MCEN 4151: FLOW VISUALIZATION

Colorado Clouds

Cloud 1 Assignment

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The second assignment in the course “Flow Visualization” is The Photography of Cloud 1. For this assignment, each student is expected to take a photo of a cloud formation between the dates of January 10th and February 23rd. In my picture, I tried to capture a cloud with as much detail as possible.

My cloud image was taken on the western edge of Arvada, CO, near the intersection of Colorado 93 and W 64th Parkway on January 21st, 2012, at 3:46 pm. The camera was facing northwest, and was 35 degrees from horizontal when the photo was taken. The surface weather at the time the photo was taken is shown in Table 1. There was no precipitation or unusual weather in the next couple days after the 21st, although it was consistently windy.

Table 1: Weather in Arvada, CO, on 1/21/12 at 4 pm[1]

Temperature	59 degrees Fahrenheit
Wind	8.1 mph North
Precipitation?	No

There are three types of clouds in this image, the main cloud in the center of the image, the high clouds covering the top of the image, and the collection of clouds near the mountains. In order to determine the types of clouds which are present in the image, information is needed as to what is happening in the atmosphere. Skew-T plots are graphs which show the wind and temperature as a function of altitude, as well as some other many other interesting but less useful pieces of information. The skew-T plot for Denver, CO, on January 21st at 5pm, is shown in Figure 1.

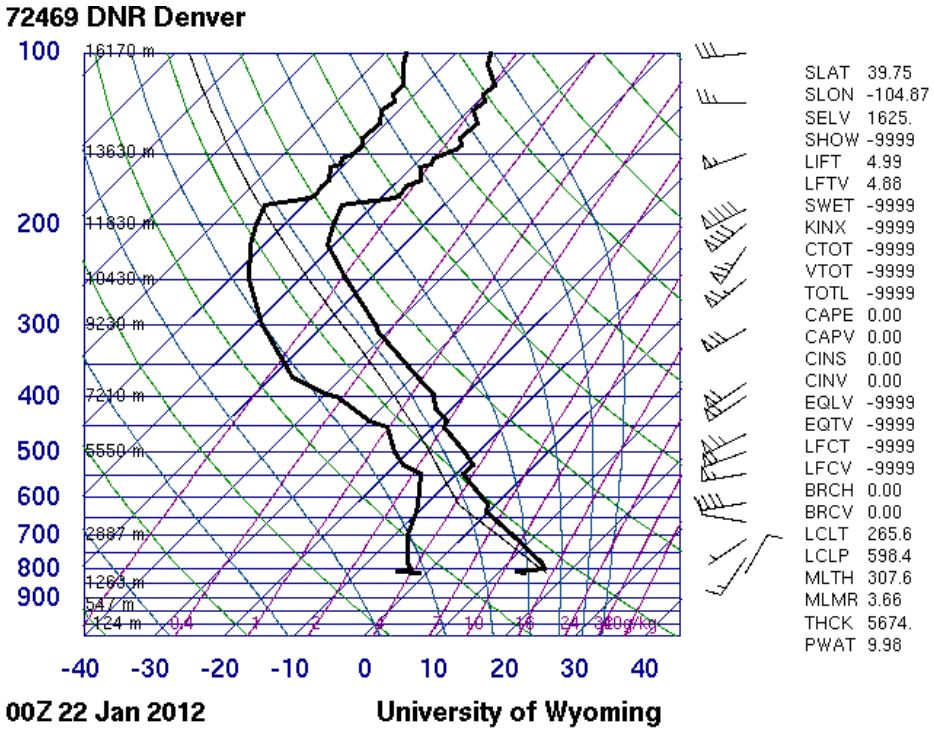

Figure 1: Skew-T Plot for Denver, CO on 1/21/12 at 5pm[2]

The right most dark black line is the temperature in the atmosphere, and the left most dark black line shows the dew point temperature. When these two lines come closer together, the likely hood of a cloud increases as the moisture in the atmosphere is more likely to freeze into a cloud. The two points at which the lines come closest together, and is therefore most likely to be the altitude which contains a cloud, is at 4880m and at 12700m, which is compared to sea level, or 3280m and 11100m from ground level as the photo was taken at an altitude of about 1600m. The other important number in this diagram is the cape number, which in this case is 0. This means that the atmosphere is stable. For the highest set of clouds covering the top of the image, knowing that the atmosphere is stable and the altitude that they were most likely located, 11100m, these clouds can now be guessed to be stratocumulus clouds, although they would need to be viewed more clearly to confirm this. The cloud type can also be guessed for the main cloud in the center of the image. Knowing that the atmosphere was stable, that the clouds were most likely located at 3280, and the large fluffy appearance of the clouds, this cloud is most likely a stratus cloud. Finally, the clouds near the mountains are mountain wave clouds, which are clouds created by the winds coming over the mountains. This wind can be seen in the skew-T diagram, which shows them blowing to the west. These mountain wave clouds are common over the mountains.

This photo captures approximately a 15 degree angle of view, and a field of view of 5000 meters. This picture is a panorama created with two images. These images were stitched together using Photoshops panorama tool. A panorama was required due to the lens which was available, which was not short enough to capture the entire cloud. The camera specs and settings are shown in Table 2.

Table 2: Camera Specs and Settings

Camera Body	Canon Rebel T2i
Camera Lens	50mm
Aperture	14.0
Shutter Speed	1/2500
ISO	400

The photo was digitally altered in photo in other ways too. The brightness was decreased and the contrasted was increased to bring out more detain in the photo. The photo was cropped to being the focus onto the large central cloud. The initial images were shot in raw and the pixel sizes of both images were 3456 x 2304 pixels. The final image has a pixel size of 4138 x 2113 pixels.

I feel that this image shows a typical cloudy day in Colorado. I like that I was able to capture multiple layers of clouds. If I could retake this photo, I would try to capture even more data and perhaps try to add more contrast to the image.

References

[1] WeatherSpark. "Weather Graphs and Maps, in Arvada Colorado." *WeatherSpark.com*. NOAA. Web. 28 Feb. 2012.

[2] University of Wyoming. "Skew-T: 72469 DNR Denver." Http://weather.uwyo.edu. University of

Wyoming. Web. 28 Feb. 2012.