Glossary

Term	Definition
Above Radar Level (ARL)	The altitude measured with respect to the radar.
Advanced Weather Interactive Processing System (AWIPS)	A processing, display, and telecommunications system that is the cornerstone of the United States National Weather Service's (NWS) operations.
Anafront	A front at which the warm air is ascending the frontal surface up to high altitudes. With anafronts, precipitation may occur to the rear of the front and is sometimes associated with cyclogenesis. *Compare* katafront. American Meteorological Society cited 2013: “term.” Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/anafront]
Anvil Cloud	The flat, spreading top of a cumulonimbus cloud, often shaped like an anvil block tool. Thunderstorm anvils may spread hundreds of miles downwind from the thunderstorm itself, and sometimes may spread upwind.
Atmospheric Boundary Layer	The bottom layer of the troposphere that is in contact with the surface of the earth. It is often turbulent and is capped by a statically stable layer of air or temperature inversion. The ABL depth (i.e., the inversion height) is variable in time and space, ranging from tens of meters in strongly statically stable situations, to several kilometers in convective conditions over deserts. During fair weather over land, the ABL has a marked diurnal cycle. During daytime, a mixed layer of vigorous turbulence grows in depth, capped by a statically stable entrainment zone of intermittent turbulence. Near sunset, turbulence decays, leaving a residual layer in place of the mixed layer. During nighttime, the bottom of the residual layer is transformed into a statically stable boundary layer by contact with the radiatively cooled surface. Cumulus and stratocumulus clouds can form within the top portion of a humid ABL, while fog can form at the bottom of a stable boundary layer. The bottom 10% of the ABL is called the planetary boundary layer. American Meteorological Society, cited 2013: Atmospheric Boundary Layer. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Atmospheric_boundary_layer]
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. National Weather Service Glossary, cited 2013.
Baroclinic Zone	A region in which a temperature gradient exists on a constant

	pressure surface. Baroclinic zones are favored regions for the development of extratropical cyclones. Also, wind shear is characteristic of a baroclinic zone.
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 (forward-flank downdraft gust front). As with any inflow band, cloud elements move toward the updraft. Its size and shape change as the strength of the inflow changes. National Weather Service Glossary, cited 2013.
Book-end Vortices	Mesoscale vortices observed at the ends of a line segment of convective cells, usually cyclonic on the northern end of the system and anticyclonic on the southern end, for an environment of westerly vertical wind shear (in the Northern Hemisphere).The vortices are generally strongest between 2 and 4 km above ground level, but may extend from near the surface to about 8 km above ground level. They have been observed at scales between 10 and 200 km, and often have lifetimes of several hours. In extreme cases, the larger cyclonic vortices may become balanced with the Coriolis force and last for several days. *See also* bow echo and comma echo. American Meteorological Society, cited 2013: Book-end Vortices. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/http://glossary.ametsoc.org/wiki/Book-end_vortices]
Boundary	A transition zone of temperature and/or moisture and/or wind in the atmosphere. Fronts, drylines, and outflow boundaries are examples.
Bounded Weak Echo Region (BWER)	(*Also called* vault). A radar signature within a convective storm characterized by a conically-shaped, nearly vertical channel of low reflectivity echo, surrounded on the sides and capped by significantly higher reflectivity echo. The BWER is associated with the core of an intense convective updraft that carries newly formed hydrometeors to high levels before they can grow into precipitation sized particles. It's capped by large concentrations of supercooled liquid water and rapidly growing (typically ≥2-inch diameter) hail. It's typically found imbedded in the slopping echo overhang and aloft above the apex of the low-level inflow notch. A persistent BWER indicates the parent convective storm is likely a supercell, but the BWER itself is not associated with updraft rotation. The BWER is typically found 3-10 km (10-33 kft.) AGL and is a few kilometers (1-4 nm) in horizontal diameter. However, on rare occasions, BWERs have been observed up to 5-6 nm wide and extending to storm summit. Because of its size, BWERs are rarely

	detected beyond about 80 mb due to radar beamwidth resolution limitations.
Bow Echo	A radar reflectivity echo which is linear, but bent outward into the shape of an archer's bow. The strongest straight-line winds often occur near the "crest" or apex of the bow. Key structural features include an intense rear-inflow jet impinging on the core of the bow, with book-end vortices on both sides of the rear-inflow jet, behind the ends of the bowed convective segment. Bow echoes have been observed with scales between 20 and 200 km, and often have lifetimes between 3 and 6 h. At early stages in their evolution, both cyclonic and anticyclonic book-end vortices tend to be of similar strength, but later in the evolution, the northern cyclonic vortex often dominates (in the Northern Hemisphere), giving the convective system a comma-shaped appearance (see comma echo). Tornadoes sometimes occur, especially with the cyclonic vortex.
Buoyancy	The tendency of a body to float or to rise when submerged in a fluid; the power of a fluid to exert an upward force on a body placed in it. National Weather Service Glossary, cited 2013.
Burn Scar	The mark left on a landscape by fire.
C Band Radar	A radar which operates in the 4-8 GHz frequency and 3.75-7.5 cm wavelength ranges. Because of these characteristics, the antenna size does not need to be as large as an S Band radar to achieve a smaller beam width. This makes C band radars more affordable. The signal is more easily attenuated, so this type of radar is best used for short range weather observation. The Terminal Doppler Weather Radar (TDWR) is a C band radar. *See also* S band radar, X band radar.
Cap	(*Also called* capping layer, capping inversion, or lid.). A region of negative buoyancy below an existing level of free convection (LFC) where energy must be supplied to the parcel to maintain its ascent.This tends to inhibit the development of convection until some physical mechanism can lift a parcel to its LFC. The intensity of the cap is measured by its convective inhibition. The term capping inversion is sometimes used, but an inversion is not necessary for the conditions producing convective inhibition to exist. American Meteorological Society, cited 2013: Cap. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Cap]
Cell	(*Also called* convective cell.) In radar usage, a deep, moist, convectively-induced local maximum in precipitation density that undergoes a life cycle of growth and decay. The rising portion of the reflectivity maximum is indicative of

	updraft, and the later descending portion is indicative of a precipitation downdraft. Cells in ordinary convective storms last from 20 to 30 min, but often form longer-lasting multicell convective storms. Cells in supercell storms are more steady and last considerably longer. *See also* thunderstorm cell.
Cloud Seeding	The addition of agents (aerosol, small ice particles) that will alter the phase and size distribution of cloud particles, with the intent of influencing precipitation. American Meteorological Society, cited 2013: Cloud Seeding. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Cloud_seeding]
Cold Pool	A region of relatively cold air surrounded by warmer air. It is 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.
Cold Rain Process	In cloud physics, precipitation generation which is dominated by deposition and the Bergeron Process. *Compare* warm rain process.
Comma Echo	A radar signature characterized by a convective storm which has evolved into a comma-like shape. It often appears during latter stages in the life cycle of a bow echo due to Coriolis forcing. *See also* book-end vortices.
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 in the atmosphere, 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. Cumulonimbus, 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. The term 'deep, moist convection' is more accurate to describe precipitating convection most often accompanying thunderstorms.
County Warning Area (CWA)	The group of counties for which a National Weather Service (NWS) Weather Forecast Office (WFO) is responsible for issuing warnings.
Critical Success Index (CSI)	(*Also called* threat score (TS)). A verification measure of categorical forecast performance equal to the total number of correct event forecasts (hits) divided by the total number of storm forecasts plus the number of misses (hits + false alarms +

	misses). The CSI is not affected by the number of non-event forecasts that verify (correct rejections). However, the CSI is a biased score that is dependent upon the frequency of the event. National Weather Service, Space Weather Prediction Center: Forecast Verification Glossary, cited 2013.
Crosswise Vorticity	The component of the vorticity vector that is perpendicular to the flow velocity vector. Compare streamwise vorticity. American Meteorological Society, cited 2013: Crosswise Vorticity. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Crosswise_vorticity]
Debris Ball	A dual-polarization tornado debris signature (DPTDS) which contains an isolated reflectivity maximum greater than 51-55 dBZ, co-located with both a tornado vortex signature (TVS) or tornado signature (TS), or other, and low (<0.72) correlation coefficients. As with the broader class of DPTDSs, debris ball identification becomes increasingly difficult with range and detection is generally limited to 80 nm. *See also* dual-polarization debris signature (DPTDS), tornado debris signature (TDS).
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. National Weather Service Glossary, cited 2013.
Deep Convergence Zone (DCZ)	A narrow interface of high shear and turbulence found along the leading edge of both the rear and forward flank gust fronts of a high precipitation (HP) supercell that extends vertically though midlevels of the storm (~10 km/ 33 kft). The DCZ behaves like a “fluid wall” separating the major storm drafts; dry, potentially cold mid-level inflow feeding downdraft on one side and very warm, moist, low-level inflow feeding the updraft on the other side. Air stream mixing is effectively confined to this narrow zone which shields the supercell updraft from destructive mixing effects and allows the undiluted updraft to approach parcel theory values supportive of significant and often giant hail.
Deep Moist Convection (DMC)	A subset of convection in which air parcels rise above their level of free convection (LFC) to release convective instability through a substantial fraction of the depth of the troposphere in the form of a cumulonimbus cloud.
Deep-Layer Vertical Shear	The vertical wind shear through the lowest half of a deep, moist

