Clouds Assignment #2 Write-Up

Blake Buchannan

Flow Visualization – MCEN 5151

4/16/13

I. Introduction

For the Clouds I assignment, I captured the flow of clouds by using a time-lapse series, a video put together of many still images. So for this assignment, I wanted to capture equally as stunning flows in the clouds, however just with one still image. Knowing this, I kept my camera in my backpack at all times, waiting for that epic scene. On a Saturday afternoon, April 6th, I saw the amazing cloud formations that I had been looking for while wandering Pearl Street. I wanted the image to enable the viewer to quite literally 'see' the flow of the clouds as caused by the wind patterns at different elevations. What makes the resulting image so unique is that it consisted of many different cloud types, which can be seen in Figure 1.

Figure 1 - Final Image

II. Image Circumstances

As mentioned, this image was taken on April 6th, 2013 on the Pearl Street mall in Boulder, CO. I took the image from the top of a parking garage located at the intersection of 11th & Spruce, to ensure minimal foreground clutter and an overall better viewpoint. The image was taken at 12:35 pm, facing South/Southwest. My camera was fairly level with my elevation, so the image was taken at a 0° angle with the horizontal. As can be seen in Figure 1, it was a fairly cloudy day, and a storm front was beginning to move in, which was part of the reason for the excellent variety of clouds present.

III. The Clouds

As can be seen in the image, there were a large variety of clouds present. These types of clouds include stratus, stratocumulus, cirrus, and even a lenticular cloud, which are identified in Figure 2. For the rest of the day, following the time that I took the photo, the sky was incredibly cloudy. The following day, Sunday, was the day that a major storm

front moved in and produced a lot of snow. So the clouds that we see in the photo are most likely only present because of the incoming storm.
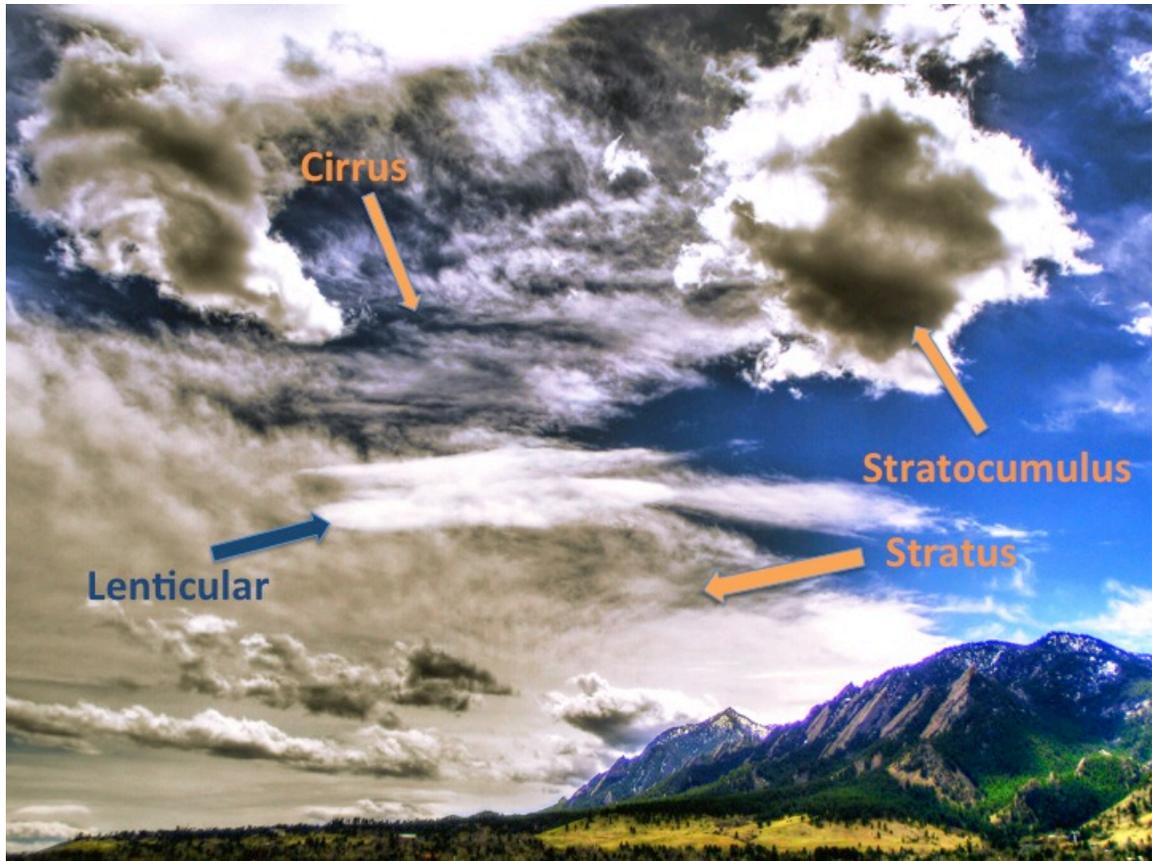

