

First Cloud Assignment
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Stratus and Cirrus clouds

5 September 2020 | 7:31 PM | Broomfield, CO

For my second cloud assignment, I took a picture of high cirrus cloud and a lower stratus cloud at sunset in Broomfield, Colorado. In this image, I wanted to capture the stark contrast of the low, darker cloud against the brighter cirrus cloud in the background. I also wanted to capture the bright reds created by the setting sun.

This picture was taken at 7:31 PM in Broomfield, CO. The camera was facing Northwest at about a 45-degree angle of elevation (from horizontal).

My image contains a stratus cloud in the foreground and a cirrus cloud in the background. This is based on information from the skew-T chart, and weather and fire data. From the skew-T chart [1] found in my image page, we can see two pinches in the thick, black lines, where the dew point nears the temperature curve of the atmosphere. These two pinches occur at about 6800 m elevation and 1100 m elevation. These could correspond to the locations of the stratus and cirrus clouds, respectively. Another thing to note is the incoming change in weather. From Table 1, we can see that three days after the image was taken, the temperature dropped significantly.

| Date | High | Low | Precipitation (in) |
|----------|------|-----|--------------------|
| 9/4/2020 | 90 | 59 | 0 |
| 9/5/2020 | 99 | 59 | 0 |
| 9/6/2020 | 99 | 68 | 0 |
| 9/7/2020 | 92 | 44 | 0 |
| 9/8/2020 | 44 | 32 | 0.49 |

Table 1. Weather data surrounding the date the image was taken (9/5/2020), highlighted in grey. (High/Low temperatures in Broomfield from [2] and precipitation information from Denver International Airport from [3]).

Additionally, the surface weather map in Figure 1 shows a region of high pressure over the Rocky Mountains in central Colorado, a low-pressure area in southeastern Colorado, and an occluded front in northeastern Colorado.

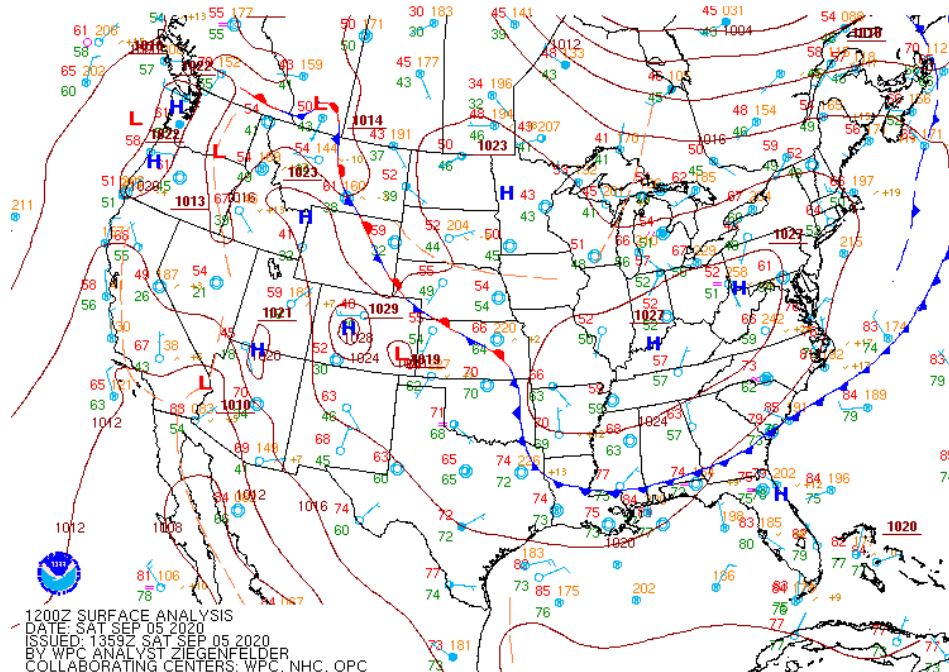


Figure 1. A surface weather map of the continental United States on September 5, 2020 (sourced from [5])

These signs also point to the abrupt weather change that occurred on September 8, 2020 –three days after this image was taken. The CAPE value of 147.2 from the skew-T diagram indicates mild instability, which could also foreshadow the incoming weather change. The strong winds from the north, also seen in the skew-T diagram, could be bringing in the occluded front from Figure 1. These signs all point to the weather change seen in the historical weather data from Table 1. This leads me to think that the stratus and cirrus clouds in the image have to do with the incoming change in weather. However, they could also be influenced by the smoke in the air. While the Mullen fire had not started by September 5, 2020, the Cameron Peak fire was already in progress as it had started around mid-August [4]. Taking the strong northerly winds into account, these clouds could also be influenced by smoke. The northern winds could have carried the smoke south from the northern Cameron Peak fire and influenced the composition and type of clouds we see in my image. Another thing to note is that, while only a portion of the lower stratus cloud is shown, it takes up a large part of the northern sky.

My picture was taken using a Nikon D7000 DSLR camera. The ISO was 800, the shutter speed was 1/320 sec., the f-stop was f/9, and the focal length was 35mm. The original image, seen in Figure 2, had an original size of 4928 x 3264.



Figure 2. Image before editing (note that this image is slightly cropped to remove identifying information for internet publication)

I estimate that the size of the field of view is about 50 feet by 50 feet at the depth of the trees, and much larger beyond that. For photographing, I would estimate the object distance as infinity, but is actually at the cloud heights discussed earlier regarding the skew-T diagram (plus some distance to account for the angle the image was taken at). In order to bring out the bright red colors and the contrast between the clouds, I adjusted the s-curve to increase the highlights and darken the shadows slightly to make the trees in the foreground darker. I also increased the exposure, the midtone lighting, the saturation, and the vibrance. This allowed me to depict the colors in the image as closer to what I remembered seeing in-person, which were more vibrant than seen in the original image.

My image reveals the contrast between the lighting of the lower level stratus cloud at sunset compared to the higher cirrus cloud, which is brighter. In my final image, I liked how I was able to bring out the contrast and colors of the clouds. I would like to know more about how the smoke and the occluded front impacted the clouds in my image and how the clouds on September 5 compared to those in the surrounding days.

Bibliography

- [1] "Atmospheric Soundings." *Department of Atmospheric Science*, University of Wyoming College of Engineering, weather.uwyo.edu/upperair/sounding.html.
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- [4] Larsen, Eric. "What Started the Cameron Peak Fire? Few Clues to Origin of Colorado's Largest Wildfire." *The Coloradoan*, Fort Collins Coloradoan, 15 Oct. 2020, www.coloradoan.com/story/news/2020/10/15/what-caused-cameron-peak-fire-largest-wildfire-colorado-mullen-fire/3664902001/.
- [5] "WPC Surface Analysis Archive." *Weather Prediction Center (WPC)*, NOAA's National Weather Service, 24 Apr. 2015, www.wpc.ncep.noaa.gov/archives/web_pages/sfc/sfc_archive_maps.php?arcdate=09%2F05%2F2020.