

Clouds 1

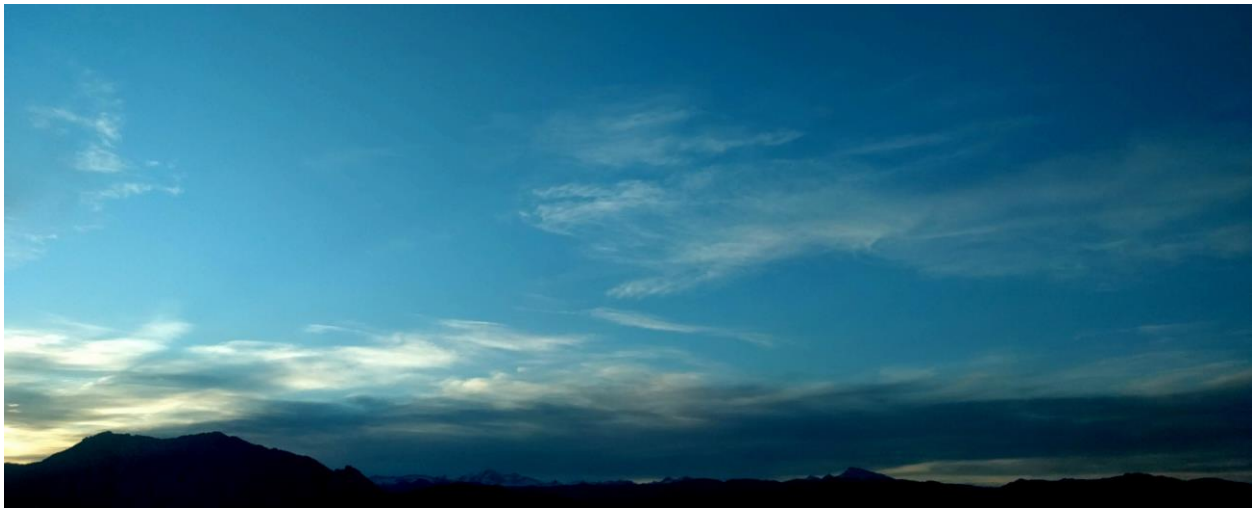


Figure 1: Final Photograph.

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Clouds First Assignment
Flow Visualization – MCEN 5151
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Introduction

The final image in Figure 1 was taken for the first cloud assignment. The purpose of this assignment was to visualize and capture different cloud types and how they change with various weather patterns. For my image, I wanted to photograph clouds and how they interacted with large objects like the mountains of the Front Range. For this reason, I wanted to photograph the wide landscape rather than zooming in and focusing on one cloud in particular. This allows you to see exactly what and where the clouds are interacting with the mountains.

Photo Location

This photograph was taken on the evening of March 3, 2018 at 5:45pm. It was taken just outside of Boulder, CO off of highway 36. The exact location was $39^{\circ} 58' 15''\text{N } 105^{\circ} 11' 54''\text{W}$, this location is detailed as the pinned location on the map in Figure 2. The elevation at this point is approximately 5500 ft., which is slightly higher than the city of Boulder. The picture was taken flat to the horizontal and facing the west/southwest direction.

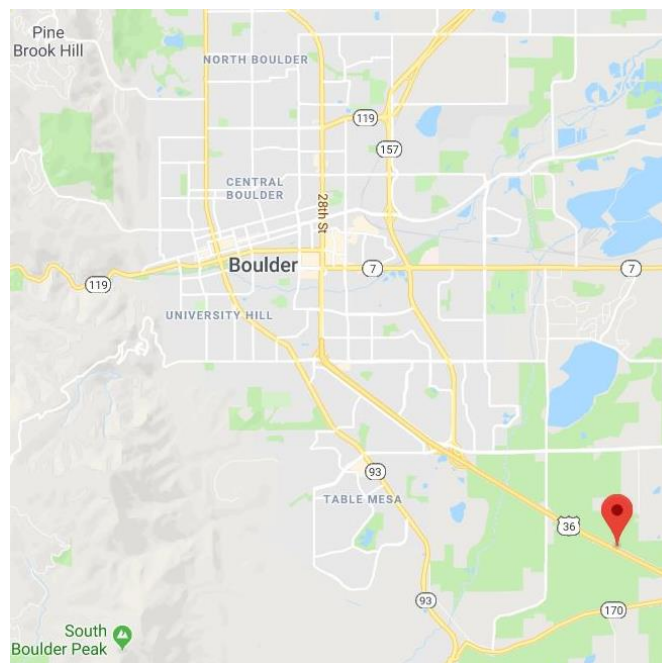
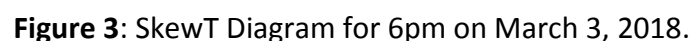


Figure 2: Exact Location where the Photograph was taken [1].

