Hotter Climate, Heat Waves, and Heat Bursts

Before we get into these heat effects, let's remember the **"Loaded Dice" game**, which the CSSG-1 Group developed for our September 2023 presentation. Both of these items can be seen in the CSSG-2 Materials library (link at bottom of the following page). The "Dice" were designed to reflect that the **Northern Hemisphere summer temperatures** have actually, and steadily changed.

Tracy in our group sent me an update of the data which informed the "Loaded Dice" game, and that article can be accessed at:
https://messaging-custom-newsletters.nytimes.com/dynamic/render?campaign_id=9&emc=edit_nn_20240620&instance_id=126713&isViewInBrowser=true&nl=the-morning&paid_regi=2&productCode=NN&regi_id=113815781&segment_id=170054&te=1&uri=nyt%3A%2F%2Fnewsletter%2F28e6e0a9-3233-5c4a-9e22-11907170d556&user_id=2ba2b687a21df560d4140287bb96fb33

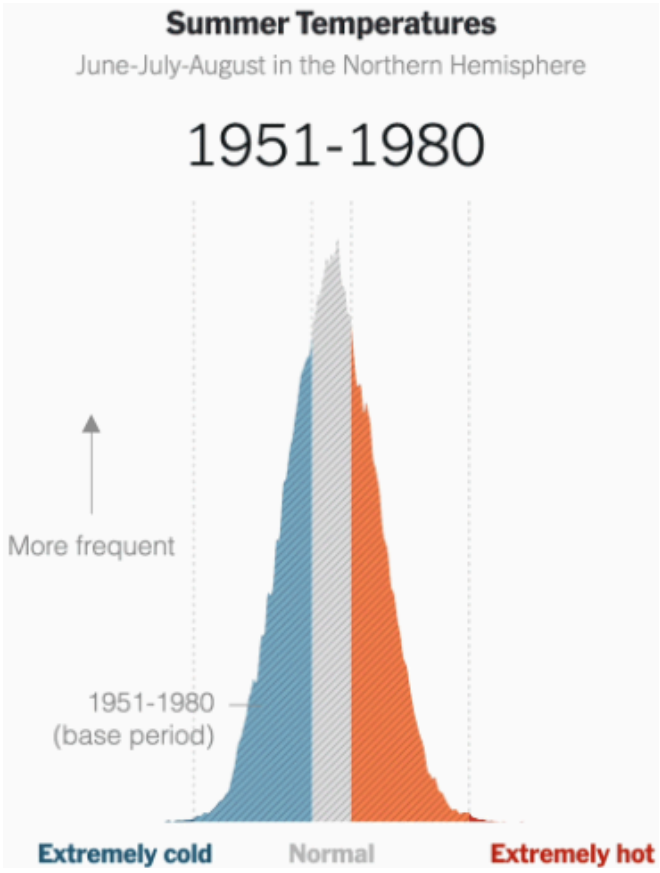
Warming Up with the DICE GAME!

