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AC - [Convective outlook](#) issued by the [SPC](#). Abbreviation for Anticipated [Convection](#); the term originates from the header coding [ACUS1] of the transmitted product. See [SWODY1](#), [SWODY2](#).

ACCAS (usually pronounced ACK-kis) - **Alto**Cumulus **CA**stellanus; mid-level clouds (bases generally 8 to 15 thousand feet), of which at least a fraction of their upper parts show [cumulus-type](#) development. These clouds often are taller than they are wide, giving them a turret-shaped appearance. ACCAS clouds are a sign of [instability](#) aloft, and may precede the rapid development of thunderstorms.

Accessory Cloud - A cloud which is dependent on a larger cloud system for development and continuance. [Roll clouds](#), [shelf clouds](#), and [wall clouds](#) are examples of accessory clouds.

Advection - Transport of an atmospheric property by the wind. See [cold advection](#), [moisture advection](#), [warm advection](#).

Air-mass Thunderstorm - Generally, a thunderstorm not associated with a [front](#) or other type of synoptic-scale forcing mechanism. Air mass thunderstorms typically are associated with warm, humid air in the summer months; they develop during the afternoon in response to [insolation](#), and dissipate rather quickly after sunset. They generally are less likely to be severe than other types of thunderstorms, but they still are capable of producing [downbursts](#), brief heavy rain, and (in extreme cases) hail over 3/4 inch in diameter. See [popcorn convection](#).

Since all thunderstorms are associated with some type of forcing mechanism, synoptic-scale or otherwise, the existence of true air-mass thunderstorms is debatable. Therefore the term is somewhat controversial and should be used with discretion.

Algorithm - A computer program (or set of programs) which is designed to systematically solve a certain kind of problem. [WSR-88D](#) radars ([NEXRAD](#)) employ algorithms to analyze radar data and automatically determine storm motion, probability of hail, [VIL](#), accumulated rainfall, and several other parameters.

Anticyclonic Rotation - Rotation in the opposite sense as the Earth's rotation, i.e., clockwise in the Northern Hemisphere as would be seen from above. The opposite of cyclonic rotation.

Anvil - The flat, spreading top of a [Cb](#) (cumulonimbus), often shaped like an anvil. Thunderstorm anvils may spread hundreds of miles downwind from the thunderstorm itself, and sometimes may spread upwind (see [back-sheared anvil](#)).

Anvil Crawler - [Slang], a lightning discharge occurring within the [anvil](#) of a thunderstorm, characterized by one or more channels that appear to crawl along the underside of the anvil. They typically appear during the weakening or dissipating stage of the parent thunderstorm, or during an active [MCS](#).

Anvil Dome - A large [overshooting top](#) or penetrating top.

Anvil Rollover - [Slang], a circular or semicircular lip of clouds along the underside of the upwind part of a [back-sheared anvil](#), indicating rapid expansion of the [anvil](#). See [cumuliform anvil](#), [knuckles](#), [mushroom](#).

Anvil Zits - [Slang], frequent (often continuous or nearly continuous), localized lightning discharges occurring from within a thunderstorm [anvil](#).

AP - Anomalous Propagation. Radar term for false (non-precipitation) echoes resulting from nonstandard propagation of the radar beam under certain atmospheric conditions.

Approaching (severe levels) - A thunderstorm which contains winds of 35 to 49 knots (40 to 57 mph), or hail 1/2 inch or larger but less than 3/4 inch in diameter. See [severe thunderstorm](#).

Arcus - A low, horizontal cloud formation associated with the leading edge of thunderstorm outflow (i.e., the [gust front](#)). [Roll clouds](#) and [shelf clouds](#) both are types of arcus clouds.

AVN - AViation model; one of the operational forecast models run at [NCEP](#). The AVN is run four times daily, at 0000, 0600, 1200, and 1800 GMT. As of fall 1996, forecast output was available operationally out to 120 hours only from the 0000 and 1200 runs. At 0600 and 1800, the model is run only out to 72 hours.

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Back-building Thunderstorm - A thunderstorm in which new development takes place on the upwind side (usually the west or southwest side), such

that the storm seems to remain stationary or propagate in a backward direction.

Backing Winds - Winds which shift in a counterclockwise direction with time at a given location (e.g. from southerly to southeasterly), or change direction in a counterclockwise sense with height (e.g. westerly at the surface but becoming more southerly aloft). The opposite of [veering winds](#).

In storm spotting, a backing wind usually refers to the turning of a south or southwest surface wind with time to a more east or southeasterly direction. Backing of the surface wind can increase the potential for [tornado](#) development by increasing the [directional shear](#) at low levels.

Back-sheared Anvil - [Slang], a thunderstorm [anvil](#) which spreads upwind, against the flow aloft. A back-sheared anvil often implies a very strong [updraft](#) and a high severe weather potential. (See [Fig. 7](#), [supercell](#).)

Barber Pole - [Slang], a thunderstorm [updraft](#) with a visual appearance including cloud [striations](#) that are curved in a manner similar to the stripes of a barber pole. The structure typically is most pronounced on the leading edge of the updraft, while drier air from the [rear flank downdraft](#) often erodes the clouds on the trailing side of the updraft.

Baroclinic Zone - A region in which a temperature gradient exists on a constant pressure surface. Baroclinic zones are favored areas for strengthening and weakening systems; [barotropic systems](#), on the other hand, do not exhibit significant changes in intensity. Also, [wind shear](#) is characteristic of a baroclinic zone.

Barotropic System - A weather system in which temperature and pressure surfaces are coincident, i.e., temperature is uniform (no temperature gradient) on a constant pressure surface. Barotropic systems are characterized by a lack of [wind shear](#), and thus are generally unfavorable areas for [severe thunderstorm](#) development. See [baroclinic zone](#).

Usually, in operational meteorology, references to barotropic systems refer to *equivalent* barotropic systems - systems in which temperature gradients exist, but are parallel to height gradients on a constant pressure surface. In such systems, height contours and [isotherms](#) are parallel everywhere, and winds do not change direction with height.

As a rule, a true equivalent barotropic system can never be achieved in the real atmosphere. While some systems (such as [closed lows](#) or [cutoff lows](#)) may reach a state that is close to equivalent barotropic, the term barotropic system usually is used in a relative sense to describe systems that are really only close to being equivalent barotropic, i.e., isotherms and height contours are nearly parallel everywhere and [directional wind shear](#) is weak.

Bear's Cage - [Slang], a region of [storm-scale](#) rotation, in a thunderstorm, which is wrapped in heavy precipitation. This area often coincides with a radar [hook echo](#) and/or [mesocyclone](#), especially one associated with an [HP storm](#).

The term reflects the danger involved in observing such an area visually, which must be done at close range in low visibility.

Beaver('s) Tail - [Slang], a particular type of [inflow band](#) with a relatively broad, flat appearance suggestive of a beaver's tail. It is attached to a [supercell's](#) general [updraft](#) and is oriented roughly parallel to the [pseudo-warm front](#), i.e., usually east to west or southeast to northwest. As with any inflow band, cloud elements move toward the updraft, i.e., toward the west or northwest. Its size and shape change as the strength of the inflow changes. See also [inflow stinger](#).

Spotters should note the distinction between a beaver tail and a [tail cloud](#). A "true" tail cloud typically is attached to the [wall cloud](#) and has a cloud base at about the same level as the wall cloud itself. A beaver tail, on the other hand, is not attached to the wall cloud and has a cloud base at about the same height as the [updraft base](#) (which by definition is higher than the wall cloud). Unlike the beaver tail, the tail cloud forms from air that is flowing from the storm's main precipitation cascade region (or outflow region). Thus, it can be oriented at a large angle to the pseudo-warm front.

Blue Watch (or Blue Box) - [Slang], a severe thunderstorm [watch](#).

Boundary Layer - In general, a layer of air adjacent to a bounding surface. Specifically, the term most often refers to the *planetary boundary layer*, which is the layer within which the effects of friction are significant. For the earth, this layer is considered to be roughly the lowest one or two kilometers of the atmosphere. It is within this layer that temperatures are most strongly affected by daytime [insolation](#) and nighttime radiational cooling, and winds are affected by friction with the earth's surface. The effects of friction die out gradually with height, so the "top" of this layer cannot be defined exactly.

There is a thin layer immediately above the earth's surface known as the *surface boundary layer* (or simply the surface layer). This layer is only a part of the planetary boundary layer, and represents the layer within which friction effects are more or less constant throughout (as opposed to decreasing with height, as they do above it). The surface boundary layer is roughly 10 meters thick, but again the exact depth is indeterminate. Like friction, the effects of insolation and radiational cooling are strongest within this layer.

Bow Echo - A radar echo which is linear but bent outward in a bow shape ([Fig. 1](#)). Damaging [straight-line winds](#) often occur near the "crest" or center of a bow echo. Areas of circulation also can develop at either end of a bow echo, which sometimes can lead to [tornado](#) formation - especially in the left (usually northern) end, where the circulation exhibits [cyclonic rotation](#).

Box (or Watch Box) - [Slang], a severe thunderstorm or tornado [watch](#). See [blue box](#), [red box](#).

BRN - See [Bulk Richardson Number](#).

Bubble High - A [mesoscale](#) area of high pressure, typically associated with cooler air from the rainy [downdraft](#) area of a thunderstorm or a complex of thunderstorms. A [gust front](#) or [outflow boundary](#) separates a bubble high from the surrounding air.

Bulk Richardson Number (or BRN) - A non-dimensional number relating vertical stability and vertical [shear](#) (generally, stability divided by shear). High values indicate unstable and/or weakly-sheared environments; low values indicate weak [instability](#) and/or strong vertical shear. Generally, values in the range of around 50 to 100 suggest environmental conditions favorable for [supercell](#) development.

Bust - [Slang], an inaccurate forecast or an unsuccessful storm chase; usually a situation in which thunderstorms or severe weather are expected, but do not occur.

BWER - Bounded Weak Echo Region. (Also known as a vault.) Radar signature within a thunderstorm characterized by a local minimum in radar [reflectivity](#) at low levels which extends upward into, and is surrounded by, higher reflectivities aloft ([Fig. 2](#)). This feature is associated with a strong [updraft](#) and is almost always found in the inflow region of a thunderstorm. It cannot be seen visually. See [WER](#).

-C-

CA - Cloud-to-Air lightning.

Cap (or Capping Inversion) - A layer of relatively warm air aloft (usually several thousand feet above the ground) which suppresses or delays the development of thunderstorms. Air parcels rising into this layer become cooler than the surrounding air, which inhibits their ability to rise further. As such, the cap often prevents or delays thunderstorm development even in the presence of extreme [instability](#). However if the cap is removed or weakened, then explosive thunderstorm development can occur. See [CIN](#) and [Fig. 6, sounding](#).

The cap is an important ingredient in most [severe thunderstorm](#) episodes, as it serves to separate warm, moist air below and cooler, drier air above. With the cap in place, air below it can continue to warm and/or moisten, thus increasing the amount of potential instability. Or, air above it can cool, which also increases potential instability. But without a cap, either process (warming/moistening at low levels or cooling aloft) results in a faster release of available instability - often before instability levels become large enough to support severe weather development.

CAPE - Convective Available Potential Energy. A measure of the amount of energy available for [convection](#). CAPE is directly related to the maximum potential vertical speed within an [updraft](#); thus, higher values indicate greater potential for severe weather. Observed values in thunderstorm environments often may exceed 1,000 joules per kilogram (j/kg), and in extreme cases may exceed 5,000 j/kg. However, as with other indices or indicators, there are no threshold values above which severe weather becomes imminent. CAPE is represented on a [sounding](#) by the area enclosed between the environmental temperature profile and the path of a rising air parcel, over the layer within which the latter is warmer than the former. (This area often is called positive area.) See also [CIN](#) and [Fig. 6, sounding](#).

***Cb - Cumulonimbus** cloud, characterized by strong vertical development in the form of mountains or huge [towers](#) topped at least partially by a smooth, flat, often fibrous [anvil](#). Also known colloquially as a "thunderhead."

CC - Cloud-to-Cloud lightning.

Cell - Convection in the form of a single [updraft](#), [downdraft](#), or updraft/downdraft couplet, typically seen as a vertical dome or [tower](#) as in a [cumulus](#) or [towering cumulus](#) cloud. A typical thunderstorm consists of several cells (see [multi-cellular thunderstorm](#)).

The term "cell" also is used to describe the radar echo returned by an individual shower or thunderstorm. Such usage, although common, is technically incorrect.

***CG - Cloud-to-Ground** lightning flash.

Chaff - Small strips of metal foil, usually dropped in large quantities from aircraft or balloons. Chaff typically produces a radar echo which closely resembles precipitation. Chaff drops once were conducted by the military in order to confuse enemy radar, but now are conducted mainly for radar testing and calibration purposes.

CIN - Convective INhibition. A measure of the amount of energy needed in order to initiate [convection](#). Values of CIN typically reflect the strength of the [cap](#). They are obtained on a [sounding](#) by computing the area enclosed between the environmental temperature profile and the path of a rising air parcel, over the layer within which the latter is cooler than the former. (This area sometimes is called negative area.) See [CAPE](#) and [Fig. 6, sounding](#).

Cirrus - High-level clouds (16,000 feet or more), composed of ice crystals and appearing in the form of white, delicate filaments or white or mostly white patches or narrow bands. Cirrus clouds typically have a fibrous or hairlike appearance, and often are semi-transparent. Thunderstorm [anvils](#) are a form of cirrus cloud, but most cirrus clouds are not associated with thunderstorms.

Classic Supercell - See [supercell](#).

Clear Slot - A local region of clearing skies or reduced cloud cover, indicating an intrusion of drier air; often seen as a bright area with higher cloud bases on the west or southwest side of a [wall cloud](#). A clear slot is believed to be a visual indication of a [rear flank downdraft](#).

Closed Low - A low pressure area with a distinct center of [cyclonic circulation](#) which can be completely encircled by one or more [isobars](#) or height contour lines. The term usually is used to distinguish a low pressure area aloft from a low-pressure [trough](#). Closed lows aloft typically are partially or completely detached from the main westerly current, and thus move relatively slowly (see [cutoff low](#)).

