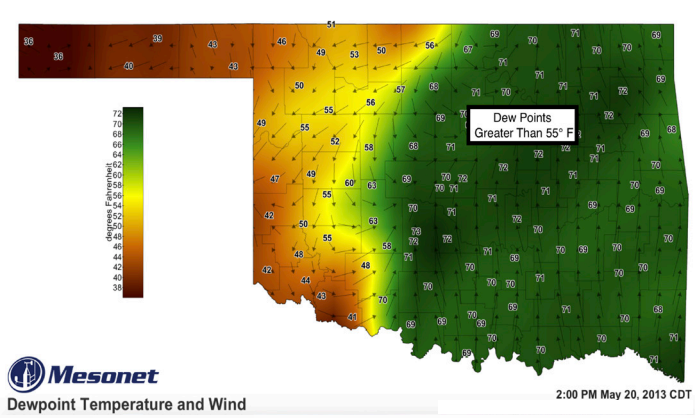
OK1FIRST Severe Weather Ingredients

Moisture



Moisture from the lower levels of the atmosphere is vital for thunderstorms to develop and maintain their strength. To determine if enough moisture is present for storm development, review surface and 850mb data. Surface Dew points above 55° F generally provide sufficient moisture for severe thunderstorms. Key phrases to look for in forecast discussions include **tropical moisture, high dew points, low-level moisture, and high theta-e values.**

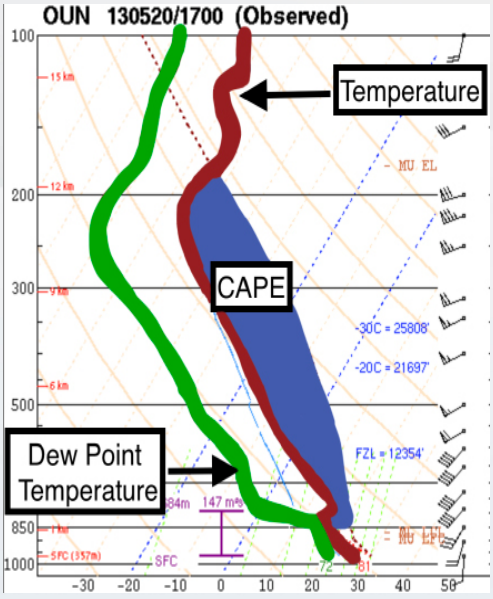
The Mesonet Dewpoint Temperature and Wind map to the left shows areas that have dew points greater than 55° F shaded in green.

Instability

If the atmosphere is said to be unstable, it means that it is in a state that supports rising motion. The table below and to the right provides a general rule of thumb for Convective Available Potential Energy (CAPE) values and atmospheric stability. **Troughs, upper level lows, large CAPE values, and shortwaves** are all words that one should look for in forecast discussions to determine atmospheric instability.

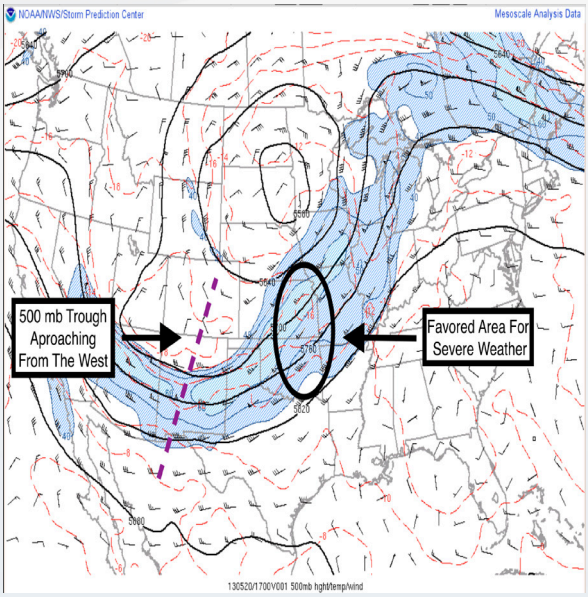
In addition, look for mentions of the "cap", which can limit or prevent storms even when significant instability is present. The cap is a layer of warmer air in the atmosphere that greatly limits vertical motion, much like how the lid on a pressure cooker keeps things contained. If the cap holds, storms won't happen. However, if it weakens or breaks, watch out as explosive storm development can quickly follow.

CAPE (J/kg)	Convective Potential
0	Stable
1-1000	Marginally Unstable
1000-2500	Moderately Unstable
2500-3500	Very Unstable
3500+	Extremely Unstable



The Skew-T diagram (sounding) on the left was launched by the Norman Forecast Office at 1pm on 5/20/13 and shows that the atmosphere is extremely unstable due to the high amount of CAPE present.

The 500 mb chart to the right highlights the area of favored conditions for severe weather ahead of a trough approaching from the west on 5/20/13.



Having all the ingredients doesn't guarantee storms will happen – they are a great indicator of **potential** for convection.

