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MCEN 4151

Clouds Assignment 1

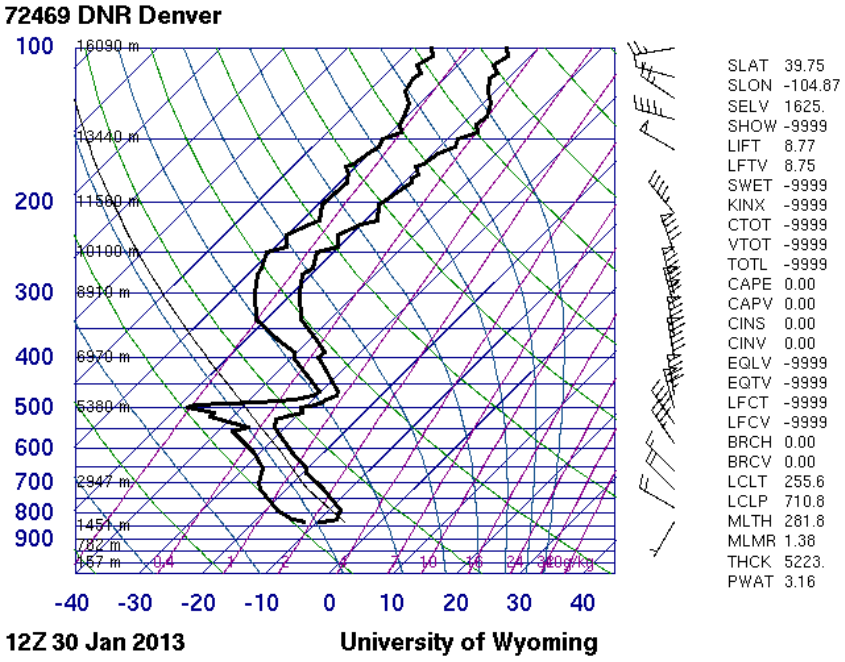
Professor Hertzberg

This picture was the first cloud assignment we had for the Flow Visualization class. The purpose of this was for us to observe clouds in our everyday and life, while also exploring the physics and fluid dynamics that develop unique characteristics of clouds. My original intent for this photo was to capture a multitude of different types of clouds in one image. Different clouds are formed at different elevations. In addition, weather, atmospheric stability, and even terrain can affect the formation of different clouds. I believe Colorado, and Boulder in particular, is the perfect setting for observing different cloud types. In my final photo, I ended up cropping out a small section of my original photo to display what I thought were the most intriguing clouds. The original photo can be seen below:

This image was actually taken South of Denver near my parent's house in Highlands Ranch, CO. The angle that this photo was taken is approximately 50 degrees from the horizontal and is facing West. This was taken on January 30th at approximately 4:30pm. For the original image, I choose to use a large field of view to capture as many cloud types as possible in one image. However after examining the images after the fact, I decided I liked a particular portion of the picture better than the rest. My final submitted image can be seen below:

This final image has some interesting cloud formations that don't necessarily look like clouds, which is why I choose to crop it this way. There appears to be some Cirrocumulus stratiformis. Those clouds are found at relatively high altitudes and are characterized with thin layers and often have spaces or rifts between the layers (Pretor-Pinney). This can be observed with the clouds in the upper right part of the image. If you look closely you can see some neatly arranged spaces in the cloud that almost look like the stripes on a zebra. I would estimate the elevation of these clouds to be approximately 20,000 feet. The other wispy looking clouds in the bottom right are believed to be cirrostratus and they appear to be a bit lower than the other

clouds. In general, these types of clouds are formed in a stable atmosphere (“Cirrus Cloud”). By looking at the skew-T diagram below, we will be able to determine the atmospheric stability conditions. The CAPE value of 0.00 translates into a stable atmosphere for Denver on the day of the photo. The chart also shows that clouds should be formed around 5500 meters which is approximately 18,000 feet, which is near the estimated elevation for these types of clouds. The weather was slightly cold the day or two before this picture was taken. There may have been a cold front on its way out, which might be observed in some of the darker cumulus clouds in the original image. Also, there appears to be some wind affecting the clouds which can be seen with some of the cloud lines and smaller wisps you can see forming on the edges of the clouds.



This photo was taken using a Sony Cyber Shot DSC HX30v, which is a small but powerful point and shoot camera. The angle of the shot and wide field of view were initially chosen to capture a wide range of clouds over a large portion of the sky. The final cropped image

was chosen because I felt it was the most intriguing part of the photo. Additionally, I brightened the photo and increased the contrast to try to bring out some of the details in the clouds. Specifically, I wanted to show the breaks in the layers of the Cirrocumulus stratiformis clouds.

It was a fun and rewarding experience to observe the beautiful cloud formations here in Colorado. I am very satisfied with my final image. I think it displays some unique detail of clouds that ordinary people may not notice on a daily basis. I may have been able to produce a better photo if I had seen some of the smaller cloud details with my naked eye. This assignment has taught me how interesting the science of clouds is and how complex the fluid dynamics can be at such high altitudes.

References

"Cirrus Cloud," Wikepedia, the Free Encyclopedia, March 02, 2011, <http://en.wikipedia.org/wiki/Cirrus_cloud>

Pretor-Pinney, Gavin, and Sanderson. The Cloudspotter's Guide: The Science, History, and

University of Wyoming College of Engineering, Department of Atmospheric Science, "DNR Denver SKEW-T," 00Z 26 Feb 2013, <http://weather.uwyo.edu/upperair/sounding.html>