Cloud Streets - Rows of [cumulus](#) or cumulus-type clouds aligned parallel to the low-level flow. Cloud streets sometimes can be seen from the ground, but are seen best on satellite photographs.

Cloud Tags - Ragged, detached cloud fragments; [fractus](#) or [scud](#).

Cold Advection - Transport of cold air into a region by horizontal winds.

Cold-air Funnel - A [funnel cloud](#) or (rarely) a small, relatively weak [tornado](#) that can develop from a small shower or thunderstorm when the air aloft is unusually cold (hence the name). They are much less violent than other types of tornadoes.

Cold Pool - A region of relatively cold air, represented on a weather map analysis as a relative minimum in temperature surrounded by closed [isotherms](#). Cold pools aloft represent regions of relatively low stability, while surface-based cold pools are regions of relatively stable air.

Collar Cloud - A generally circular ring of cloud that may be observed on rare occasions surrounding the upper part of a [wall cloud](#). See [Fig. 7, supercell](#).

This term sometimes is used (incorrectly) as a synonym for [wall cloud](#).

Comma Cloud - A [synoptic scale](#) cloud pattern with a characteristic comma-like shape, often seen on satellite photographs associated with large and intense low-pressure systems.

Comma Echo - A thunderstorm radar echo which has a comma-like shape. It often appears during latter stages in the life cycle of a [bow echo](#) (see [Fig. 1](#)).

Condensation Funnel - A funnel-shaped cloud associated with rotation and consisting of condensed water droplets (as opposed to smoke, dust, debris, etc.). Compare with [debris cloud](#).

Confluence - A pattern of wind flow in which air flows inward toward an axis oriented parallel to the general direction of flow. It is the opposite of [diffuence](#). Confluence is not the same as [convergence](#). Winds often accelerate as they enter a confluent zone, resulting in speed [divergence](#) which offsets the (apparent) converging effect of the confluent flow.

Congestus (or [Cumulus Congestus](#)) - same as [towering cumulus](#).

Convection - Generally, transport of heat and moisture by the movement of a fluid. In meteorology, the term is used specifically to describe vertical transport of heat and moisture, especially by [updrafts](#) and [downdrafts](#) in an unstable atmosphere. The terms "convection" and "thunderstorms" often are used interchangeably, although thunderstorms are only one form of convection. [Cbs](#), [towering cumulus](#) clouds, and [ACCAS](#) clouds all are visible forms of convection. However, convection is not always made visible by clouds. Convection which occurs without cloud formation is called dry convection, while the visible convection processes referred to above are forms of moist convection.

Convective Outlook (sometimes called [AC](#)) - A forecast containing the area(s) of expected thunderstorm occurrence and expected severity over the contiguous United States, issued several times daily by the [SPC](#). The terms [approaching](#), [slight risk](#), [moderate risk](#), and [high risk](#) are used to describe [severe thunderstorm](#) potential. Local versions sometimes are prepared by local [NWS](#) offices.

Convective Temperature - The approximate temperature that the air near the ground must warm to in order for [surface-based convection](#) to develop, based on analysis of a [sounding](#). See [Fig. 6](#).

Calculation of the convective temperature involves many assumptions, such that thunderstorms sometimes develop well before or well after the convective temperature is reached (or may not develop at all). However, in some cases the convective temperature is a useful parameter for forecasting the onset of [convection](#).

Convergence - A contraction of a vector field; the opposite of [divergence](#). Convergence in a horizontal wind field indicates that more air is entering a given area than is leaving at that level. To compensate for the resulting "excess," vertical motion may result: upward forcing if convergence is at low levels, or downward forcing ([subsidence](#)) if convergence is at high levels. Upward forcing from low-level convergence increases the potential for thunderstorm development (when other factors, such as [instability](#), are favorable). Compare with [confluence](#).

Core Punch - [Slang], a penetration by a vehicle into the heavy precipitation core of a thunderstorm.

Core punching is not a recommended procedure for storm spotting.

Cumuliform Anvil - A thunderstorm [anvil](#) with visual characteristics resembling [cumulus-type](#) clouds (rather than the more typical fibrous appearance associated with [cirrus](#)). A cumuliform anvil arises from rapid spreading of a thunderstorm [updraft](#), and thus implies a very strong updraft. See [anvil rollover](#), [knuckles](#), [mushroom](#).

Cumulus - Detached clouds, generally dense and with sharp outlines, showing vertical development in the form of domes, mounds, or [towers](#). Tops

normally are rounded while bases are more horizontal. See [Cb](#), [towering cumulus](#).

Cumulus Congestus (or simply [Congestus](#)) - Same as [towering cumulus](#).

Cutoff Low - A [closed low](#) which has become completely displaced (cut off) from basic westerly current, and moves independently of that current. Cutoff lows may remain nearly stationary for days, or on occasion may move westward opposite to the prevailing flow aloft (i.e., [retrogression](#)).

"Cutoff low" and "closed low" often are used interchangeably to describe low pressure centers aloft. However, not all closed lows are completely removed from the influence of the basic westerlies. Therefore, the recommended usage of the terms is to reserve the use of "cutoff low" only to those closed lows which clearly are detached completely from the westerlies.

Cyclic Storm - A thunderstorm that undergoes cycles of intensification and weakening (pulses) while maintaining its individuality. Cyclic supercells are capable of producing multiple [tornadoes](#) (i.e., a [tornado family](#)) and/or several bursts of severe weather.

A storm which undergoes only one cycle (pulse), and then dissipates, is known as a [pulse storm](#).

Cyclogenesis - Development or intensification of a low-pressure center (cyclone).

***Cyclonic Circulation** (or Cyclonic Rotation) - Circulation (or rotation) which is in the same sense as the Earth's rotation, i.e., counterclockwise (in the Northern Hemisphere) as would be seen from above. Nearly all [mesocyclones](#) and strong or violent [tornadoes](#) exhibit cyclonic rotation, but some smaller vortices, such as [gustnadoes](#), occasionally rotate anticyclonically (clockwise). Compare with [anticyclonic rotation](#).

-D-

dBZ - Nondimensional "unit" of radar [reflectivity](#) which represents a logarithmic power ratio (in decibels, or dB) with respect to radar reflectivity factor, Z.

The value of Z is a function of the amount of radar beam energy that is backscattered by a target and detected as a signal (or echo). Higher values of Z (and dBZ) thus indicate more energy being backscattered by a target. The amount of backscattered energy *generally* is related to precipitation intensity, such that higher values of dBZ that are detected from precipitation areas generally indicate higher precipitation rates. However, other factors can affect reflectivity, such as width of the radar beam, precipitation type, drop size, or the presence of [ground clutter](#) or [AP](#). [WSR-88D](#) radars can detect reflectivities as low as -32 dBZ near the radar site, but significant (measurable) precipitation generally is indicated by reflectivities of around 15 dBZ or more. Values of 50 dBZ or more normally are associated with heavy thunderstorms, perhaps with hail, but as with most other quantities, there are no reliable threshold values to confirm the presence of hail or severe weather in a given situation. See [VIP](#) for threshold dBZ values associated with each VIP level.

***Debris Cloud** - A rotating "cloud" of dust or debris, near or on the ground, often appearing beneath a [condensation funnel](#) and surrounding the base of a [tornado](#).

This term is similar to [dust whirl](#), although the latter typically refers to a circulation which contains dust but not necessarily any debris. A [dust plume](#), on the other hand, does not rotate. Note that a debris cloud appearing beneath a thunderstorm will confirm the presence of a tornado, even in the absence of a condensation funnel.

Delta T - A simple representation of the mean [lapse rate](#) within a layer of the atmosphere, obtained by calculating the difference between observed temperatures at the bottom and top of the layer. Delta Ts often are computed operationally over the layer between pressure levels of 700 mb and 500 mb, in order to evaluate the amount of [instability](#) in mid-levels of the atmosphere. Generally, values greater than about 18 indicate sufficient instability for severe thunderstorm development.

Derecho - (Pronounced deh-REY-cho), a widespread and usually fast-moving windstorm associated with [convection](#). Derechos include any family of [downburst](#) clusters produced by an extratropical [MCS](#), and can produce damaging [straight-line winds](#) over areas hundreds of miles long and more than 100 miles across.

Dew Point (or Dew-point Temperature) - A measure of atmospheric moisture. It is the temperature to which air must be cooled in order to reach saturation (assuming air pressure and moisture content are constant).

Differential Motion - Cloud motion that appears to differ relative to other nearby cloud elements, e.g. clouds moving from left to right relative to other clouds in the foreground or background. Cloud rotation is one example of differential motion, but not all differential motion indicates rotation. For example, horizontal [wind shear](#) along a [gust front](#) may result in differential cloud motion without the presence of rotation.

Diffluence (or Diffluence) - A pattern of wind flow in which air moves outward (in a "fan-out" pattern) away from a central axis that is oriented parallel to the general direction of the flow. It is the opposite of [confluence](#).

Diffluence in an upper level wind field is considered a favorable condition for [severe thunderstorm](#) development (if other parameters are also favorable). But diffluence is not the same as [divergence](#). In a diffluent flow, winds normally decelerate as they move through the region of diffluence, resulting in speed convergence which offsets the apparent diverging effect of the diffluent flow.

Directional Shear - The component of [wind shear](#) which is due to a change in wind direction with height, e.g., southeasterly winds at the surface and southwesterly winds aloft. A [veering wind](#) with height in the lower part of the atmosphere is a type of directional shear often considered important for [tornado](#) development.

Diurnal - Daily; related to actions which are completed in the course of a calendar day, and which typically recur every calendar day (e.g., diurnal temperature rises during the day, and diurnal falls at night).

Divergence - The expansion or spreading out of a vector field; usually said of horizontal winds. It is the opposite of [convergence](#). Divergence at upper levels of the atmosphere enhances upward motion, and hence the potential for thunderstorm development (if other factors also are favorable).

Doppler Radar - Radar that can measure [radial velocity](#), the instantaneous component of motion parallel to the radar beam (i.e., toward or away from the radar antenna).

***Downburst** - A strong [downdraft](#) resulting in an outward burst of damaging winds on or near the ground. Downburst winds can produce damage similar to a strong [tornado](#). Although usually associated with thunderstorms, downbursts can occur with showers too weak to produce thunder. See [dry and wet microburst](#).

Downdraft - A small-scale column of air that rapidly sinks toward the ground, usually accompanied by precipitation as in a shower or thunderstorm. A [downburst](#) is the result of a strong downdraft.

Downstream - In the same direction as a stream or other flow, or toward the direction in which the flow is moving.

Dry Adiabats - A line of constant [potential temperature](#) on a [thermodynamic chart](#). See [Fig. 6, sounding](#).

Dry Line - A boundary separating moist and dry air masses, and an important factor in severe weather frequency in the Great Plains. It typically lies north-south across the central and southern high Plains states during the spring and early summer, where it separates moist air from the Gulf of Mexico (to the east) and dry desert air from the southwestern states (to the west). The dry line typically advances eastward during the afternoon and retreats westward at night. However, a strong storm system can sweep the dry line eastward into the Mississippi Valley, or even further east, regardless of the time of day. A typical dry line passage results in a sharp drop in [humidity](#) (hence the name), clearing skies, and a wind shift from south or southeasterly to west or southwesterly. (Blowing dust and rising temperatures also may follow, especially if the dry line passes during the daytime; see [dry punch](#)). These changes occur in reverse order when the dry line retreats westward. Severe and sometimes tornadic thunderstorms often develop along a dry line or in the moist air just to the east of it, especially when it begins moving eastward. See [LP storm](#).

Dry-line Bulge - A bulge in the [dry line](#), representing the area where dry air is advancing most strongly at lower levels (i.e., a surface [dry punch](#)). Severe weather potential is increased near and ahead of a dry line bulge.

Dry-line Storm - Generally, any thunderstorm that develops on or near a [dry line](#). The term often is used synonymously with [LP storm](#), since the latter almost always occurs near the dry line.

Dry Microburst - A [microburst](#) with little or no precipitation reaching the ground; most common in semi-arid regions. They may or may not produce lightning. Dry microbursts may develop in an otherwise fair-weather pattern; visible signs may include a [cumulus](#) cloud or small [Cb](#) with a high base and high-level [virga](#), or perhaps only an [orphan anvil](#) from a dying rain shower. At the ground, the only visible sign might be a [dust plume](#) or a ring of blowing dust beneath a local area of virga. Compare with [wet microburst](#).

Dry Punch - [Slang], a surge of drier air; normally a [synoptic-scale](#) or [mesoscale](#) process. A dry punch at the surface results in a [dry line bulge](#). A [dry punch](#) aloft above an area of moist air at low levels often increases the potential for severe weather.

Dry Slot - A zone of dry (and relatively cloud-free) air which wraps east- or northeastward into the southern and eastern parts of a [synoptic scale](#) or [mesoscale](#) low pressure system. A dry slot generally is seen best on satellite photographs.

Dry slot should not be confused with [clear slot](#), which is a [storm-scale](#) phenomenon.

Dust Devil - A small atmospheric vortex not associated with a thunderstorm, which is made visible by a rotating cloud of dust or debris ([dust whirl](#)). Dust devils form in response to surface heating during fair, hot weather; they are most frequent in arid or semi-arid regions.

***Dust Plume** - A non-rotating "cloud" of dust raised by [straight-line winds](#). Often seen in a [microburst](#) or behind a [gust front](#).

If rotation is observed, then the term [dust whirl](#) or [debris cloud](#) should be used.

***Dust Whirl** - A rotating column of air rendered visible by dust. Similar to [debris cloud](#); see also [dust devil](#), [gustnado](#), [tornado](#).

Dynamics - Generally, any forces that produce motion or affect change. In operational meteorology, dynamics usually refer specifically to those forces that produce vertical motion in the atmosphere.

-E-

ECMWF - European Center for Medium-Range Weather Forecasting. Operational references in forecast discussions typically refer to the ECMWF's medium-range forecast model. See [MRF](#), [UKMET](#).