2

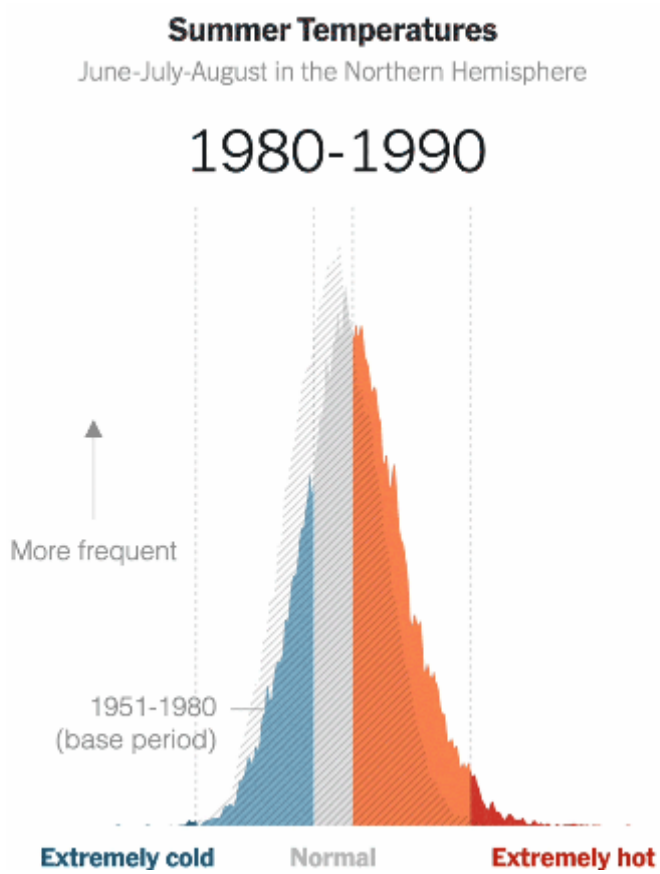
Each Dice is a different CLIMATE

WEATHER is a roll of that dice

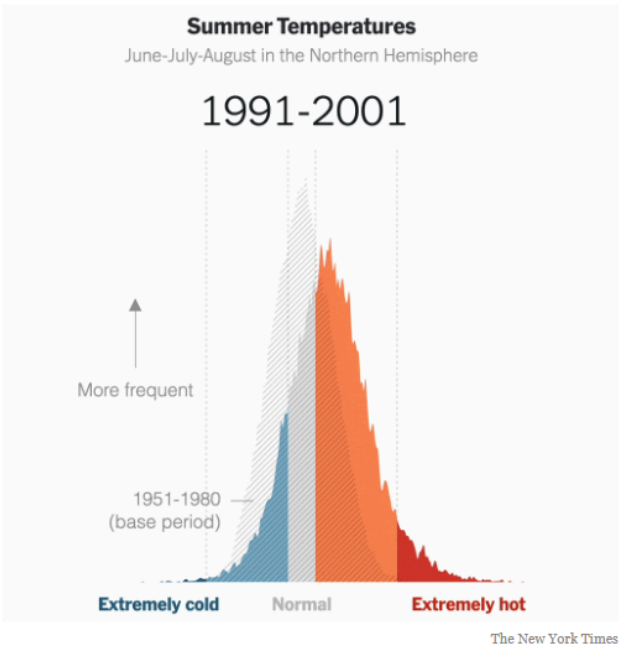
This is from the link Tracy sent. Let's look at the evidence that that we really are living in a strongly changing climate:

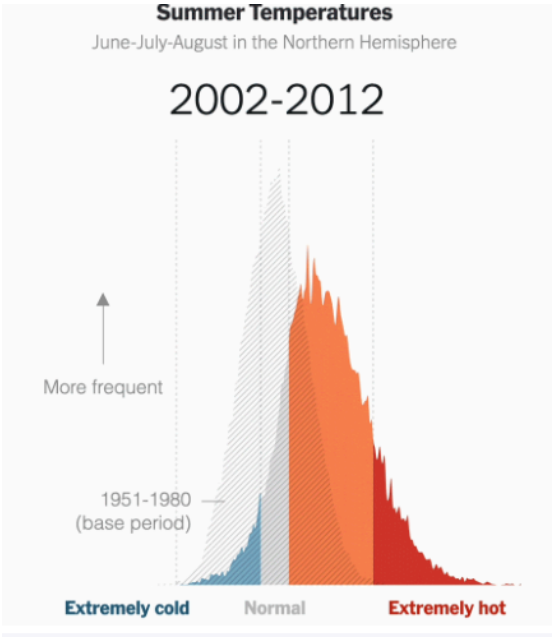


Notice that the middle (gray) bar is ⅓ of the days, as are the blue and red. Extremely hot is a very small tail of the chart. These are used to **"define"** normal, cold, extremely cold, hot, etc.



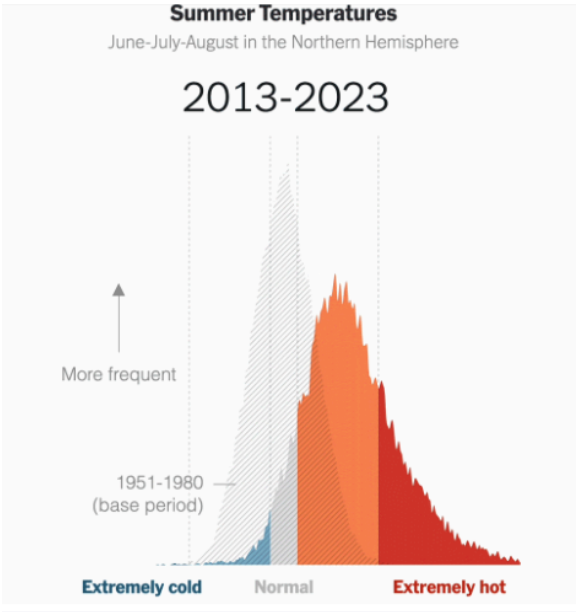
One decade after that 30-year baseline, things are changing. Fewer cold and normal days are being exchanged for more hot and extremely hot days.