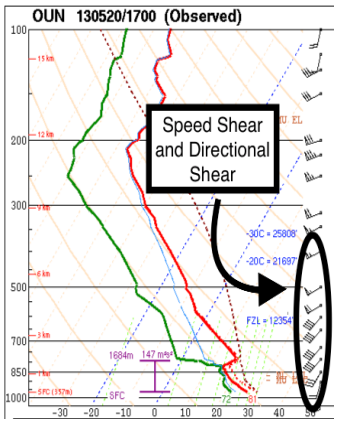
Mesonet
Oklahoma's Weather Network

Lift

Lifting mechanisms include fronts, dry lines, outflow boundaries, and mountains. One or more of these features must start the process of forming storms by providing the initial push to get storms going. These boundaries are commonly visible on Base Reflectivity data as "fine lines" or in Mesonet data as temperature, dewpoint, and wind shifts. When reading forecast discussions look for words such as **surface boundaries, outflow boundaries, dry lines, or fronts.**

Shear

Shear is not absolutely required for severe thunderstorms, but when it is present it causes them to last longer, be more organized, and produce more significant hazards. There are two types of shear: speed shear (wind speeds increasing with height) and directional shear (winds changing direction with height – most commonly from SE to W which is known as veering winds). Both types of shear can cause rotation on their own, but sometimes they work together to create enhanced rotation. Several ways to diagnose shear in the atmosphere include looking at the change in winds in soundings and looking for the "S-curve" in Base Velocity data. When reading forecast discussions, key words to look for are **veering, shear, and helicity** (a measure of rotation in a storm's updraft).



The sounding to the right is from Norman, OK at 1pm on 5/20/13, which shows speed shear and directional shear. Winds at the surface are coming from the south and turn clockwise with height. In addition, these winds are increasing with height.

Forecast Discussion Example

Moisture
Instability
Lift
Shear

DAY 1 CONVECTIVE OUTLOOK CORR 1
NWS STORM PREDICTION CENTER NORMAN OK
0117 AM CDT MON MAY 20 2013
(Edited for OK-First Severe Weather Ingredients Cheat Sheet)

...SYNOPSIS...
YET ANOTHER ACTIVE/RELATIVELY WIDESPREAD SEVERE WEATHER DAY IS LIKELY ACROSS PORTIONS OF THE SOUTHERN PLAINS TO MIDWEST TODAY AND TONIGHT. **A PROMINENT CENTRAL CONUS UPPER TROUGH** WILL CONTINUE A GENERAL EASTWARD ADVANCEMENT THROUGH TONIGHT...WITH A LEAD/CLOSED **UPPER LOW** PIVOTING OVER THE DAKOTAS/UPPER MIDWEST. **A SOUTHERN STREAM SHORTWAVE TROUGH**/MODERATELY STRONG POLAR JET WILL EJECT EAST-NORTHEASTWARD OVER THE SOUTHERN ROCKIES TO THE SOUTHERN PLAINS/OZARKS...WITH SEVERE TSTMS INCREASINGLY LIKELY BY PEAK HEATING AND CONTINUING INTO TONIGHT.

...SOUTHERN PLAINS/OZARKS/MIDDLE MS VALLEY (Including OKLAHOMA)...
THE AIRMASS IS EXPECTED TO AGAIN BECOME QUITE UNSTABLE ACROSS MUCH OF THE REGION BY THE AFTERNOON.**MIDDLE/UPPER 60S AND SOME LOWER 70S F SURFACE DEWPOINTS** WILL BE QUITE COMMON WITHIN A SPATIALLY BROAD WARM SECTOR AHEAD OF A **COLD FRONT** EXTENDING FROM AN EASTERN DAKOTAS/MN SURFACE LOW SOUTHWESTWARD TO NEAR THE KANSAS CITY AREA/EASTERN KS AND WESTERN OK...AND AHEAD OF A **DRYLINE** EXTENDING FROM SOUTHWEST OK SOUTHWARD INTO WESTERN NORTH TX/WEST-CENTRAL TX.

THAT SAID...THE MOST INTENSE/MOST PROBABLE SEVERE STORMS ARE ANTICIPATED A BIT FARTHER SOUTH-SOUTHWEST ACROSS THE SOUTHERN PLAINS/OZARKS BY MID/LATE AFTERNOON INTO TONIGHT.THIS INCLUDES AREAS ROUGHLY PARALLEL AND NORTHWEST OF THE I-44 CORRIDOR...BUT ESPECIALLY SOUTH-SOUTHWESTWARD INTO MUCH OF THE MIDDLE PART OF OK /POTENTIALLY INCLUDING OKC METRO/...TO NEAR THE HEAT-AIDED **SURFACE LOW** AND **SOUTHWARD-EXTENDING SHARPENING DRYLINE** INTO THE WESTERN PART OF NORTH TX/WEST-CENTRAL TX. IN THIS CORRIDOR...ML **CAPE VALUES ARE LIKELY TO EXCEED 2500-3000 J/KG** BY AFTERNOON WITHIN THE WARM SECTOR ACROSS OK AND WEST-CENTRAL/NORTH-CENTRAL TX..**40-50 KT OF EFFECTIVE SHEAR** WILL COINCIDE WITH THE MAJORITY OF THE EFFECTIVE FRONTAL ZONE AND/OR **DRYLINE** ACROSS OK/EXTREME NORTH TX INTO SOUTHEAST KS AND THE OZARKS.THE DEGREE OF **SHEAR** AND **MOISTURE**/**INSTABILITY** WITHIN THE WARM SECTOR WILL FAVOR SCATTERED TO NUMEROUS SUPERCELL STRUCTURES. VERY LARGE HAIL AND TORNADOES ARE POSSIBLE WITH SUPERCELLS...WITH AN EARLY EVENING PEAK TORNADO THREAT /PERHAPS A COUPLE OF STRONG TORNADOES.