Elevated Convection - [Convection](#) occurring within an elevated layer, i.e., a layer in which the lowest portion is based above the earth's surface. Elevated convection often occurs when air near the ground is relatively cool and stable, e.g., during periods of [isentropic lift](#), when an unstable layer of air is present aloft. In cases of elevated convection, stability indices based on near-surface measurements (such as the [lifted index](#)) typically will underestimate the amount of [instability](#) present. Severe weather is possible from elevated convection, but is less likely than it is with [surface-based convection](#).

Energy Helicity Index (or EHI) - An index that incorporates vertical [shear](#) and [instability](#), designed for the purpose of forecasting [supercell](#) thunderstorms. It is related directly to storm-relative [helicity](#) in the lowest 2 km (SRH, in m^2/s^2) and [CAPE](#) (in J/kg) as follows:

$$\text{EHI} = (\text{CAPE} \times \text{SRH}) / 160,000.$$

Thus, higher values indicate unstable conditions and/or strong vertical shear. Since both parameters are important for severe weather development, higher values generally indicate a greater potential for severe weather. Values of 1 or more are said to indicate a heightened threat of [tornadoes](#); values of 5 or more are rarely observed, and are said to indicate potential for violent tornadoes. However, there are no magic numbers or critical threshold values to confirm or predict the occurrence of tornadoes of a particular intensity.

Enhanced V - A pattern seen on satellite infrared photographs of thunderstorms, in which a thunderstorm [anvil](#) exhibits a V-shaped region of colder cloud tops extending downwind from the thunderstorm core. The enhanced V indicates a very strong [updraft](#), and therefore a higher potential for severe weather.

Enhanced V should not be confused with [V notch](#), which is a radar signature.

Enhanced Wording - An option used by the [SPC](#) in tornado and severe thunderstorm [watches](#) when the potential for strong/violent [tornadoes](#), or unusually widespread damaging straight-line winds, is high. The statement "THIS IS A PARTICULARLY DANGEROUS SITUATION WITH THE POSSIBILITY OF VERY DAMAGING TORNADOES" appears in tornado watches with enhanced wording. Severe thunderstorm watches may include the statement "THIS IS A PARTICULARLY DANGEROUS SITUATION WITH THE POSSIBILITY OF EXTREMELY DAMAGING WINDS," usually when a [derecho](#) event is occurring or forecast to occur. See [PDS watch](#).

Entrance Region - The region [upstream](#) from a wind speed maximum in a [jet stream](#) ([jet max](#)), in which air is approaching (entering) the region of maximum winds, and therefore is accelerating. This acceleration results in a vertical circulation that creates [divergence](#) in the upper-level winds in the right half of the entrance region (as would be viewed looking along the direction of flow). This divergence results in upward motion of air in the [right rear quadrant](#) (or [right entrance region](#)) of the jet max. Severe weather potential sometimes increases in this area as a result. See also [exit region](#), [left exit region](#).

Equilibrium Level (or EL) - On a [sounding](#), the level above the level of free convection (LFC) at which the temperature of a rising air parcel again equals the temperature of the environment. (See [Fig. 6](#), [sounding](#).)

The height of the EL is the height at which thunderstorm [updrafts](#) no longer accelerate upward. Thus, to a close approximation, it represents the height of expected (or ongoing) thunderstorm tops. However, strong updrafts will continue to rise past the EL before stopping, resulting in storm tops that are higher than the EL. This process sometimes can be seen visually as an [overshooting top](#) or [anvil dome](#).

The EL typically is higher than the [tropopause](#), and is a more accurate reference for storm tops.

Eta Model - One of the operational numerical forecast models run at [NCEP](#). The Eta is run twice daily, with forecast output out to 48 hours.

Exit Region - The region [downstream](#) from a wind speed maximum in a [jet stream](#) ([jet max](#)), in which air is moving away from the region of maximum winds, and therefore is decelerating. This deceleration results in [divergence](#) in the upper-level winds in the left half of the [exit region](#) (as would be viewed looking along the direction of flow). This divergence results in upward motion of air in the [left front quadrant](#) (or left exit region) of the jet max. Severe weather potential sometimes increases in this area as a result. See also [entrance region](#), [right entrance region](#).

-F-

F scale - See [Fujita Scale](#).

Feeder Bands - Lines or bands of low-level clouds that move (feed) into the [updraft](#) region of a thunderstorm, usually from the east through south (i.e., parallel to the inflow). Same as [inflow bands](#).

This term also is used in tropical meteorology to describe spiral-shaped bands of [convection](#) surrounding, and moving toward, the center of a tropical cyclone.

***Flanking Line** - A line of [cumulus](#) or [towering cumulus](#) clouds connected to and extending outward from the most active part of a [supercell](#), normally on the southwest side. The line normally has a stair-step appearance, with the tallest clouds closest to the main storm, and generally coincides with the [pseudo-cold front](#). See [Fig. 3, HP storm](#), and [Fig. 7, supercell](#).

Forward Flank Downdraft - The main region of [downdraft](#) in the forward, or leading, part of a [supercell](#), where most of the heavy precipitation is. Compare with [rear flank downdraft](#). See [pseudo-warm front](#), and [Fig. 7, supercell](#).

Front - A boundary or transition zone between two air masses of different density, and thus (usually) of different temperature. A moving front is named according to the advancing air mass, e.g., cold front if colder air is advancing.

Fractus - Ragged, detached cloud fragments; same as [scud](#).

Fujita Scale (or F Scale) - A scale of wind *damage* intensity in which wind speeds are inferred from an analysis of wind damage:

F0 (weak):	40- 72 mph, light damage.
F1 (weak):	73-112 mph, moderate damage.
F2 (strong):	113-157 mph, considerable damage.
F3 (strong):	158-206 mph, severe damage.
F4 (violent):	207-260 mph, devastating damage.
F5 (violent):	261-318 mph, (rare) incredible damage.

All [tornadoes](#), and most other severe local windstorms, are assigned a single number from this scale according to the most intense damage caused by the storm.

***Funnel Cloud** - A [condensation funnel](#) extending from the base of a [towering cumulus](#) or [Cb](#), associated with a rotating column of air that is *not* in contact with the ground (and hence different from a [tornado](#)). A condensation funnel is a tornado, *not* a funnel cloud, if either a) it is in contact with the ground or b) a [debris cloud](#) or [dust whirl](#) is visible beneath it.

-G-

Ground Clutter - A pattern of radar echoes from fixed ground targets (buildings, hills, etc.) near the radar. Ground clutter may hide or confuse precipitation echoes near the radar antenna.

Gunge - [Slang], anything in the atmosphere that restricts visibility for storm spotting, such as fog, haze, precipitation (steady rain or drizzle), widespread low clouds ([stratus](#)), etc.

Gust Front - The leading edge of gusty surface winds from thunderstorm [downdrafts](#); sometimes associated with a [shelf cloud](#) or [roll cloud](#). See also [downburst](#), [gustnado](#), [outflow boundary](#).

Gustnado (or Gustinado) - [Slang], gust front tornado. A small [tornado](#), usually weak and short-lived, that occurs along the [gust front](#) of a thunderstorm. Often it is visible only as a [debris cloud](#) or [dust whirl](#) near the ground. Gustnadoes are not associated with [storm-scale](#) rotation (i.e. [mesocyclones](#)); they are more likely to be associated visually with a [shelf cloud](#) than with a [wall cloud](#).

-H-

Helicity - A property of a moving fluid which represents the potential for helical flow (i.e. flow which follows the pattern of a corkscrew) to evolve. Helicity is proportional to the strength of the flow, the amount of vertical [wind shear](#), and the amount of turning in the flow (i.e. [vorticity](#)). Atmospheric helicity is computed from the vertical wind profile in the lower part of the atmosphere (usually from the surface up to 3 km), and is measured relative to storm motion. Higher values of helicity (generally, around $150 \text{ m}^2/\text{s}^2$ or more) favor the development of mid-level rotation (i.e. [mesocyclones](#)). Extreme values can exceed $600 \text{ m}^2/\text{s}^2$.

High Risk (of [severe thunderstorms](#)) - Severe weather is expected to affect more than 10 percent of the area. A high risk is rare, and implies an unusually dangerous situation and usually the possibility of a major severe weather outbreak. (See [slight risk](#), [moderate risk](#), [convective outlook](#).)

Hodograph - A plot representing the vertical distribution of horizontal winds, using polar coordinates. A hodograph is obtained by plotting the end points of the wind vectors at various altitudes, and connecting these points in order of increasing height. Interpretation of a hodograph can help in forecasting the subsequent evolution of thunderstorms (e.g., [squall line](#) vs. [supercells](#), [splitting vs. non-splitting storms](#), tornadic vs. nontornadic storms, etc.).

Hook (or Hook Echo) - A radar [reflectivity](#) pattern characterized by a hook-shaped extension of a thunderstorm echo, usually in the right-rear part of the storm (relative to its direction of motion). A hook often is associated with a [mesocyclone](#), and indicates favorable conditions for [tornado development](#). See [Fig. 2, BWER](#), and [Fig. 7, supercell](#).

HP Storm or HP Supercell - High-Precipitation storm (or High-Precipitation supercell). A [supercell](#) thunderstorm in which heavy precipitation (often including hail) falls on the trailing side of the [mesocyclone](#) ([Fig. 3](#)). Precipitation often totally envelops the region of rotation, making visual identification of any embedded [tornadoes](#) difficult and very dangerous. Unlike most classic supercells, the region of rotation in many HP storms develops in the front-flank region of the storm (i.e., usually in the eastern portion). HP storms often produce extreme and prolonged [downburst](#) events, serious flash flooding, and very large damaging hail events.

Mobile storm spotters are strongly advised to maintain a safe distance from any storm that has been identified as an HP storm; close observations (e.g., [core punching](#)) can be extremely dangerous. See [bear's cage](#).

Humidity - Generally, a measure of the water vapor content of the air. Popularly, it is used synonymously with [relative humidity](#).

-I-

Impulse - See [upper level system](#).

Inflow Bands (or [Feeder Bands](#)) - Bands of low clouds, arranged parallel to the low-level winds and moving into or toward a thunderstorm. They may indicate the strength of the inflow of moist air into the storm, and, hence, its potential severity. Spotters should be especially wary of inflow bands that are curved in a manner suggesting [cyclonic rotation](#); this pattern may indicate the presence of a [mesocyclone](#).

Inflow Jets - Local jets of air near the ground flowing inward toward the base of a [tornado](#).

Inflow Notch - A radar signature characterized by an indentation in the [reflectivity](#) pattern on the inflow side of the storm. The indentation often is V-shaped, but this term should not be confused with [V-notch](#). [Supercell](#) thunderstorms often exhibit inflow notches, usually in the right quadrant of a [classic supercell](#), but sometimes in the eastern part of an [HP storm](#) or in the rear part of a storm (rear inflow notch).

Inflow Stinger - A [beaver tail](#) cloud with a stinger-like shape.

Insolation - Incoming solar radiation. Solar heating; sunshine.

Instability - The tendency for air parcels to accelerate when they are displaced from their original position; especially, the tendency to accelerate upward after being lifted. Instability is a prerequisite for severe weather - the greater the instability, the greater the potential for severe thunderstorms. See [lifted index](#), and [Fig. 6, sounding](#).

Inversion - Generally, a departure from the usual increase or decrease in an atmospheric property with altitude. Specifically it almost always refers to a temperature inversion, i.e., an increase in temperature with height, or to the layer within which such an increase occurs. An inversion is present in the lower part of a [cap](#). See [Fig. 6, sounding](#).

Isentropic Lift - Lifting of air that is traveling along an upward-sloping [isentropic surface](#).

Isentropic lift often is referred to erroneously as [overrunning](#), but more accurately describes the physical process by which the lifting occurs. Situations involving isentropic lift often are characterized by widespread [stratiform](#) clouds and precipitation, but may include [elevated convection](#) in the form of embedded thunderstorms.

Isentropic Surface - A two-dimensional surface containing points of equal [potential temperature](#).

Isobar - A line connecting points of equal pressure.

Isodrosotherm - A line connecting points of equal [dew point](#) temperature.

Isohyet - A line connecting points of equal precipitation amounts.

Isopleth - General term for a line connecting points of equal value of some quantity. [Isobars](#), [isotherms](#), etc. all are examples of isopleths.

Isotach - A line connecting points of equal wind speed.

Isotherm - A line connecting points of equal temperature.

-J-

Jet Max (or Speed Max, [Jet Streak](#)) - a point or area of relative maximum wind speeds within a [jet stream](#).

Jet Streak - A local wind speed maximum within a [jet stream](#).

Jet Stream - Relatively strong winds concentrated in a narrow stream in the atmosphere, normally referring to horizontal, high-altitude winds. The position and orientation of jet streams vary from day to day. General weather patterns (hot/cold, wet/dry) are related closely to the position, strength and orientation of the jet stream (or jet streams). A jet stream at low levels is known as a [low-level jet](#).

-K-

Knuckles - [Slang], lumpy protrusions on the edges, and sometimes the underside, of a thunderstorm [anvil](#). They usually appear on the upwind side of a [back-sheared anvil](#), and indicate rapid expansion of the anvil due to the presence of a very strong [updraft](#). They are not [mammatus clouds](#). See also [cumuliform anvil](#), [anvil rollover](#).

-L-

Laminar - Smooth, non-turbulent. Often used to describe cloud formations which appear to be shaped by a smooth flow of air traveling in parallel layers or sheets.

Landspout - [Slang], a [tornado](#) that does not arise from organized [storm-scale](#) rotation and therefore is not associated with a [wall cloud](#) (visually) or a [mesocyclone](#) (on radar). Landspouts typically are observed beneath [Cbs](#) or [towering cumulus](#) clouds (often as no more than a [dust whirl](#)), and essentially are the land-based equivalents of [waterspouts](#).

Lapse Rate - The rate of change of an atmospheric variable, usually temperature, with height. A steep lapse rate implies a rapid decrease in temperature with height (a sign of [instability](#)) and a steepening lapse rate implies that destabilization is occurring. See [Fig. 6](#), [sounding](#).

Large-scale - See [synoptic-scale](#).

Left Front Quadrant (or Left Exit Region) - The area [downstream](#) from and to the left of an upper-level [jet max](#) (as would be viewed looking along the direction of flow). Upward motion and [severe thunderstorm](#) potential sometimes are increased in this area relative to the wind speed maximum. See also [entrance region](#), [right rear quadrant](#).

