

# **Clouds Second Report**

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Cumulus Fractus Clouds in Boulder CO

Taken 11/7/23 at 11:33 AM

**MCEN 5151 – Flow Visualization**

12/2/23

## Introduction

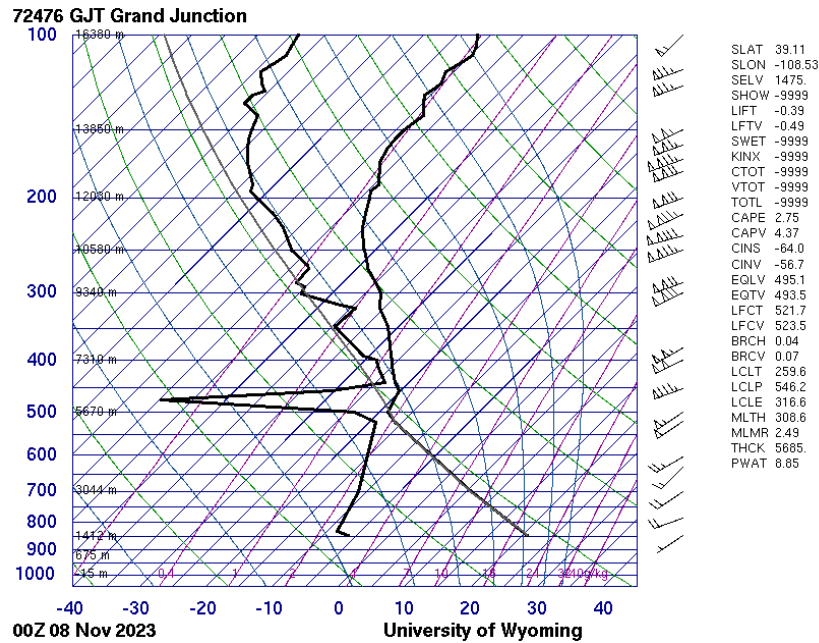
This image was captured for the first Cloud Image assignment for MCEN 5151. This is a Flow Visualization course at the University of Colorado Boulder. The goal of this course is to focus on making the physics of fluid flow more visible to the human eye [1]. The intent of this image was to capture a cloud phenomenon. After taking a variety of cloud pictures this semester, I found this picture taken on a beautiful sunny day to be my favorite. The cloud you see in the image above is a cumulus fractus cloud.

## Circumstances

This image was taken at the University of Colorado Boulder business field on 11/7/23 at 11:33 AM. The photo was taken by my Apple iPhone 14, and I was sitting on a bench. The approximate elevation was 5577 feet. I was facing approximately  $60^\circ$  W and  $60^\circ$  from the horizontal. Overall, it was a warm and sunny day with temperatures around  $55^\circ$  F and winds at 10 mph E.

## Cumulus Fractus Clouds

Cumulus fractus clouds are a species of cumulus or stratus clouds with a fractured and shredded appearance. This cloud species is found in only low-altitude cumulus and stratus cloud types. The translation from Latin can be displayed as “Cu fra” which means broken. This broken appearance can be formed in two ways. First, if warm rain falls from slightly higher clouds, water evaporates from the raindrops. This causes too much humidity, forcing some of the water vapor to condense into tiny cloud droplets. Another way is if the air near the ground is humid but also cool. The humid air is forced upwards if the air is windy [2]. Based on the weather conditions that day, I believe the clouds formed because of the second method. The air was relatively cool, and the wind was high. As I sat and observed the clouds, I could see them moving rather quickly. The figure below shows the skew-t plot from Grand Junction, Colorado.



**Figure 1) Skew-t chart derived from Grand Junction, CO on Nov 8<sup>th</sup>.**

The Skew-t chart shows a CAPE of 2.75 which indicates rather low atmospheric instability. Generally, cumulus fractus clouds with a vertical extent may indicate the presence of elevated instability, especially in the morning [3]. However, these clouds seem to line up in a generally horizontal fashion which lines up with the chart. These clouds tend to line up in a row or street fashion, however I only captured one individual cloud. The cloud axes can indicate areas of moist air and clear zones between rows of drier air.

## Photograph Technique

This image was captured with my iPhone 14 camera. I used the standard settings on the phone camera. This includes a 26mm lens with an aperture of 1.5. The ISO was only 50 as it was very bright outside. The original picture was a 3024 x 4032. The original picture can be seen below. The field of view was around 210 degrees estimated.



**Figure 2) Original Photo**

I used Dark Table to edit the image. The first step I took was cropping the image to focus in on the cumulus fractus cloud. I wanted to remove the sun shining on the upper left-hand corner. I also edited the black and white relative exposure to make the clouds stand out more. A few more notable edits included sharpening and haze removal to make everything look a lot clearer.

## Conclusion

Overall, I believe I was able to capture a great image of some cumulus fractus clouds. I love the way the mountains are also visible in the image. The fluid physics shown line up well with the surrounding weather and atmosphere. I think the editing of the image also brought everything together nicely. Since it was quite windy and I could visually see the clouds moving, I believe a video would also capture a great representation of this.

## References

- [1] Hertzberg, Jean. "SYLLABUS MCEN 4151/5151/ FILM 4200/ ARTF 5200/ ATLS 4151/5151 Flow Visualization: The Physics and Art of Fluid Flow Fall 2023." FLOW VISUALIZATION A Course in the Physics and Art of Fluid Flow, 23 Aug. 2023, <https://www.flowvis.org/wp/content/uploads/2023/08/syllabusF23.pdf>.
- [2] "Learn about Fractus Clouds: Ragged, Broken Up." Whatsthiscloud, 16 May 2023, [whatsthiscloud.com/cloud-species/fractus/](https://whatsthiscloud.com/cloud-species/fractus/).
- [3] Cloud Classifications and Characteristics - National Weather Service, [www.weather.gov/media/lmk/soo/cloudchart.pdf](https://www.weather.gov/media/lmk/soo/cloudchart.pdf). Accessed 14 Oct. 2023.