Things are continuing to change.

Very few cold and normal days compared to our 1950-1980 baseline.



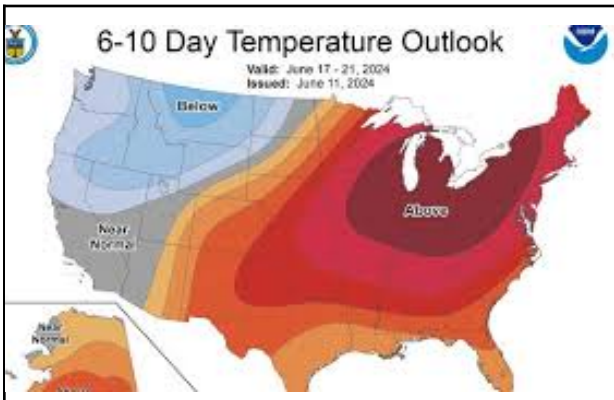
And now, the climate has dramatically changed, and will continue to change. We are now having around **90% hot and extremely hot days, compared to the 33% in 1951-1980**.

So, it seems pretty appropriate to expand on some **WEATHER** patterns which develop during hot periods (remember that CLIMATE is the trend over decades, while **WEATHER** is what's happening today, this week, etc.). The **HEAT DOME** discussion last time was of a **WEATHER** pattern. The changing **CLIMATE** may make such domes more likely;

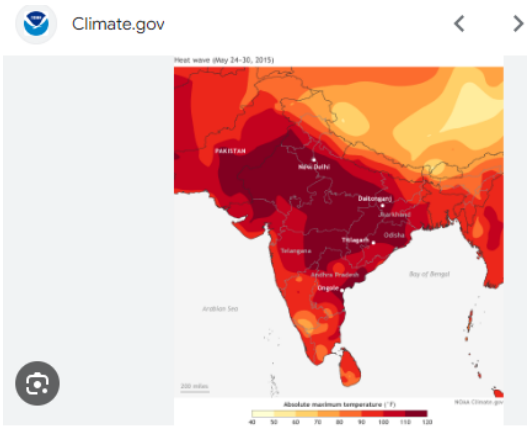
HEAT WAVES

Q. What is a heat wave? "Heat Waves are a period of unusually high temperatures as compared to what is normally expected over a region. Therefore, the temperatures at which Heat waves are declared differ from place to place based on the temperature climatology (historical temperatures) of that region. The impact of heat waves gets aggravated by supportive meteorological factors such as high humidity, high wind speed, duration of heat wave events, etc".

From two weeks ago; this is weather:

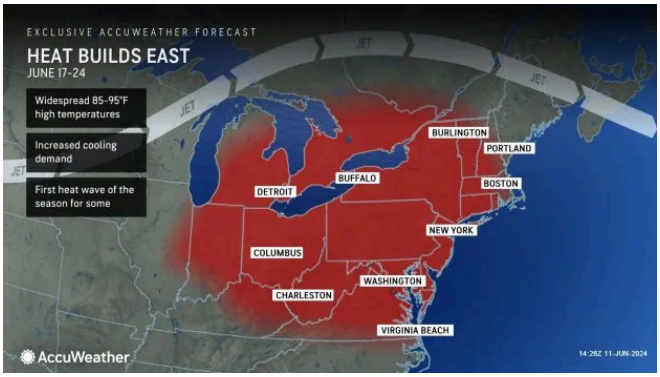


Can you guess where the jet stream is in this heat wave? It took me quite a while to find it.



India heat wave kills thousands | NOAA Climate.gov

https://www.climate.gov/news-features/event-tracker/india-heat-wave-kills-thousands (also mentions a Heat Bomb)



Like the HEAT DOME, the heat wave is South of the jet stream. What seems to be different is that the jet stream is much less kinked, which prevents the high pressure build-up from above which captures the heat dome.