Left Mover - A thunderstorm which moves to the left relative to the [steering winds](#), and to other nearby thunderstorms; often the northern part of a [splitting storm](#). See also [right mover](#).

LEWP - Line Echo Wave Pattern. A bulge in a thunderstorm line producing a wave-shaped "kink" in the line ([Fig. 4](#)). The potential for strong outflow and damaging [straight-line winds](#) increases near the bulge, which often resembles a [bow echo](#). Severe weather potential also is increased with storms near the crest of a LEWP.

Lifted Index (or LI) - A common measure of atmospheric [instability](#). Its value is obtained by computing the temperature that air near the ground would have if it were lifted to some higher level (around 18,000 feet, usually) and comparing that temperature to the actual temperature at that level. Negative values indicate instability - the more negative, the more unstable the air is, and the stronger the [updrafts](#) are likely to be with any developing thunderstorms. However there are no "magic numbers" or threshold LI values below which severe weather becomes imminent. See [Fig. 6](#), [sounding](#).

Loaded Gun (Sounding) - [Slang], a [sounding](#) characterized by extreme [instability](#) but containing a [cap](#), such that explosive thunderstorm development can be expected if the [cap](#) can be weakened or the air below it heated sufficiently to overcome it. See [Fig. 6](#), [sounding](#).

Longwave Trough - A [trough](#) in the prevailing westerly flow aloft which is characterized by large length and (usually) long duration. Generally, there are no more than about five longwave troughs around the Northern Hemisphere at any given time. Their position and intensity govern general weather patterns (e.g., hot/cold, wet/dry) over periods of days, weeks, or months. Smaller disturbances (e.g., [shortwave troughs](#)) typically move more rapidly through the broader flow of a longwave trough, producing weather changes over shorter time periods (a day or less).

Low-level Jet (abbrev. LLJ) - A region of relatively strong winds in the lower part of the atmosphere. Specifically, it often refers to a southerly wind maximum in the [boundary layer](#), common over the Plains states at night during the warm season (spring and summer).

The term also may be used to describe a narrow zone of strong winds *above* the boundary layer, but in this sense the more proper term would be low-level [jet stream](#).

LP Storm (or LP Supercell) - Low-Precipitation storm (or Low-Precipitation supercell). A [supercell](#) thunderstorm characterized by a relative lack of visible precipitation. Visually similar to a classic supercell, except without the heavy precipitation core ([Fig. 5](#)). LP storms often exhibit a striking visual appearance; the main [tower](#) often is bell-shaped, with a corkscrew appearance suggesting rotation. They are capable of producing [tornadoes](#) and very large hail. Radar identification often is difficult relative to other types of supercells, so visual reports are very important. LP storms almost always occur on or near the [dry line](#), and thus are sometimes referred to as [dry line storms](#).

LSR - Local Storm Report. A product issued by local [NWS](#) offices to inform users of reports of severe and/or significant weather-related events.

-M-

Mammatus Clouds - Rounded, smooth, sack-like protrusions hanging from the underside of a cloud (usually a thunderstorm [anvil](#)). Mammatus clouds often accompany [severe thunderstorms](#), but do not produce severe weather; they may accompany non-severe storms as well. See [Figs. 3 \(HP storm\)](#), [5 \(LP storm\)](#), and [7 \(supercell\)](#).

MCC - Mesoscale Convective Complex. A large [MCS](#), generally round or oval-shaped, which normally reaches peak intensity at night. The formal definition includes specific minimum criteria for size, duration, and eccentricity (i.e., "roundness"), based on the cloud shield as seen on infrared satellite photographs:

- Size: Area of cloud top -32 degrees C or less: 100,000 square kilometers or more (slightly smaller than the state of Ohio), and area of cloud top -52 degrees C or less: 50,000 square kilometers or more.
- Duration: Size criteria must be met for at least 6 hours.
- Eccentricity: Minor/major axis at least 0.7.

MCCs typically form during the afternoon and evening in the form of several isolated thunderstorms, during which time the potential for severe weather is greatest. During peak intensity, the primary threat shifts toward heavy rain and flooding.

MCS - Mesoscale Convective System. A complex of thunderstorms which becomes organized on a scale larger than the individual thunderstorms, and normally persists for several hours or more. MCSs may be round or linear in shape, and include systems such as tropical cyclones, [squall lines](#), and [MCCs](#) (among others). MCS often is used to describe a cluster of thunderstorms that does not satisfy the size, shape, or duration criteria of an MCC.

Medium Range - In forecasting, (generally) three to seven days in advance.

Meridional Flow - [Large-scale](#) atmospheric flow in which the north-south component (i.e., longitudinal, or along a meridian) is pronounced. The accompanying [zonal](#) (east-west) component often is weaker than normal. Compare with [zonal flow](#).

***Mesocyclone** - A [storm-scale](#) region of rotation, typically around 2-6 miles in diameter and often found in the right rear flank of a [supercell](#) (or often on the eastern, or front, flank of an [HP storm](#)). The circulation of a mesocyclone covers an area much larger than the [tornado](#) that may develop within it.

Properly used, mesocyclone is a radar term; it is defined as a rotation signature appearing on [Doppler radar](#) that meets specific criteria for magnitude, vertical depth, and duration. Therefore, a mesocyclone should not be considered a visually-observable phenomenon (although visual evidence of rotation, such as curved [inflow bands](#), may imply the presence of a mesocyclone).

Mesohigh - A [mesoscale](#) high pressure area, usually associated with [MCSs](#) or their remnants.

Mesolow (or [Sub-synoptic Low](#)) - A [mesoscale](#) low-pressure center. Severe weather potential often increases in the area near and just ahead of a mesolow.

Mesolow should not be confused with [mesocyclone](#), which is a [storm-scale](#) phenomenon.

Mesonet - A regional network of observing stations (usually surface stations) designed to diagnose [mesoscale](#) weather features and their associated processes.

Mesoscale - Size scale referring to weather systems smaller than [synoptic-scale](#) systems but larger than [storm-scale](#) systems. Horizontal dimensions generally range from around 50 miles to several hundred miles. [Squall lines](#), [MCCs](#), and [MCSs](#) are examples of mesoscale weather systems.

***Microburst** - A small, concentrated [downburst](#) affecting an area less than 4 kilometers (about 2.5 miles) across. Most microbursts are rather short-lived (5 minutes or so), but on rare occasions they have been known to last up to 6 times that long.

Mid-level Cooling - Local cooling of the air in middle levels of the atmosphere (roughly 8 to 25 thousand feet), which can lead to destabilization of the entire atmosphere if all other factors are equal. Mid-level cooling can occur, for example, with the approach of a mid-level [cold pool](#).

Moderate Risk (of [severe thunderstorms](#)) - Severe thunderstorms are expected to affect between 5 and 10 percent of the area. A moderate risk indicates the possibility of a significant severe weather episode. See [high risk](#), [slight risk](#), [convective outlook](#).

Moisture Advection - Transport of moisture by horizontal winds.

Moisture Convergence - A measure of the degree to which moist air is converging into a given area, taking into account the effect of converging winds and [moisture advection](#). Areas of persistent moisture convergence are favored regions for thunderstorm development, if other factors (e.g., [instability](#)) are favorable.

Morning Glory - An elongated cloud band, visually similar to a [roll cloud](#), usually appearing in the morning hours, when the atmosphere is relatively stable. Morning glories result from perturbations related to gravitational waves in a stable [boundary layer](#). They are similar to ripples on a water surface; several parallel morning glories often can be seen propagating in the same direction.

MRF - Medium-Range Forecast model; one of the operational forecast models run at [NCEP](#). The MRF is run once daily, with forecast output out to 240 hours (10 days).

Multi-cell(ular) Thunderstorm - A thunderstorm consisting of two or more [cells](#), of which most or all are often visible at a given time as distinct domes or [towers](#) in various stages of development.

Nearly all thunderstorms (including [supercells](#)) are multi-cellular, but the term often is used to describe a storm which does not fit the definition of a supercell.

***Multiple-vortex (or Multi-vortex) Tornado** - a [tornado](#) in which two or more [condensation funnels](#) or [debris clouds](#) are present at the same time, often rotating about a common center or about each other. Multiple-vortex tornadoes can be especially damaging. See [suction vortex](#).

Mushroom - [Slang], a thunderstorm with a well-defined [anvil rollover](#), and thus having a visual appearance resembling a mushroom.

-N-

NCEP - National Centers for Environmental Prediction; the modernized version of [NMC](#).

Negative-tilt Trough - An [upper level system](#) which is tilted to the west with increasing latitude (i.e., with an axis from southeast to northwest). A negative-tilt trough often is a sign of a developing or intensifying system.

NEXRAD - NEXt-Generation Weather RADar. Technologically-advanced weather radar being deployed to replace [WSR-57](#) and [WSR-74](#) units. NEXRAD is a high-resolution [Doppler radar](#) with increased emphasis on automation, including use of [algorithms](#) and automated volume scans. NEXRAD units are known as [WSR-88D](#).

NGM - Nested Grid Model; one of the operational forecast models run at [NCEP](#). The NGM is run twice daily, with forecast output out to 48 hours.

NMC - National Meteorological Center, with headquarters near Washington D.C.; now known as [NCEP](#).

NOAA - National Oceanographic and Atmospheric Administration.

Nocturnal - Related to nighttime, or occurring at night.

Nowcast - A short-term weather forecast, generally out to six hours or less.

NSSFC - National Severe Storms Forecast Center, in Kansas City MO; now known as [SPC](#).

NSSL - National Severe Storms Laboratory, in Norman OK. (Sometimes pronounced NES-sel.)

NWP - Numerical Weather Prediction.

NWS - National Weather Service.

-O-

Occluded Mesocyclone - A [mesocyclone](#) in which air from the [rear-flank downdraft](#) has completely enveloped the circulation at low levels, cutting off the inflow of warm unstable low-level air.

Orographic - Related to, or caused by, physical geography (such as mountains or sloping terrain).

Orographic Lift - Lifting of air caused by its passage up and over mountains or other sloping terrain.

Orphan Anvil - [Slang], an [anvil](#) from a dissipated thunderstorm, below which no other clouds remain.

Outflow Boundary - A [storm-scale](#) or [mesoscale](#) boundary separating thunderstorm-cooled air (outflow) from the surrounding air; similar in effect to a cold front, with passage marked by a wind shift and usually a drop in temperature. Outflow boundaries may persist for 24 hours or more after the thunderstorms that generated them dissipate, and may travel hundreds of miles from their area of origin. New thunderstorms often develop along outflow boundaries, especially near the point of intersection with another boundary (cold [front](#), [dry line](#), another outflow boundary, etc.; see [triple point](#)).

Overhang - Radar term indicating a region of high [reflectivity](#) at middle and upper levels above an area of weak reflectivity at low levels. (The latter area is known as a weak-echo region, or [WER](#).) The overhang is found on the inflow side of a thunderstorm (normally the south or southeast side). See [Fig. 2](#), [BWER](#).

Overrunning - A weather pattern in which a relatively warm air mass is in motion above another air mass of greater density at the surface. Embedded thunderstorms sometimes develop in such a pattern; [severe thunderstorms](#) (mainly with large hail) can occur, but [tornadoes](#) are unlikely.

Overrunning often is applied to the case of warm air riding up over a retreating layer of colder air, as along the sloping surface of a warm [front](#). Such use of the term technically is incorrect, but in general it refers to a pattern characterized by widespread clouds and steady precipitation on the cool side of a front or other boundary.

***Overshooting Top** (or Penetrating Top) - A dome-like protrusion above a thunderstorm anvil, representing a very strong [updraft](#) and hence a higher potential for severe weather with that storm. A persistent and/or large overshooting top ([anvil dome](#)) often is present on a [supercell](#). A short-lived overshooting top, or one that forms and dissipates in cycles, may indicate the presence of a [pulse storm](#) or a [cyclic storm](#). See [Figs. 3 \(HP storm\)](#), [5 \(LP storm\)](#), and [7 \(supercell\)](#).

-P-

PDS Watch - [Slang], a tornado [watch](#) with [enhanced wording](#) (**P**articularly **D**angerous **S**ituation).

Pendant Echo - Radar signature generally similar to a [hook echo](#), except that the hook shape is not as well defined.

Penetrating Top - Same as [overshooting top](#).

Popcorn Convection - [Slang], Showers and thunderstorms that form on a scattered basis with little or no apparent organization, usually during the afternoon in response to [diurnal](#) heating. Individual thunderstorms typically are of the type sometimes referred to as [air-mass thunderstorms](#): they are small, short-lived, very rarely severe, and they almost always dissipate near or just after sunset.

Positive Area - The area on a [sounding](#) representing the layer in which a lifted parcel would be warmer than the environment; thus, the area between the environmental temperature profile and the path of the lifted parcel. See [Fig. 6](#), [sounding](#). Positive area is a measure of the energy available for [convection](#); see [CAPE](#).

Positive CG - A [CG](#) flash that delivers positive charge to the ground, as opposed to the more common negative charge. Positive CGs have been found to occur more frequently in some severe thunderstorms. Their occurrence is detectable by most lightning detection networks, but visually it is not considered possible to distinguish between a positive CG and a negative CG. (Some claim to have observed a relationship between [staccato lightning](#) and positive CGs, but this relationship is as yet unproven.)

Positive-tilt Trough - An [upper level system](#) which is tilted to the east with increasing latitude (i.e., from southwest to northeast). A positive-tilt trough often is a sign of a weakening weather system, and generally is less likely to result in severe weather than a [negative-tilt trough](#) if all other factors are equal.

Potential Temperature - The temperature a parcel of dry air would have if brought adiabatically (i.e., without transfer of heat or mass) to a standard pressure level of 1000 mb.

PPINE - Plan Position Indicates No Echoes, referring to the fact that a radar detects no precipitation within its range.

Profiler - An instrument designed to measure horizontal winds directly above its location, and thus measure the vertical wind profile. Profilers operate on the same principles as [Doppler radar](#).

