Cloud One

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MCEN 5151

Introduction

The purpose of this assignment stemmed from the course's lessons on atmospheric conditions and specifically clouds. We were asked to capture and analyze a cloud formation captured between the beginning of the class (January 13, 2014) and February 19, 2014. The directions for clouds to capture were completely open-ended and allowed us to study many different formations before having to choose an image to capture. I took many different photos over the month period since Boulder often has highly varied cloud formations due to the close proximity to the mountains. Eventually, I saw the perfect cloud to capture during an unusually warm January day. The cloud captured can be seen on the title page.

Image Circumstances

The captured image was taken on January 26, 2014 at approximately 1:30 PM. I was driving my mother to the airport for her flight when I noticed the quite unusual cloud. We were driving along highway E-470 eastbound near Brighton, Colorado. As I had never seen a cloud like this, I decided to pull over and try and capture a decent image of the cloud. As seen in the image, the cloud is quite large and fills the majority of the southern sky. Due to the size of the cloud formation, the camera was held at a near horizontal orientation for capturing the image.

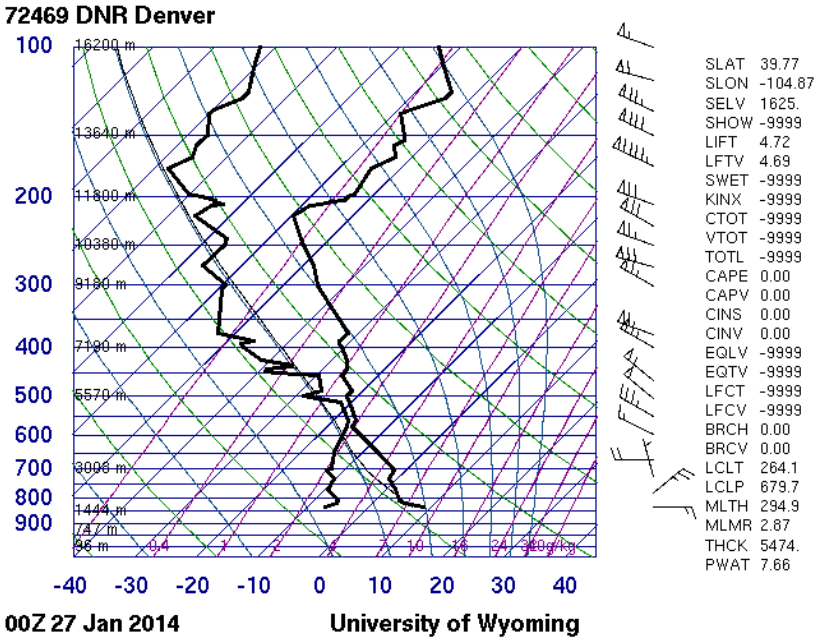

Figure 1- Skew-T diagram for 6pm MST on January 26 (Oolman, 2014)

Cloud Analysis

In order to fully analyze the clouds, there were many resources that were used in order to help determine the type of cloud that can be seen in the image. Due to the unusual formation, simply comparing with existing cloud pictures did not offer enough evidence to determine with a high amount of certainty. The resources I used to help identify including a skew-t diagram, cloud spotters guide, weatherspark.com, and information page about Foehn winds. The critical beginning to identifying the cloud formation began with looking at the skew-t diagram seen in Figure 1. As we can see, the CAPE is zero that indicates a stable atmosphere. Also seen in the diagram, the dewpoint line (left black line) nears the temperature line (right black line) at approximately 6000m-7000m. This is the altitude most likely to produce clouds since the dewpoint temperature is near the actual air temperature. So from this sounding, we can determine that the atmosphere was stable and the approximate height of the clouds for the day. In order to further determine the cloud height, I used weatherspark.com to determine the cloud

height. This was mainly to ensure no major changes had occurred from 1:30pm to 6pm wen the weather balloon was launched for the skew-t diagram. Interestingly, the cloud cover did change significantly from 1:30pm to 6pm as seen in Figure 2. These two pieces of data do show a rather significant difference and yet make sense as there was a major cold front that moved in with precipitation around 7pm. Using the weatherspark information, I began to cross-reference the cloud height data and with types of clouds that form at around 6000 ft (the lowest black line in Figure 2). After performing this cross reference, I found that Stratocumulus clouds usually form below six thousand, five hundred feet making them the most likely type of cloud (National Weather Service, 2011).

