CLOUDS FIRST

MCEN 5151 Flow Visualization

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Cloud Type: Altocumulus Cloud

Photo Taken: 30 September 2023 @ 0647

Location: Mt. Bierstadt Trail, Guanella Pass, Colorado

PURPOSE/BACKGROUND

The purpose of this assignment was to capture the fluid physics that formulate with clouds in the atmosphere from the beginning portion of the Fall 2023 Semester, beginning August 28th until October 20th. The cloud image could be taken on any date or time, at any location. My artistic intent was to find a unique cloud formation at either sunset or sunrise, as those are two of my favorite times of days to be out hiking and when I find myself mostly looking up in the sky anyways. I appreciate a good color variation of a sunrise/sunset and hoped those colors could be reflected into the photo as well. I did not have any scientific intent behind this photo as I did not know much about specific cloud formations at the beginning of this semester.

IMAGE DESCRIPTION

This image was taken along the beginning portion of the Mt. Bierstadt trail, one of the Colorado 14er mountains, in Guanella Pass near Georgetown, CO at 0647 on September 30th, 2023. The elevation of the site of the photo was approximately 11,500 ft. The camera faced South/Southeast at an angle of about 20 degrees above the horizon.

CLOUD DESCRIPTION

The clouds depicted in this image are altocumulus, and to a non-engineering eye these clouds look like some delicious cotton candy. According to NOAA, altocumulus clouds are “white and/or gray patchy sheet, or layered clouds generally composed of laminae (plates), rounded masses, or rolls” (Commerce, 2023). As defined by UCAR, Center for Science Education, “altocumulus clouds are about as wide as your thumb when you hold up your hand at arm’s length” (Altocumulus clouds, n.d.) The thumb trick worked while in observation on the date of this photograph, which helped to identify the cloud type on site. This cloud was a standalone cloud seen throughout the sky that morning; this characteristic can be typical of altocumulus clouds which are very common mid-level clouds. As the morning progressed a layer of wispy cirrus type clouds rolled through over the mountain as well as a few more altocumulus clouds scattered throughout the sky. The clouds were similar in appearance the day before, which I particularly noted as I camped the night of September 29th in Guanella Pass. The sun was shining and there was no precipitation for multiple days preceding the date this image was taken. One area to note is the wind exhibited during the day of the photo; as we continued to hike and gain elevation the winds significantly increasing to what I would estimate to be around 20-40 knots, also confirmed on the skew-T plot below by the wind vectors on the right side of the plot. The cloud pattern changed, as mentioned before, which I think could be contributed to the winds and the warming of the ambient air temperature throughout the morning. The conclusion of this image’s clouds to be altocumulus is also supported from the Skew-T plot, Figure (1), pulled from the Grand Junction station in Colorado on September 30, 2023 at 12Z. (Oolman, n.d.)