Pseudo-Cold Front - A boundary between a [supercell's](#) inflow region and the [rear-flank downdraft](#) (or RFD). It extends outward from the [mesocyclone](#) center, usually toward the south or southwest (but occasionally bows outward to the east or southeast in the case of an [occluded mesocyclone](#)), and is characterized by advancing of the [downdraft](#) air toward the inflow region. It is a particular form of [gust front](#). See also [pseudo-warm front](#).

Pseudo-Warm Front - A boundary between a [supercell's](#) inflow region and the [forward-flank downdraft](#) (or FFD). It extends outward from at or near the [mesocyclone](#) center, usually toward the east or southeast, and normally is either nearly stationary or moves northward or northeastward ahead of the [mesocyclone](#). See [pseudo-cold front](#) and [beaver tail](#).

Pulse Storm - A thunderstorm within which a brief period (pulse) of strong [updraft](#) occurs, during and immediately after which the storm produces a short episode of severe weather. These storms generally are not [tornado](#) producers, but often produce large hail and/or damaging winds. See [overshooting top](#), [cyclic storm](#).

PVA - Positive **V**orticity **A**dvection. [Advection](#) of higher values of [vorticity](#) into an area, which often is associated with upward motion (lifting) of the air. PVA typically is found in advance of disturbances aloft (i.e., [shortwaves](#)), and is a property which often enhances the potential for thunderstorm development.

-R-

RADAP II - **R**ADar **D**Ata **P**rocessor II, attached to some [WSR-57](#) and [WSR-74](#) radar units. It automatically controls the [tilt sequence](#) and computes several radar-derived quantities at regular intervals, including [VIL](#), storm tops, accumulated rainfall, etc.

Radial Velocity - Component of motion toward or away from a given location. As "seen" by [Doppler radar](#), it is the component of motion parallel to the radar beam. (The component of motion *perpendicular* to the beam cannot be seen by the radar. Therefore, strong winds blowing strictly from left to right or from right to left, relative to the radar, can *not* be detected.)

Rain Foot - [Slang], a horizontal bulging near the surface in a precipitation shaft, forming a foot-shaped prominence. It is a visual indication of a [wet microburst](#).

***Rain-free Base** - A dark, horizontal cloud base with no visible precipitation beneath it. It typically marks the location of the thunderstorm [updraft](#). [Tornadoes](#) may develop from [wall clouds](#) attached to the rain-free base, or from the rain-free base itself - especially when the rain-free base is on the south or southwest side of the main precipitation area.

Note that the rain-free base may not actually be rain free; hail or large rain drops may be falling. For this reason, [updraft base](#) is more accurate. See [Figs. 3 \(HP storm\)](#), [5 \(LP storm\)](#), and [7 \(supercell\)](#).

Rear Flank Downdraft (or RFD) - A region of dry air subsiding on the back side of, and wrapping around, a [mesocyclone](#). It often is visible as a [clear slot](#) wrapping around the wall cloud. Scattered large precipitation particles (rain and hail) at the interface between the clear slot and [wall cloud](#) may show up on radar as a [hook](#) or [pendant](#); thus the presence of a hook or pendant may indicate the presence of an RFD. See [Fig. 7, supercell](#).

Red Watch or Red Box - [Slang], a tornado [watch](#).

Reflectivity - Radar term referring to the ability of a radar target to return energy; used to derive echo intensity, and to estimate precipitation intensity and rainfall rates. See [dBZ](#), [VIP](#).

Relative Humidity - A dimensionless ratio, expressed in percent, of the amount of atmospheric moisture present relative to the amount that would be present if the air were saturated. Since the latter amount is dependent on temperature, relative humidity is a function of both moisture content and temperature. As such, relative humidity by itself does not directly indicate the actual amount of atmospheric moisture present. See [dew point](#).

Retrogression (or Retrograde Motion) - Movement of a weather system in a direction opposite to that of the basic flow in which it is embedded, usually referring to a [closed low](#) or a [longwave trough](#) which moves westward.

Return Flow - South winds on the back (west) side of an eastward-moving surface high pressure system. Return flow over the central and eastern United States typically results in a return of moist air from the Gulf of Mexico (or the Atlantic Ocean).

Right Entrance Region (or [Right Rear Quadrant](#)) - The area [upstream](#) from and to the right of an upper-level [jet max](#) (as would be viewed looking along the direction of flow). Upward motion and [severe thunderstorm](#) potential sometimes are increased in this area relative to the wind speed maximum. See also [exit region](#), [left front quadrant](#).

Ridge - An elongated area of relatively high atmospheric pressure; the opposite of [trough](#).

***Right Mover** - A thunderstorm that moves appreciably to the right relative to the main steering winds and to other nearby thunderstorms. Right movers typically are associated with a high potential for severe weather. ([Supercells](#) often are right movers.) See [left mover](#), [splitting storm](#).

Right Rear Quadrant - see [Right Entrance Region](#).

***Roll Cloud** - A low, horizontal tube-shaped [arcus cloud](#) associated with a thunderstorm [gust front](#) (or sometimes with a cold [front](#)). Roll clouds are relatively rare; they are completely detached from the thunderstorm base or other cloud features, thus differentiating them from the more familiar [shelf clouds](#). Roll clouds usually appear to be "rolling" about a horizontal axis, but should not be confused with [funnel clouds](#).

***Rope** (or Rope Funnel) - A narrow, often contorted [condensation funnel](#) usually associated with the decaying stage of a [tornado](#). See [rope stage](#).

Rope Cloud - In satellite meteorology, a narrow, rope-like band of clouds sometimes seen on satellite images along a [front](#) or other boundary.

The term sometimes is used synonymously with [rope](#) or [rope funnel](#).

Rope Stage - The dissipating stage of a [tornado](#), characterized by thinning and shrinking of the [condensation funnel](#) into a [rope](#) (or [rope funnel](#)). Damage still is possible during this stage.

RUC - **R**apid **U**ppdate **C**ycle, a numerical model run at [NCEP](#) that focuses on short-term (up to 12 h) forecasts and small-scale ([mesoscale](#)) weather features. Forecasts are prepared every 3 hours for the contiguous United States.

-S-

***Scud** (or [Fractus](#)) - Small, ragged, low cloud fragments that are unattached to a larger cloud base and often seen with and behind cold [fronts](#) and thunderstorm [gust fronts](#). Such clouds generally are associated with cool moist air, such as thunderstorm outflow.

SELS - **SE**vere **L**ocal **S**torms Unit, former name of the Operations Branch of the Storm Prediction Center ([SPC](#)) in Norman, OK (formerly in Kansas City, MO).

***Severe Thunderstorm** - A thunderstorm which produces [tornadoes](#), hail 0.75 inches or more in diameter, or winds of 50 knots (58 mph) or more. Structural wind damage may imply the occurrence of a severe thunderstorm. See [approaching](#) (severe).

Shear - Variation in wind speed ([speed shear](#)) and/or direction ([directional shear](#)) over a short distance. Shear usually refers to vertical wind shear, i.e., the change in wind with height, but the term also is used in [Doppler radar](#) to describe changes in [radial velocity](#) over short horizontal distances.

***Shelf Cloud** - A low, horizontal wedge-shaped [arcus cloud](#), associated with a thunderstorm [gust front](#) (or occasionally with a cold front, even in the absence of thunderstorms). Unlike the [roll cloud](#), the shelf cloud is attached to the base of the parent cloud above it (usually a thunderstorm). Rising cloud motion often can be seen in the leading (outer) part of the shelf cloud, while the underside often appears turbulent, boiling, and wind-torn.

Short-Fuse Warning - A [warning](#) issued by the [NWS](#) for a local weather hazard of relatively short duration. Short-fuse warnings include tornado warnings, severe thunderstorm warnings, and flash flood warnings. Tornado and severe thunderstorm warnings typically are issued for periods of an hour or less, flash flood warnings typically for three hours or less.

Shortwave (or Shortwave Trough) - A disturbance in the mid or upper part of the atmosphere which induces upward motion ahead of it. If other conditions are favorable, the upward motion can contribute to thunderstorm development ahead of a shortwave.

Slight Risk (of [severe thunderstorms](#)) - Severe thunderstorms are expected to affect between 2 and 5 percent of the area. A slight risk generally implies that severe weather events are expected to be isolated. See [high risk](#), [moderate risk](#), [convective outlook](#).

Sounding - A plot of the vertical profile of temperature and [dew point](#) (and often winds) above a fixed location ([Fig. 6](#)). Soundings are used extensively in severe weather forecasting, e.g., to determine [instability](#), locate temperature [inversions](#), measure the strength of the [cap](#), obtain the [convective temperature](#), etc.

SPC - Storm Prediction Center. A national forecast center in Norman, Oklahoma, which is part of [NCEP](#). The SPC is responsible for providing short-term forecast guidance for severe [convection](#), excessive rainfall (flash flooding) and severe winter weather over the contiguous United States.

Speed Shear - The component of [wind shear](#) which is due to a change in wind speed with height, e.g., southwesterly winds of 20 mph at 10,000 feet increasing to 50 mph at 20,000 feet. Speed shear is an important factor in severe weather development, especially in the middle and upper levels of the atmosphere.

Spin-up - [Slang], a small-scale vortex initiation, such as what may be seen when a [gustnado](#), [landspout](#), or [suction vortex](#) forms.

Splitting Storm - A thunderstorm which splits into two storms which follow diverging paths (a [left mover](#) and a [right mover](#)). The left mover typically moves faster than the original storm, the right mover, slower. Of the two, the left mover is most likely to weaken and dissipate (but on rare occasions can become a very severe anticyclonic-rotating storm), while the right mover is the one most likely to reach [supercell](#) status.

***Squall Line** - A solid or nearly solid line or band of active thunderstorms.

Staccato Lightning - A [CG](#) lightning discharge which appears as a single very bright, short-duration stroke, often with considerable branching.

Steering Winds (or Steering Currents) - A prevailing [synoptic scale](#) flow which governs the movement of smaller features embedded within it.

Storm-relative - Measured relative to a moving thunderstorm, usually referring to winds, [wind shear](#), or [helicity](#).

Storm-scale - Referring to weather systems with sizes on the order of individual thunderstorms. See [synoptic scale](#), [mesoscale](#).

***Straight-line Winds** - Generally, any wind that is not associated with rotation, used mainly to differentiate them from tornadic winds.

Stratiform - Having extensive horizontal development, as opposed to the more vertical development characteristic of [convection](#). Stratiform clouds

cover large areas but show relatively little vertical development. Stratiform precipitation, in general, is relatively continuous and uniform in intensity (i.e., steady rain versus rain showers).

Stratocumulus - Low-level clouds, existing in a relatively flat layer but having individual elements. Elements often are arranged in rows, bands, or waves. Stratocumulus often reveals the depth of the moist air at low levels, while the speed of the cloud elements can reveal the strength of the [low-level jet](#).

Stratus - A low, generally gray cloud layer with a fairly uniform base. Stratus may appear in the form of ragged patches, but otherwise does not exhibit individual cloud elements as do [cumulus](#) and [stratocumulus clouds](#). Fog usually is a surface-based form of stratus.

Striations - Grooves or channels in cloud formations, arranged parallel to the flow of air and therefore depicting the airflow relative to the parent cloud. Striations often reveal the presence of rotation, as in the [barber pole](#) or "corkscrew" effect often observed with the rotating [updraft](#) of an [LP storm](#).

Subsidence - Sinking (downward) motion in the atmosphere, usually over a broad area.

Sub-synoptic Low - Essentially the same as [mesolow](#).

Suction Vortex (sometimes Suction Spot) - A small but very intense vortex within a [tornado](#) circulation. Several suction vortices typically are present in a [multiple-vortex tornado](#). Much of the extreme damage associated with violent tornadoes (F4 and F5 on the [Fujita scale](#)) is attributed to suction vortices.

***Supercell** - A thunderstorm with a persistent rotating [updraft](#). Supercells are rare, but are responsible for a remarkably high percentage of severe weather events - especially [tornadoes](#), extremely large hail and damaging [straight-line winds](#). They frequently travel to the right of the main environmental winds (i.e., they are [right movers](#)). Radar characteristics often (but not always) include a [hook](#) or [pendant](#), bounded weak echo region ([BWER](#)), [V-notch](#), [mesocyclone](#), and sometimes a [TVS](#). Visual characteristics often include a [rain-free base](#) (with or without a [wall cloud](#)), [tail cloud](#), [flanking line](#), [overshooting top](#), and [back-sheared anvil](#), all of which normally are observed in or near the right rear or southwest part of the storm ([Fig. 7](#)). Storms exhibiting these characteristics often are called classic supercells; however [HP storms](#) ([Fig. 3](#)) and [LP storms](#) ([Fig. 5](#)) also are supercell varieties.

Surface-based Convection - [Convection](#) occurring within a surface-based layer, i.e., a layer in which the lowest portion is based at or very near the earth's surface. Compare with [elevated convection](#).

SWEAT Index - Severe Weather ThrEAT index. A stability index developed by the Air Force which incorporates [instability](#), [wind shear](#), and wind speeds as follows:

$$\text{SWEAT} = (12 \text{ Td } 850) + (20 [\text{TT} - 49]) + (2 \text{ f } 850) + \text{f } 500 + (125 [\text{s} + 0.2])$$
 where

- o Td 850 is the [dew point temperature](#) at 850 mb,
- o TT is the [total-totals index](#),
- o f 850 is the 850-mb wind speed (in knots),
- o f 500 is the 500-mb wind speed (in knots), and
- o s is the sine of the angle between the wind directions at 500 mb and 850 mb (thus representing the [directional shear](#) in this layer).

SWEAT values of about 250-300 or more indicate a greater potential for severe weather, but as with all stability indices, there are no magic numbers.

The SWEAT index has the advantage (and disadvantage) of using only mandatory-level data (i.e., 500 mb and 850 mb), but has fallen into relative disuse with the advent of more detailed [sounding](#) analysis programs.

SWODY1, SWODY2 (sometimes pronounced swoe-dee) - The day-1 and day-2 convective outlooks issued by [SELS](#).

Synoptic Scale (or Large Scale) - Size scale referring generally to weather systems with horizontal dimensions of several hundred miles or more. Most high and low pressure areas seen on weather maps are synoptic-scale systems. Compare with [mesoscale](#), [storm-scale](#).