	convective storm. It is best determined using the effective bulk vertical shear, but often the 0-6 km bulk shear is used for simplicity.
Derecho	A widespread convectively induced straight-line windstorm.Specifically, the term is defined as any family of downburst clusters produced by an extratropical mesoscale convective system. Two sub-categories are commonly identified: Serial and progressive.A serial derecho consists of an extensive squall line which is oriented such that the angle between the mean wind direction and the squall line axis is small. A series of LEWPs and bow echoes move along the line. The downburst activity is associated with the LEWPs and bows. It is associated with a linear type mesoscale convective system that moves along and in advance of a cold front or dry line. These boundaries are often associated with a strong, migratory surface low pressure system and strong short wave trough at 500 mb (strong dynamic forcing). Lifted Indices are typically -6 or lower and the advection of dry air in the mid-troposphere (3-7 km above ground) by relatively strong winds leads to high convective instability and increased downdraft potential. The bow echoes move along the line in the direction of the mean flow, often southwest to northeast. These storms move at speeds exceeding 35 knots. Squall line movement is often less than 30 knots.A progressive derecho is characterized by a short curved squall line oriented nearly perpendicular to the mean wind direction with a bulge in the general direction of the mean flow. Downburst activity occurs along the bulging portion of the line. This type of derecho typically occurs in the warm season (May through August) and is most frequent in a zone extending from eastern South Dakota to the upper Ohio Valley. The severe wind storms typically begin during the afternoon and continue into the evening hours. Several hours typically pass between initial convection and the first wind damage report. *See also* serial derecho, progressive derecho. American Meteorological Society, cited 2013: Derecho. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Derecho] National Weather Service Glossary, cited 2013.
Differential Reflectivity (ZDR)	The ratio of radar reflectivity measured by means of two signals that differ in one attribute, for example, polarization or wavelength. As applied to polarimetric radar observations, the differential reflectivity is the ratio of the reflectivity observed with transmitted and received signals of horizontal polarization to that observed with signals of vertical polarization. It is commonly represented by the symbol ZDR. American Meteorological Society, cited 2013: Differential Reflectivity (ZDR). Glossary of Meteorology. [Available online at

	http://glossary.ametsoc.org/wiki/Zdr]
Downburst	An area of strong, often damaging winds produced by one or more convective downdrafts over an area from less than 1 to 400 km in horizontal dimensions. *See also* macroburst, microburst. American Meteorological Society, cited 2013: Downburst. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Downburst] Buoyancy induced downbursts typically have spatial dimensions in the meso-B to meso-gamma scales. *See also* downdraft.
Downdraft	Small-scale downward moving air current, most often forced by negative buoyancy processes, in a cumulonimbus cloud. *Compare* updraft.
Downshear	In the same direction as the shear vector within a specified layer. *Compare* upshear.
Downwind	In the same direction as the wind flow, or toward the direction in which the wind is moving. *Compare* upwind. National Weather Service Glossary, cited 2013.
Dual-Polarization Radar	A radar capable of transmitting and receiving two orthogonal polarizations. The transmitted polarization must be switchable at a rate that is fast compared with the timescale of changes in the scattering properties of the target and the propagation medium. American Meteorological Society, cited 2013: Dual-Polarization Radar. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Dual-polarization_radar]
Dust Devil	A well-developed dust whirl; a small but vigorous whirlwind, usually of short duration, rendered visible by dust, sand, and debris picked up from the ground. Dust devils occasionally are strong enough to cause minor damage (up to F1 on the Fujita scale). Diameters range from about 3 m to greater than 30 m; their average height is about 200 m, but a few have been observed as high as 1 km or more. They have been observed to rotate anticyclonically as well as cyclonically. Although the vertical velocity is predominantly upward, the flow along the axis of large dust devils may be downward. Large dust devils may also contain secondary vortices.

	Dust devils are best developed on a hot, calm afternoon with clear skies, in a dry region when intense surface heating causes a very steep lapse rate of temperature in the lowest 100 m of the atmosphere.: American Meteorological Society, cited 2013: Dust Devil. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Dust_devil]
Dust Plume	A non-rotating "cloud" of dust raised by straight-line winds. Often seen in a microburst or behind a gust front. National Weather Service Glossary, cited 2013.
Dust Whirl	(Also called dancing dervish, dancing devil, devil, satan, shaitan; and, over desert areas, desert devil, sand auger, sand devil.) A rapidly rotating column of air (whirlwind) over a dry and dusty or shady area, carrying dust, leaves, and other light material picked up from the ground.When well developed it is known as a dust devil. Dust whirls typically form as the result of strong convection during sunny, hot, calm summer afternoons. This type is generally several meters in diameter at the base, narrowing for a short distance upward and then expanding again, like two cones apex to apex. Their height varies; normally it is only 30–100 m, but in hot desert country it may be as high as 1 km. Rotation may be either clockwise or counterclockwise. Dust whirls move erratically, from one patch of heated air to another, and generally slowly. In desert country it is not unusual for three or more desert devils to be visible at the same time. Another type of vigorous dust whirl occurs under the bases of cumulonimbus or cumulus clouds, almost always on or near a wind-shift line. These vortices often inflict little or no damage and are short- lived, but occasionally represent the first visible sign of a developing tornado. Another form of dust whirl, often seen at street corners, is merely an eddy caused by the meeting of winds blowing along two intersecting streets. Such whirls are small and very short-lived. American Meteorological Society, cited 2013: Dust Whirl. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Dust-whirl]
Echo	In radar, a general term for the appearance, on a radar display, of the radio signal scattered or reflected from a target. The characteristics of a radar echo are determined by 1) the waveform, frequency, and power of the incident wave; 2) the range and velocity of the target with respect to the radar; and 3) the size, shape, and composition of the target. American Meteorological Society, cited 2013: Echo. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Echo]
Echo Overhang	(*Also called* overhang). In the radar reflectivity echo associated with a convective storm, that portion of the echo that is located

	above the weak-echo region on the low-level inflow side of the storm. The overhang consists of precipitation particles diverging from the storm's summit that descend as they are carried downwind. If the storm echo develops a bounded weak-echo region, it is found within the echo overhang. *See also* bounded weak echo region (BWER). American Meteorological Society, cited 2013: Overhang. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Overhang]
Echo Top	The height above ground of the center of the radar beam using the tilt, or scan, that contains the highest elevation where reflectivities greater than 18 dBZ can be detected. National Weather Service Glossary, cited 2013.
Elevated Convection	Convection whose ascending air parcels are rooted within an atmospheric layer above the boundary layer. Elevated convection often occurs when air near the ground is relatively cool and stable (e.g., during periods of isentropic lift), but an unstable layer of air is present aloft. In these cases, stability indices based on near-surface measurements (such as the lifted index) will underestimate the amount of instability present. Severe weather (particularly hail) is possible from elevated convection, but is less likely than it is from surface-based convection.
Enhanced Fujita (EF) Scale	(Formerly called Fujita (F) Scale). A scale of wind damage intensity in which wind speeds are inferred from an analysis of wind damage. It uses three-second gusts estimated at the point of damage based on a judgment of eight (8) levels of damage to the twenty eight (28) damage indicators (DIs). 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.EF0 (weak): 65- 85 mph, GaleEF1 (weak): 85-110 mph, WeakEF2 (strong): 111-135 mph, StrongEF3 (strong): 136-165 mph, SevereEF4 (violent): 166-200 mph, DevastatingEF5 (violent): >200 mph, Incredible
Enhanced "V"	A signature on infrared satellite imagery that depicts a warm, wedge-shaped region stretching from the upshear edge of a thunderstorm anvil, downshear along its long axis. This so-called warm wake is surrounded by long, narrow regions of colder pixels along either side, forming an apparent V shape. The warmer pixels may form from 1) Stratospheric cirrus "blow-off" from overshooting tops, meaning that they are higher than the mean anvil height, even though they are warmer. 2) Mixing of saturated updraft air with warmer air at higher altitudes resulting in a narrow, cloudy, warmer interface. The signature typically forms

	on convective storms possessing extremely strong updrafts. Enhanced V should not be confused with V notch, which is a radar signature.
Enhanced Wording	1. An option used by the Storm Prediction Center (SPC) in tornado and severe thunderstorm watches when the potential for strong/violent tornadoes, or unusually widespread damaging straight-line winds, is high. The text that accompanies a watch of this type will include the line "THIS IS A PARTICULARLY DANGEROUS SITUATION." 2. Strong wording used in National Weather Service (NWS) Weather Forecast Office (WFO) products (such as in warnings and statements) to convey the urgency of the action needed from impending weather threat. An example is "This is a Tornado Emergency." Enhanced wording should only be used in extremely rare, life-threatening situations. National Weather Service Glossary, cited 2013.
Entrainment	In meteorology, the mixing of environmental air into a preexisting organized air current so that the environmental air becomes part of the current; the opposite of detrainment. Entrainment of air into clouds, especially cumulus, is said to be inhomogeneous when the timescale for mixing of environmental air is very much greater than the timescale for drop evaporation. Under these conditions, which are often found when environmental air is first entrained into cumulus, regions of cloud and entrained air are intertwined, with evaporation occurring only on the edges of the interface between the cloudy and entrained environmental air. See also entrainment zone. American Meteorological Society, cited 2013: Entrainment. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Entrainment]
Entrainment Zone	A shallow region at the top of a mixed layer where fluid is entrained into the growing atmospheric boundary layer from the overlying fluid by the collapse of rising convective plumes or bubbles. *See also* entrainment. National Weather Service Glossary, cited 2013.
Equilbrium Level (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. Thus, according to parcel theory, the height of the EL is the height at which thunderstorm updrafts no longer accelerate upward. The EL is often considered the layer at which thunderstorm anvil tops are found.