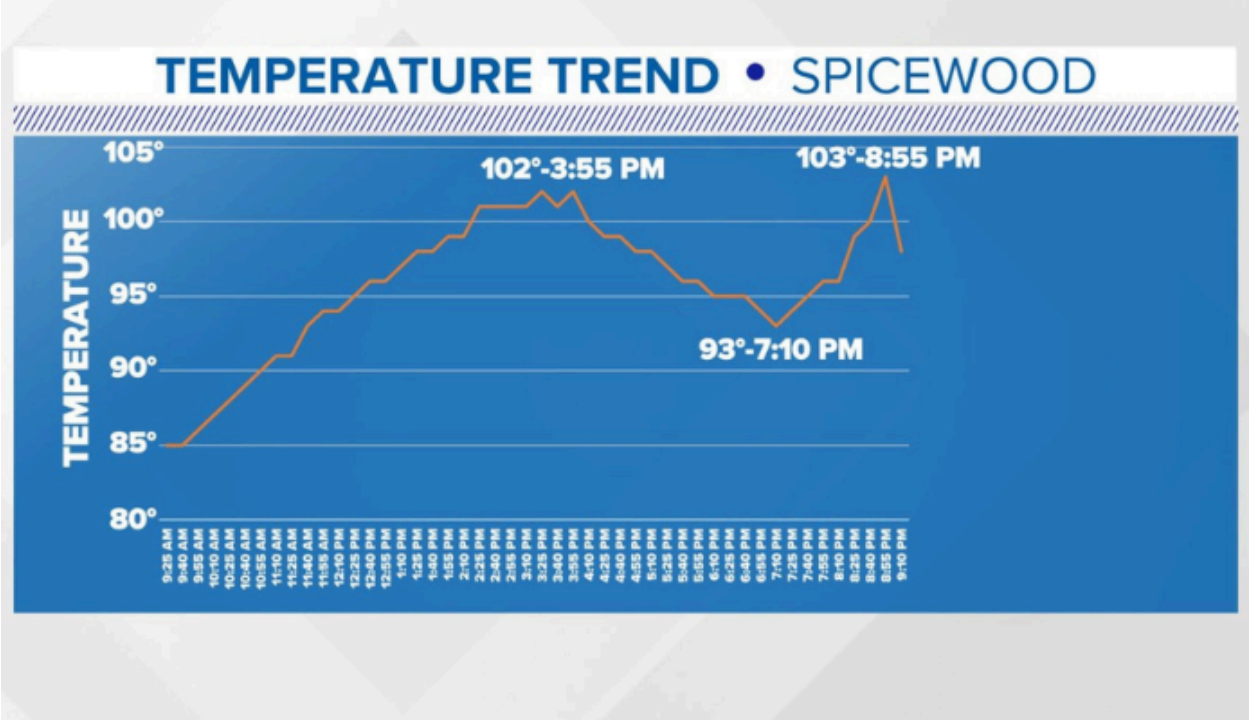
HEAT BURSTS

Now, this is something that is so rare that the one we heard about from our friends in Austin a year ago, is the only one I could find. Here's the article:

https://www.kvue.com/article/weather/heat-burst-explainer/269-a59168ef-e02a-4b7c-9fcc-d3465e219350 and a video: https://www.youtube.com/watch?v=LrpuIIMu_rs

Similar to HEAT DOMES, the big effect is from **COMPRESSION**. These graphics are from the article above:

