and climate change (e.g., hurricanes, tornadoes, El Niño/La Niña, global warming).**

Objectives

- Explain how weather stations communicate weather data.**
- Explain how a weather map is created.**
- Explain how computer models help meteorologists forecast weather.**
- List three types of weather that meteorologists have attempted to control.**

Global Weather Monitoring

- Weather stations around the world exchange the weather information they have collected.**
- The World Meteorological Organization (WMO) sponsors a program called *World Weather Watch* to promote the rapid exchange of weather information.**
- It also offers advice on the effect of weather on natural resource and on human activities, such as farming and transportation.**

WEATHER MAPS

Weather Symbols

station model - a pattern of meteorological symbols that represent the weather at a particular observing station and that is recorded on a weather map

- Common weather symbols describe cloud cover, wind speed, wind direction, and weather conditions, such as type of precipitation and storm activity.
- Other information included in the station model are the air temperature and the dew point.
- The dew point indicates how high the humidity of the air is, or how much water is in the air.
- The station model also indicates the atmospheric pressure by using a three-digit number in the upper right hand corner.

The diagram below shows the different weather symbols used on weather maps.

Cloud cover (fraction of sky covered)	Clear	$\frac{1}{8}$	Scattered	$\frac{3}{8}$	$\frac{4}{8}$	
	$\frac{5}{8}$	Broken	$\frac{7}{8}$	Overcast	Obscured	No data
Wind speed (knots)	Calm	1 to 2	3 to 7	8 to 12	13 to 17	
	18 to 22	23 to 27	48 to 52	73 to 77	103 to 107	
Wind direction	North	Northeast	East	Southeast		
	South	Southwest	West	Northwest		
Weather conditions	Drizzle	Fog	Hail	Haze	Rain	Shower
	Freezing rain	Smoke	Snow	Thunderstorm	Hurricane	Tropical storm

Plotting Temperature and Pressure

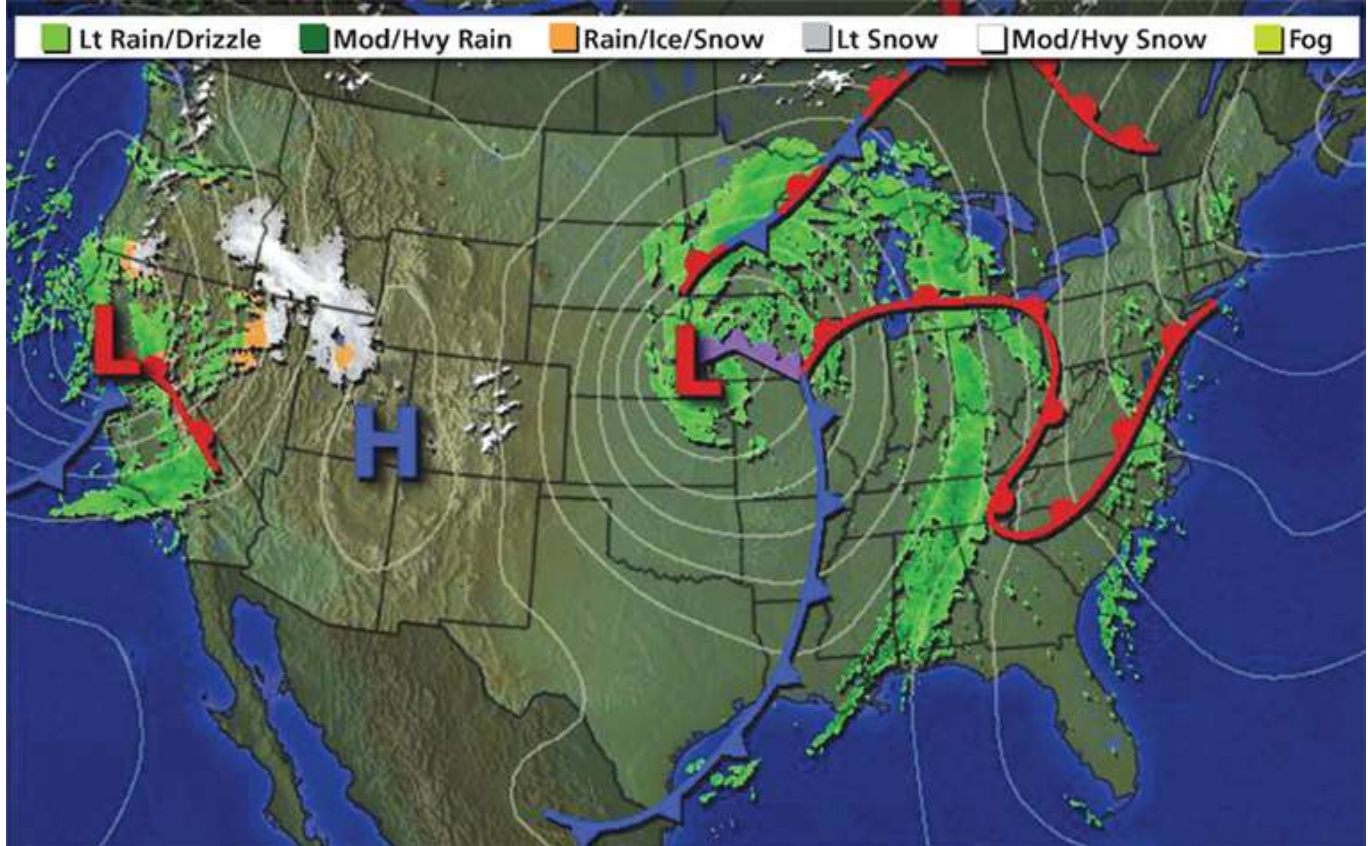
- Lines that connect points of equal temperatures are called ***isotherms***.
- Lines that connect points of equal atmospheric pressure are called ***isobars***.

