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Clouds First
MCEN 4151
10/30/23

Stratocumulus floccus Clouds
September 4th, 2023 at 2:01 PM
University of Colorado Boulder Campus

Figure 1: Stratocumulus floccus Clouds Overhead

This photograph was taken for an assignment in the course *Flow Visualization* at the University of Colorado Boulder during the 2023 fall semester. The goal of the assignment was to capture a cloud formation that was interesting to the student and submit a picture with a description of why the cloud formed as it did in regard to the atmospheric physics and weather record. This cloud formation stuck out to the author for several reasons. First of all, the clouds are thick, yet one can see the contrasting dark blue sky behind the cluster. Secondly, the formation is blocking the sun and it is interesting to see the sunlight create an illuminating effect on the cloud formation in the upper left frame of the image. Finally, the specific type of formation that is shown was unknown by the author and more details were desired.

The author shot the image on the University of Colorado Boulder campus on September 4th, 2023 at 2:01 PM. The author's elevation was approximately 5,430 feet (1628 meters). The camera was pointed toward the northwest direction.

These clouds can be generally classified as stratocumulus. Specifically, the clouds can be thought to be of the floccus variety. A brief description of cloud physics, the weather report on September 4th and the Skew-T diagram can help support this fact. One reason clouds form

is because the air can only contain so much water vapor, which is in a gaseous state. This is called the saturation point. After this point, the water molecules emerge as visible liquid water molecules in the form of clouds. The saturation point is dependent on the amount of water vapor or temperature and pressure of the atmosphere. Cloud formation can happen in two different ways. These two ways are an increase in humidity or a decrease in temperature (1). When there is an increase in water vapor above the saturation point, evaporation occurs, and the moisture may rise due to atmospheric lift (1,2). When the temperature decreases, condensation occurs and the moisture is released as liquid water droplets, forming a cloud (1).

The weather conditions on September 4th were part of a cold front that occurred between September 1st to September 5th. On September 1st, the average temperature was 77.88 °F, while on September 5th, the average temperature was 65.92 °F (3). Cloud formation on this day can be partially explained by stating that with the decrease in temperature the moisture in the air saturated the air, leading to a cloud in that region of the atmosphere. Of course, the temperature obtained from the weather station would not be the same as the temperature of the atmosphere of the cloud's altitude, however one can still use this information for the cloud creation in conjunction with decreased temperature. Other atmospheric conditions during this time include an average dew point of 49.29 °F and a slight drop in pressure throughout the day. The atmospheric pressure at 5:56 AM was 24.84 inches of mercury (in-Hg), while at 1:56 AM it was 24.74 in-Hg. On September 3rd at 1:56 PM, around 24 hours before this picture was taken, the atmospheric pressure was 24.97 in-Hg. The decrease in pressure can also explain the cloud creation, as a decrease in pressure in the atmosphere can lead to lower temperatures and increase the likelihood of saturation of the atmosphere when the temperature decreases to the dew point temperature. At the time this image was captured there was wind blowing in the southwest direction at the elevation these clouds sat at. The atmosphere was stable with a CAPE score of 60.78 (figure 2). There was no precipitation on this day.

The cloud can be justified as being altocumulus for several reasons. First of all based on physical appearance, the clouds are fluffy and thick. They are also relatively low to the ground, seeming to be a low to middle altitude cloud formation (figure 1). Examining the Skew-T diagram in figure 2, cloud formation is most likely to occur at about 4000 meters (roughly 13,000 ft) above sea level. Given the fact that Boulder is at an elevation around 1655 meters (5,430 feet) above seal level, the altocumulus cloud would roughly 2345 meters (7694 feet) above ground level and would be in the 2000 meter (roughly 6,500 feet) to 6000 meter (roughly 20,000 feet) range that would classify it as a mid level cloud.