Figure 2 – Cloud types present in image

Despite the incoming storm front, the atmosphere was stable on the day that the photo was taken; the following day however, was unstable. The Skew-T diagram, as can be seen in Figure 3, shows a CAPE value of zero, indicating stability in the atmosphere. Another means of comparison is relating the slope of the dark black line on the right, the Temperature profile, to the slope of the saturation adiabat, the navy blue curved line. The slope of the temperature profile is less than that of the saturation adiabat, indicating stability.
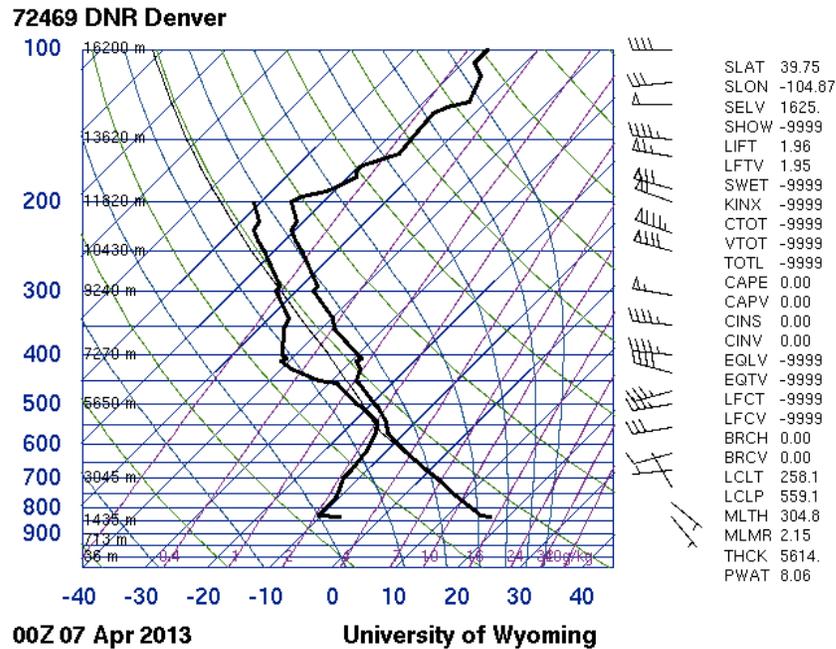
72469 DNR Denver

00Z 07 Apr 2013   University of Wyoming

SLAT 39.75
SLON -104.87
SELV 1625.
SHOW -9999
LIFT   1.96
LFTV   1.95
SWET -9999
KINX -9999
CTOT -9999
VTOT -9999
TOTL -9999
CAPE 0.00
CAPV 0.00
CINS 0.00
CINV 0.00
EQLV -9999
EQTV -9999
LFCT -9999
LFCV -9999
BRCH 0.00
BRCV 0.00
LCLT 258.1
LCLP 559.1
MLTH 304.8
MLMR 2.15
THCK 5614.
PWAT 8.06

Figure 3 – April 6th, Denver Skew-T

In the image, the elevation of the different cloud types varies greatly. The more obvious stratocumulus clouds, which seem to dominate the image, are at an elevation of roughly 5,000 ft. Stratocumulus are commonly found between 5,000 and 10,000 ft, and comparing them to the elevation change of the Flatiron mountains, roughly 1,400 ft, the elevation can be crudely confirmed. The stratus clouds appear at a lower elevation than the stratocumulus clouds, approximately half that, around 3,000 ft, which is a common elevation for stratus clouds. The lenticular cloud in the image appears to be slightly below the stratus clouds, and just above the flatirons, at an estimated 2,000 ft. The last major type of clouds in the image, and also the highest in elevation, the cirrus clouds are at an elevation of approximately 10,000 – 15,000 ft, which is much lower than they're commonly found.

The winds at those elevations above 5,000 meters were quite significant on April 6th, as can be seen in the Skew-T in Figure 3 on the right side, looking like little flags. As the number of tick marks on the line increase, this indicates increasing wind speed at the corresponding elevation. The wind was also present at 2,000 m, just not as substantial. It was coming from west to east, over the top of the Flatirons. This can be seen in the image, it appears almost as though the clouds are being pushed from right to left.

