Project 5: “Clouds 2”

MCEN 5151 – Flow Visualization
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1.0 Introduction

This report focuses on the second cloud assignment for MCEN 5151 – Flow Visualization (Flow Vis), spring 2013. The clouds assignments are designed to photograph atmospheric phenomena, and then comparing the pictures to correlating atmospheric readings. Following lessons learned from the first cloud project, special attention was given to lighting and focus while taking photographs. The final photograph was comprised of stratocumulus clouds that formed off the Flatirons in Boulder, CO, and is shown on the front cover of this report and in Section 4.0.

2.0 Photograph Timeframe

The final photograph was in North Boulder, Boulder, CO facing northwest. The time and date of the photograph was March 15th, 2013, 15:00 MST, or March 15th, 2013, 21:00 GMT. At that specific time, the temperature was 72 ^{O}F, and a western wind was recorded at 9 mph for the northwest.[1] The clouds were taken approximately 70^{O} from the horizontal plane, and were between 6,500 and 10,000 feet above sea level.

3.0 Atmospheric Determination

The clouds in the final photograph are primarily stratocumulus clouds. The sun was slightly offset and behind the cloud, giving them a dark underside. The clouds' relative size in the sky was roughly equivalent to a hand. These two traits are indicative of stratocumulus clouds.[2] Similar clouds could be seen throughout the very blue sky, particularly farther to the northwest along the Front Range.

Looking at atmospheric conditions, weather was very cooperative in the days surrounding the photograph. Days prior to March 15th saw a steady increase in temperature, which peaked on the 15th. The following days only saw highs in the 50's, but no appreciable precipitation. While rain was predicted for the weekend, the weather did not break that much. However, the winds increased in speed during these days, leading to precipitation around March 20th.[1]

A Skew-T diagram also does an excellent job of exhibiting atmospheric conditions. As Skew-T diagrams are recorded in GMT, the closest diagram for Friday, March 15th , 2013, at 15:00 MST (21:00 GMT), would be the Skew-T for Saturday, March 16th, 2013, at 00:00 GMT:[3]

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[1] Taken from WeatherSpark beta, April 17th, 2013; *www.weatherspark.com*

[2] Pretor-Pinney, G. *The cloudspotter's guide: the science, history, and culture of clouds*. New York, NY: Perigee, 2006. Print.

[3] Taken from the University of Wyoming, College of Engineering, Department of Atmospheric Science site *http://weather.uwyo.edu/upperair/sounding.html*