False Alarm Ratio (FAR)	A verification measure of categorical forecast performance equal to the number of false alarms (e.g., a NWS warning which does not verify) divided by the total number of event forecasts. National Weather Service, Space Weather Prediction Center: Forecast Verification Glossary, cited 2013.
Family of Tornadoes	(*Also called* tornado family). A sequence of long-lived tornadoes produced by a "cyclic" supercell thunderstorm. Tornadoes touch down at quasi-regular intervals (typically 45 min). Usually a new tornado develops in a new mesocyclone just after an old tornado has decayed in an old, occluded neighboring mesocyclone. Sometimes, two successive tornadoes may overlap in time for a while. The two mesocyclones may rotate partially around each other. If the damage tracks of the tornadoes appear to form a wavy broken line, the family is classified as a series mode. In the more common parallel-mode family, the damage tracks are parallel arcs with each new tornado forming on the right side of its predecessor. The parallel mode is subcategorized into left turn and right turn, according to the direction in which the paths curve. American Meteorological Society, cited 2013: Family of Tornadoes. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Family_of_tornadoes]
Flanking Line	An organized lifting zone of cumulus and towering cumulus clouds, connected to and extending outward from the mature updraft tower of a supercell or strong multicell convective storm. The flanking line often has a stair-step appearance, with the tallest clouds adjacent to the mature updraft tower. American Meteorological Society, cited 2013: Flanking Line. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Flanking_line]
Flash Flood	A rapid and extreme flow of high water into a normally dry area, or a rapid water level rise in a stream or creek above a predetermined flood level, beginning within six hours of the causative event (e.g., intense rainfall, dam failure, ice jam). However, the actual time threshold may vary in different parts of the country. Ongoing flooding can intensify to flash flooding in cases where intense rainfall results in a rapid surge of rising flood waters. National Weather Service Glossary, cited 2013.
Flash Flood Guidance (FFG)	Forecast guidance produced by the National Weather Service (NWS) River Forecast Centers (RFCs), often model output, specific to the potential for flash flooding (e.g., how much rainfall over a given area will be required to produce flash flooding).

	National Weather Service Glossary, cited 2013.
Flash Flood Statement (FFS)	In hydrologic terms, a statement by a National Weather Service (NWS) Weather Forecast Office (WFO) which provides follow-up information on flash flood watches and warnings. National Weather Service Glossary, cited 2013.
Flash Flood Warning	A National Weather Service (NWS) Weather Forecast Office (WFO) product issued to inform the public, emergency management, and other cooperating agencies that flash flooding is in progress, imminent, or highly likely. National Weather Service Glossary, cited 2013.
Flash Flood Watch	A National Weather Service (NWS) Weather Forecast Office (WFO) product issued to indicate current or developing hydrologic conditions that are favorable for flash flooding in and close to the watch area, but the occurrence is neither certain or imminent. National Weather Service Glossary, cited 2013.
Forcing	Energy exerted upon the air which causes a change in its vertical motion.
Forward Flank Downdraft (FFD)	The main region of downdraft in the forward, or leading, part of a supercell, where most of the heavy precipitation is. *See also* rear flank downdraft (RFD). National Weather Service Glossary, cited 2013.
Frontogenesis	1. The initial formation of a front or frontal zone. 2. In general, an increase in the horizontal gradient of an airmass property, principally density, and the development of the accompanying features of the wind field that typify a front.. *Compare* frontolysis. American Meteorological Society, cited 2013: Frontogenesis. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Frontogenesis]
Frontolysis	1. The dissipation of a front or frontal zone. 2. In general, a decrease in the horizontal gradient of an air mass property, principally density, and the dissipation of the accompanying features of the wind field. *Compare* frontogenesis. American Meteorological Society, cited 2013: Frontolysis. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Frontolysis]
Funnel Cloud	A condensation cloud, typically funnel-shaped and extending outward from a cumuliform cloud, associated with a rotating

	column of air (a vortex) that may or may not be in contact with the surface. If the rotation is violent and in contact with the surface, the vortex is a tornado. Funnel clouds can occur through a variety of processes in association with convection. For example, small funnel clouds are infrequently seen extending from small, dissipating cumulus clouds in environments with significant vertical wind shear in the cloud-bearing layer. American Meteorological Society, cited 2013: Funnel Cloud. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Funnel_cloud]
Graupel	Heavily rimed snow particles, often called snow pellets; often indistinguishable from very small soft hail except for the size convention that hail must have a diameter greater than 5 mm. Sometimes distinguished by shape into conical, hexagonal, and lump (irregular) graupel. American Meteorological Society, cited 2013: Graupel. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Graupel]
Gust Front	The leading edge of a mesoscale pressure dome separating the outflow air in a convective storm from the environmental air.This boundary, which is marked by upward motion along it and downward motion behind it, is followed by a surge of gusty winds on or near the ground. A gust front is often associated with a pressure jump, wind shift, temperature drop, and sometimes with heavy precipitation. Gust fronts are often marked by arcus clouds. American Meteorological Society, cited 2013: Gust Front. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Gust_front]
Gustnado	A short-lived, shallow, generally weak, vertically oriented vortex found along a gust front. Gustnadoes are usually visualized by a rotating dust or debris cloud. 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.
Hagen-Poiseuille Law	(*Also called* the Hagen-Poiseuille Equation, Poiseuille Law, or Poiseuille equation). A statement in physics was states that the volume of water through the pore length is proportional to the pore space.
Hail	Precipitation in the form of balls or irregular lumps of ice more than 5mm in diameter, always produced by convective clouds, nearly always cumulonimbus.
Hail Growth Zone	The region of supercooled water within a deep, moist, convective storm where hailstone growth is maximized, approximately the -10°C to -30°C layer. The growth rate is maximized near -13°C and rapidly diminishes at temperatures approaching -30°C as

	supercooled water droplets become rare at these colder temperatures.
Heidke Skill Score (HSS)	A skill corrected verification measure of categorical forecast performance. The HSS is equal to the total number of correct forecasts minus the correct random forecasts (hits + correct rejections - correct random forecasts) divided by the total number of forecasts minus the correct forecasts due to chance (hits + false alarms + misses + correct rejections - correct random forecasts). This skill score falls within a (-1, +1) range. No incorrect forecasts give a score of +1, no correct forecasts give a score of -1, and either no events forecast or no events observed give a score of 0. National Weather Service, Space Weather Prediction Center: Forecast Verification Glossary, cited 2013.
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 m2/s2 or more) favor the development of mid-level rotation (i.e. mesocyclones). National Weather Service Glossary, cited 2013.
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.). National Weather Service, WFO Norman: A Comprehensive Glossary of Weather Terms for Storm Spotters, cited 2013.
Hook Echo	A radar signature characterized by a curve-shaped band of reflectivity echo caused when precipitation is drawn into the spiral of a mesocyclone. The hook is a fairly shallow feature, typically 3-4 km in height, extending downward as a precipitation streamer from the echo overhang aloft. When high resolution radar imagery is available, the hook is seen to spiral inward forming a sharply defined figure “6.” A tornado, if present, is within the figure “6” or at the tip of the hook echo itself.
Hydrometeor	Any product of condensation or deposition of atmospheric water vapor, whether formed in the free atmosphere or at the earth's surface; also, any water particle blown by the wind from the

	earth's surface. American Meteorological Society, cited 2013: Hydrometeor. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Hydrometeor]
Index	In meteorology forecasting, a number derived from a formula, used to characterize a set of data. Examples include Lifted Index (LI) and Energy Helicity Index (EHI).
Infiltration	In hydrologic terms, movement of water through the soil surface into the soil. National Weather Service Glossary, cited 2013.
Infiltration Capacity	In hydrologic terms, the maximum rate at which water can enter the soil at a particular point under a given set of conditions. National Weather Service Glossary, cited 2013.
Infiltration Index	In hydrologic terms, an average rate of infiltration, in inches per hour, equal to the average rate of rainfall such as that the volume of rainfall at greater rates equals the total direct runoff. National Weather Service Glossary, cited 2013.
Infiltration Rate	The ability of water to move into the soil from the surface.
Inflow Bands	(*Also called* feeder bands.) Low clouds, arranged in parallel rows 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. National Weather Service Glossary, cited 2013.
Inflow Jet	Local jets of air near the surface flowing inward toward the base of a tornado. National Weather Service Glossary, cited 2013.
Inflow Notch	A radar signature characterized by an enhanced, low-level, concave reflectivity gradient open to the inflow side of a convective storm. This signature indicates the presence of a very strong updraft with associated enhanced low-level inflow. *See also* rear inflow notch.
Intercell Seeding	A method of feeding hydrometeors to the main updraft(s) of a deep, moist, convective storm by flanking lines or recycling. It improves precipitation efficiency because cells share hydrometeors while the environmental humidity increases. Multicell storms whose updrafts recycle hydrometeors are more efficient than more discrete cells.
Internal Dynamics (ID) Method	(*Also called* Bunker's Method, Bunker's Motion). A method for estimating supercell motion which uses the mechanisms by which updraft and shear interact. It can be used to calculate storm

	motion for both the cyclonically and anticyclonically rotating supercells resulting from a storm split. Supercell motion is approximately 7.5 m/s right and left of the deep-layer shear vector along a line that passes through the point describing the mean convective steering layer flow.
Katafront	A front (usually a cold front) at which the warm air descends the frontal surface (except, presumably, in the lowest layers). *Compare* anafront. American Meteorological Society, cited 2013: Katafront. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Katafront]
KDP Column	A dual-polarimetric radar signature of specific differential phase (KDP) values > 2-3°/km caused by high concentrations of liquid water in a convective cell.*See also* ZDR column, KPD column.
Kinematics	The branch of dynamics that describes the properties of pure motion without regard to force, momentum, or energy. Translation, advection, vorticity, and deformation are examples of kinematic variables. American Meteorological Society, cited 2013: Kinematics. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Kinematics]
Lag	1) The measure of the time between the center of mass of precipitation to the center of mass of runoff (on the hydrograph); basin lag is a function of not only basin characteristics, but also of storm intensity and movement. Some hydrologic texts define lag from the center of mass of rainfall to the hydrograph peak. 2) The time it takes a flood wave to move downstream. National Weather Service Glossary, cited 2013.
Landspout	A non-mesocyclonic tornado occurring with a parent cloud in its growth stage and with its vorticity originating in the boundary layer. 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.
Left Mover	A thunderstorm (often a supercell) which moves to the left relative to the steering winds, and to other nearby thunderstorms. *Compare* right mover. National Weather Service Glossary, cited 2013.
Level of Free Convection (LFC)	The level at which a parcel of air lifted dry-adiabatically until saturated and saturation-adiabatically thereafter would first become warmer than its surroundings in a conditionally unstable atmosphere.