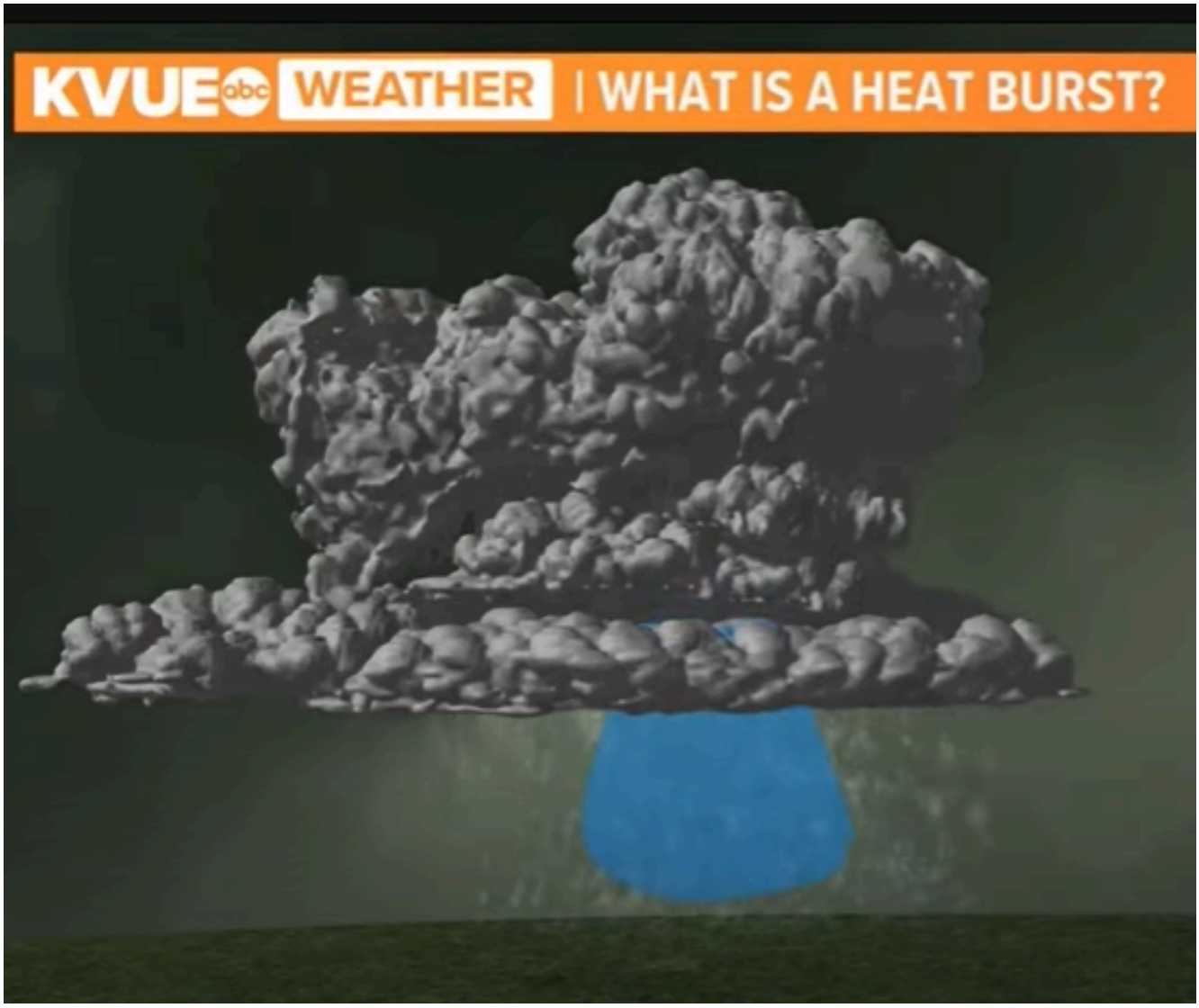
This is what they experienced - it got hotter for a short, intense period that night!



Now that's a HEAT BURST!

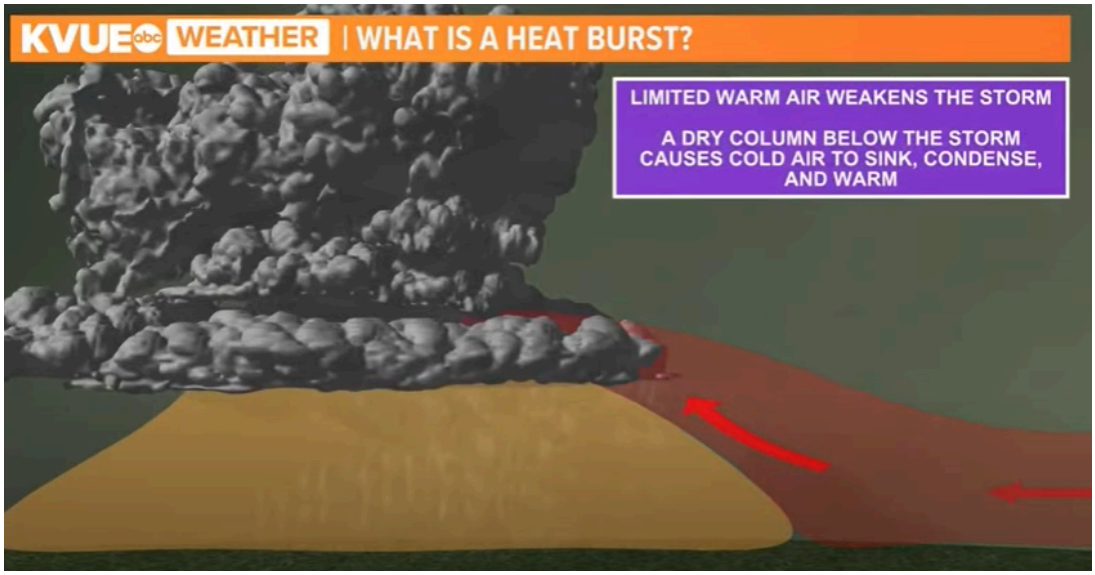
We start with a big thunderstorm and very hot temperatures (which means the moist, hot air at the surface will drive upwards further into the cold air towards the top of the Troposphere). This hot, moist air forms the towering clouds, and the high, cold air turns it into heavy rain…

