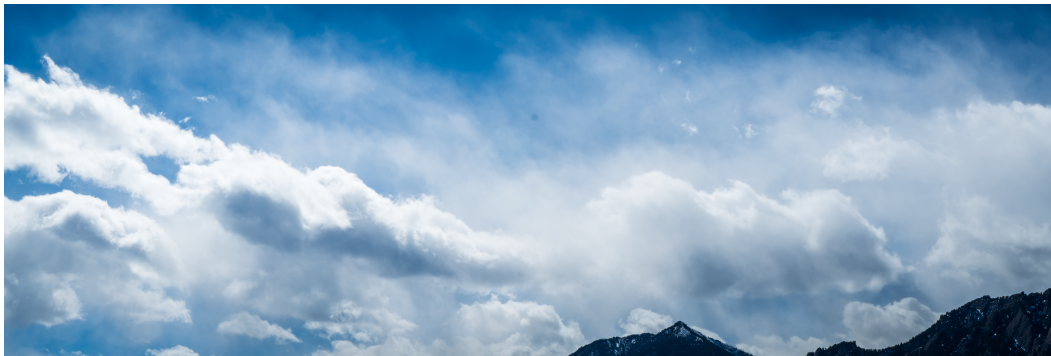


Flow Visualization Cloud First Report

Hanwen Zhao

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1 Introduction

The purpose of the "Cloud First" project is to apply all the cloud knowledge we have taught by Professor Hertzberg. After learning all the cloud knowledge from class such as identify cloud types, atmospheric stability and skew-T plot, the cloud first is our first chance to photograph the cloud and utilize the atmospheric information.

2 Image Circumstances

The image was captured on Monday March 5, 2018. Denver local time 12:34 pm. The weather at 12 pm was around 34° - 39° Fahrenheit. I was standing on the CU-Boulder Business Filed pointing South. The original, untouched image as shown below:

The camera was pointing at horizon and took a shot with the cloud and Rocky Mountains as the background. The local elevation of Boulder is 5430 ft(1655 m).



Figure (1) Original, untouched image.

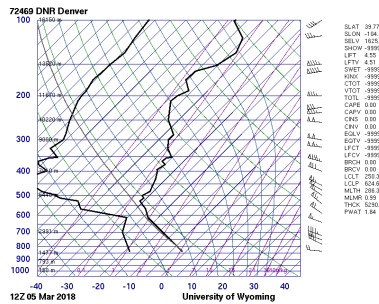
The weather on March 5th was most sunny from morning to 2 pm, and getting cloudy and windy in the afternoon.

3 Clouds Captured

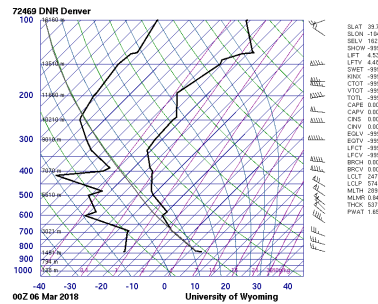
The image was captured on Sony A7RIII with Sony FE 35mm f/1.4 lens. Here are some details of the image info:

- 35mm
- f/16
- 1/80 sec
- ISO 100

To maximum the depth of the field, I used the maximum f/16 aperture. Also ISO 100 to maximum the power of CMOS capture as many details as possible. In order to analyze the cloud we captured in the image, a good way to start is to looking at the Skew-T diagram. From a University of Wyoming website([http :](http://)



(a) Skew-T at 6am



(b) Skew-T at 6pm

([//weather.uwyo.edu/upperair/sounding.html](http://weather.uwyo.edu/upperair/sounding.html)), we can download Skew-T diagram for selected date. The Skew-T diagram is updating twice a day at UTC 0 and 12, which corresponding to 6 am and 6 pm Denver local time. The following two plots shows the Skew-T diagram for Denver area at 6 am and 6 pm local time.

We need to take a look of both Skew-T diagrams since the picture was taken at 12 pm. The atmosphere is pretty consistent in the large scale, so we can use the Skew-T for Boulder area. The clouds will most likely occur where two black lines stays closest. From the 6 am Skew-T, we can see the cloud is somewhere 3800 meters. And if we start parcel and raise it, we can see the neighboring parcels are cooler and more dense, it trends to be stable. Also we can check the CAPE value on the right which is 0, means the atmosphere is stable. Then we can compare the plot on the right, the 6 pm plot shows that the atmosphere is becoming less stable, which proved what observed, the weather in the afternoon is more windy and cloudy. The Skew-T diagram also gives us the corresponding wind speed at different evaluation, from the plots we can see that the wind speed at 6 am is 55 knots(63 MPH) and 45 knots (51 MPH) at 6 pm. The high wind speed explains the reason the clouds looks unstable even the Skew-T tells us the atmosphere is stable. In the image, we can see I have some mixture of startocumulus and stratus.

4 Post Processing

For post processing, my first version of edited image as show below which I have large area of unnecessary foreground. What I did was increasing the contrast, and tweaked shadow/black so that we can see more clouds in the image. Also increase the saturation and hue on blue make the sky looks nicer. During the critique, I



Figure (3) Edited image before critique

received many valuable advises, especially on the foreground, therefore I have re-cropped my image into the following:

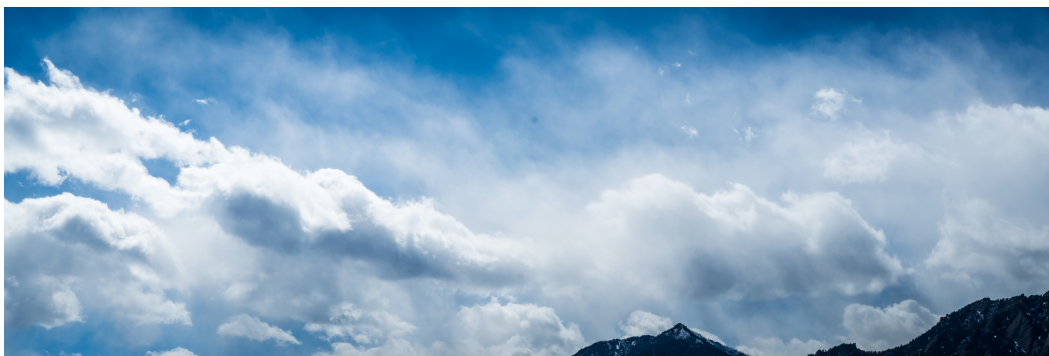


Figure (4) Edited image after critique

Now, with less distracting objects, the audience attention can focus on the clouds.

5 Reference

<https://www.timeanddate.com/weather/usa/boulder/historic?month=3&year=2018>