Cloud 1 Report

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Assignment: **Cloud 1**
Course: **MCEN 5151, Flow Visualization**
Date: **October 24, 2022**
Cloud Type: **Cumulus & Stratocumulus**
Image Time Stamp: **August 27, 2022 16:23 MST**
Image Location: **Chautauqua Park Boulder, CO (39.9992° N, 105.2815° W)**

Figure 1, Image taken of Cumulus Clouds in Boulder, CO on August 27, 2022

Introduction

The image above in Figure 1, was taken for the First Cloud project in the MCEN 5151, the Flow Visualization course at the University of Colorado, Boulder during the Fall 2022 semester. The purpose of Flow Visualization is to capture and observe fluid phenomena while exploring the interface between art and science [2]. The image in Figure 1 depicts Cumulus and Stratocumulus clouds in Boulder, Colorado

on August 27, 2022. Cloud pictures were taken for this assignment over the course of 2 months to capture common cloud phenomena that occur daily in Colorado. The image in Figure 1 was chosen because it depicts the mountain environment and clouds as a whole. The intent of this image was to capture what a common, busy sky of clouds looks like from a higher vantage point, Chautauqua Park.

Image Circumstances

The image in Figure 1 was taken at 39.9992° N, 105.2815° W, otherwise known as Chautauqua Park in Boulder, CO. The photo was taken on the Flatirons Trail at about 6,000 feet elevation, part way up the mountain. The camera direction was facing North and about 10 degrees above the horizon in order to make the clouds the main subject in the frame. It was 4:26 PM Mountain Standard Time on August 27, 2022 when the photo was taken.

Cloud Information

The image in Figure 1 depicts Cumulus clouds with some Stratocumulus in the sky as well. Below is the Skew-T Plot from the Grand Junction weather station on the University of Wyoming website for atmospheric data.