Heavy rain falls from the thunderstorm, cooling the air beneath it (remember, the rain evaporates at the surface and that takes energy, so the air cools - like the mister coolers…

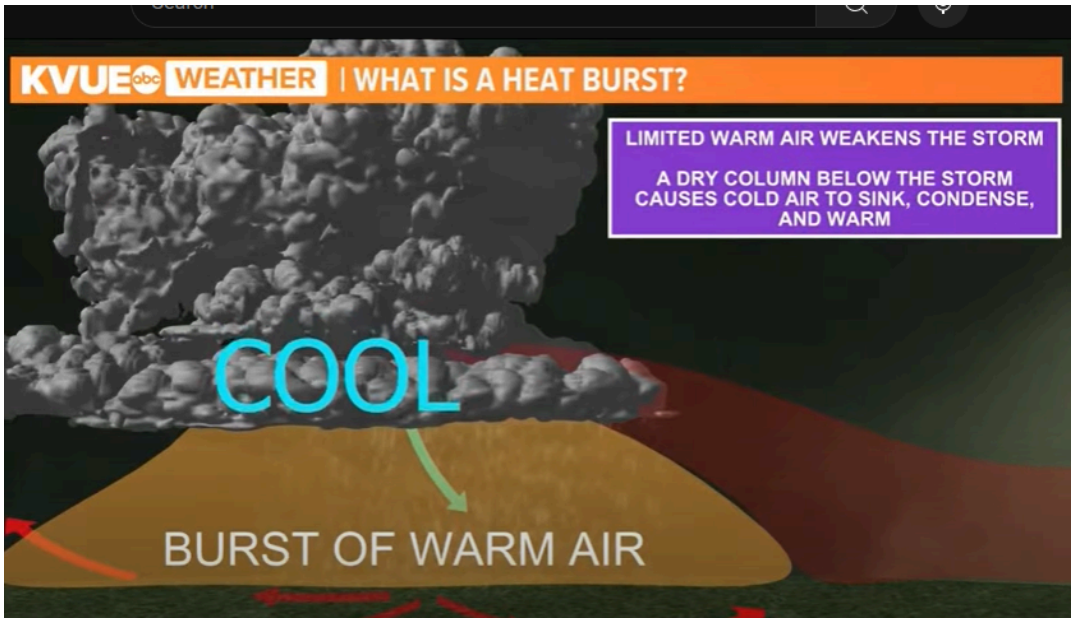


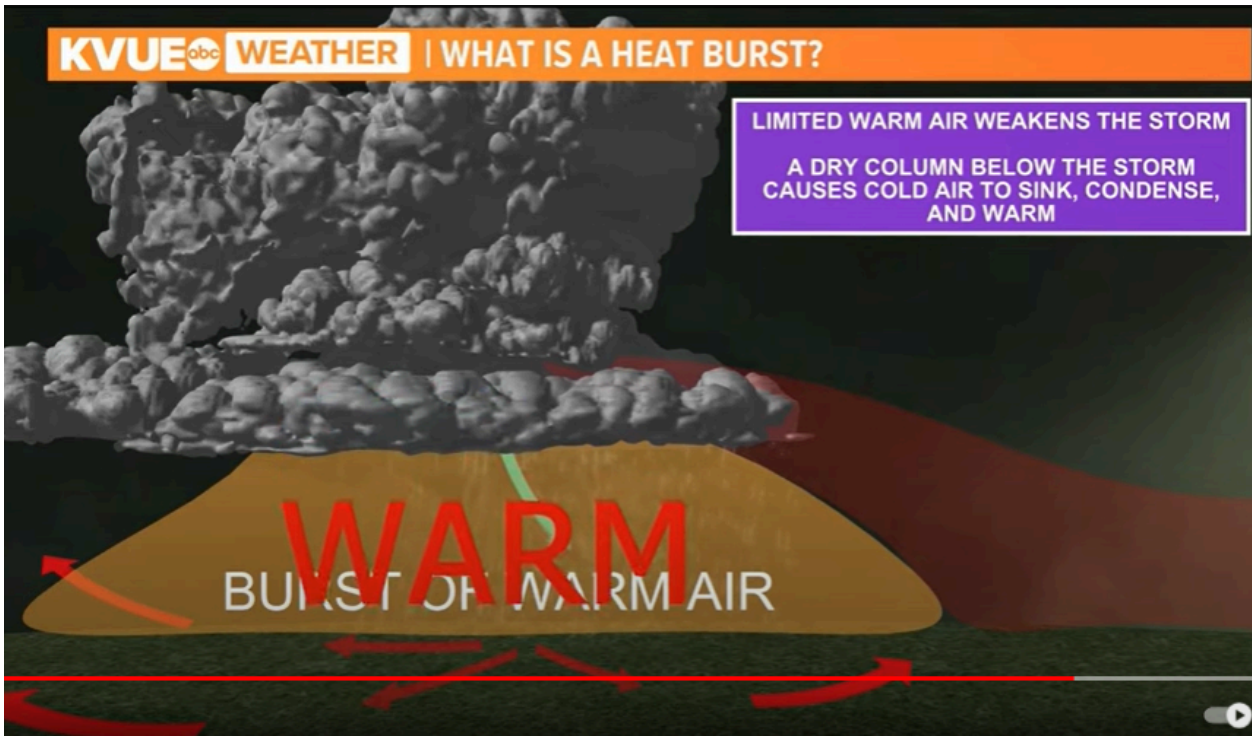
Towards the end of the hot day, the air feeding the storm from below is cooling, and this limited warm air means the storm weakens. It's not surging upwards so strongly. And the cool air up there begins to cool the column from the side and add to the cool air at the ground.

The cooled air below the cloud now has little moisture (because it can't hold much being cool).