	On a thermodynamic diagram the level of free convection is given by the point of intersection of the process curve, representing the process followed by the ascending parcel, and the sounding curve, representing the lapse rate of temperature in the environment. From the level of free convection to the point where the ascending parcel again becomes colder than its surroundings the atmosphere is characterized by latent instability. Throughout this region the parcel will gain kinetic energy as it rises. American Meteorological Society, cited 2013: Level of Free Convection. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Level_of_free_convection]
Lifting Condensation Level (LCL)	The level at which a parcel of moist air lifted dry-adiabatically would become saturated. On a thermodynamic diagram it is located at the point of intersection of the dry adiabat through the point representing the parcel's original pressure and temperature with the saturation mixing ratio line having the same value of the mixing ratio as the parcel. The pressure and temperature at the lifting condensation level are usually called the condensation pressure and condensation temperature, respectively, and the corresponding point on a thermodynamic diagram is called either the characteristic point, adiabatic saturation point, or adiabatic condensation point. American Meteorological Society, cited 2013: Lifting Condensation Level. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Lifting_condensation_level]
Line Echo Wave Pattern (LEWP)	A weather radar formation in which an area of thunderstorms forms a mesoscale low-pressure area with a rotating "head" (cyclonically-rotating bookend vortex) and, typically, a bow echo to its south (or equatorward). LEWPs are often associated with a multiple-bow serial derecho and often produce tornadoes, some of which can be strong, particularly those associated with the rotating "head." *See also* bow echo, comma echo.
Liquid Water Loading	(*Also called* precipitation loading). The amount of liquid water present within an air parcel as cloud droplets, rain, or ice, usually expressed in percent or fraction by weight (e.g., as a liquid water mixing ratio rL) or volume. The higher the liquid water loading, the greater the average density and colder the virtual temperature of the parcel. American Meteorological Society, cited 2013: Liquid Water Loading. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Liquid_water_loading]
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. National Weather Service Glossary, cited 2013.
Low CC column	A dual-pol radar signature used to identify a deep, moist, convective updraft. It appears as an upward extension of the low (< 0.8) Correlation Coefficient (CC) clear air boundary layer echoes into the updraft. The echo is associated with scattering from flying insects, light vegetative debris, and other non-meteorological scatterers. *See also* ZDR column, KPD column.
Low CC Inflow	A dual-pol radar signature of low (< 0.8) Correlation Coefficient (CC) clear air boundary layer echoes that help demarcate the inflow into a deep, moist, convective updraft. The echo is associated with scattering from flying insects, light vegetative debris, and other non-meteorological scatterers.
Low CC Ring	A dual-polarimetric radar signature of low (< 0.8) Correlation Coefficient (CC) echoes located at the periphery of a persistent updraft in a sheared environment, just above the freezing level, caused by mixed-phase precipitation which forms as a result of melting between the environment and the updraft. *See also* ZDR ring.
Low-Echo Centroid (LEC) Signature	A radar signature in which the greatest reflectivity of a mature cell is below the freezing (0°C) level.
Low-Level	The lower portion of the troposphere. No distinct limit is set, but the term can generally be applied to the levels 850 mb and below. *Compare* midlevel. *See also* upper air.
Low-Level Jet (LLJ)	Relatively strong winds concentrated within a narrow band found in the lowest 2–3 km of the troposphere. At night, sometimes called a nocturnal jet. In the United States, 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).
Low-Level Rotational Velocity (LLDV)	The velocity difference (DV) measured in the lowest radar elevation slice calculated by adding the absolute magnitudes of the lowest and highest radial velocities found within a storm-scale vortex signature (typically a mesocyclone, tornado vortex signature, or tornado signature).
Macroburst	A downburst that covers an area greater than 4 km (2.5 nm) along a side and peak winds lasting between 5 and 20 minutes. Extreme macrobursts may cause wind damage up to EF-3 intensity. *See also* microburst.
Macroscale	Meteorological expression referring to synoptic events occurring on a scale of thousands of kilometers, such as warm and cold

	fronts.*Compare* mesoscale, microscale. American Meteorological Society, cited 2013: Macroscale. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Macroscale]
Manning Equation	An empirical equation that applies to uniform flow in open channels and is a function of the channel velocity, flow area, and channel slope. Corvallis Forestry Research Community: Hydraulic Reference (http://www.fsl.orst.edu/geowater/FX3/help/FX3_Help.html#8_Hydraulic_Reference/Manning_s_Equation.htm), cited 2013.
Maximum Delta V (MDV)	The maximum velocity difference (DV) for all Doppler radar elevation slices containing a TS/TVS.
Melting Layer	The altitude interval throughout which ice-phase precipitation melts as it descends. The top of the melting layer is the melting level. The melting layer may be several hundred meters deep, reflecting the time it takes for all the hydrometeors to undergo the transition from solid to liquid phase. The temperature of the melting layer is typically 0°C or slightly warmer. *See* bright band. American Meteorological Society, cited 2013: Melting Layer. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Melting_layer]
Meltwater	The water released by the melting of snow or ice, including hail.
Mesocyclogenesis	Any development or strengthening of a mesocyclone.
Mesocyclone	A storm-scale (around 2–10 km in diameter) vertical vorticity maximum partially or fully embedded within an updraft of deep, moist convection (DMC). The vorticity associated with a mesocyclone is often on the order of 10-2 s-1 or greater. A mesocyclone is the defining characteristic of a supercell. Tornadoes sometimes form in mesocyclones. Persistent mesocyclones that have significant vertical extent are detected by Doppler radar as mesocyclone signatures. A mesocyclone can often be implied visually by the existence of updraft striations and/or curved inflow bands.
Mesocyclone Signature	The Doppler velocity pattern of a mesocyclone. In a storm-relative reference frame, the idealized signature is symmetric about the radar viewing direction with marked azimuthal shear across the core region between peak Doppler velocity values of opposite sign. Typical signatures consist of Doppler velocity differences of 25– 75 m s-1 across core diameters of 2–8 km, with resulting azimuthal shear values of 5 × 10-3 s-1 to 2 × 10-2 s-1.

	American Meteorological Society, cited 2013:Mesocyclone Signature. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Mesocyclone_signature]
Mesocyclonic Tornado	A tornado that is associated with a mesocyclone. Also called a "supercell tornado." *Compare* non-mesocyclonic tornado.
Mesohigh	A mesoscale area of high atmospheric pressure that typically forms beneath a multicell thunderstorm. It is usually associated with a mesoscale convective system (MCS) or its remnants.*Compare* mesolow.
Mesolow	A mesoscale low pressure center. Mesolow should not be confused with mesocyclone, which is a storm-scale phenomenon. *Compare* mesohigh. National Weather Service Glossary, cited 2013.
Mesoscale	Pertaining to atmospheric phenomena having horizontal scales ranging from a few to several hundred kilometers, including thunderstorms, squall lines, fronts, precipitation bands in tropical and extratropical cyclones, and topographically generated weather systems such as mountain waves and sea and land breezes. From a dynamical perspective, this term pertains to processes with timescales ranging from the inverse of the Brunt–Väisälä frequency to a pendulum day, encompassing deep moist convection and the full spectrum of inertio-gravity waves but stopping short of synoptic-scale phenomena, which have Rossby numbers less than 1. *Compare* macroscale, microscale. American Meteorological Society, cited 2013: Mesoscale. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Mesoscale]
Mesoscale Beta Elements (MBE) Technique	A procedure used to forecast the short-term (3-6 hour) motion of Mesoscale Convective System (MCS) centroids which builds on the long-established observation that MCS motion is a function of both the advection of existing cells by the mean wind and the propagation of new cells relative to existing storms. MCS centroid forecast motion is calculated to be the vector sum of the mean cloud-layer wind (typically assumed to be the 850-300 mb layer) and the mesoscale beta element (MBE) propagation component. The MBE propagation vector is dictated by the location of the maximum cold-pool gust front convergence in the presence of

	conditional instability. For an upwind (downwind) propagating MCS, the magnitude and direction is assumed to be equal and opposite (identical) to that of the low-level jet (typically assumed to be the 850 mb wind). Corfidi, Stephen F., 2003: Cold Pools and MCS Propagation: Forecasting the Motion of Downwind-Developing MCSs. Wea. Forecasting, 18, 997–1017.
Mesoscale Convective Complex (MCC)	A subset of mesoscale convective systems (MCS) that exhibits a large, circular (as observed by satellite), long-lived, cold cloud shield with the following physical characteristics: Size: A - Cloud shield with continuously low infrared (IR) temperature ≤ -32°C must have an area ≥ 105 km2; and B - Interior cold cloud region with temperature ≤ -52°C must have an area ≥ 0.5 X 105 km2. Initiate: Size definitions A and B are first satisfied Duration: Size definitions A and B must be met for a period ≥ 6 h. Maximum extent: Contiguous cold cloud shield (IR temperature ≤ -33°C) reaches maximum size. Shape: Eccentricity (minor axis/major axis) ≥ 0.7 at time of maximum extent. Terminate: Size definitions A and B no longer satisfied.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 (usually at night), the primary threat shifts toward heavy rain and flooding.
Mesoscale Convective System (MCS)	A complex of thunderstorms which becomes organized on a scale larger than the individual thunderstorms, produces a contiguous precipitation area on the order of 100 km or more in horizontal scale in at least one direction, and normally persists for several hours or more. An MCS exhibits deep, moist convective overturning contiguous with or embedded within a mesoscale vertical circulation that is at least partially driven by the convective overturning. 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 criteria of a mesoscale convective complex (MCC).
Mesoscale Convective Vortex (MCV)	A quasi-steady, mesoscale, cyclonic circulation that forms in the mid-troposphere within the stratiform region of a mesoscale convective system (MCS) often persisting after its parent MCS has dissipated. With a core of only 50-100 km wide and 1500-4500 m deep, and MCV is often overlooked in standard weather analyses. And MCV can persist for more than 12 hours upon achieving a balance between pressure gradient and Coriolis forces, sometimes becoming the seed of the next thunderstorm outbreak or, upon reaching tropical waters, serving as the nucleus for a tropical cyclone.
Microburst	A downburst that covers an area less than 4 km (2.5 nm) along a side with peak winds that last 2–5 minutes. Differential velocity across the divergence center is greater than