IV. Photographic Technique

Unlike my other images, this one was not taken with a DSLR; it was taken with a Casio Exilim ZR-100 point and shoot camera. The Casio is quite an impressive little camera, with features that aren't in most others, such as high-speed video, great macro photography, and my personal favorite, in-camera HDR processing. This image was taken with the in-camera HDR setting, which means that the camera took a quick succession of 3 photos at different exposure levels and combined them into one resulting image with greater dynamic range. The image was taken at a focal length of 7mm (which is as wide an angle as the camera will go), an aperture of f/4, and ISO of 100, and a shutter speed of $\frac{1}{1600}$ of a second. The resulting image was 10 megapixels, given a size of 3648×2736 pixels.

The flatirons were roughly 2 miles away from where I took the picture, and I would estimate the size of the field of view is approximately 1.5 miles horizontally. The final image also contained a decent amount of post-processing. I manually created three separate exposures of the image, and performed additional HDR tone-mapping processing in Photomatix Pro. The resulting image was then edited in Photoshop CS5. Levels, curves, brightness, contrast, saturation and color balancing were performed. I manually selected the sky and edited it separately from the mountains, helping to create that unique light in the image. The before and after processing images can be seen in Figure 4.
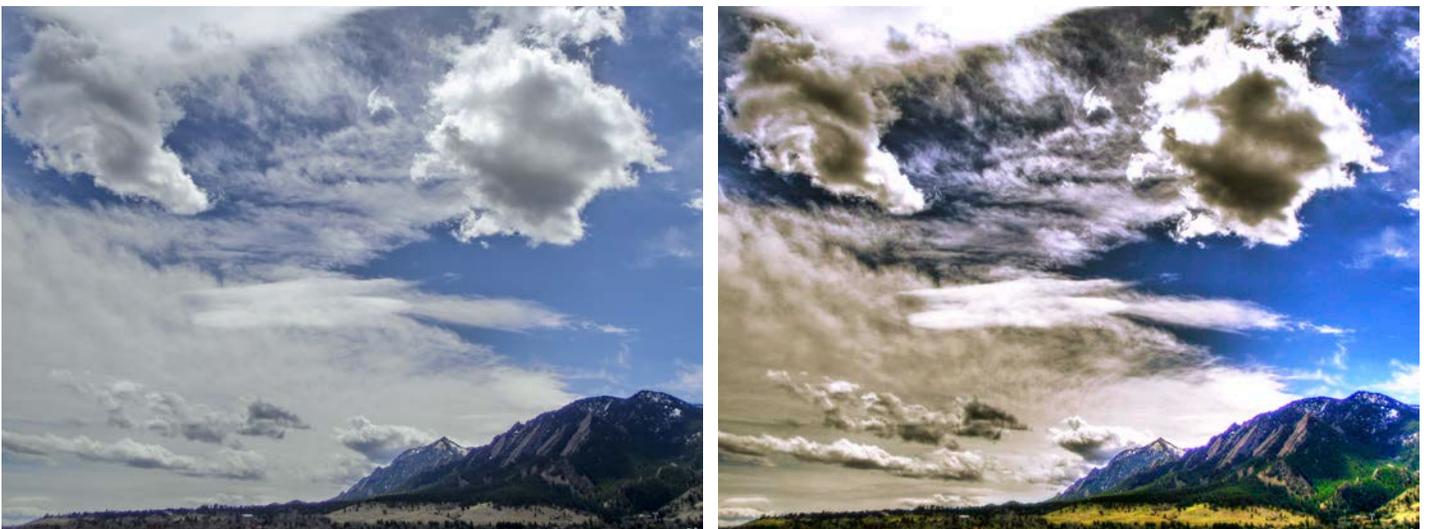

Figure 4 – Before (left) and after (right) post-processing images

V. Conclusion

In the end, I am incredibly pleased with the final picture. The original picture successfully captured the cloud phenomena that I was looking for, however it lacked the 'wow' factor. The post-processing was key in this circumstance for making the image really look incredible. The image captured a key group of cloud types, showed great motion of the wind patterns at the varying elevations. I believe that I would have a hard time improving on the final picture for a still image of clouds. However, if I could do it again, I would use my Nikon D90 DSLR to improve the quality and size of the image and also potentially wait until sunset to capture great colors with roughly the same clouds.