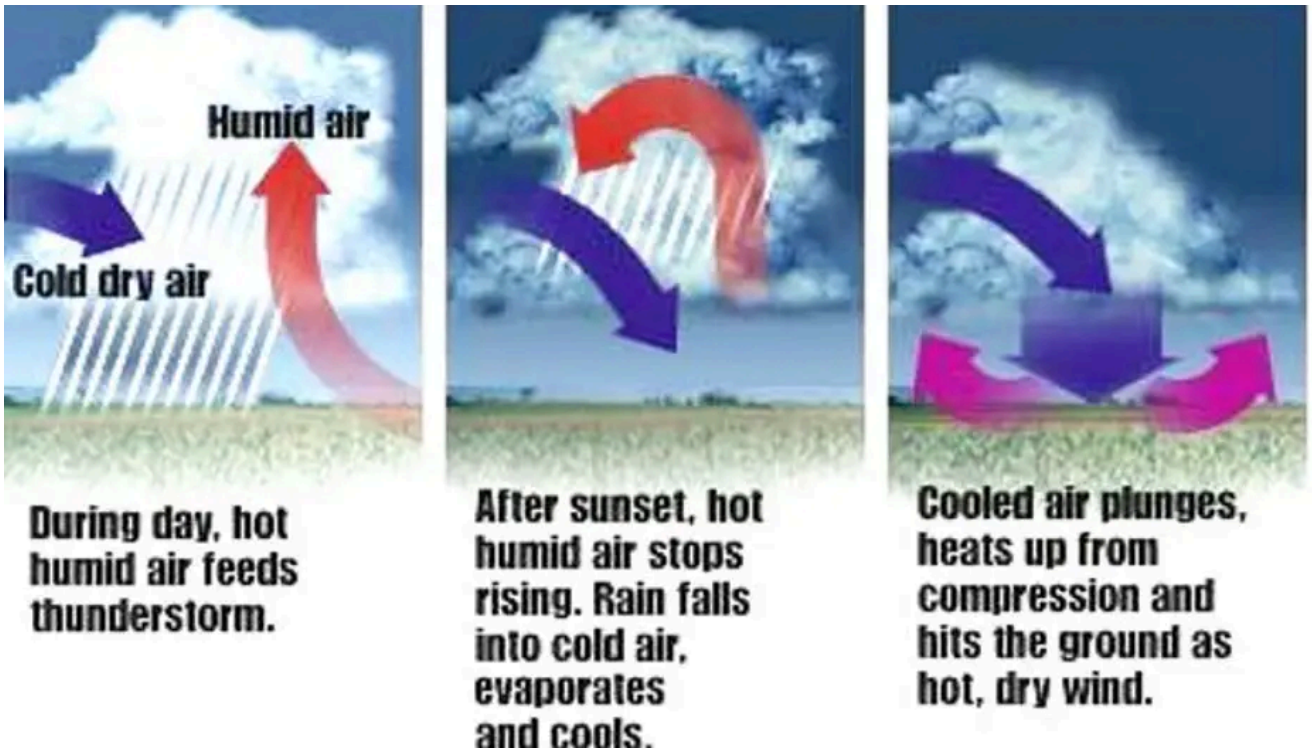


The cool, dry air below the storm allows the <u>weakened, cooled thunderstorm column to sink</u>. This COMPRESSES the cool, dry air below, causing it to heat rapidly…





Here's another graphic:



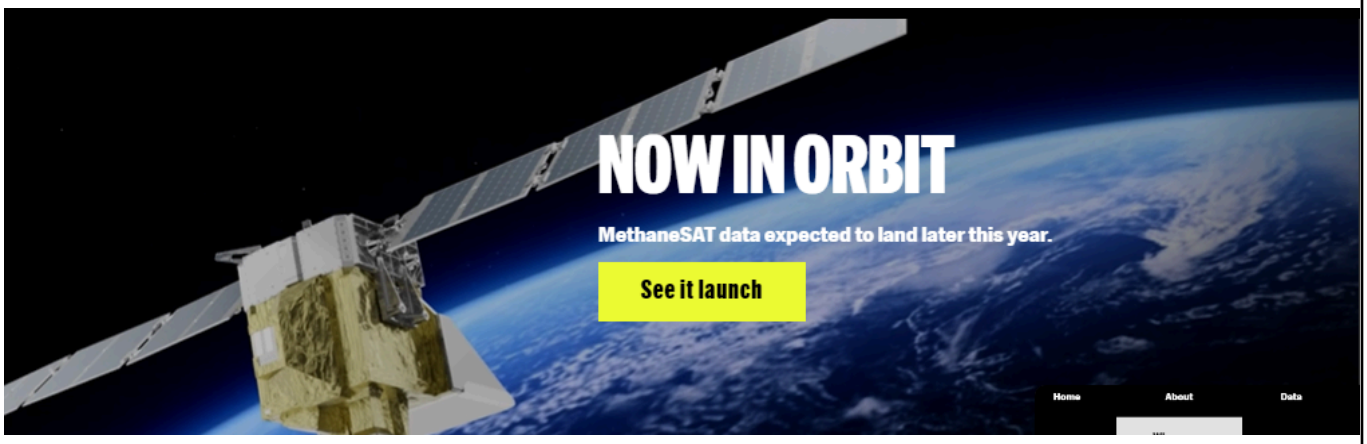
Here's a very sloppy thunderhead, which allows us to see the rain forming very high up…

And a final gift from the gods…

GOOD NEWS CORNER

https://www.methanesat.org/

Our privately-placed methane-sensing satellite is about to come on line.



ANALYZE, COMPARE AND ACT

Compare emissions across different areas, monitor how emissions change and deploy solutions that achieve maximum reductions.

UNMATCHED ACCURACY AND PRECISION

Advanced sensing technology detects methane emissions across the globe with unprecedented resolution and precision.

FAST, FREE TRANSPARENT DATA

Levels of MethaneSAT data will be online for free, ushering in a new era of climate transparency and accountability