



Mechanical Engineering
University of Colorado Boulder

Cloud Second Report

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MCEN 5151 - Flow Visualization
Type of Cloud(s): Altocumulus Stratiformis
Date and Time: 11/01/2019 at 8:17 AM
Location: Denver, Colorado

December 2, 2019

Contents

Table of Contents	i
1 Background	1
2 Location, Date, and Time	2
3 Cloud Information	3
4 Photographic Technique	4
5 Conclusion	5



1 Background



Figure 1: Cloud second submission.

Figure 1 is the final photo submitted for the Cloud Second assignment. I took this picture on my morning commute from Denver to Boulder. My intention was to capture the thin globular-mass clouds that covered the sky at sunrise. Denver experienced light snow in the first 3 days of the week of 10/28 to 11/01. Also, the atmosphere experienced instability early in the week. It became more stable as the week progressed. I live in downtown Denver. This picture was taken while I was waiting for the FF2 bus from Denver to Boulder. I noticed the thinly clumped layer of clouds that covered the sky above me. The clouds rested against a radiant sun rise. It was a beautiful sight and I decided to capture these clouds for the second cloud assignment.

2 Location, Date, and Time

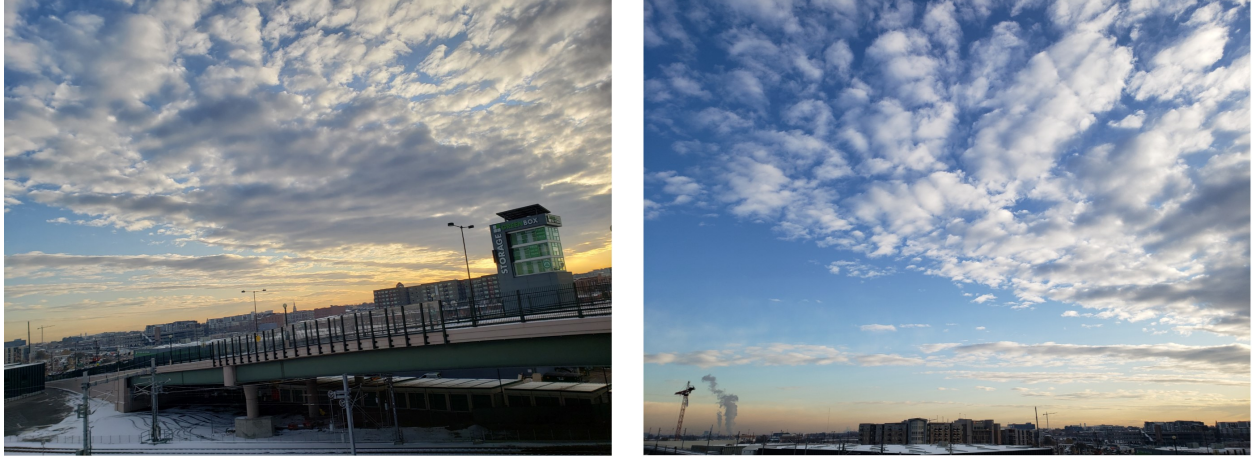


Figure 2: The same clouds in two different directions.

The pictures above were taken near my home in Denver. I was waiting for the FF2 bus at the intersection of Park Ave West and Delgany St heading towards Boulder. The image I submitted for this assignment was taken at exactly 8:17 AM on November, 01, 2019.

Denver sits at an elevation of 1,609 meters above sea level. The clouds in focus hovered 4,000 meters above me. The wind was blowing in the north-east direction. The camera was also facing in the north-east direction. I took the image at a 45 degree angle from the horizon.

3 Cloud Information

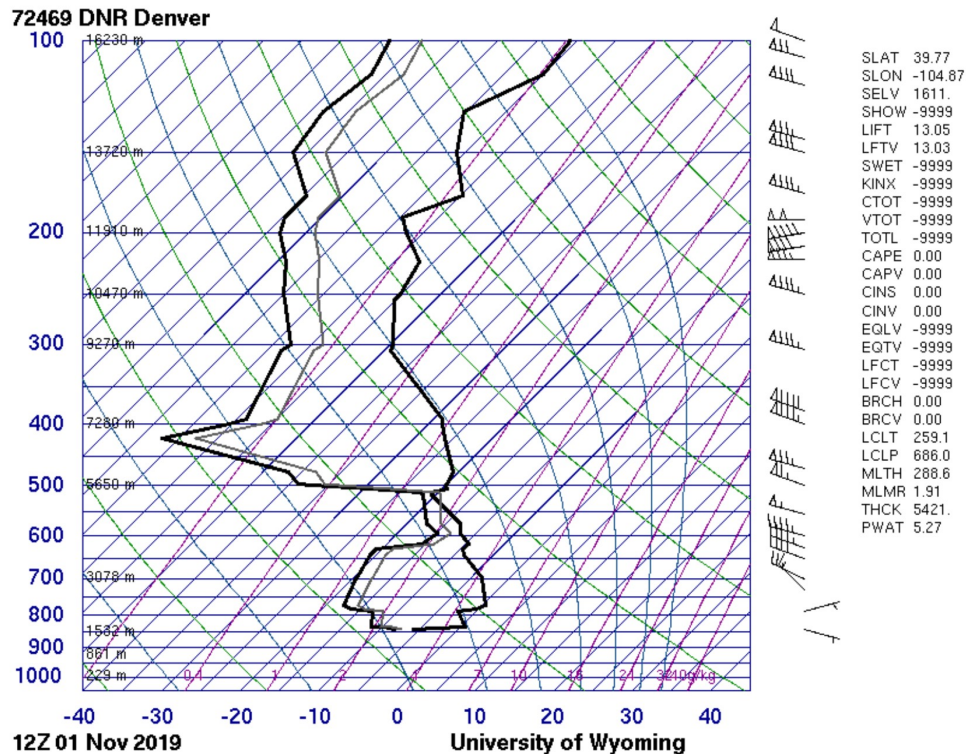


Figure 3: Skew-T Plot for 11/01/2019.