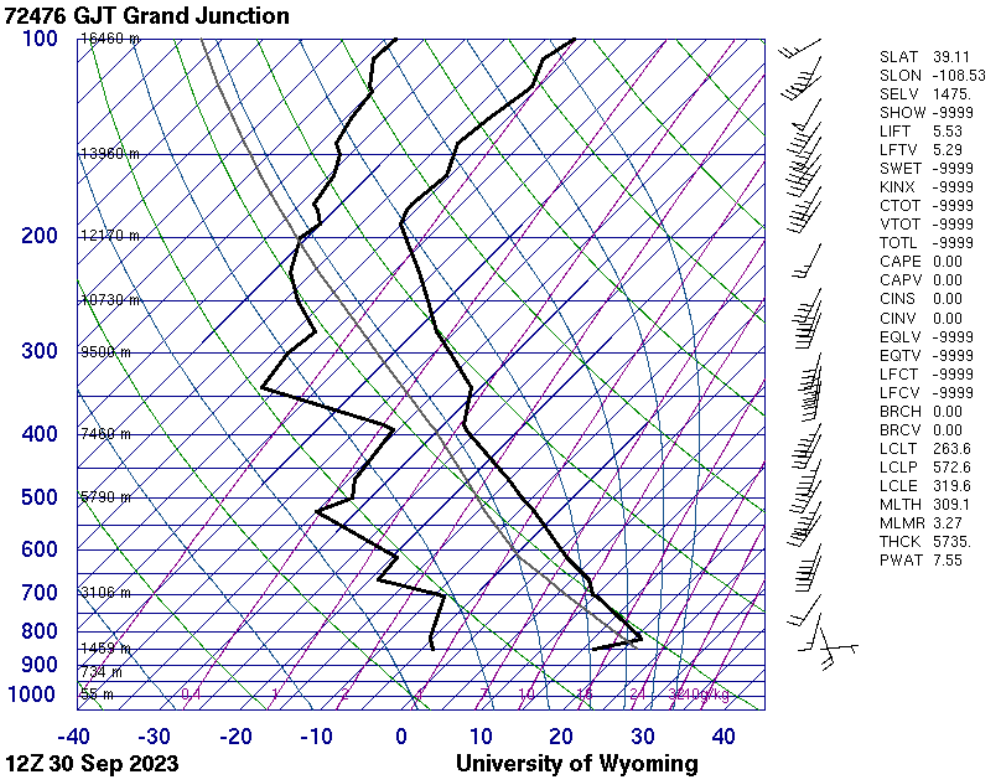

Figure 1: Skew-T Plot; Grand Junction, CO Station on 30 SEP 2023 at 12Z

The atmosphere was very dry which is indicated by the large separation between the leftward dewpoint line and the rightward temperature line; this observation concurs with what I experienced while camping on Guanella Pass for a couple nights with no precipitation. (Hertzberg, 2023) To identify the type of clouds depicted in an area from the skew-T plot, I looked at the section of the plot where the dewpoint and temperature line, left and right plot respectively, were the closest to each other; at this point one could expect there to be cloud formation. (Hertzberg, 2023) According to this skew-T plot, the closest regions occur at around 3,000 m and 7,500 m; however, this plot is relatively consistent throughout the elevation variance. Altocumulus clouds are typically located between 2,000 m and 6,000 m. (Bramer, Wojtowicz, & Hall, n.d.) This weather pattern is a stable atmosphere, as the moist adiabat is less steep than the temperature line indicating a stable system. (Hertzberg, 2023) Additionally, the convective available potential energy (CAPE) is equal to zero according to the skew-T plot which also proves this atmospheric system is stable; this also concurs with the relatively consistent difference between the dewpoint line and the temperature gradient line. An area to note is the distance from this skew-T plot location and the site of the photo. The station and the photo site were significantly far from each other and therefore, this distance contributes to a source of error for this cloud analysis.

Photographic Technique

Table 2 below indicates the type of camera and the characteristics of the image. I used the special apple feature of the 2x optical zoom in feature on the iPhone camera. (iPhone 12 Pro - Technical Specifications, 2023)

Table 1: Image Characteristics

Camera	iPhone 12 Pro 12 MP
Focal Length	52 mm
Aperture	f/2
Shutter speed	1/99
ISO	80
Other	Auto focus, no flash

The initial image size was 3024 x 4032 pixels for a total size of 940 KB. Figure (2) shows the initial image before any editing.

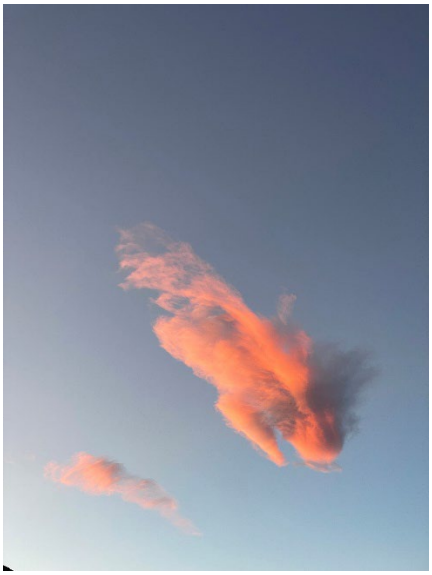

Figure 2: Initial Cloud Image

After editing Figure (2) in Darktable, a free software program specific to editing of photographs, the final image is displayed in Figure (3). Due to the initial uniqueness and coloration of the original photo, not much editing was necessary in Darktable. However, I did bring the green magenta contrast higher to bring out the starkness of the pink coloring. I altered the RBG curve slightly to achieve a more aggressive coloring as well. Lastly, to adjust the colors and bring out the pink while keeping the dark contrast of the black seen in the middle of the cloud, I adjusted the local contrast detail to 178% while also bringing the red input color calibration to the left, the green to the right, and the blue to the right as well. This allowed for the pink coloring from the sunrise to pop while also adding in the dark cloud tails off to the right of the main cloud. It was difficult while making color adjustments to ensure that the individual cloud features remained intact. The final image is 2604 x 2430 pixels for a file size of 4.2 MB. The only cropping of this image was done to remove the blue sky above the clouds to narrow the attention on the

clouds themselves. The final image selection shown in Figure (3) still brings out the features and fluid formation within the cloud.

Figure 3: Final Edited Cloud Image

CONCLUSION

I liked the final image of this cloud, especially because of the pink coloring. I like that the photo didn't require much editing to achieve the goal of a sunrise reflected cloud with bright colors. I think the contrast was articulately displayed throughout the cloud formation. Additionally, I liked how the fluid flow of the cloud features are shown naturally and only enhanced through the minor editing completed. Lastly, I think this photo turned out really unique because I was taking the photo from already a high altitude (approx. 11,500 ft) so the vantage point was different than a typical cloud photo taken a sea level or even in Boulder, CO which sits at around 5,300 feet. I think if I were to develop this shot again, I would like to compare a similar angle and spot of this photo throughout the year and analyze how the temperature and humidity gradients affect the cloud formations.

REFERENCES

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