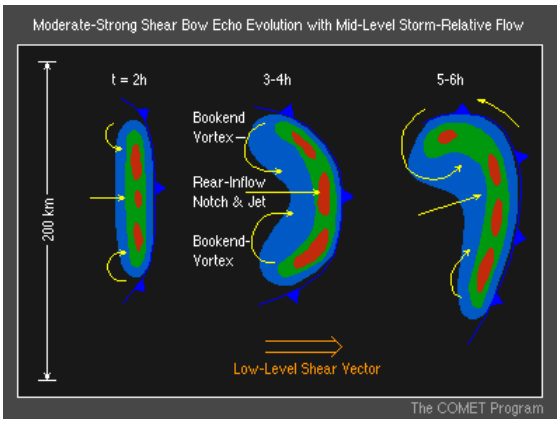
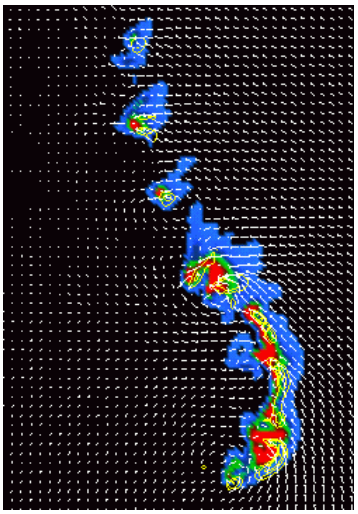
Thunderstorm Glossary

bow echo

The radar signature of a squall line that "bows out" as winds descend behind the line and circulations develop on either end. A strongly bowed echo may indicate high winds in the middle of the line, where the storms are progressing most quickly. Brief tornadoes may occur on the leading edge of a bow echo. Often the north side of a bow echo becomes dominant over time, gradually evolving into a comma-shaped storm complex.





The evolution of a bow echo. In the diagram at left, note the development of a rear-inflow jet at the center and "bookend" vortices on either end. In the Northern Hemisphere, the northern vortex tends to dominate later in the life cycle, creating a comma-shaped system. At right is a simulation of a squall line that includes several examples of bookend vortices. (Illustrations © COMET Program.)

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convection

Usually created by surface heating, convection is upward atmospheric motion that transports whatever is in the air along with it—especially any moisture available in the air.

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derecho

A violent, widespread windstorm caused by a long-lived MCS with a series of bow echoes. Derecho (pronounced deh-RAY-cho) is Spanish for "straight ahead" (in contrast with the turning contained in the Latin- and Spanish-influenced *tornado*). Derechos produce winds of 60 to over 100 miles per hour, downing trees and power lines over paths tens of miles wide and hundreds of miles long.

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mesocyclone

Thunderstorm links
Resources to learn more about thunderstorms

Research news from NCAR and UOP
Warmer Seas, Wetter Air Make Harder Rains as Greenhouse Gases Build (October 13, 2005)
Rapid-Scanning Doppler on Wheels Keeps Pace with Twisters (June 1, 2005)
Midwest Thunderstorm Study Points toward Better Forecasts (September 27, 2004)
In Midst of Drought, Scientists Hunt for Water Vapor (May 7, 2002)

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A storm-scale vortex within a severe thunderstorm, usually a supercell. Mesocyclones are typically a few miles or kilometers wide. They pull surface winds into and up through the storm's rapid updraft. Supercell tornadoes are usually preceded by a mesocyclone a few minutes to a half hour or more before tornado formation, although most mesocyclones produce no tornadoes. Doppler radar displays can track mesocyclones even when a tornado itself is too narrow to be detected.

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mesoscale convective system (MCS)

A collection of thunderstorms that act as a system. An MCS can range across an entire state and last more than 12 hours. On radar one of these behemoths might appear as a solid line, a broken line, or a cluster of cells. This all-encompassing term can include any of the following storm types:

- **mesoscale convective complex (MCC)** --A particular type of MCS, an MCC is a large, circular, long-lived cluster of showers and thunderstorms identified by satellite. It often emerges out of other storm types during the late-night and early-morning hours. MCCs can cover an entire state; they play a role in many summertime **floods** across the Great Plains.

