Zack Cymanski
Flow Visualization
Clouds First
October 13 2016

Clouds First: Various stabilities in the atmosphere over Wisconsin

I never have been so attracted to looking at and thinking how clouds were formed. Ever since this was assigned you probably have found me staring up at the sky looking for that perfect cloud. Little did I know I would not have found that cloud from the ground but instead from the skies. I was flying to Detroit, WI for the Colorado Football game at Michigan, and I looked out the window and saw something extraordinary. The endless rows of clouds and how welcoming the clouds looked from above, grabbed my attention. I knew I had to take a picture of these clouds because of how beautiful they were. I did not realize what exactly I captured until I sat down and really analyzed it. I captured a photo where you can easily see the change in atmospheric stabilities. Below is the final produced image after some simple changes in Adobe Photoshop.

Figure 1: Post processing clouds in different atmospheric stabilities

As mentioned above this image was taken from a plane above Wisconsin. I unfortunately did not have access to my DSLR camera but could not pass on this sight. This image was taken roughly above Watertown, WI (in between Madison and Milwaukee) at approximately 37,000 feet looking south. My camera was slightly angled downward because the more eye pleasing clouds were below. I would say my camera angle was 10-15° downwards from an upright position. The image was captured on September 16, 2016 at 2:55pm EST (local time).

There are a ton of different formations of clouds in the image because of the changing atmospheric stabilities. The top cloud is probably the easiest to identify and this is where the atmosphere is stable. This cloud is most likely a thick altostratus, I say this because the high clouds are patchy and thin, and during the summer atmospheres are longer so I believe this is classified as a mid cloud. The cloud in my image is most likely not patchy, however it is difficult to tell because of my point of perception. The top cloud is around 39,000 feet, according to the planes elevation and the T-Skew plot below. In the unstable atmosphere, there are numerous types of clouds. Most of the clouds are cumulus but you can see a cumulonimbus cloud in the top-mid right of the image. In the far distance the clouds look like they are most likely stratocumulous. It is almost impossible to guess the heights of the clouds when looking down on them, so based off the Skew-T plot I would guess they are around 700 m or 2300 feet. The heights on these clouds are rather small except for the cumulonimbus cloud in the distance. That one might reach close to 10,000 feet. There was definitely rain in the area around this time (Wunderground). Below, the skew-t plot shows the atmosphere characteristics on Sept. 16 2016 at sunrise (12Z stamp). I chose Davenport's weather station over Green Bay's because I was looking south in the general direction towards Iowa and I could roughly see 230 miles south (USA Today). 230 miles south of my location ends up in the center of Illinois, much closer to Davenport than Green Bay (the other local weather station).

Time (CDT)	Temp.	Heat Index	Dew Point	Humidity	Pressure	Visibility	Wind Dir	Wind Speed	Gust Speed	Precip	Events	Conditions
2:55 PM	71.1 °F	-	71.1 °F	100%	29.89 in	2.0 mi	SW	12.7 mph	20.7 mph	N/A	Rain , Thunderstorm	Heavy Thunderstorms and Rain

Figure 2: Atmospheric Information at time image was taken, Janesville, WI on September 16, 2016

This figure above, tell you the exact weather characteristics when I took this picture. The town is Janesville, which is south of my location but center of the image.