-T-

***Tail Cloud** - A horizontal, tail-shaped cloud (not a [funnel cloud](#)) at low levels extending from the precipitation cascade region of a [supercell](#) toward the [wall cloud](#) (i.e., it usually is observed extending from the wall cloud toward the north or northeast). The base of the tail cloud is about the same as that of the wall cloud. Cloud motion in the tail cloud is away from the precipitation and toward the wall cloud, with rapid upward motion often observed near the junction of the tail and wall clouds. See [Fig. 7](#), [supercell](#).

Compare with [beaver tail](#), which is a form of inflow band that normally attaches to the storm's main [updraft](#) (not to the wall cloud) and has a base at about the same level as the [updraft base](#) (not the wall cloud).

Tail-end Charlie - [Slang], the thunderstorm at the southernmost end of a [squall line](#) or other line or band of thunderstorms. Since low-level southerly inflow of warm, moist air into this storm is relatively unimpeded, such a storm often has a higher probability of strengthening to severe levels than the other storms in the line.

Thermodynamic Chart (or Thermodynamic Diagram) - A chart containing contours of pressure, temperature, moisture, and [potential temperature](#), all drawn relative to each other such that basic thermodynamic laws are satisfied. Such a chart typically is used to plot atmospheric [soundings](#), and to estimate potential changes in temperature, moisture, etc. if air were displaced vertically from a given level. A thermodynamic chart thus is a useful tool in diagnosing atmospheric [instability](#). (See [Fig. 6, sounding](#).)

Thermodynamics - In general, the relationships between heat and other properties (such as temperature, pressure, density, etc.) In forecast discussions, thermodynamics usually refers to the distribution of temperature and moisture (both vertical and horizontal) as related to the diagnosis of atmospheric [instability](#).

Theta-e (or Equivalent Potential Temperature) - The temperature a parcel of air would have if a) it was lifted until it became saturated, b) all water vapor was condensed out, and c) it was returned adiabatically (i.e., without transfer of heat or mass) to a pressure of 1000 millibars. Theta-e, which typically is expressed in degrees Kelvin, is directly related to the amount of heat present in an air parcel. Thus, it is useful in diagnosing atmospheric [instability](#).

Theta-e Ridge - An axis of relatively high values of [theta-e](#). Severe weather and excessive rainfall often occur near or just [upstream](#) from a theta-e ridge.

Tilt Sequence - Radar term indicating that the radar antenna is scanning through a series of antenna elevations in order to obtain a [volume scan](#).

Tilted Storm or Tilted Updraft - A thunderstorm or cloud [tower](#) which is not purely vertical but instead exhibits a slanted or tilted character. It is a sign of vertical [wind shear](#), a favorable condition for severe storm development.

***Tornado** - A violently rotating column of air in contact with the ground and extending from the base of a thunderstorm. A [condensation funnel](#) *does not need to reach to the ground* for a tornado to be present; a [debris cloud](#) beneath a thunderstorm is all that is needed to confirm the presence of a tornado, even in the total absence of a condensation funnel.

Tornado Family - A series of [tornadoes](#) produced by a single [supercell](#), resulting in damage path segments along the same general line.

Total-Totals Index - A stability index and severe weather forecast tool, equal to the temperature at 850 mb plus the [dew point](#) at 850 mb, minus twice the temperature at 500 mb. The total-totals index is the arithmetic sum of two other indices: the Vertical Totals Index (temperature at 850 mb minus temperature at 500 mb) and the Cross Totals Index (dew point at 850 mb minus temperature at 500 mb). As with all stability indices there are no magic threshold values, but in general, values of less than 50 or greater than 55 are considered weak and strong indicators, respectively, of potential severe storm development.

Tower - (Short for [towering cumulus](#)), a cloud element showing appreciable upward vertical development.

Towering Cumulus - (Same as [congestus](#).) A large [cumulus](#) cloud with great vertical development, usually with a cauliflower-like appearance, but lacking the characteristic [anvil](#) of a [Cb](#). (Often shortened to "towering cu," and abbreviated TCU.)

Transverse Bands - Bands of clouds oriented perpendicular to the flow in which they are embedded. They often are seen best on satellite photographs. When observed at high levels (i.e., in [cirrus](#) formations), they may indicate severe or extreme turbulence. Transverse bands observed at low levels (called [transverse rolls](#) or [T rolls](#)) often indicate the presence of a temperature [inversion](#) (or [cap](#)) as well as [directional shear](#) in the low- to mid-level winds. These conditions often favor the development of strong to [severe thunderstorms](#).

Transverse Rolls - Elongated low-level clouds, arranged in parallel bands and aligned parallel to the low-level winds but perpendicular to the mid-level flow. Transverse rolls are one type of [transverse band](#), and often indicate an environment favorable for the subsequent development of [supercells](#). Since they are aligned parallel to the low-level inflow, they may point toward the region most likely for later storm development.

T Rolls - [Slang], same as [transverse rolls](#).

Triple Point - The intersection point between two boundaries ([dry line](#), [outflow boundary](#), cold [front](#), etc.), often a focus for thunderstorm development.

Triple point also may refer to a point on the [gust front](#) of a [supercell](#), where the warm moist inflow, the rain-cooled outflow from the [forward flank downdraft](#), and the [rear flank downdraft](#) all intersect; this point is a favored location for [tornado](#) development (or redevelopment).

Tropopause - The upper boundary of the [troposphere](#), usually characterized by an abrupt change in [lapse rate](#) from positive (decreasing temperature with height) to neutral or negative (temperature constant or increasing with height). See [Fig. 6, sounding](#).

Troposphere - The layer of the atmosphere from the earth's surface up to the [tropopause](#), characterized by decreasing temperature with height (except, perhaps, in thin layers - see [inversion](#), [cap](#)), vertical wind motion, appreciable water vapor content, and sensible weather (clouds, rain, etc.).

Trough - An elongated area of relatively low atmospheric pressure, usually not associated with a closed circulation, and thus used to distinguish from a [closed low](#). The opposite of [ridge](#).

Turkey Tower - [Slang], a narrow, individual cloud [tower](#) that develops and falls apart rapidly. The sudden development of turkey towers from small [cumulus](#) clouds may signify the breaking of a [cap](#).

TVS - Tornadoic Vortex Signature. [Doppler radar](#) signature in the [radial velocity](#) field indicating intense, concentrated rotation - more so than a [mesocyclone](#). Like the mesocyclone, specific criteria involving strength, vertical depth, and time continuity must be met in order for a signature to become a TVS. Existence of a TVS strongly increases the probability of [tornado](#) occurrence, but does *not* guarantee it. A TVS is not a visually observable feature.

-U-

UKMET - A medium-range numerical weather prediction model operated by the **United Kingdom MET**eorological Agency.

Updraft - A small-scale current of rising air. If the air is sufficiently moist, then the moisture condenses to become a [cumulus](#) cloud or an individual [tower](#) of a [towering cumulus](#) or [Cb](#).

Updraft Base - Alternate term for a [rain-free base](#).

Upper Level System - A general term for any [large-scale](#) or [mesoscale](#) disturbance capable of producing upward motion (lift) in the middle or upper parts of the atmosphere. This term sometimes is used interchangeably with impulse or [shortwave](#).

Upslope Flow - Air that flows toward higher terrain, and hence is forced to rise. The added lift often results in widespread low cloudiness and [stratiform](#) precipitation if the air is stable, or an increased chance of thunderstorm development if the air is unstable.

Upstream - Toward the source of the flow, or located in the area from which the flow is coming.

UVM (or UVV) - **Upward Vertical Motion** (or **Velocity**).

-V-

VAD - **Velocity Azimuth Display**. A radar display on which mean [radial velocity](#) is plotted as a function of azimuth. See [VWP](#).

Vault - Same as [BWER](#).

Veering Winds - Winds which shift in a *clockwise* direction with time at a given location (e.g., from southerly to westerly), or which change direction in a clockwise sense with height (e.g., southeasterly at the surface turning to southwesterly aloft). The latter example is a form of [directional shear](#) which is important for [tornado](#) formation. Compare with [backing winds](#).

Vertically-stacked System - A low-pressure system, usually a [closed low](#) or [cutoff low](#), which is not tilted with height, i.e., located similarly at all levels of the atmosphere. Such systems typically are weakening and are slow-moving, and are less likely to produce severe weather than tilted systems. However, [cold pools](#) aloft associated with vertically-stacked systems may enhance [instability](#) enough to produce severe weather.

VIL - **Vertically-Integrated Liquid water**. A property computed by [RADAP II](#) and [WSR-88D](#) units that takes into account the three-dimensional [reflectivity](#) of an echo. The maximum VIL of a storm is useful in determining its potential severity, especially in terms of maximum hail size.

VIP - **Video Integrator and Processor**, which contours radar [reflectivity](#) (in [dBZ](#)) into six VIP levels:

- VIP 1 (Level 1, 18-30 dBZ) - Light precipitation
- VIP 2 (Level 2, 30-38 dBZ) - Light to moderate rain.

- VIP 3 (Level 3, 38-44 dBZ) - Moderate to heavy rain.
- VIP 4 (Level 4, 44-50 dBZ) - Heavy rain
- VIP 5 (Level 5, 50-57 dBZ) - Very heavy rain; hail possible.
- VIP 6 (Level 6, >57 dBZ) - Very heavy rain and hail; large hail possible.

***Virga** - Streaks or wisps of precipitation falling from a cloud but evaporating before reaching the ground. In certain cases, shafts of virga may precede a [microburst](#); see [dry microburst](#).

V Notch - A radar [reflectivity](#) signature seen as a V-shaped notch in the downwind part of a thunderstorm echo. The V-notch often is seen on [supercells](#), and is thought to be a sign of diverging flow around the main storm [updraft](#) (and hence a very strong updraft). This term should not be confused with [inflow notch](#) or with [enhanced V](#), although the latter is believed to form by a similar process. See [Fig. 7, supercell](#).

Volume Scan - A radar scanning strategy in which sweeps are made at successive antenna elevations (i.e., a [tilt sequence](#)), and then combined to obtain the three-dimensional structure of the echoes. Volume scans are necessary to determine thunderstorm type, and to detect features such as [WERS](#), [BWERS](#), and [overhang](#).

Vorticity - A measure of the local rotation in a fluid flow. In weather analysis and forecasting, it usually refers to the vertical component of rotation (i.e., rotation about a vertical axis) and is used most often in reference to [synoptic scale](#) or [mesoscale](#) weather systems. By convention, positive values indicate [cyclonic rotation](#).

Vort Max - (Slang; short for **vorticity maximum**), a center, or maximum, in the [vorticity](#) field of a fluid.

WVP - VAD Wind Profile. A radar plot of horizontal winds, derived from [VAD](#) data, as a function of height above a [Doppler Radar](#). The display is plotted with height as the vertical axis and time as the horizontal axis (a so-called time-height display), which then depicts the change in wind with time at various heights. This display is useful for observing local changes in vertical [wind shear](#), such as backing of low-level winds, increases in [speed shear](#), and development or evolution of nearby [jet streams](#) (including [low-level jets](#)).

This product often is referred to erroneously as a [VAD](#).

-W-

***Wall Cloud** - A localized, persistent, often abrupt lowering from a [rain-free base](#). Wall clouds can range from a fraction of a mile up to nearly five miles in diameter, and normally are found on the south or southwest (inflow) side of the thunderstorm. When seen from within several miles, many wall clouds exhibit rapid upward motion and [cyclonic rotation](#). However, not all wall clouds rotate. Rotating wall clouds usually develop before strong or violent [tornadoes](#), by anywhere from a few minutes up to nearly an hour. Wall clouds should be monitored visually for signs of *persistent, sustained* rotation and/or rapid vertical motion. See [Fig. 7, supercell](#).

"Wall cloud" also is used occasionally in tropical meteorology to describe the inner cloud wall surrounding the eye of a tropical cyclone, but the proper term for this feature is eyewall.

Warm Advection - Transport of warm air into an area by horizontal winds.

Low-level warm advection sometimes is referred to (erroneously) as [overrunning](#). Although the two terms are not properly interchangeable, both imply the presence of lifting in low levels.

Warning - A product issued by [NWS](#) local offices indicating that a particular weather hazard is either imminent or has been reported. A warning indicates the need to take action to protect life and property. The type of hazard is reflected in the type of warning (e.g., tornado warning, blizzard warning). See [short-fuse warning](#).

Watch - An [NWS](#) product indicating that a particular hazard is possible, i.e., that conditions are more favorable than usual for its occurrence. A watch is a recommendation for planning, preparation, and increased awareness (i.e., to be alert for changing weather, listen for further information, and think about what to do if the danger materializes).

Watch Box (or [Box](#)) - [Slang], a severe thunderstorm or tornado [watch](#).

Waterspout - In general, a [tornado](#) occurring over water. Specifically, it normally refers to a small, relatively weak rotating column of air over water beneath a [Cb](#) or [towering cumulus](#) cloud. Waterspouts are most common over tropical or subtropical waters.

The exact definition of waterspout is debatable. In most cases the term is reserved for small vortices over water that are not associated with [storm-scale](#)

rotation (i.e., they are the water-based equivalent of [landspouts](#)). But there is sufficient justification for calling virtually any rotating column of air a waterspout if it is in contact with a water surface.

Wedge (or Wedge Tornado) - [Slang], a large [tornado](#) with a [condensation funnel](#) that is at least as wide (horizontally) at the ground as it is tall (vertically) from the ground to cloud base.

The term "wedge" often is used somewhat loosely to describe any large tornado. However, not every large tornado is a wedge. A true wedge tornado, with a [funnel](#) at least as wide at the ground as it is tall, is very rare.

Wedges often appear with violent tornadoes (F4 or F5 on the [Fujita Scale](#)), but many documented wedges have been rated lower. And some violent tornadoes may not appear as wedges (e.g., Xenia, OH on 3 April 1974, which was rated F5 but appeared only as a series of [suction vortices](#) without a central condensation funnel). Whether or not a tornado achieves "wedge" status depends on several factors other than intensity - in particular, the height of the environmental cloud base and the availability of moisture below cloud base. Therefore, spotters should *not* estimate wind speeds or F-scale ratings based on visual appearance alone. However, it generally is safe to assume that most (if not all) wedges have the potential to produce strong (F2/F3) or violent (F4/F5) damage.