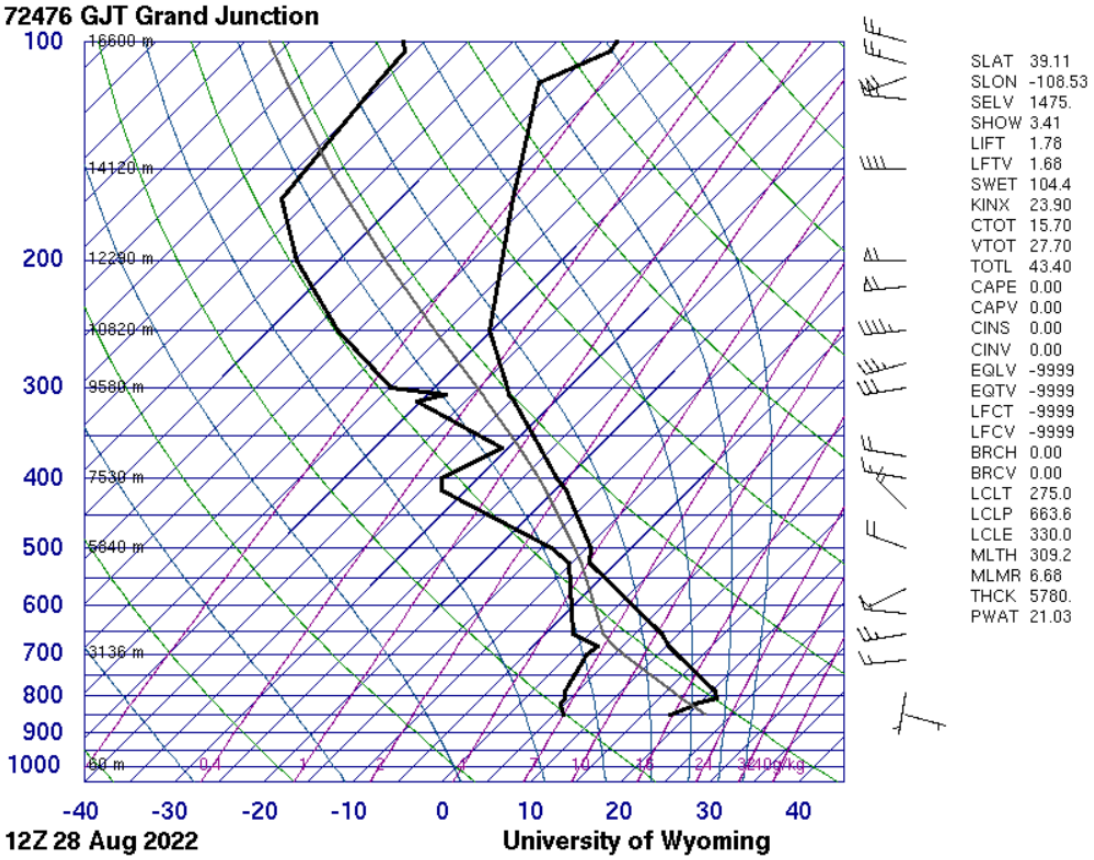

Figure 2, Skew-T Plot for the Time of Image in Figure 1 from University of Wyoming

The Skew-T plot above in Figure 2 shows that on the day of the image clouds formed at about 5500 meters, or 18000 feet. With the elevation of the image at 6000 feet, this means the clouds on that day were about 13000 feet above the ground. Cumulus clouds commonly occur at around 6000 to 15000 feet, aligning with the image and the Skew-T chart from that day. There was no precipitation that day, before or after the time that the image was taken. The wind was relatively mild for that day, and there was no

front incoming for that time as well. The clouds around that time were similar the day before and after, very common for summer weather in Boulder. The rest of the sky was a similar bright blue and partly sunny with Cumulus clouds. Cumulus clouds are formed due to the air heated from the surface of the Earth and water vapor condensing into a cloud [1]. Clouds stay formed and in the sky due to the wind and subsequent lift, upward force, it provides to keep condensed water vapor suspended in the air.

Photographic Technique

This photo was taken with an iPhone 12 Pro digital camera using 1.0 times zoom. Estimating with a cloud elevation of about 10,000 feet, the distance from a center cloud (object) to the lens is about 12,000 feet. The ISO, Shutter Speed and Aperture are automatic for the iPhone Camera and estimated to be about ISO 25, a 1/8000 shutter speed, f/1.6 aperture, along with a 26mm focal length. The original image, depicted in Figure 3 below, was shot at 4032 by 3024 pixels while the final image was cropped down to 1300 by 900 pixels. The processing applied to this image was to make the RGB curve into an S shape, adding contrast, cropping, sharpening, and some rotational correction.

Figure 3, Original image of image in Figure 1

Image Conclusions

The image in Figure 1, the final image, reveals a beautiful mountain landscape with an abundance of well formed Cumulus clouds. I really like the contrast of the foreground versus the background and the way the Cumulus clouds stretch the length of the photo. I believe the fluid physics are shown as the flat bottom of the clouds are depicted well which shows the lift from wind and how the water vapor is

suspended in the air, the very essence of a cloud. I wonder about how the horizontal wind from the mountains affect the formation layout of the clouds. I would love to develop this idea and image more into a photo of Cumulus clouds in the same location but at night time. I think a night with well developed clouds and bright moonlight would add another layer of mystery and beauty to this image.

References

[1] “Cumulus Clouds.” *Met Office*, https://www.metoffice.gov.uk/weather/learn-about/weather/types-of-weather/clouds/low-level-clouds/cumulus#:~:text=All%20cumulus%20clouds%20develop%20because,eventually%20form%20into%20cumulonimbus%20clouds.

[2] Hertzberg, Jean. “SYLLABUS MCEN 4151/5151/ FILM 4200/ ARTF 5200/ ATLS 4151/5151 Flow Visualization: The Physics and Art of Fluid Flow Fall 2022.” *FLOW VISUALIZATION A Course in the Physics and Art of Fluid Flow*, 18 Aug. 2022, https://www.flowvis.org/wp-content/uploads/2022/08/syllabusF22.pdf.