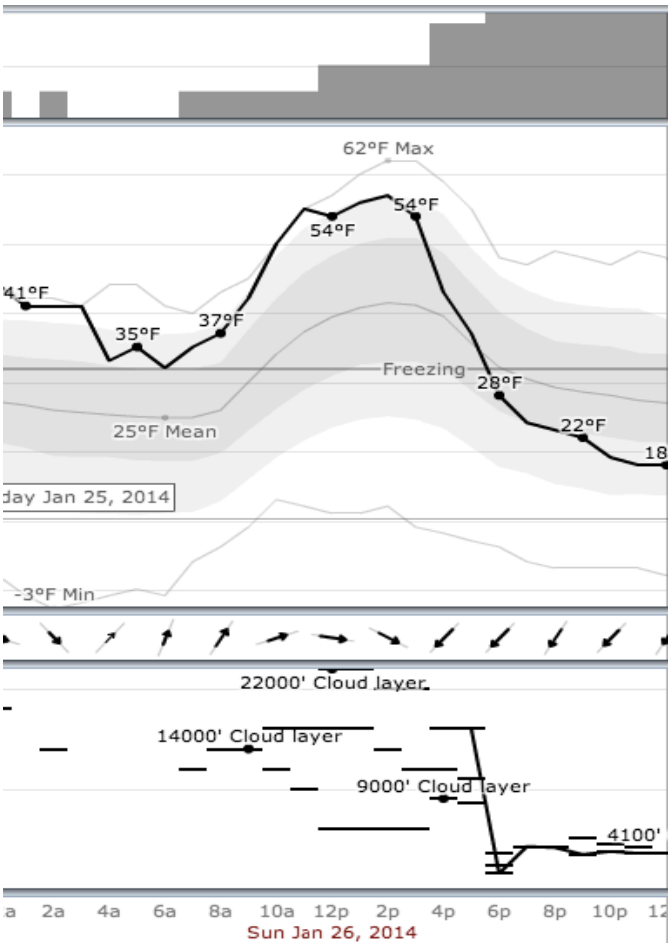

Figure 2 - Weatherspark screenshot for January 26 (Diebel & Norda , 2014)

After continuing my research on Colorado weather patterns, I found that a significant amount of the cloud formations were due to Foehn (or Chinook) winds. These winds are created when moist air encounters a mountain barrier. As the air is forced upslope, the air becomes more and more saturated creating clouds. With the moisture now trapped in the clouds and the air beginning to pass the ridge, dry air begins to descend again. With less water in the air, the temperature can increase faster thus resulting in dry, warm winds (Ka-hon, 2012). Due to the unusually warm day and windy that we were having on January 26th, I knew that we were experiencing these Foehn winds. Since the Foehn winds deposit most of their moisture into clouds at the ridgeline, the clouds form have a very unique formations known as Lenticularis clouds. After continuing my search for Stratocumulus Lenticularis clouds, I found that many images looked similar to the cloud formation (see Figure 3) that I captured leading me the conclusion that I had chosen the correct cloud formation.

Figure 3 - 3rd Part image of a Stratocumulus Lenticularis (Djclimber, 2008)

Capturing the image

Since this image was captured at the spur-of-the-moment, I was not as prepared as I would liked to have been. As a result, I had to use my IPhone's camera. While it does not take completely awful images, it was far from ideal. The camera's settings were automatically determined with the software and are as follows: Focal Length 4.2mm, f-stop 2.4, ISO 50, Exposure 1/9091. These settings were used to produce the photo seen in Figure 4. The

Figure 4 - Original Pre-processed image

field of view for this photo is somewhat difficult to determine due to the large variation between the foreground and the background. The mountains can be seen in the distance and span for more than 30 miles. The subject of the image, the cloud is more than likely about two miles across and takes up the full frame. The cloud was approximately four miles from where the image was taken. After taking the image, a small bit of post processing was used to liven the colors and increase the contrast. I started by adjusting the exposure levels to make sure that there were no areas that were completely over exposed. After this I increased the blue of the image to help enhance the true color of the captured sky. Finally I removed a few road signs that were in the image. Other than these small changes, the image remained original.

Final Thoughts

While I was not thrilled to be capturing the image with my iPhone, I am extremely happy that I was able to capture such a unique cloud. The cloud captured combines many different weather patterns that are often seen thought Colorado. I really love the contrast that I was able to capture within the cloud with the deep greys to the bright whites while not washing out the image. In addition, due to the fact that I was shooting with the sun close to the cloud, I am glad that I was able to actually capture an image that was not completely washed out. The one thing that I wish had been removed from the image was the iridescence that was captured by the curvature of the lens. While I like the sun being in the image, I would have enjoyed having a cleaner capture of it. Overall, I am happy that I was able to capture a mountain wave cloud that displayed unique characteristics. This project encouraged me to always try and notice the amazing weather patterns overhead. I captured many other images besides my final and noticed many new phenomenon discussed during the lecture. It was great to have a project that tied in directly with the lecture material.

Works Cited

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