	10 m s-1. The strong wind shears associated with a microburst can result in aircraft accidents. Microburst are commonly sub-classified as wet, dry, or hybrid. A wet microburst is accompanied by heavy precipitation at the surface; an outward distortion of the precipitation near the surface called a rain foot is a common visual sign. A dry microburst produces little or no precipitation which reaches the surface; a dust plume or a ring of blowing dust beneath a local area of virga is a common visual sign. A hybrid microburst contains characteristics of both wet and dry microbursts. *See also* macroburst.
Microphysics	The branch of physics concerned with small objects and systems, such as atoms, molecules, nuclei, and elementary particles. Specifically, in the meteorological field, physics associated with cloud and precipitation processes.
Microscale	Atmospheric motions with Lagrangian Rossby numbers greater than 200 or spatial scales 2 km or less. *Compare* macroscale, mesoscale. American Meteorological Society, cited 2013: Microscale. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Microscale]
Mid-Altitude Radial Convergence (MARC) Velocity Signature	A Doppler radar-velocity signature that serves as a precursor to the initial onset of damaging straight-line winds in a deep, moist, convective cell; Quasi-Linear Convective System (QLCS); or bowing convective system. It may also represent the upper portions of a gust front associated with a deep, convergence zone (DCZ).
Mid-level	The middle portion of the troposphere. No distinct limits are set, but the term can generally be applied to levels between 700 mb to 500 mb.*Compare* low-level. *See* also upper air.
Mie Scattering	Any scattering produced by spherical particles whose diameters are greater than 1/10 the wavelength of the scattered radiation. This type of scattering causes the clouds to appear white in the sky. Often, hail exhibits in this type of scattering. National Weather Service Glossary, cited 2013.
Misocyclone	A horizontal vortex with a width of between 40 m and 4 km. It is often used to refer to 1) a vortex within a convective storm with a horizontal scale of less than 4 km, and 2) a near-surface vortex with a horizontal scale of less than 4 km along a convergence line. *Compare* mesocyclone. American Meteorological Society, cited 2013: Misocyclone.

	Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Misocyclone]
Mixed Layer (ML)	(Also called convective mixed layer, convective boundary layer (CBL), or mixing layer). A type of atmospheric boundary layer characterized by vigorous turbulence tending to stir and uniformly mix, primarily in the vertical, quantities such as potential temperature and momentum or wind speed. Moisture is often not so well mixed, showing a slight decrease with height. The vigorous turbulence can be caused by either strong winds or wind shears that generate mechanical turbulence (called forced convection), or by buoyant turbulence (called free convection) associated with large thermals. The buoyantly generated mixed layers are usually statically unstable, caused by heating at the bottom boundary such as the earth's surface or radiative cooling at the tops of cloud or fog layers within the mixed layer. American Meteorological Society, cited 2013: Mixed Layer. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Mixed_layer]
Multi-Radar/Multi-Sensor (MRMS)	MRMS is a system with automated algorithms that quickly and intelligently integrate data streams from multiple radars, surface and upper air observations, lightning detection systems, and satellite and forecast models. Numerous two-dimensional multiple-sensor products offer assistance for hail, wind, tornado, quantitative precipitation estimation forecasts, convection, icing, and turbulence diagnosis. National Severe Storms Laboratory, cited 2018: Multi-Radar/Multi-Sensor System (MRMS) [https://www.nssl.noaa.gov/projects/mrms/]
Multicell Convective Storm	(*Also called* multicell, multicell thunderstorm). A cluster of ordinary cells and/or supercells at various stages of their life cycle in close enough proximity to at least share a common precipitation area and cold pool (gust front). New cells are generated primarily by either low-level convergence along a preexisting boundary or by lifting at the leading edge of the system-scale cold pool that was produced by the previous cells. The cells move roughly with the mean wind. However, the storm motion usually deviates significantly from the mean wind due to discrete propagation (new cell development) along the gust front. The multicellular nature of the storm is usually apparent on radar with multiple reflectivity cores and maximum tops. Lifetime may be several hours.
Multiple Vortex Tornado	A tornado in which two or more vortices are present at the same time, often rotating about a common center or about each other. Multiple-vortex tornadoes can be especially damaging.
National Hurricane Center	One of three branches of the Tropical Prediction Center (TPC).

(NHC)	This center maintains a continuous watch on tropical cyclones over the Atlantic, Caribbean, Gulf, and the Eastern Pacific. The Center prepares and distributes hurricane watches and warnings for the general public, and also prepares and distributes marine and military advisories for other users. During the "off-season" NHC provides training for U.S. emergency managers and representatives from many other countries that are affected by tropical cyclones. NHC also conducts applied research to evaluate and improve hurricane forecasting techniques, and is involved in public awareness programs. National Weather Service Glossary, cited 2013.
National Severe Storms Laboratory (NSSL)	A federal research facility under the National Oceanic and Atmospheric Administration's (NOAA's) Office of Oceanic and Atmospheric Research (OAR) at the National Weather Center (NWC) in Norman, Oklahoma which serves the nation by working to improve the lead time and accuracy of severe weather warnings and forecasts in order to save lives and reduce property damage. NSSL's basic and applied research focuses on understanding severe weather processes, developing weather observation technology, and improving forecast tools, with emphasis on: Weather radar, tornadoes, flash floods, lightning, damaging winds, hail, and winter weather.
NEXRAD	NEXt Generation RADar. A National Weather Service (NWS) network of about 159 S-band WSR-88D Doppler radars operating nationwide.
Non-Mesocyclonic Tornado	(*Also called* non-supercell tornado). A tornado which is not associated with a mesocyclone. *Compare* mesocyclonic tornado. *See also* landspout, waterspout.
Ordinary Cell	The most basic component of a convective storm, consisting of a single main updraft that is usually quickly replaced by a downdraft once precipitation begins. Ordinary cells are especially observed in environments with weak vertical wind shear, and typically have lifetimes of 30-50 minutes. Ordinary cells are the primary component of multicell storms. *See also* convective cell, multicell convective storm, thunderstorm. American Meteorological Society, cited 2013: Ordinary Cell. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Ordinary_Cell]
Outflow Boundary	A mesoscale surface boundary separating thunderstorm-cooled air (outflow) from the surrounding air. Outflow boundaries may be short-lived, or persist for longer than a day 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.).
Overshooting Top	(*Also called* anvil dome, penetrating top.) A domelike protrusion above a cumulonimbus anvil, representing the intrusion of an updraft through its equilibrium level (level of neutral buoyancy). It is usually a transient feature because the rising parcel's momentum acquired during its buoyant ascent carries it past the point where it is in equilibrium (i.e., anvil level); the air within it rapidly becomes negatively buoyant and descends. Tall and persistent overshooting tops are frequently observed with strong or severe thunderstorms in which there is a nearly continuous stream of buoyant updrafts. American Meteorological Society, cited 2013: Overshooting Top. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Overshooting_top]
Parameter	In general, any quantity of a problem that is not an independent variable. More specifically, the term is often used to distinguish, from dependent variables, quantities that may be more or less arbitrarily assigned values for purposes of the problem at hand. Examples include the Vorticity Generation Parameter (VGP), Significant Hail Parameter (SHIP), and Significant Tornado Parameter (STP). American Meteorological Society, cited 2013: Parameter. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Parameter]
Parcel	An imaginary volume of air to which may be assigned various thermodynamic and kinematic quantities.The size of a parcel is arbitrary but is generally much smaller than the characteristic scale of variability of its environment. American Meteorological Society, cited 2013: Parcel. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Parcel]
Partial Beam Filling	A limitation of the rainfall estimation techniques used by weather radar. At far ranges from the radar, a storm may occupy only a portion of the radar beam (which may be several miles across). However, the radiation received by the radar antenna consists of the average reflectivity across the entire beam, so the reflectivity and associated rainfall rates are underestimated. National Weather Service Glossary, cited 2013.
Pendant Echo	Radar signature generally similar to a hook echo, except that the hook shape is not as well defined, typically due to radar range and/or beamwidth resolution limitations.