WER - Weak Echo Region. Radar term for a region of relatively weak ([reflectivity](#) at low levels on the inflow side of a thunderstorm echo, topped by stronger reflectivity in the form of an echo [overhang](#) directly above it (see [Fig. 2](#)). The WER is a sign of a strong [updraft](#) on the inflow side of a storm, within which precipitation is held aloft. When the area of low reflectivity extends upward into, and is surrounded by, the higher reflectivity aloft, it becomes a [BWER](#).

Wet Microburst - A [microburst](#) accompanied by heavy precipitation at the surface. A [rain foot](#) may be a visible sign of a wet microburst. See [dry microburst](#).

Wind Shear - See [shear](#).

Wrapping Gust Front - A [gust front](#) which wraps around a [mesocyclone](#), cutting off the inflow of warm moist air to the mesocyclone circulation and resulting in an [occluded mesocyclone](#).

WSR-57, WSR-74 - [NWS Weather Surveillance Radar](#) units, replaced by [WSR-88D](#) units.

WSR-88D - **Weather Surveillance Radar** - 1988 Doppler; [NEXRAD](#) unit.

-Z-

Zonal Flow - [Large-scale](#) atmospheric flow in which the east-west component (i.e., latitudinal) is dominant. The accompanying meridional (north-south) component often is weaker than normal. Compare with [meridional flow](#).

Figure 1 - Bow Echo

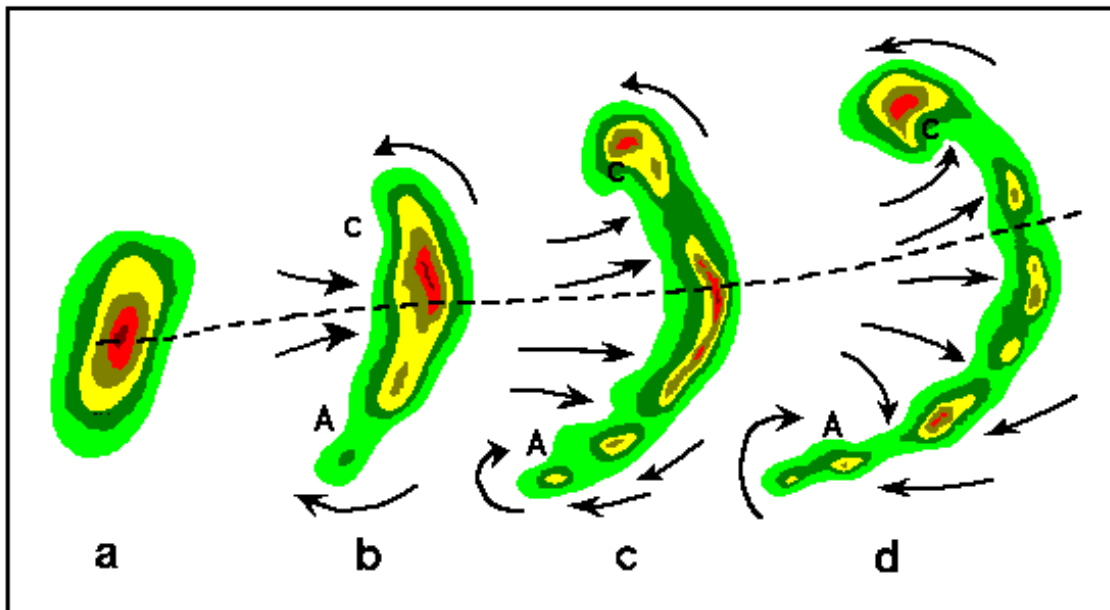


Fig. 1. Bow Echo. Typical evolution of a thunderstorm radar echo (a) into a bow echo (b,c) and into a comma echo (d). Dashed line indicates axis of greatest potential for downbursts. Arrows indicate wind flow relative to the storm. Note regions of cyclonic rotation (C) and anticyclonic rotation (A); both regions, especially C, are capable of supporting tornado development in some cases.

Figure 2 - Bounded Weak Echo/Weak Echo Regions

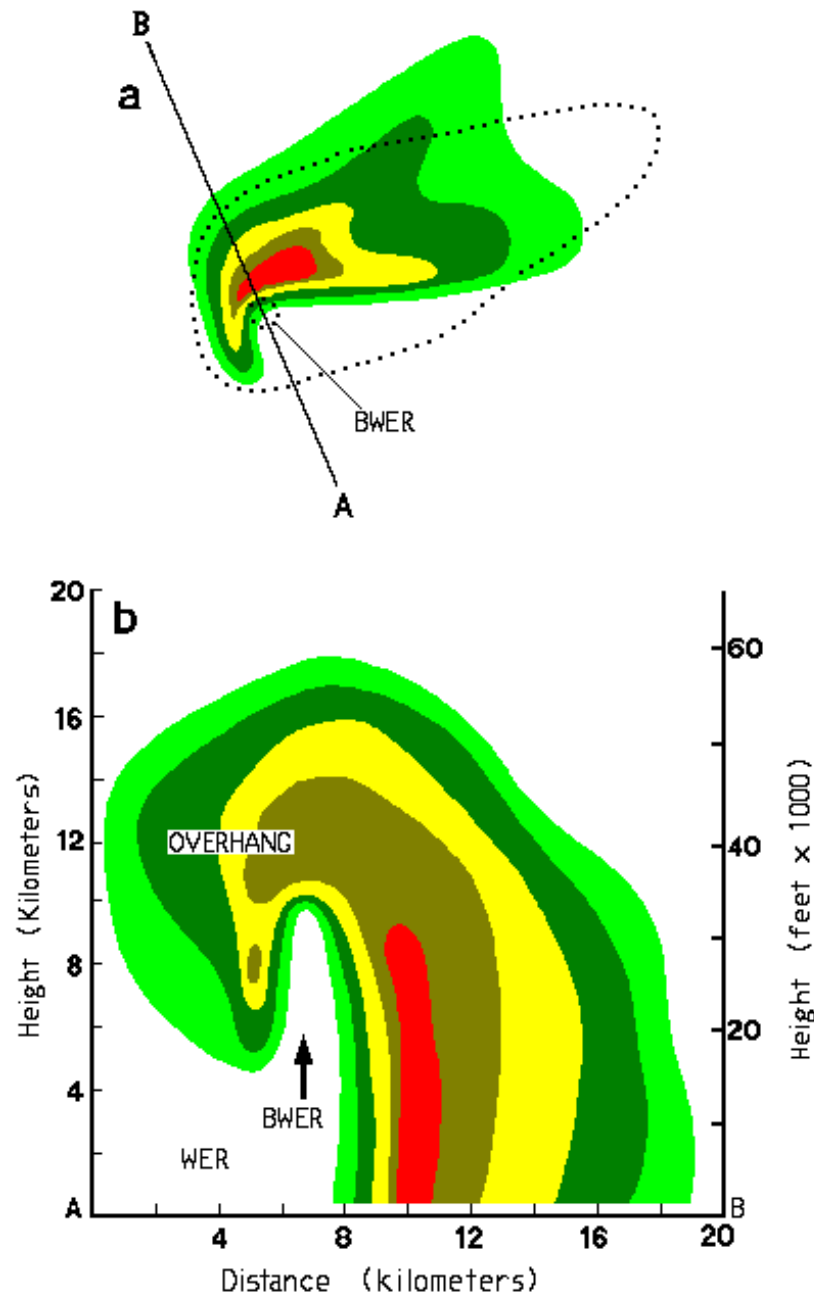


Fig. 2. BWER, WER. (a) Schematic showing relative positions of low-level radar reflectivity contours (solid colors) and mid-level echo (around 8 km or 26,000 feet, dashed), (b) Vertical cross-section through AB showing echo overhang above weak-echo region (WER), and a BWER where the area of weak reflectivity extends upward into the region of higher reflectivity aloft. (In (a), note the hook echo at the lower left and the Y-notch at upper right; compare with Fig. 7.)

Figure 3 - Heavy Precipitation Supercell Thunderstorm

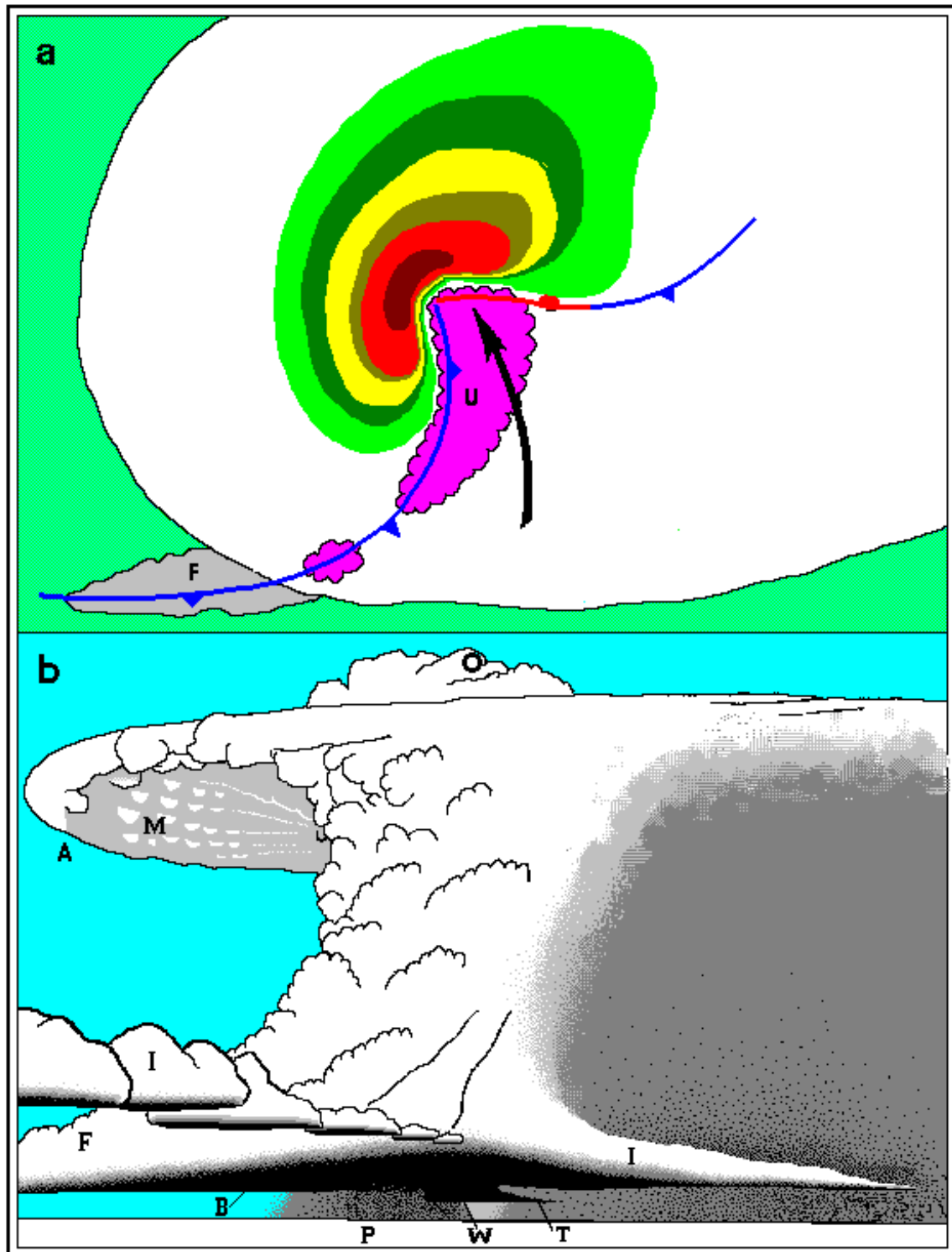


Fig. 3. HP storm (HP supercell). Schematic view from above of an HP storm (a), and visual features of the same storm as might be seen from the east or southeast (b). In (a), regions of radar reflectivity are colored according to intensity. Scalloped lines and violet shading indicate the region of main updraft (U). Surface inflow is indicated by arrow. Frontal symbols indicate location of gust front. Features in (b) include overshooting top (O), back-sheared anvil (A), wall cloud (W; often obscured by precipitation), tail cloud (T), inflow band (I), rain-free base (B), and regions of heavy precipitation (P). Compare with figures 5 and 7.

Figure 4 - Line Echo Wave Pattern (LEWP)

LINE ECHO WAVE PATTERN (LEWP) AS SEEN ON RADAR

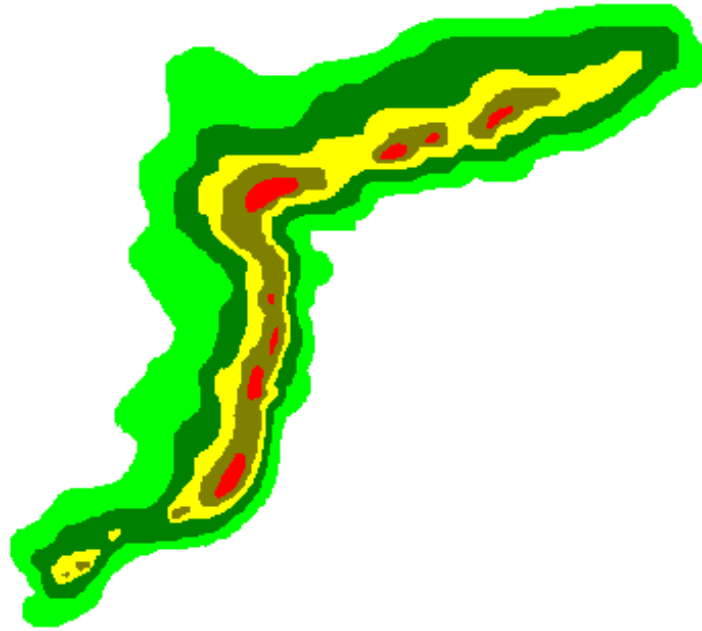


Fig. 4. LEWP (line-echo wave pattern). Typical radar reflectivity contours associated with a LEWP. Note similarity of the lower half of the echo to the bow echo in Fig. 1.

