MCEN 5151

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Clouds First Report

Introduction:

This photograph was taken for the first cloud assignment for the fall 2015 Flow Visualization class. The original assignment was to capture a cloud photograph and identify the cloud type, the atmosphere stability, and any other significant information relevant to course discussion. After several different attempts in capturing a sufficient picture, I was satisfied the photo I chose would display the desired deliverables.

Figure 1: Clouds 1

Environment & Location:

The photograph was taken in Broomfield, Colorado at approximately 5:30 pm on October 3rd, 2015. The camera was pointed at about a 30° angle from the horizon, facing in the east direction. The angle of the photo and altitude of the location used give the clouds an approximate altitude of 3050 meters above sea level.

Clouds:

The photograph was taken with an 11 mph North West wind at about 59°F with approximately a 65% relative humidity. In the proceeding hours the wind speed rose to nearly 20 mph in a Northern direction, the temperature dropped to nearly 50°F, and the humidity reached nearly 95%. [1] These figures can be attributed to a substantially large thunderstorm system that was moving through this area. My photograph was taken after some of these clouds had moved through the Broomfield area. Essentially, the back side of part of the system. With all of the given information, including the SKEW-T diagram, I believe this is a Cumulonimbus Calvus which further developed into a Cumulonimbus Arcus or potentially a Cumulus Congestus cloud. [2, 4, 6] The SKEW-T diagram below further validates this belief as the CAPE was greater than zero and there seems to be some instability near the estimated height of the cloud (Roughly 3050 m). [3] This was further validated with analysis of cloud-layer during this time. [1]
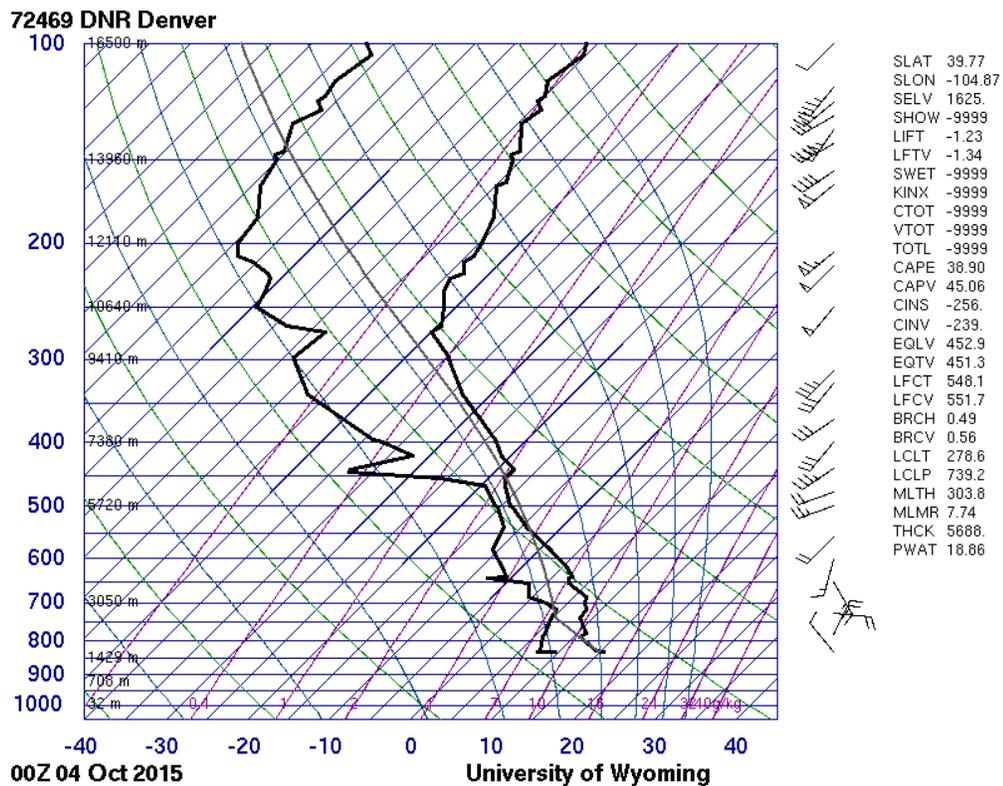

Figure 2: SKEW-T

Camera Configuration & Technique:

The following camera settings were used to acquire the above picture:

Table 1	
Camera Model	Samsung WB150F
Size of Field of View	Approx. 3600 x 2400 m [5]
Distance from Object to Lens	Approx. 8 km
Lens	4-72mm
Lens Focal Length	50mm
Aperture	f/5.2
Exposure/Shutter Speed	1/350
ISO	80
Exposure	0

There was minimal post-processing done; minor cropping and I utilized the "Curves" feature in GIMP (GNU Image Manipulation Program). After presenting to the class, the suggestion of changing the contrast was mentioned. This did end up improving the overall image of the photo as well.