Based on how the sky looks in the photograph and weather from that day, it seems that the lower clouds are altostratus and the higher clouds are cirrus. The weather throughout March 3rd and the surrounding days were relatively stable, as can be seen in the SkewT in Figure 3. On March 3rd, the temperature ranged from 34F to 64F with a mean temperature of 49F. Regarding wind, the day was calm with a max wind speed of 8 mph. There was a front approaching, and arrived approximately 24 hours later when the temperature dropped and started to get really windy (20+ mph winds) [2].

The higher wispy looking clouds appear to be very close to cirrus in appearance. Being that they are at very high elevations in the sky, I am confident with that classification. Looking at Figure 3, another most likely place for cloud formations are between 9,000 – 12,000 m (30,000 – 40,000 ft.). This is the correct range for cirrus clouds to form, which is right in line with the classification.



Photographic Techniques

Since this image was taken using the camera on a smartphone, there wasn't much control over the settings used. Instead I focused on the subject of the image and making sure it was as clear as possible. With that, I set myself up to be able to easily post process the image to obtain a final photograph that highlights what I want.

The picture was shot with a Nexus 5X smartphone camera with the following settings: ISO 60, shutter speed – 1/304 sec, and aperture- f/2. Such a small aperture allowed for a large depth of field where almost everything in the landscape is in focus. The mountains in the photograph are approximately 8 miles away, making it important to use that small aperture. The focal length of the digital lens of the camera is 4.67mm.

The original photograph can be seen in Figure 4, the original size (pixels) was 4032 x 3024 while the edited photograph was reduced to 4032 x 1628. Not too much was done in post processing of the image. The most significant change was cropping the picture down to get rid of the blank sky with no clouds. This allowed for the focus to be on the major clouds and mountains. Additionally, the entire image contrast was slightly increased and brightness was decreased to darken the mountains so only a silhouette was left.

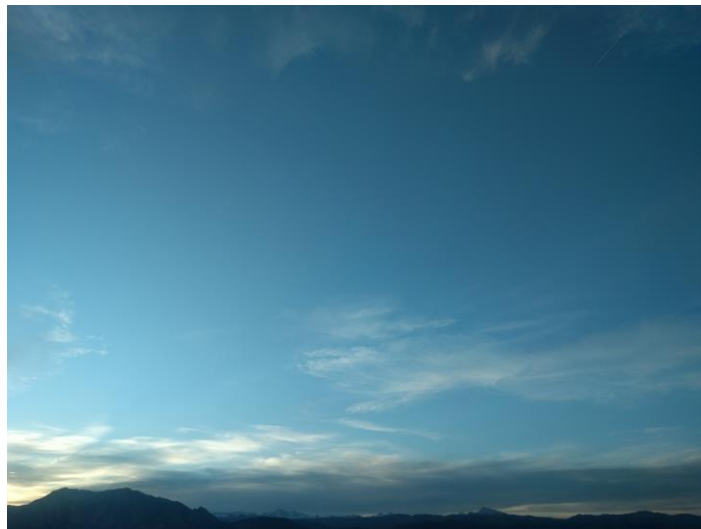


Figure 4: Original Photograph.

Conclusion

Overall, this photograph does show the interaction of clouds and the mountains a little less than hoped. This shows more just clouds at an elevation close to that of the mountains. However, in the end I do like how the image turned out. If I were to change anything, I would

have liked the small details within the clouds to be more visible. For that reason, the fluid physics within the clouds are kind of hard to see. But those details are hard to show when the distance is so far away. Perhaps focusing on one specific cloud and getting closer would allow for those details to be better seen.

References

- [1] Google. (n.d.). [Boulder, CO Map]. Retrieved March 18, 2018, from <https://www.google.com/maps/place/39%C2%B058'14.6%22N+105%C2%B011'54.3%22W/@39.9703971,-105.2011552,16.69z/data=!4m5!3m4!1s0x0:0x0!8m2!3d39.9707278!4d-105.1984028>.
- [2] Weather History for KBDU - March, 2018. (n.d.). Retrieved March 18, 2018, from https://www.wunderground.com/history/airport/KBDU/2018/3/3/DailyHistory.html?req_city=Boulder&req_state=CO&req_statename=&reqdb.zip=80301&reqdb.magic=1&reqdb.wmo=99999.
- [3] Environment and Climate Change Canada. (2017, August 17). ARCHIVED - Environment and Climate Change Canada - Weather and Meteorology - Skywatchers Guide to Cloud Identification. Retrieved March 18, 2018, from <https://www.ec.gc.ca/meteoaloeil-skywatchers/default.asp?lang=En&n=5A0D647D-1>.