	National Weather Service Glossary, cited 2013.
Percolation	The gravity flow of water within soil. American Meteorological Society, cited 2013: Percolation. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Percolation]
Pfafstetter Coding System	A methodology for assigning watershed (basin) identifications based on the topology of the land surface. It is a hierarchical system where watersheds are delineated from junctions on a river network based on levels. The base level (Level 1) corresponds to the continental scale while higher levels (Levels 2, 3, 4, etc.) represent finer details of the watershed. Watershed Topology: The Pfafstetter System by J. Furnans and F. Olivera (http://proceedings.esri.com/library/userconf/proc01/professional/abstracts/a1008.html), cited 2013.
Precipitation Efficiency	The percentage of the total volume of moisture transported upward to the volume of precipitation received at ground-level over the lifetime of a precipitating system.
Probability of Detection (POD)	A verification measure of categorical forecast performance equal to the total number of correct event forecasts (hits) divided by the total number of events observed. Simply stated, it is the percent of events that are forecast. National Weather Service, Space Weather Prediction Center: Forecast Verification Glossary, cited 2013.
Propagation	1. The component of convective storm motion that does not lie along the passive steering layer flow. It is the result of new cell development and old cell dissipation. 2. The transmission of electromagnetic energy as waves through or along a medium.
Proximity Sounding	Atmospheric properties (i.e. temperature, dew point, and wind) plotted on a thermodynamic diagram (usually a SKEW-T diagram) that represent the atmospheric environment associated with a particular meteorological event such as a tornadic supercell.
Pulse Storm	An ordinary cell with a stronger than typical updraft phase, during and immediately after which the storm produces a short episode of severe weather.
Quasi-Linear Convective System (QLCS)	A linear mesoscale convective system (MCS) that has taken the form of a squall line or bow echo.
Radar	(Coined word for radio detection and ranging.) An electronic instrument used for the detection and ranging of distant objects of such composition that they scatter or reflect radio energy.A radar consists of a transmitter, receiver, antenna, display, and associated equipment for control and signal processing. The most common radars are monostatic radars, which use the same antenna for both transmission and reception. These radars depend on backscattering to produce a detectable echo from a target. Bistatic radars have the transmitter and its antenna at one

	location and the receiver and its antenna at a remote location. These radars depend upon forward scattering to produce a detectable signal. Radio energy emitted by the transmitter and focused by the antenna of a monostatic radar propagates outward through the atmosphere in a narrow beam. Objects lying in the path of the beam reflect, scatter, and absorb the energy. A small portion of the reflected and scattered energy, called the target signal, travels back along the same path through the atmosphere and is intercepted by the receiving antenna. The time delay between the transmitted signal and the target signal is used to determine the distance or slant range of the target from the radar. The direction in which the focused beam is pointing at the instant the target signal is received (i.e., the azimuth and elevation angles of the antenna) determine the direction and height of the target. This information is presented visually as echoes on different types of radar displays. Because hydrometeors scatter radio energy, weather radars, operating in certain radar frequency bands, can detect the presence of precipitation and other weather phenomena at distances up to several hundred kilometers from the radar, depending upon meteorological conditions and the type of radar. MST radars and wind profilers, which operate at longer wavelengths than weather radars, are able to detect echoes from optically clear air that are caused by spatial fluctuations of refractivity. Additional information provided by a radar about a target may include the radial velocity or rate of change of range, as measured by a Doppler radar, or the depolarizing characteristics of the target, as measured by a polarimetric radar. American Meteorological Society, cited 2013: Radar. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Radar]
Radar Beam	The focused electromagnetic emissions from a radar antenna. The beam is defined by the main lobe of the antenna pattern. American Meteorological Society, cited 2013: Radar beam. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Radar_beam]
Radar Frequency Band	A frequency band of microwave radiation within which radars operate. *See also* C band, S band, X band. American Meteorological Society, cited 2013: Radar Frequency Band. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Radar_frequency_band]
Radar Mosaic	A product that combines information from multiple radars to give a regional or national view of reflectivity, precipitation, echo top, etc.
Rain Foot	Slang for a horizontal bulging near the surface in a precipitation shaft, forming a foot-shaped prominence. It is a visual indication of

	a wet microburst. National Weather Service Glossary, cited 2013.
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. 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. National Weather Service Glossary, cited 2013.
Range Aliasing	(*Also called* range folding.) A radar sampling problem that arises when echoes located beyond the maximum unambiguous range (rmax) are received as if they were within this range of the radar.This occurs when the radar receives a signal return from a pulse other than the most recent pulse. In this case, the radar sends out a pulse (a short burst of energy). This pulse will continue to go in a straight line until it strikes a target. When it strikes the target, a portion of the pulse will be back scattered towards the radar. If the target it strikes is well beyond the normal range of the radar, it will take longer for the back scattered energy to arrive back at the radar. As a result, the radar will most likely have sent out another pulse in the same direction before the back scattered energy arrives back at the radar. Therefore, when the radar receives the back scattered energy, it will assume that it came from an object much closer to the radar and it will improperly locate the echo. A multiple-trip return appears at the difference of the true range and a multiple of the unambiguous range, i.e., R_displayed = R_true - n * R_max, where n = 0,1,2,... American Meteorological Society, cited 2013: Range aliasing. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Range_aliasing] National Weather Service Glossary, cited 2013.
Range Gate	The discrete point in range along a single radial of radar data at which the received signal is sampled. Range gates are typically spaced at 100-1000 meter intervals. A "radial" of radar data is composed of successive range gates, out to the maximum unambiguous range. National Weather Service Glossary, cited 2013.
Range Resolution	The least radial separation between two targets in the same direction from a radar that allows them to be distinguished. This separation equals one-half the transmitted pulse length. Targets closer together than this distance are not resolved and appear as a single target on the display. American Meteorological Society, cited 2013: Range Resolution.

	Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Range_resolution]
Range Unfolding	Process of removing range ambiguity in apparent range of a multitrip target on the radar. National Weather Service Glossary, cited 2013.
Rayleigh Scattering	Changes in directions of electromagnetic energy by particles whose diameters are 1/16 wavelength or less. This type of scattering is responsible for the sky being blue. National Weather Service Glossary, cited 2013.
Rear Flank Downdraft (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 also* forward flank downdraft (FFD). National Weather Service Glossary, cited 2013.
Rear Flank Downdraft Gust Front (RFDGF)	A gust front associated with a rear flank downdraft (RFD).
Rear Flank Downdraft Internal Surge (RFDIS)	A secondary rear flank downdraft (RFD) embedded within a pre-existing RFD. RFDIS events appear to influence tornado development, intensity, and demise by altering the thermodynamic and kinematic character of the RFD region bounding the pretornadic and tornadic circulations.
Rear Flank Downdraft Internal Surge Boundary (RFDISB)	A gust front associated with a rear flank downdraft internal surge (RFDIS).
Rear Inflow Jet (RIJ)	A mesoscale region of strong winds that originate in the trailing stratiform rainfall region of a squall line near the top of the cold pool and are directed toward the leading edge.
Rear-Inflow Notch	(*Also called* weak echo channel). A radar signature of a rear inflow jet (RIJ) characterized by an indentation or channel in the reflectivity pattern that originates in the trailing stratiform rainfall region of a squall line near the top of the cold pool and is directed toward the leading edge. *See also* inflow notch.
Richards Equation	A tool used to define the threshold for rainfall runoff, and ultimately flash flood guidance, which states that the infiltration rate of a soil is proportional to the ease with which water can move through its pore space.
Right Mover	A thunderstorm (usually a supercell) 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.

	Compare left mover. National Weather Service Glossary, cited 2013.
River Forecast Center (RFC)	A National Weather Service (NWS) office which provides hydrologic guidance to weather forecast offices (WFO) and is the first echelon office for the preparation of river and flood forecasts and warnings.
Roll Cloud	A low-level, horizontal, tube-shaped arcus cloud associated with a gust front of a convective storm (or occasionally a cold front). Roll clouds are relatively rare; they are completely detached from the convective storm's cloud base, thus differentiating them from the more familiar shelf clouds. Roll clouds appear to be rolling about a horizontal axis because of the shearing effects and horizontal vorticity provided by the differing air masses. American Meteorological Society, cited 2013: Roll Cloud. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Roll_cloud]
Rope	(*Also called* "Rope Funnel") A narrow, often contorted condensation funnel usually associated with the decaying stage of a tornado. *See also* rope stage. National Weather Service Glossary, cited 2013.
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. National Weather Service Glossary, cited 2013.
Rotational Velocity (Vr)	The single site Doppler radar intensity of an atmospheric circulation (i.e., mesocyclone, TVS, or TS) as quantified by the sum of the absolute value of the minimum radial velocity (Vmin) and the absolute value of the maximum radial velocity (Vmax) divided by two. *Compare* velocity difference (DV). *See also* rotational velocity (Vr) shear.
Rotational Velocity (Vr) Shear	The single site Doppler radar intensity of an atmospheric circulation (i.e., mesocyclone, TVS, or TS) as quantified by the sum of the absolute value of the minimum radial velocity (Vmin) and the absolute value of the maximum radial velocity (Vmax) divided by the distance between velocity peaks. Values are on the order of 10-2 s-1 for mesocyclones.
S-Band Radar	A radar which operates in the 2-4 GHz wavelength and 7.5-15 cm wavelength ranges. Because of these characteristics, S band radars are not easily attenuated. This makes them useful for both near and far range weather observation. The National Weather

	Service (NWS) WSR-88D is an S band radar which operates on a wavelength of just over 10 cm. The drawback to this band of radar is that it requires a large antenna dish and a large motor to power it.*See also* C band radar, X band radar.
Severe Local Storm	A convective storm that usually covers a relatively small geographic area, or moves in a narrow path, and is sufficiently intense to threaten life and/or property. Examples include severe thunderstorms with large hail, damaging wind, or tornadoes. Although cloud-to-ground lightning is not a criteria for severe local storms, it is acknowledged to be highly dangerous and a leading cause of deaths, injuries, and damage from thunderstorms. A thunderstorm need not be severe to generate frequent cloud-to-ground lightning. Additionally, excessive localized convective rains are not classified as severe storms but often are the product of severe local storms. Such rainfall may result in related phenomena (flash floods) that threaten life and property. National Weather Service Glossary, cited 2013.
Severe Thunderstorm	A thunderstorm that produces a tornado, winds of at least 58 mph (50knots), and/or hail at least 1" in diameter. Structural wind damage may imply the occurrence of a severe thunderstorm. A thunderstorm wind equal to or greater than 40 mph (35 knots) and/or hail of at least 1" is defined as approaching severe. National Weather Service Glossary, cited 2013.
Severe Thunderstorm Warning	A National Weather Service (NWS) Weather Forecast Office (WFO) product issued when either a severe thunderstorm is indicated by radar or a spotter reports a thunderstorm producing hail one inch or larger in diameter and/or winds equal or exceed 58 miles an hour. They are usually issued for a duration of 30 minutes to one hour. Lightning frequency is not a criteria for issuing a severe thunderstorm warning. If the severe thunderstorm will affect the nearshore or coastal waters, it will be issued as the combined product--Severe Thunderstorm Warning and Special Marine Warning.
Severe Thunderstorm Watch	A National Weather Service (NWS) product issued when conditions are favorable for the development of severe thunderstorms in and close to the watch area. The size of the watch can vary depending on the weather situation. They are normally issued well in advance of the actual occurrence of severe weather with a typical duration of 4 to 8 hours. A Severe Thunderstorm Watch is issued by the Storm Prediction Center in Norman, Oklahoma. Prior to the issuance, SPC will usually contact the affected local NWS Weather Service Forecast Office (WFO) and they will discuss what their current thinking is on the weather situation. Afterwards, SPC will issue a preliminary Severe Thunderstorm Watch and then the affected WFO will then adjust the watch (adding or eliminating counties/parishes) and