Light snow had fallen on the first three days of the week in which the final picture was taken. On Tuesday, the CAPE value reached 2.05; implying that the atmosphere had been unstable. But, on Thursday, the CAPE was 0.00, which means that the atmosphere had become stable again.

Figure 4 is the Skew-T plot for the day that my image was taken. The plot shows that, on the day my photo was taken, clouds were able to form at altitudes between 5000-5600 meters. Using the skew-t plot, we can explain this by looking at the distance between the dew point (thick black line on the left) and the temperature (thick black line on the right). As air mass rises, it tends to cool with increasing elevation. When the air mass reaches a temperature at which the atmosphere can no longer hold the moisture as water vapor, the air starts to condense. This leads to the formation of clouds. Referring back to the skew-t plot, we can see that the distance between the dew point and the temperature are closest at altitudes between 5,000-5,600 meters. At these altitudes, clouds were likely to form. Moreover, another important feature of the skew-t plot is the CAPE value. The CAPE value on this particular day was 0.00. This indicates that the air was unstable.

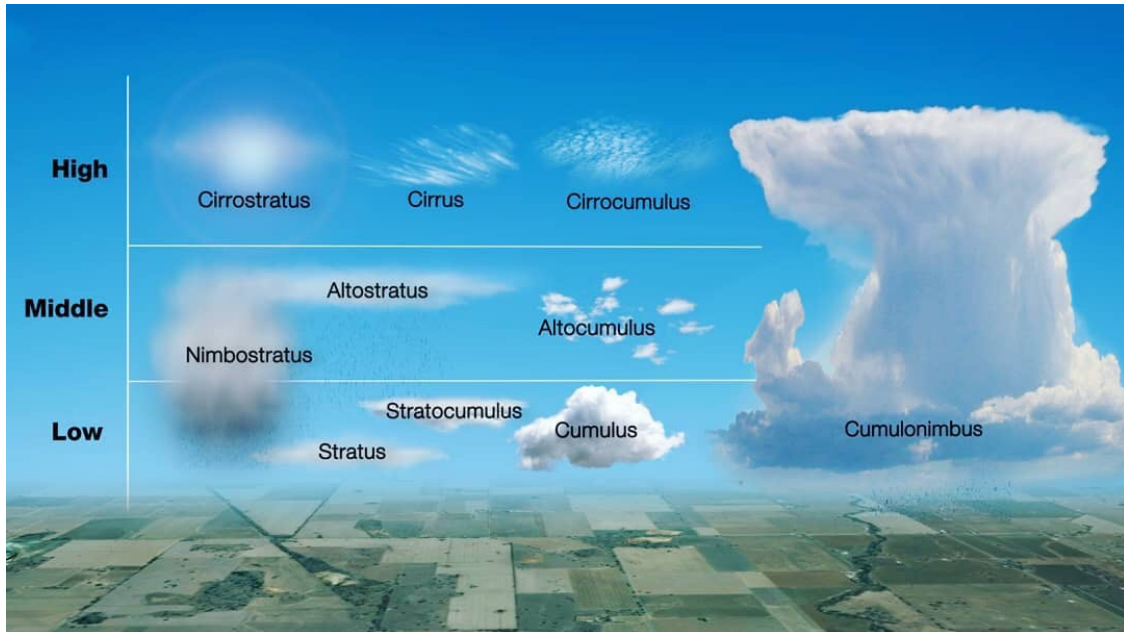


Figure 4: Cloud types.

My image captured altocumulus stratiformis clouds. Altocumulus stratiformis clouds are thin mid-level clouds. This cloud type occurs when atmosphere is changing from good weather to more unstable conditions, or vice versa. They are thin clouds and they appear in the form of sheets. These clouds are the highest form of cumulus clouds. Typically these clouds occur at an altitudes close to 2,000 to 6,000 meters. My image (Figure 1) and the information presented in the skew-t plot on the day it was taken match perfectly. The thin globular cloud in focus is a altocumulus stratiformis cloud. It is suspended at an altitude of about 5,600 meters (4,000 meters more than the elevation on which I was standing). The thin and clumpy clouds are broken into separate sheets due to the environment being conditionally unstable.

4 Photographic Technique

Table 1: Camera Properties

Property	Value
Camera Maker	Samsung
Camera Model	Galaxy S9
ISO	ISO-50
F-stop	f/2.4
Exposure Time	1/942 sec.
Flash Mode	No Flash
Focal Length	4mm

The field of view of the original image is 4032 x 3024 pixels. Denver is at 1,609 meters above sea level. The clouds in focus formed at around 5,600 meters. Therefore, I was standing at a distance of approximately 4,000 meters away from the altocumulus stratiformis clouds. Table 1 breaks down all the properties that I used to capture the original image.

Moreover, I used Photoshop to edit my image. I cropped-out part of the buildings at the bottom to make the image less distracting. Then, I used the magic wand to select the distracting elements (cranes, light poles, etc) and deleted them. Photoshop is able fill in the empty space from the deleted objects with the background surrounding it. Then I increased the contrast of the buildings to create greater contrast between the buildings and the clouds.



Figure 5: Original and post-processed images.

5 Conclusion

In conclusion, the image I submitted for this assignment captured altocumulus stratiformis clouds. I am pleased that I was able to capture this type of cloud. I also like that the sunrise created a gradient of color that is very pleasing to the eye. In contrast to my previous cloud photo, I tried to maintain the integrity of the colors true to the natural colors. I think I was successful in this regard.