

Clouds 2 Image Report

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This is the second cloud image for the Flow Visualization course at the University of Colorado at Boulder. The assignment was to take an image of an interesting cloud phenomenon between the dates of February 20 and April 9 of this year. I found a particularly interesting contrail in Boulder within this time period and decided to use the image I captured of the contrail for my assignment. From the observations of the clouds on this day and the specific contrail, I was able to determine a lot of information about the weather and atmosphere of that day.

The image was taken in Boulder, Colorado from a rooftop at a house on the "Univesity Hill" in central Boulder. I sat on the roof for about 2 hours on the evening of April 8th observing the clouds and the sky. It was a very beautiful day, with few clouds in the sky until later when I took the image around 7:15 pm. The atmosphere was stable, as suggested by the CAPE number and the Skew-T diagram in Figure 1. The clouds seen in the image are the only clouds that were in the sky that evening, in addition to the many contrails that were seen below the clouds. The contrail in this image piqued my interest because of the high contrast of dark and light

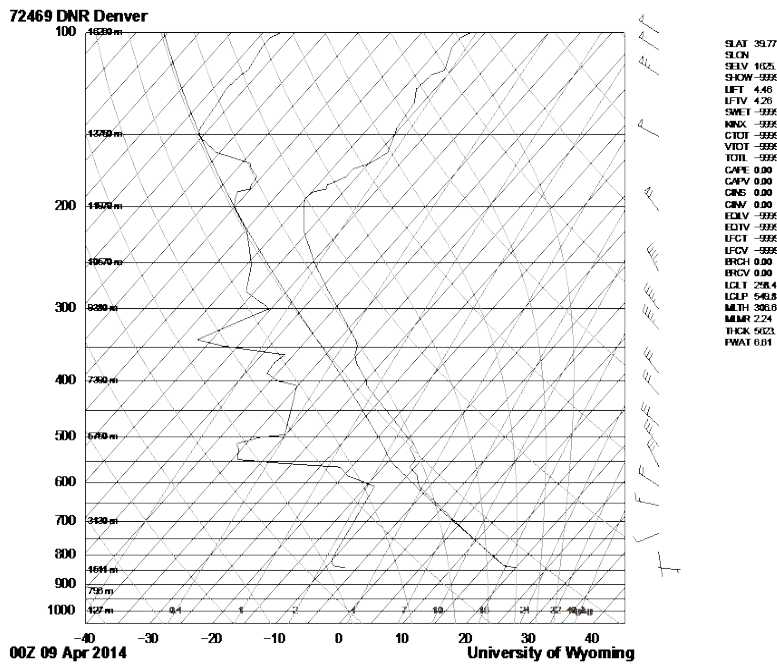


Figure 1 Skew-T Diagram of Denver for April 8 after 12:00 pm

that can be seen because of the position of the sun. The sun was nearly set behind the Boulder Flatirons, so the light was hitting the contrail in a perfect way to light it up in front of the clouds.

The clouds in the image are called cirrocumulus lenticularis clouds, or high altitude mountain wave clouds. These were the only types of clouds seen in the sky that evening, and there had not been many other clouds earlier that day of the previous day either. There were also no other significant weather changes later that week, so the atmosphere and the weather was stable at about 70 degrees Fahrenheit each day until Saturday. However, the wind that was present that day is what fascinated me because of how it affected the airplane contrails. The wind was blowing at about 12 mph in the East-Southeast direction when I took the image.

Therefore, since I was facing Southwest, it was interesting to determine which way the contrail would move as I sat and observed the clouds. My camera was facing up at a sharp angle of about 60 degrees from horizontal. Therefore, I estimate the clouds in my image to be very high, which is consistent with high altitude mountain wave clouds. My estimation for the elevation of the clouds is that they were above 35,000 feet since the contrail was from a jetliner. Normal jetliners fly at about 33,000 feet in altitude, which seems consistent with what I saw that day based on the clouds, the size of the airplane, and the size of the contrail.

This image was taken with a Nikon D60 DSLR camera. The exposure specs for the image are a shutter speed of 1/400, an ISO setting of 100 and an aperture of F11. I estimate the size of the field of view to be about a mile across because of the mountains in the foreground, and about 40 miles tall because of the length of the contrail of the plane. This image was originally photographed in color, which can be seen in Figure 2. In



Photoshop, I increased the contrast significantly and made the image black and white. I did this because I thought that it made the contrail stand out more against the mountain wave clouds. The original, unedited image is 2592×3872 pixels, and the final cut image is shorter at 2592×3728 pixels.

Overall, the image reveals the intense contrast that can be seen between clouds and an airplane contrail. I believe that fluid physics are shown well in this image because of how the mountain wave clouds have such a stark contrasting difference against the contrail. If I could improve upon this idea, I would have liked to create a time lapse to see the movement of the contrail as the wind moved it to the left. Additionally, when the image is extremely zoomed in, the contrail has very interesting effects that I would have liked to show. However, in the end, I am happy with the final image that I submitted because airplane contrails can provide so much interesting information.