Figure 5 - Low Precipitation Supercell Thunderstorm

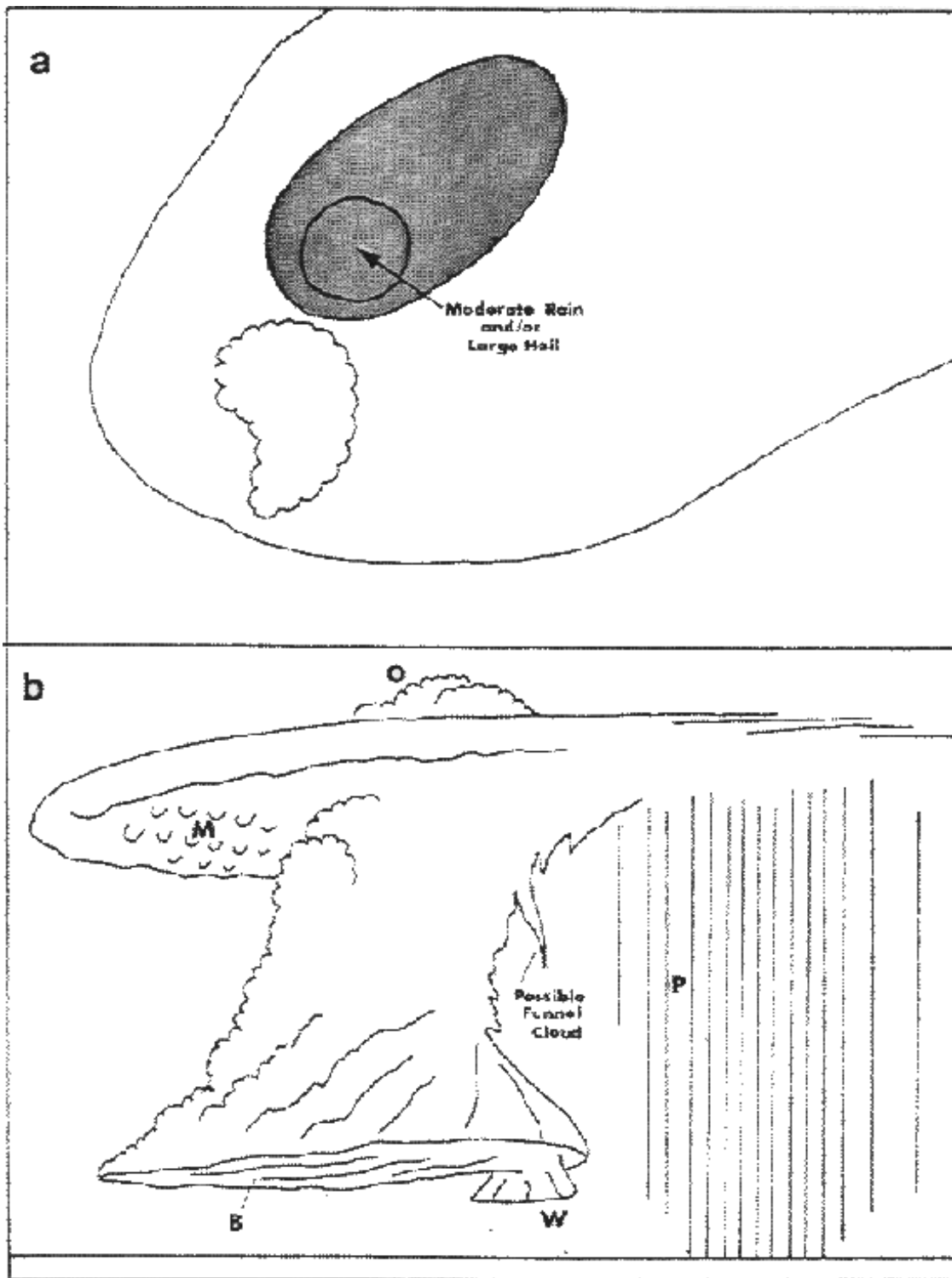


Fig. 5. LP Storm (LP Supercell). Schematic view of an LP storm(a), and visual features of the same storm as might be seen from the east or southeast (b). In (a), the region of radar reflectivity is shaded. Scalloped line encloses region of main updraft (U). (Note the absence of a dominant downdraft.) Features in (b) include overshooting top (O), mammatus (M), rain-free base (B), wall cloud (W), and area of mostly light precipitation (P). Compare with Figs. 3 and 7.

Figure 6 - Sounding

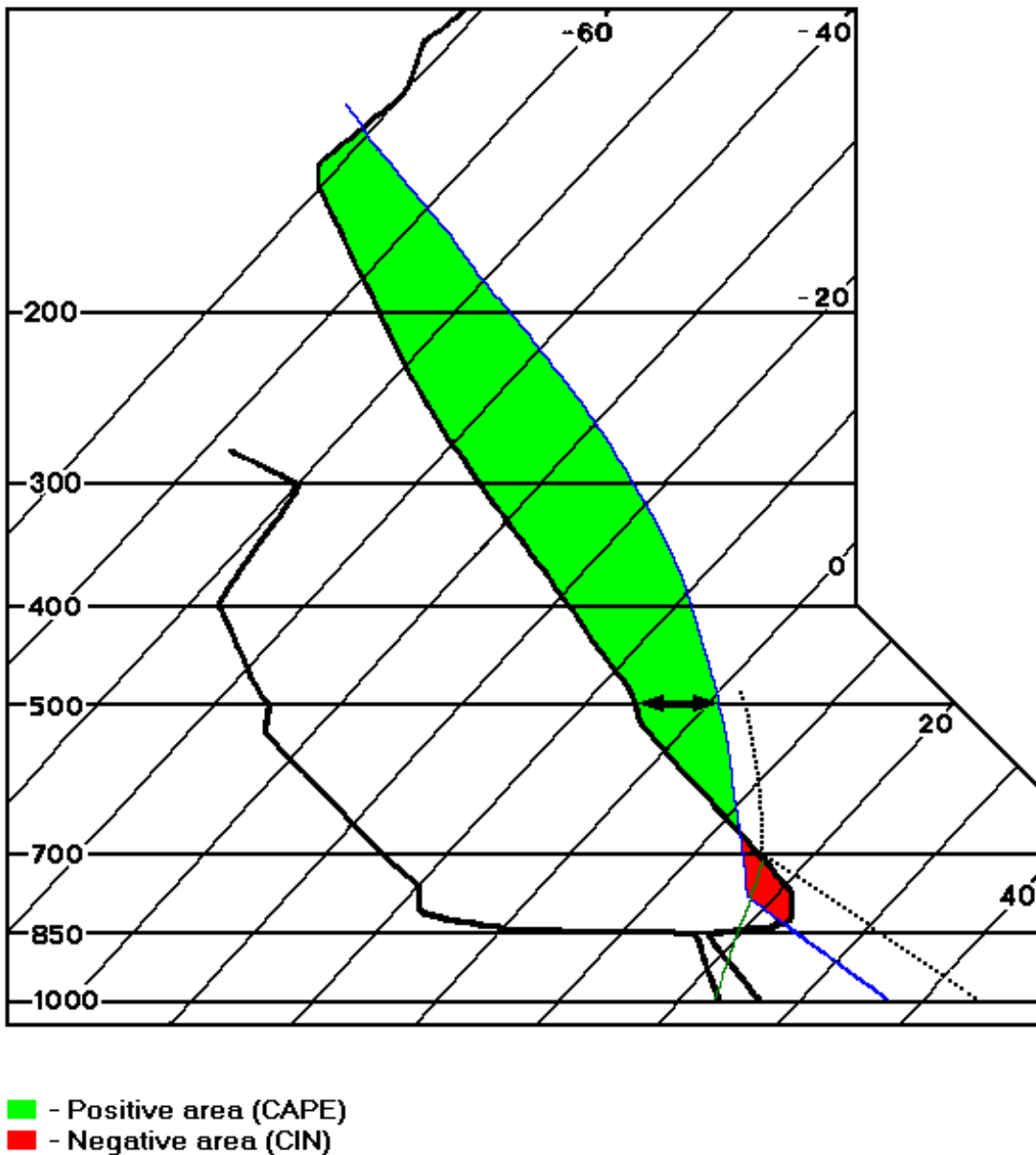


Figure 6 - Sounding. Plotted sounding from Oklahoma City, OK at 7 AM CDT, 8 June 1974. Horizontal lines represent height in pressure coordinates (millibars, or mb); diagonal lines represent temperature. Heavy solid lines show the vertical profile of observed temperature (right) and dew point (left). The blue line shows the temperature that a parcel of surface air would have if it were heated to about 38 degrees C (100 F, the forecast high that day), and then lifted.

This is a typical **loaded gun sounding**. A temperature **inversion** exists near 850 mb; the **cap** is represented by the warm layer above it, wherein the parcel would be cooler than the surrounding air (red area). Above the cap, the parcel would be warmer than the surrounding air and thus would accelerate upward (i.e., **instability**). At these levels, (above about 690 mb), **positive area** is seen as the green area. This area is related directly to the convective available potential energy or **CAPE**. The **Lifted Index** (LI) is shown by the temperature difference at 500 mb; in this case, it would be about minus 6. The **convective temperature** is found using the dotted lines; surface air would have to heat of about 43 C (109 F) to rise above the cap. This value assumes no subsequent changes in the sounding - a bad assumption on this day since a tornado touched down at the location of the sounding later that afternoon, despite surface temperatures in the 90s.

Figure 7 - Classic Supercell Thunderstorm

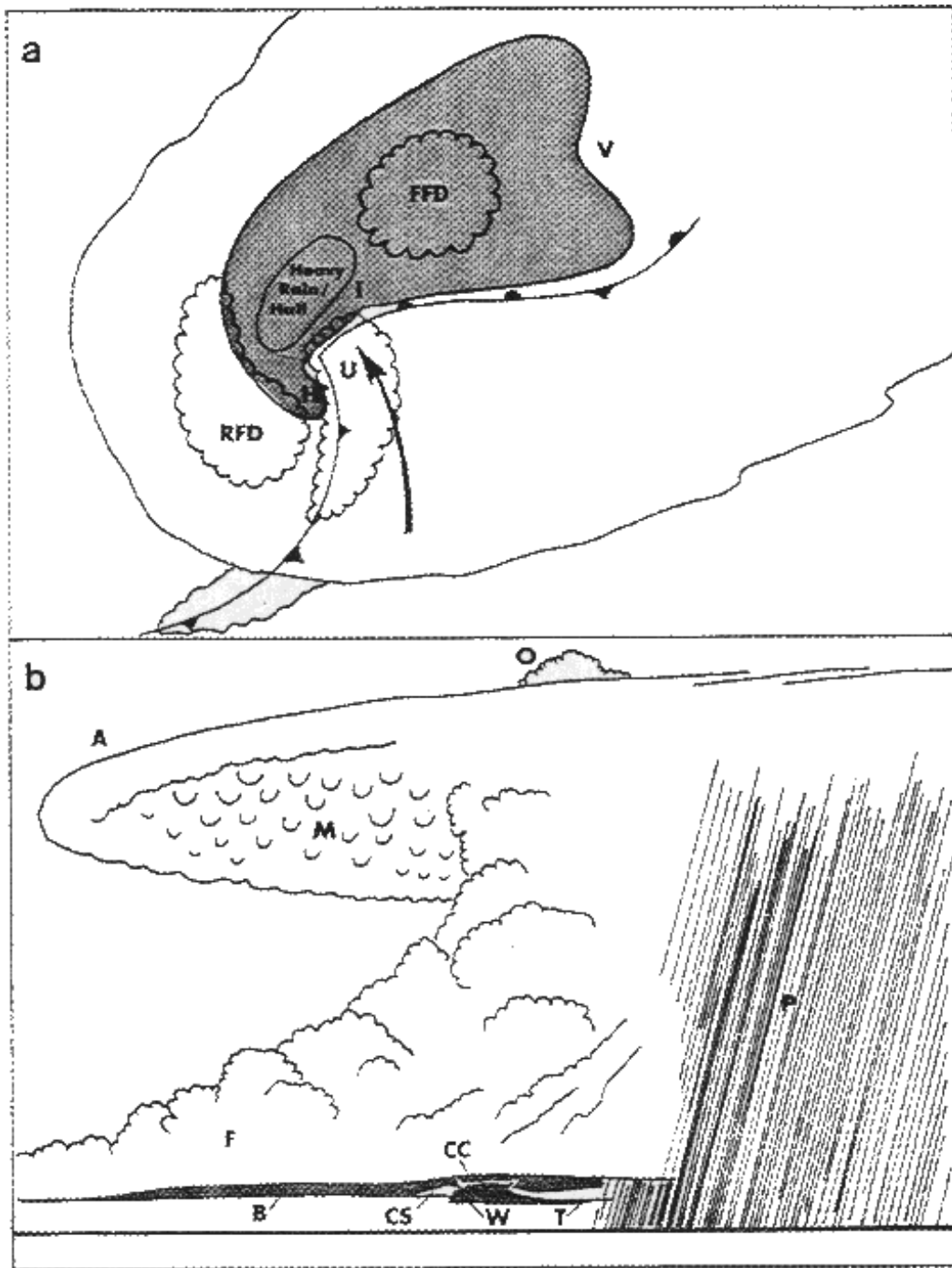


Figure 7.
Supercell. Schematic view of a classic supercell (a), and visual characteristics of the same storm as might be seen from the east or southeast (b). In (a), the region of radar reflectivity is shaded; note V-notch (V), inflow notch (I), and hook echo (H). Scalloped lines enclose region of main updraft (U), forward flank downdraft (FFD) and rear flank downdraft (RFD). Surface inflow is indicated by arrow. Frontal symbols indicate location of gust front. Features in (b) include overshooting top (O), backsheared anvil (A), mammatus (M), flanking line (F), rain-free base (B), clear slot (CS), collar cloud (CC), wall cloud (W), tail cloud (T) and area of heavy precipitation (P). Compare with Figs. 3 and 5.