Clouds 2

MCEN 5151

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For the second cloud assignment I was looking to capture a cloud type that is not typically seen in Colorado. Since it is not summertime yet, afternoon storm clouds are hard to come by. However, one day I noticed a very large cumulus cloud that was growing at a rapid rate. It was sunny in Boulder at the time since the cloud was forming to the east making lighting conditions very appealing for a photograph. With this image I was hoping to capture the great size and expansion rate of a swelling cumulus.

Originally this cloud was spotted while I was on the CU campus after coming out of class. It looked like a very interesting cloud so I went home to get my camera and found a good vantage point. This picture was taken at 14:07 on a sunny day in Boulder on March 4th, 2011. The cloud was forming due east of Boulder, and the lighting was very good. The image was taken from west of campus looking east at an angle of about 20 degrees above the horizon.

Figure 1: Cumulus congestus

The main cloud that is in this image is a Cumulus mediocris, also sometimes referred to as a swelling Cumulus cloud. At the time, there were no clouds covering the sun. This allowed for the sun to illuminate this particular cloud. The winds were quite calm in Boulder and the temperature at the time was around 45 degrees F. Swelling cumulus clouds are often not seen in the colder months from what I have experienced in Boulder. These clouds can typically lead to precipitation.

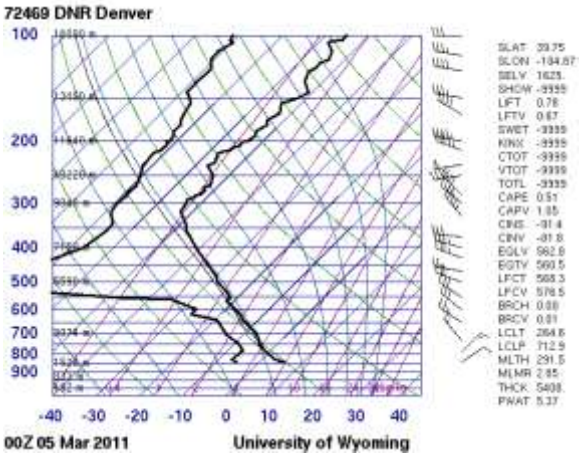

Figure 2: Skew-T Denver 3/4/2011 18:00

From looking at the skew-t plot in Figure 2 it can be seen that the CAPE = 0.51. A non-zero value for CAPE (Convective Available Potential Energy) indicates that the atmosphere is unstable. Since this skew-T plot was from roughly 4 hours after the image was taken, I believe the CAPE was actually slighter higher at 14:07 than what is found at 18:00. With a CAPE value of 0.51 here, it represents that the atmosphere is only marginally unstable. This is consistent with the cloud formation that is seen in Figure 1. The cloud is growing upward because it is undergoing convection. This type of convection is generally caused by the heating of the earth by the sun. The air directly above the ground becomes warm and starts to expand. As the air expands due to heating, it becomes less dense than surrounding air causing it to rise. This air will continue to rise until it has reached an equilibrium temperature based on the surround air. "The latent heat released within the Cumulus is how the cloud grows vertically. It gives the air added lift and is why the Cumulus has puffy mounds at its top."[2]

Typically a Cumulus mediocris cloud will continue to undergo convection and form into a Cumulus congestus cloud. If there is a great amount of instability in the atmosphere then this cloud type can even mature in a cumulonimbus storm cloud. The instability was not high enough on this day and thus a Cumulus congestus cloud was not observed.

The image shown in Figure 1 was taken using all natural light. The size of the field of view would have to be several hundred to a thousand feet wide. This cloud was a good distance away from where I was standing. The trees in the foreground are the width of a two lane street which does give some perspective to the size of the image. The focal length of the camera was set to 23.1 mm. The shortest focal length for the lens is 18 mm, so the lens was zoomed in some to eliminate distracting elements on either side of the street. The image was taken using a Pentax K2000 DSLR that was set to aperture priority. The aperture was set to F/8.0. With the copious amounts of light available, the shutter speed was 1/2000s which allowed the image to be very well resolved in both time and space. Good lighting conditions such as this allow for the sensitivity to be set low, thus it was set to ISO 200. The original image was 3872 x 2592 pixels, but this was cropped down slighting in post processing to a size of 3576 x 2464 pixels. There was some contrast enhancements made to bring out the details in the cloud. Also to the lower portion of the image, there was a street light that was removed since it was distracting. The street pole is still visible, but the lamp is no longer in the way.

I really like this image because it reveals the great texture and details on a cumulus cloud. The only thing that I dislike about this image is the distracting elements of trees and light post in the foreground. While these elements could be cropped out, I think it takes away from the magnitude and perspective of the cloud itself. An ideal location would to be above tree line or in a more open space where the cloud could be the entire focus. I think a time lapse of a swelling cumulus would be a really cool thing to do.

References

[1] NWS Internet Services Team. "Glossary - CAPE." *NOAA's National Weather Service*. 25 June 2009. Web. 04 Apr. 2011. <http://www.weather.gov/glossary/index.php?word=cape>.

[2] Pinney, Gavin, and Bill Sanderson. *The cloudspotter's guide: the science, history, and culture of clouds*. Perigee trade paperback ed. New York: Berkley Pub. Group, 2007. Page 39. Print.