- **mesoscale convective vortex (MCV)** --A low-pressure center within an MCS that pulls winds into a circling pattern, or vortex. With a core only 30 to 60 miles wide and 1 to 3 miles deep, an MCV is often overlooked in standard weather analyses. But an MCV can take on a life of its own, persisting for up to 12 hours after its parent MCS has dissipated. This orphaned MCV will sometimes then become the seed of the next thunderstorm outbreak. An MCV that moves into tropical waters, such as the Gulf of Mexico, can serve as the nucleus for a tropical storm or hurricane.

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multicell storm

A typical, garden-variety thunderstorm in which new updrafts form along the leading edge of rain-cooled air (the **gust front**). Individual cells usually last 30 to 60 minutes, while the system as a whole may last for many hours. Multicell storms may produce hail, strong winds, brief tornadoes, and/or flooding.

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single-cell storm

Often called "popcorn" convection, single-cell thunderstorms are small, brief, weak systems that grow and die within an hour or so. They are typically driven by heating on a summer afternoon. Single-cell storms may produce brief heavy rain and lightning.

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supercell storm

An especially long-lived thunderstorm with a rotating updraft that continually regenerates on the storm's flank (often on the south or right-hand side). Supercells form in regions of strong vertical wind shear. They typically produce large hail and high winds and may also produce violent, long-lived **tornadoes**. Supercells often feature a hook-like appearance on radar precipitation displays as rain wraps around a tornadic circulation.

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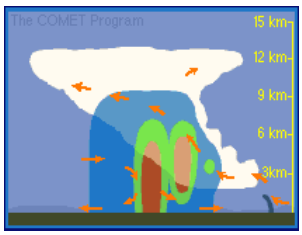
squall line

A linear arrangement of storms, often accompanied by squalls of high wind and heavy rain. Squall lines tend to pass quickly and are less prone to produce tornadoes than are supercells. They can be hundreds of miles long but are typically only 10 or 20 miles wide.



This cross section through a mature squall line shows the formation of new cells on the line's forward flank. There, air is being forced up by a rain-cooled gust front (the short dark line extending up from the lower-right corner). (Illustration © COMET Program.)

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wall cloud

A low-hanging, collar-shaped cloud extending below the rain-free portion of a thunderstorm cloud base, usually toward the south or southwest side of the storm. Wall clouds may be 1 to 4 mi (0.6 to 2.4 km) in diameter. They are formed by the intense updraft in a very strong or severe thunderstorm. Most supercell tornadoes are preceded by a rotating wall cloud a few minutes to as much as an hour in advance.

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Thunderstorm Web links

Related Research and Forecasting

NOAA National Severe Storms Laboratory

NOAA Storm Prediction Center

More Background

NCAR Visualizations: Squall Line with Mesoscale Convective Vortex

National Weather Service Hazardous Weather Glossary

Hazardous Weather Fact Sheets from FEMA and NWS

Train with the Professionals

COMET Classroom Slides: Mesoscale Convective Systems

MetEd: Mesoscale Convective Systems: Squall Lines and Bow Echoes

MetEd: Severe Convection II: Mesoscale Convective Systems (2004)

MetEd: Anticipating Hazardous Weather and Community Risk

For Learners:

Atmospheric Science Explorers: Thunderstorm, Tornado, Lightning, Hailstone (PDF)

Color images and experiments to try in the classroom or at home

Kid's Crossing: Look Out for Dangerous Weather!

Web Weather for Kids: Thunderstorms and Tornadoes

VORTEX: Unraveling the Secrets (NOAA QUEST Series)

Windows to the Universe: Atmosphere & Weather Activities

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