- The spacing and shape of the isobars help meteorologists interpret their observations about the speed and direction of the wind.

Plotting Fronts and Precipitation

- Most weather maps mark the locations of fronts and areas of precipitation.
- Fronts are identified by sharp changes in wind speed and direction, temperature or humidity.
- Areas of precipitation are commonly marked by using colors or symbols.

The diagram below shows an example of a typical weather map.



READING CHECK

How do meteorologists mark precipitation on a weather map?

Areas of precipitation are marked by using colors or symbols.

Weather Forecasts

- To forecast the weather, meteorologists regularly plot to the intensity and path of weather systems on maps.
- Meteorologists then study the most recent weather map and compare it with maps from previous hours.
- By following the progress of weather systems, meteorologists can forecast the weather.

Weather Data

- Computer models can show the possible weather conditions for several days.
- Comparing models helps meteorologists better predict weather.
- By using computers, scientists can manipulate data on temperature and pressure to simulate errors in measuring these data.

READING CHECK

Why do meteorologists compare models?

Meteorologists compare computer models because different models are better at predicting different weather variables. If information from two or more models matches, scientists can be more confident of their predictions.

Types of Forecasts

- Meteorologists make four types of forecasts.
- *Daily forecasts* predict weather conditions for a 48-hour period. *Extended forecasts* look ahead 3 to 7 days. *Medium range forecasts* look ahead 8 to 14 days. *Long-range forecasts* cover monthly and seasonal periods.
- Accurate weather forecasts can be made for 0 to 7 days. However, accuracy decreases with each day.

Severe Weather Watches and Warnings

- One main goal of meteorology is to reduce the amount of destruction caused by severe weather by forecasting severe weather early.

- A ***watch*** is issued when the conditions are ideal for severe weather.
- A ***warning*** is given when severe weather has been spotted or is expected within 24 hours.

Controlling the Weather

- Some meteorologists are investigating methods of controlling rain, hail, and lightning.
- Currently, the most researched method for producing rain has been ***cloud seeding***.
- Cloud seeding can also be used to prevent more severe precipitation.

Hurricane Control

- Hurricanes have also been seeded with freezing nuclei in an effort to reduce the intensity of the storm.
- During Project Stormfury, which took place from 1962 to 1983, four hurricanes were seeded, and the project had mixed results.
- Scientists have, for the most part, abandoned storm and hurricane control because it is not an attainable goal with existing technology.

Lightning Control

- Seeding of potential lightning storms with silver-iodide nuclei has seemed to modify the occurrence of lightning.
- However, no conclusive results have been obtained.