	then issue it to the public by way of a Watch Redefining Statement. During the watch, the WFO will keep the public informed on what is happening in the watch area and also let the public know when the watch has expired or been cancelled. National Weather Service Glossary, cited 2013.
Severe Weather Statement	A National Weather Service (NWS) Weather Forecast Office (WFO) product which provides follow up information on severe weather conditions (severe thunderstorm or tornadoes) which have occurred or are currently occurring. National Weather Service Glossary, cited 2013.
Shear	Variation in wind speed (speed shear) and/or direction (directional shear) over a short distance within the atmosphere. 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. National Weather Service Glossary, cited 2013.
Shelf Cloud	A low-level, horizontal wedge-shaped arcus cloud, associated with a convective storm's 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. National Weather Service Glossary, cited 2013.
Squall Line	A line of active thunderstorms, either continuous or with breaks, including contiguous precipitation areas resulting from the existence of the thunderstorms. The squall line is a type of mesoscale convective system (MCS) distinguished from other types by a larger length-to-width ratio. American Meteorological Society, cited 2013: Squall line. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Squall_line]
Steering Winds	(*Also called* steering currents, steering flow). A prevailing synoptic scale flow which governs the movement of smaller features embedded within it. National Weather Service Glossary, cited 2013.
Storm Motion	The speed and direction at which a thunderstorm travels. National Weather Service Glossary, cited 2013.
Storm Prediction Center (SPC)	A National Weather Service (NWS) National Center for Environmental Prediction (NCEP) in Norman, Oklahoma, which is responsible for providing short-term forecast guidance for severe convection, excessive rainfall (flash flooding), fire weather, and

	severe winter weather over the contiguous United States.
Storm Scale	Referring to weather systems with sizes on the order of individual thunderstorms. *See also* synoptic scale, mesoscale. National Weather Service Glossary, cited 2013.
Storm-Relative	Measured relative to a moving thunderstorm, usually referring to winds, wind shear, or helicity. National Weather Service Glossary, cited 2013.
Streamwise Vorticity	The component of vorticity that is parallel to the ambient velocity vector. *Compare* crosswise vorticity. *See also* helicity. American Meteorological Society, cited 2013: Streamwise Vorticity. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Streamwise_vorticity]
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 a Low Precipitation (LP) supercell. National Weather Service Glossary, cited 2013.
Suction Vortices	Smaller-scale secondary vortices within a tornado core that orbit around a central axis.The transition of a one-celled vortex into secondary vortices in laboratory and numerical simulations occurs at high swirl ratios. The vortices produce cycloidal swaths within tornado damage tracks and are often used to explain the gradation of wind damage caused by a tornado. Structures in the path of a suction vortex are damaged while others are spared. American Meteorological Society, cited 2013: Suction Vortices. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Suction_vortices]
Supercell	An often dangerous convective storm that consists primarily of a single, quasi-steady rotating updraft (i.e., a mesocyclone), which persists for a period of time much longer than it takes an air parcel to rise from the base of the updraft to its summit (often much longer than 10–20 min). Most rotating updrafts (in the Northern Hemisphere) are characterized by cyclonic vorticity (see mesocyclone). The supercell typically has a very organized internal structure that enables it to propagate continuously. It may exist for several hours and usually forms in an environment with strong vertical wind shear. Supercells propagate in a direction and with a speed other than indicated by the mean wind in the environment. Such storms

	sometimes evolve through a splitting process, which produces a cyclonic, right-moving (with respect to the mean wind), and anticyclonic, left-moving, pair of supercells. Severe weather often accompanies supercells, which are capable of producing high winds, large hail, and strong, long-lived tornadoes. American Meteorological Society, cited 2013: Supercell. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Supercell] Supercells comprise a spectrum, but are often sub-categorized based on the extent to which their mesocyclone is wrapped in precipitation as revealed by their radar and/or visual appearance. A low precipitation (LP) supercell (also called a dryline storm) is dominated by updraft with little precipitation reaching the ground. It is visualized by an exposed updraft and a translucent to nearly transparent precipitation core. Low-level mesocyclones and tornadoes are rare owing to the lack of a well-defined rear flank downdraft (RFD). Most of the precipitation is carried well downstream of the updraft by strong (>30 m/s or 58 kt) anvil-layer winds. A high precipitation (HP) supercell (also called an HP storm) is a highly efficient precipitation producer that develops and maintains precipitation-filled rear flank downdrafts (RFDs) that often envelop the mesocyclones. This makes visual identification of any embedded tornadoes difficult and very dangerous. HP supercells often produce large damaging hail, extreme and prolonged downbursts, and flash flooding. A classic supercell, which falls in between these two extremes, exhibits moderate precipitation production. While there may be some precipitation with a classic supercell's rear flank downdraft (RFD) (and hook echo), its radar reflectivities will be lower than its forward flank downdraft (FFD) precipitation core.
Supercooled Water	(*Also called* supercooled liquid water). Liquid water at a temperature less than the freezing point. Important in the formation of graupel and hail.
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* elevated convection. National Weather Service Glossary, cited 2013.
Synoptic Scale	(*Also called* large scale). Size scale which refers to weather systems ranging in size from several hundred kilometers to several thousand kilometers, the scale of migratory high and low pressure systems (frontal cyclones) of the lower troposphere.

	Compare mesoscale, storm-scale. American Meteorological Society, cited 2013: Synoptic scale. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Synoptic_scale]
Tail Cloud	A cloud band, often laminar and tube-shaped, but sometimes ragged and turbulent, that extends from the forward-flank downdraft precipitation cascade region of a supercell toward 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. 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] A 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. National Weather Service Glossary, cited 2013.
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. National Weather Service Glossary, cited 2013.
Three-Body Scatter Spike (TBSS)	(*Also called* hail spike.) A radar artifact caused by radar microwave scattering associated with large hydrometeors, typically severe hail. The TBSS is strictly an artifact of the electromagnetic radar beam being subject to “Mie scattering” instead of the usual “Rayleigh scattering” process. A TBSS forms as incident energy from the radar is reflected off the hail, down to the ground, then back up to the hail and back to the radar. Because of the delay in reception of the pulses, the radar circuitry displays the TBSS as downrange from the hail core. The TBSS is characterized by a 10-30 km (5-16 nm) long, low reflectivity (< 25 dBZ), echo “spike” aligned radially downrange from a high reflectivity (usually > 63 dBZ) core. The TBSS signature also produces low radial velocities (V), high spectrum widths (SW), extremely low correlation coefficients (CC), and extremely positive Differential Reflectivity (ZDR) transitioning into lower positive or even negative values farther down-radial. The presence of a TBSS with reflectivities greater than 5 dBZ on a S-band (10 cm) radar (such as the WSR-88D) suggests that the

	thunderstorm possesses severe hail.
Thunderstorm	In general, a local storm, invariably produced by a cumulonimbus cloud and always accompanied by lightning and thunder, usually with strong gusts of wind, heavy rain, and sometimes with hail. A thunderstorm is a consequence of atmospheric instability and constitutes, loosely, an overturning of air layers in order to achieve a more stable density stratification. A strong convective updraft is a distinguishing feature of this storm in its early phases. A strong downdraft in a column of precipitation marks its dissipating stages. Thunderstorms often build to altitudes of 40 000–50 000 ft in midlatitudes and to even greater heights in the Tropics; only the great stability of the lower stratosphere limits their upward growth. American Meteorological Society, cited 2013: Thunderstorm. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Thunderstorm]
Thunderstorm Cell	The convective cell of a cumulonimbus cloud having lightning and thunder. American Meteorological Society, cited 2013: Thunderstorm Cell. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Thunderstorm_cell]
Time of Concentration	The time it takes for runoff to travel from the hydraulically most distant points of the basin to the basin outlet.
Tornadic Vortex Signature (TVS)	A Doppler velocity identified tornado-scale vortex whose diameter, measured by the distance between the maximum and minimum radial velocity, is smaller than the effective beam width. With azimuthal over-sampling, as is the case with WSR-88D super-resolution data, the velocity peaks can be separated by up to three radials. As the signature occurs when the radar beam is wider than the vortex, the measured Doppler velocities are weaker than the rotational velocities within the vortex and the apparent core diameter is larger than that of the vortex. The signature, which may extend throughout a considerable vertical depth, is ideally characterized by extreme Doppler velocity values of opposite sign separated in azimuth by the equivalent of one beamwidth. However, since most radars display and record Doppler velocity values at discrete azimuthal intervals, the extreme Doppler velocity values are usually at azimuthally adjacent positions that are roughly one beamwidth apart. *See also* tornado signature (TS)
Tornado	A violently rotating column of air, in contact with the earth's surface, either pendant from a cumuliform cloud or underneath a cumuliform cloud, and often (but not always) visible as a funnel cloud. When tornadoes do occur without any visible funnel cloud, debris at the surface is usually the indication of the existence of