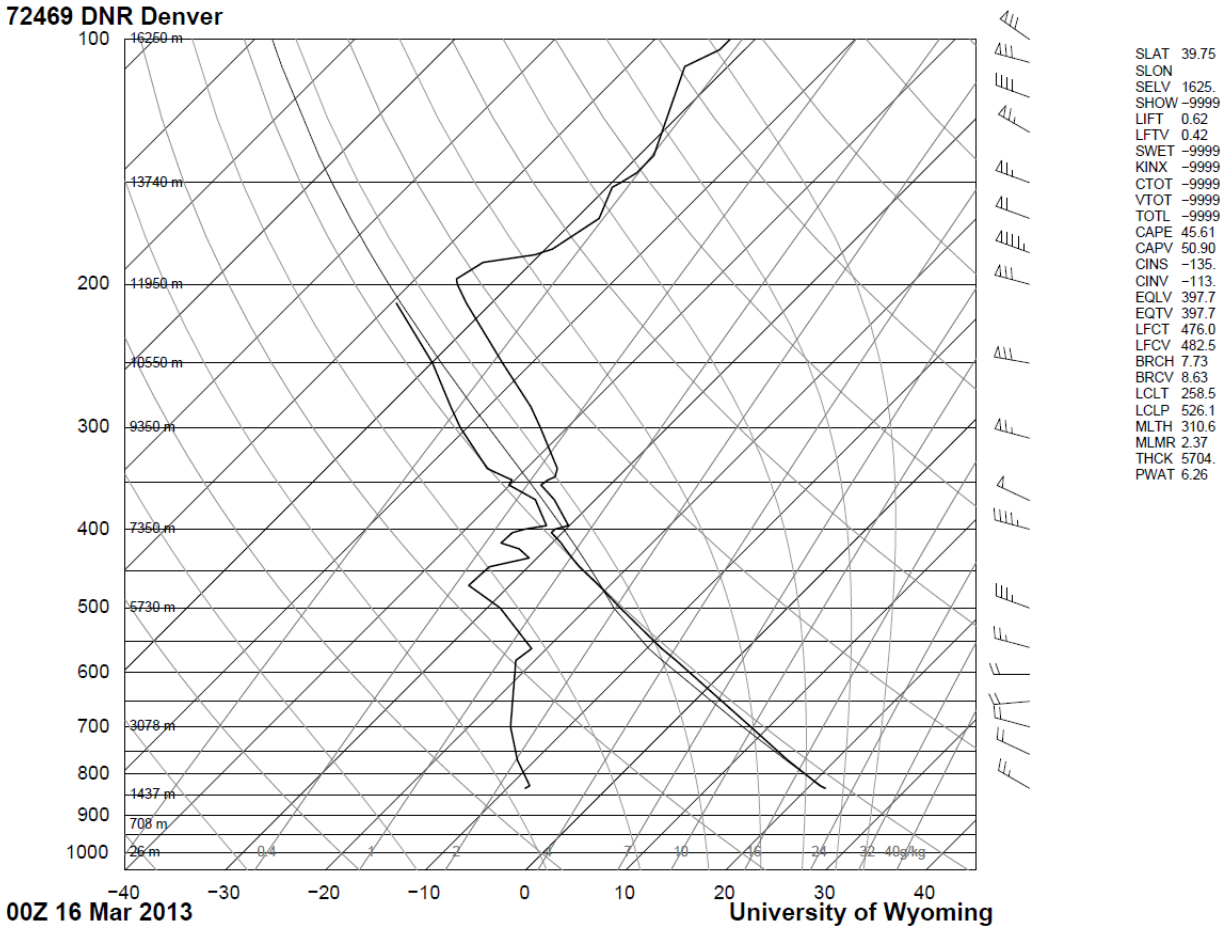

Figure 1: Skew-T Diagram for 15:00 MST, March 15th. 2013 Timeframe

Looking at the Skew-T's CAPE value, which was taken a few hours past the time of the photograph, the atmosphere during the photograph was becoming highly unstable. The stability is also shown by raising a parcel of air to cloud height. Looking at the adiabat (light black, smooth curve) line, the parcel of air would experience cooler temperatures and desire to return to its original location. The temperature and dew point lines draw together closely around 24000 feet, but do not cross, which would indicate precipitation occurring.

4.0 Photograph Specifics

The final photograph was taken with the Olympus Stylus XZ-2 digital camera. A 1.0x zoom was used, and the focal length was 16.7 mm (78.0 mm – 35mm equivalent). The shutter speed was 1/800 sec, the aperture size was F8.0, and the ISO was set at 250. The original image was 3968x2232 (16:9 ratio) pixels and taken in .JPEG format; it is shown in Figure 2.

Figure 2: Original/Final Image

From previous lessons learned with the first Clouds project, the white balance was customized to 5600K. As a result, the histogram appeared well-centered, and it was decided that post-processing was not necessary. This also included leaving the trees around the edge of the photograph to frame the clouds. The final image is in .TIF format, but was otherwise identical to the photograph shown in Figure 2.

5.0 Conclusions

Although it was predicted that the weather on the 15th was to be nice, the fullness of the clouds during the afternoon were still surprising. The clouds on that day were quite impressive, and they resulted in some excellent images. From the set, this particular photograph was chosen because of the framing created by the trees and the formation of the jet contrail, which is always an interesting sight to see. The contrail suggests much cooler temperatures in the upper regions of the atmosphere, despite the near-balmy March conditions on the ground.

This photograph was the best project capture to date. Previous lessons about choosing the correct, aperture size, shutter speed, ISO, and white balance were all taken into consideration, which resulted in an excellent picture (for this beginner). As a result, the photograph did not seem to require the normal base-level editing, with editing considerations only necessary from an artistic standpoint.

6.0 References (Re-listed)

1) WeatherSpark beta – Data taken for March 15th, 2013, 00:00 GMT

2) Pretor-Pinney, G. *The cloudspotter's guide: the science, history, and culture of clouds*. New York, NY: Perigee, 2006. Print.

3) University of Wyoming, College of Engineering, Department of Atmospheric Science site *http://weather.uwyo.edu/upperair/sounding.html*