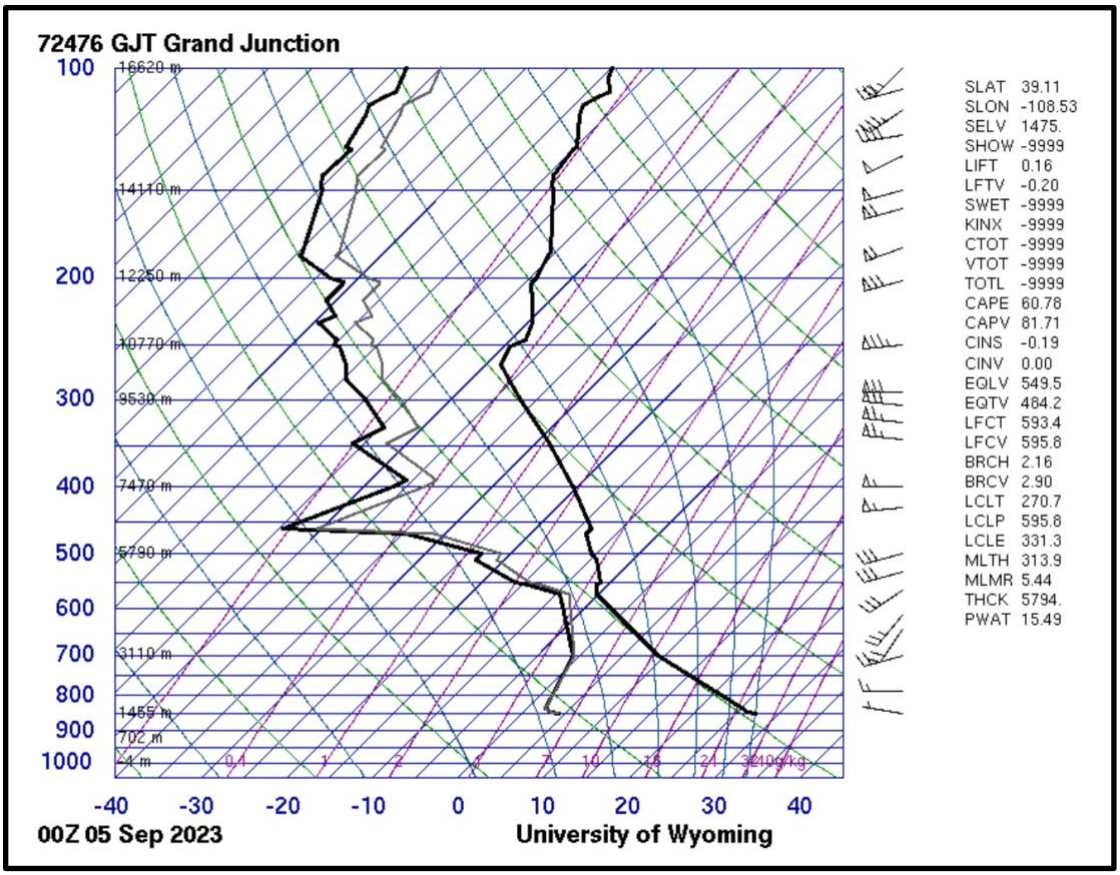

Figure 2: Skew-T Diagram

This image was taken with an apple iPhone 8. The automatic settings of the phone were used. After focusing on the sky the settings used were an ISO of 25, shutter speed of 1/16129 seconds, f-stop of 1.8, and a focal length of 28 mm. The image was manipulated with the program Darktable. There were multiple manipulations made with the image under the “color balance rgb tab”. The contrast was increased to darken the space between the clouds and to increase the darkness for the cloud in the foreground of the image. Within the perceptual saturation grading, Increasing the shadows and highlights settings brought out a stronger blue color to the photo. The unedited image is displayed in figure 3.

Figure 3: Unedited Image

This image reflects altocumulus cloud formation on an autumn day with a stable atmosphere and light wind. I enjoy this image because it shows a nice cluster of clouds with a break in the bunch to show the blue sky behind the grouping. My goal for the next cloud report is to walk around with my digital camera more often to capture clouds with the camera instead of my iphone. Through this project I have learned more about identifying different types of clouds, which has been very interesting and I would like to apply those skills to the next project as well to photograph a different species of cloud.

References

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