	an intense circulation in contact with the ground. *See also* landspout and waterspout.
Tornado Debris Signature (TDS)	A unique radar feature which indicates objects lofted by a violently rotating column of air in contact with the ground. It typically possesses a localized correlation coefficient (CC) minimum with values less than 0.9 (typically less than 0.8), centered near a storm-scale vortex (i.e., mesocyclone, TVS, or TDS), and reflectivities at least 40 dBZ. Differential Reflectivity (ZDR) values are typically near zero in valid tornado debris, but this signature is not nearly as pronounced as CC. Nevertheless, ZDR can be used as a confirmatory check. *See also* debris ball.
Tornado Emergency	Enhanced wording that National Weather Service (NWS) Weather Forecast Offices (WFOs) can insert into tornado warnings and severe weather statements that describes an exceedingly rare situation when a severe threat to human life and catastrophic damage from a tornado is imminent or ongoing. Use of "TORNADO EMERGENCY" terminology is appropriate for the tornadic situation if all of the following criteria are met: a. Severe threat to human life is imminent or ongoing b. Catastrophic damage is imminent or ongoing c. Reliable sources confirm tornado (either 1 or 2) (1) Visual (2) Radar imagery strongly suggests the existence of a damaging tornado (e.g., debris ball signature).
Tornado Signature (TS)	A Doppler velocity identified tornado-scale vortex which is larger than or equal to the effective beam width. *See also* tornado vortex signature.
Tornado Warning	A National Weather Service (NWS) Weather Forecast Office (WFO) product issued when a tornado is indicated by weather radar or sighted by spotters. They are usually issued for a duration of 30-45 minutes. If the tornado will affect the nearshore or coastal waters, it will be issued as the combined product--Tornado Warning and Special Marine Warning. *See also* tornado emergency.
Tornado Watch	A National Weather Service (NWS) product issued when conditions are favorable for the development of tornadoes in and close to the watch area. Their size can vary depending on the weather situation. They are normally issued well in advance of the actual occurrence of severe weather with a typical duration of 4 to 8 hours.A Tornado Watch is issued by the Storm Prediction Center (SPC) in Norman, Oklahoma. Prior to the issuance of a Tornado Watch, SPC will usually contact the affected local NWS Weather Forecast Office (WFO) and they will discuss what their

	current thinking is on the weather situation. Afterwards, SPC will issue a preliminary Tornado Watch and then the affected WFO will then adjust the watch (adding or eliminating counties/parishes) and then issue it to the public. After adjusting the watch, the WFO will let the public know which counties are included by way of a Watch Redefining Statement. During the watch, the NWFO will keep the public informed on what is happening in the watch area and also let the public know when the watch has expired or been cancelled. National Weather Service Glossary, cited 2013.
Tornadogenesis	The process by which a tornado forms. *See also* mesocyclonic tornado, non-mesocyclonic tornado.
Torus	A doughnut-shaped surface generated by a circle rotated about an axis in its plane that does not intersect the circle. For a hailstone, a torus is the meltwater which forms a band around the equator of the hailstone due to drag as it falls through the atmosphere.
Training	(*Also called* train echo). Repeated areas of rain, typically associated with thunderstorms, that move over the same region in a relatively short period of time and are capable of producing excessive rainfall totals. Train(ing) echoes can frequently be a source of flash flooding. National Weather Service Glossary, cited 2013.
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. National Weather Service Glossary, cited 2013.
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. National Weather Service Glossary, cited 2013.
Triple Point	A junction point of three distinct airmasses denoted by 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).
Universal Time (UT)	(*Also called* Coordinated Universal Time or Universal Time Coordinated (UTC), Z time, Zulu Time). By international agreement, the local time at the prime meridian, which passes through Greenwich, England. Prior to 1972, this time was called Greenwich Mean Time (GMT) but is now referred to as Coordinated Universal Time or Universal Time Coordinated (UTC). It is a coordinated time scale, maintained by the Bureau International des Poids et Mesures (BIPM). National Weather Service Glossary, cited 2013.
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 Cumulonimbus. *Compare* downdraft. National Weather Service Glossary, cited 2013.
Upper Air	(*Also called* upper level). In synoptic meteorology and in weather observing, that portion of the atmosphere that is above the lower troposphere. No distinct lower limit is set but the term can be generally applied to the levels above 850 mb. *See also* low-level, midlevel. American Meteorological Society, cited 2013: Upper Air. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Upper Air]
Upshear	In the opposite direction as shear vector within a specified layer. *Compare* downshear.
Upwind	In the opposite direction as the wind flow, or opposite the direction in which the wind is moving. *Compare* downwind.
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. National Weather Service Glossary, cited 2013.
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). *Compare* backing winds. National Weather Service Glossary, cited 2013.
Velocity Difference (DV)	(*Also called* delta V). The single site Doppler radar intensity of a convergent velocity signature, divergent velocity signature, or atmospheric circulation as quantified by the product of the absolute value of the minimum radial velocity and the absolute value of the maximum radial velocity. *See also* low-level rotational velocity (LLDV).
Vertical Wind Shear	The change in the wind's direction and speed with height. It plays a critical role in the evolution of deep, moist, convection. *See also* wind shear.
Vortex	In its most general use, any flow possessing vorticity.More often the term refers to a flow with closed streamlines or to the idealized case in which all vorticity is concentrated in a vortex filament. American Meteorological Society, cited 2013: Vortex. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Vortex]
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. *See also* crosswise vorticity, streamwise vorticity.
Wall Cloud	A localized, persistent, often abrupt lowering from a cumulonimbus cloud base into a low-hanging accessory cloud, normally a kilometer or more in diameter. A wall cloud marks the lower portion of a very strong updraft, usually associated with a supercell or severe multicell storm. It typically develops near the precipitation region of the cumulonimbus. Wall clouds that exhibit significant rotation and vertical motions often precede tornado formation by a few minutes to an hour. American Meteorological Society, cited 2013: Wall Cloud. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Wall_cloud]
Warm Cloud	Cloud that is only in the liquid phase; levels are not present with temperature below 0°C (32°F); no ice is present. Any precipitation will originate from droplet coalescence.
Warm Rain Process	In cloud physics, the process producing precipitation through collision between liquid particles (cloud droplets, drizzle drops,

	and raindrops). The major role of the warm rain process in thunderstorms is to transfer condensed water, in the form of cloud droplets, to precipitable water, in the form of drizzle droplets and raindrops, by the collision–coalescence process.
Waterspout	1. In general, any tornado over a body of water. 2. In its most common form, a non-mesocyclonic tornado over water. *See also* landspout.
Weak Echo Region (WER)	A radar signature characterized by a region of weak reflectivity on the low-altitude inflow side of a thunderstorm topped by stronger reflectivity in the form of a sloping echo overhang directly above. The WER is produced by strong updraft and associated strong storm-summit divergence that carries large amounts of precipitation particles in all directions. This creates a high reflectivity echo-canopy (slopping echo overhang) over the low-level inflow of a strong or intense convective storm.
Weather Forecast Office (WFO)	A National Weather Service (NWS) office responsible for issuing advisories, warnings, statements, and short term forecasts for its county warning area (CWA). National Weather Service Glossary, cited 2013.
Wedge Tornado	(*Also called* wedge.). [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 (EF4 or EF5 on the Fujita Scale), but many documented wedges have been rated lower. And some violent tornadoes may not appear as wedges. 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 EF-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 (EF2/EF3) or violent (EF4/EF5) damage. National Weather Service Glossary, cited 2013.
Whirlwind	General term for a small-scale, rotating column of air. More specific terms are dust whirl, dust devil, waterspout, and tornado. American Meteorological Society, cited 2013: Wind Shear. Glossary of Meteorology. [Available online at http://glossary.ametsoc.org/wiki/Wind_shear]

Wind Shear	The rate at which wind velocity changes from point to point in a given direction (as, vertically). The shear can be speed shear (where speed changes between the two points, but not direction), direction shear (where direction changes between the two points, but not speed) or a combination of the two. *See also* vertical wind shear. National Weather Service Glossary, cited 2013.
WSR-88D	Weather Surveillance Radar - 1988 Doppler; NEXRAD unit. National Weather Service Glossary, cited 2013.
X Band Radar	A radar which operates in the 8-12 GHz and 2.5-3.75 cm wavelength ranges. Because of the smaller wavelength, the X band radar is more sensitive and can detect smaller particles. These radars are used for studies on cloud development because they can detect the tiny water particles and also used to detect light precipitation such as snow. X band radars also attenuate very easily, so they are used for only very short range weather observation. Also, due to the small size of the radar, it can therefore be portable. Most major airplanes are equipped with an X band radar to pick up turbulence and other weather phenomenon. This band is also shared with some police speed radars and some space radars. *See also* C band radar, S band radar.
ZDR Arc	A region of high differential reflectivity (ZDR) precipitation echoes that lie along the sharp low-level reflectivity gradient facing the storm-relative inflow. Some of these hydrometeors are from the sloping echo overhang and others are from the edge of the precipitation cascade region. Research has theorized that the ZDR arc originates as the precipitation falling from aloft, is sorted by the vertical wind shear present in the environment, and enhanced along the forward flank outflow.
ZDR Column	A dual-polarimetric radar signature of differential reflectivity (ZDR) values above 1-2 dB caused by large liquid drops associated with the updraft of a convective cell+B134
ZDR Ring	A dual-polarimetric radar signature of differential reflectivity (ZDR) values above 1-2 dB horizontally surrounding a bounded weak echo region (BWER) caused by large liquid drops which have been transported around the exterior of a supercell thunderstorm updraft. The ZDR ring is often small and ephemeral making radar detection difficult due to sampling limitations. *See also* low CC ring.
Zulu (Z) Time	For practical purposes, the same as Coordinated Universal Time (UTC). The notation formerly used to identify time Greenwich Mean Time. The word "Zulu" is notation in the phonetic alphabet corresponding to the letter "Z" assigned to the time zone on the Greenwich Prime Meridian.

	National Weather Service Glossary, cited 2013.