Figure 3: Original - 4320 x 3240 pixels
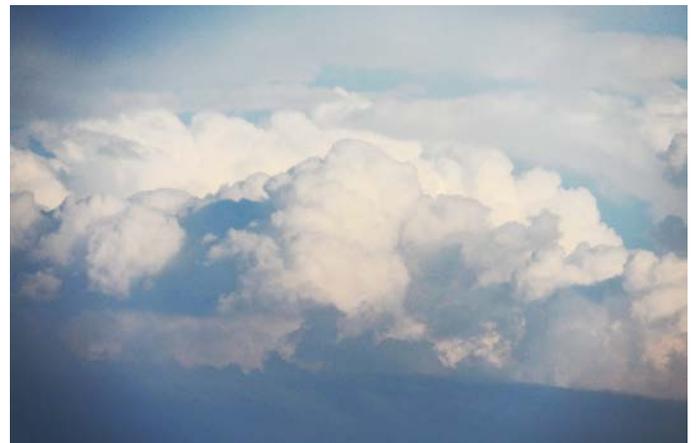
Figure 4: Final - 4320 x 2992 pixels

Reflection:

In conclusion, the cloud captured shows an interesting view of a cumulonimbus cloud "rolling" in before a thunderstorm. I believe this may be a "Calvus" type due to its "soft indistinct flattened mounds, without any fibrous or striated appearance." [2] Not seen in the picture is that this particular cloud was not alone as it was only a piece of a bigger cloud system. Additionally, as mentioned before, this cloud system turned into a storm system that brought precipitation to the Broomfield and Boulder areas. After further analysis with Dr. Jean Hertzberg, this could also be a Cumulus Congestus cloud which occur between a Culumlus Mediocris and a Cumulonimbus cloud. [6] These clouds are characterized by unstable atmospheres as well. [6]

Before presenting to the class I was extremely pleased with my image, however after seeing it on the projector I was disappointed with the "graininess" of my image. Many mentioned this could be attributed to my ISO level, however I now believe distance and camera specifications may be the only other explanation. This was frustrating as I desire to put forth a good deliverable. I believe the fluids physics are evident, but not as crisp as I had initially hoped to capture. For the next assignment I will strive for a crisper and cleaner image than the current one. I would also like to capture a more colorful cloud image, similar to some that were shared in class.

Sources Used:

[1] "WeatherSpark Beta." *Beautiful Weather Graphs and Maps*. Web. 13 Oct. 2015. https://weatherspark.com/#!dashboard;q=Broomfield%2C%20Colorado%2C%20United%20States.

[2] Pinney, Gavin, and Bill Sanderson. "Cumulonimbus." *The Cloudspotter's Guide: The Science, History and Culture of Clouds*. New York: Penguin Group, 2007. 45-69. Print.

[3] "Atmospheric Soundings." Department of Atmospheric Science. University of Wyoming College of Engineering. Web. 13 Oct. 2015. http://weather.uwyo.edu/upperair/sounding.html

[4] Wikipedia contributors. "Cumulonimbus cloud." *Wikipedia, The Free Encyclopedia*. Wikipedia, The Free Encyclopedia, 1 Oct. 2015. Web. 13 Oct. 2015. https://en.wikipedia.org/wiki/Cumulonimbus_cloud

[5] "Photography Calculators." Web. 30 Oct. 2015. http://www.tawbaware.com/maxlyons/calc.htm.

[6] Wikipedia contributors. "Cumulus congestus cloud." *Wikipedia, The Free Encyclopedia*. Wikipedia, The Free Encyclopedia, 31 Jul. 2015. Web. 30 Oct. 2015. https://en.wikipedia.org/wiki/Cumulus_congestus_cloud.