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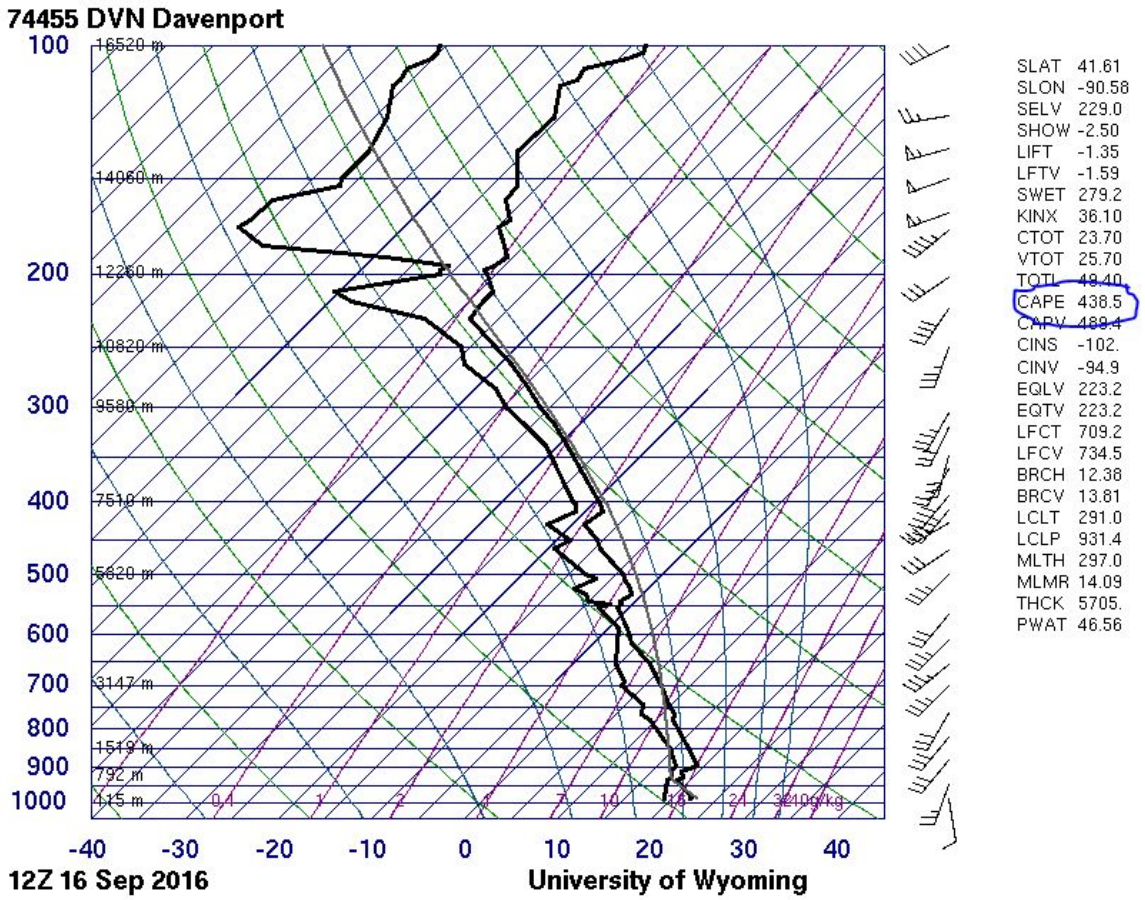

Figure 3: Skew-T plot of Davenport, IA, 12Z September 16, 2016

The Skew-T plot (University of Wyoming) shows rather close dew point and outside temperatures which indicates where the clouds will be. You can also see where the lines come together at roughly 12260 m (37,000 ft) which I believe is the cloud formation above me in my image. The circled CAPE value is at 438.5 indicating that the atmosphere is unstable and that is supported by the stormy weather a couple days before.

I took the image from my phone because I did not have access to my DSLR camera however my camera is a 13M (4128 x 3096) pixel camera. This also means my ISO and shutter speed are on auto. The default f stop number is f/2.0 (phone specs). The post processing techniques I used were cropping, increasing the brightness and slightly changing the curves (Figure 4, below).

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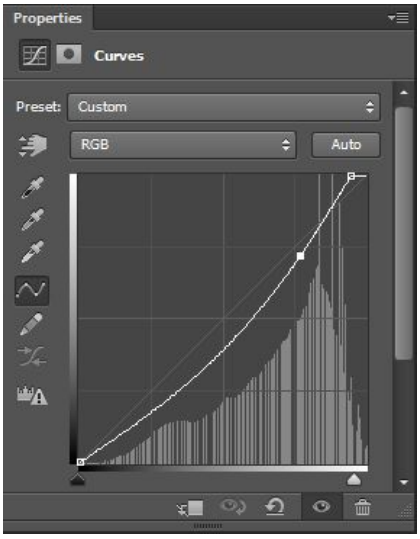

Figure 4: Curve properties

The final image has a size of (2460 x 2556). The original image is slightly dark so increasing the brightness gives the clouds more of a vibrant feel. I also cropped the top and bottom because those clouds/space seemed to be a bit “dull” compared to the rest of the clouds. Below, figures 5 and 6, you can see the original side by side with the final image.

Figure 5: Original photo

Figure 6: Post processed Image

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I love this image because I think it shows a great and obvious difference in stable and unstable atmospheres. The top cloud is in stable, while the lower clouds are in unstable atmospheres. I'm glad I could post process the image to make it less "dull". I wish I had my DSLR camera on me so I could get a cleaner and higher resolution. There are a couple of questions I have regarding my image: Why is there that "random" cumulonimbus cloud in the top right and how accurate the Skew-T diagrams are around mid day? I know you can see the overall stability of the atmosphere by analyzing the Skew-T's but do the dew point and ambient temperature lines change a lot throughout the day? I would like to somehow take another picture from the ground in the same direction as this image and see the similarities and differences. I know it is virtually impossible but would be extremely interesting.

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