Clouds Second Report

Sarah Hartin

MCEN 5151: Flow Visualization

December 16, 2023

I. Overview

This image was taken for the second Clouds assignment for MCEN 5151: Flow Visualization. For this assignment, we were tasked with observing and photographing different clouds over the second half of the semester. I think this image provides a really unique perspective of being in between two layers of clouds.

II. Image Location and Context

This image was taken November 26th at 10:42 AM, in Philadelphia, Pennsylvania. I took this image shortly after takeoff on my flight back to Colorado after Thanksgiving. At this point in the flight, we had not reached the full elevation, so we were between two layers of clouds. This image was taken facing approximately North. I was on the right side of the plane, heading West to Colorado. This image was taken approximately parallel to the horizon.

III. Cloud Identification and Physics

Figure 1, below, is the Skew-T diagram for Upton, NY for the date and time that this photo was taken [2]. Upton, NY is about 170 miles North-East from Philadelphia, PA.

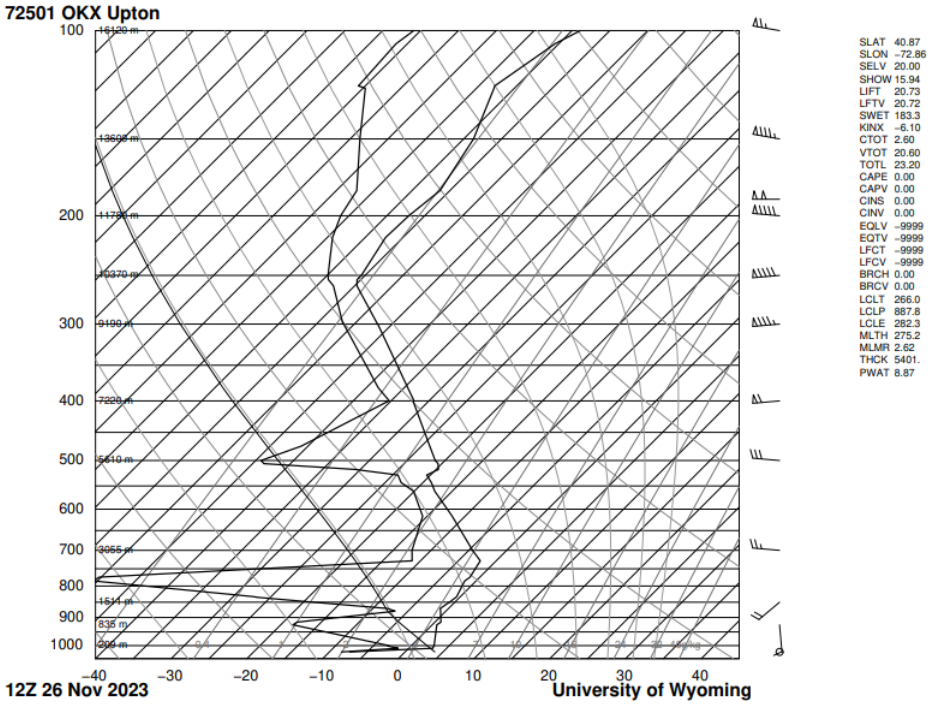

Figure 1: Skew-T diagram.

The Skew-T diagram shows that there were likely clouds around an altitude of 1300 meters and 7720 meters above sea level, which is approximately the same altitude above ground level, as Philadelphia is at an elevation of 12 m [2]. These are the points in the diagram where the dewpoint line (left) and temperature line (right) are close. The atmosphere was stable at this point in time, as shown by the CAPE value of 0.0.

The weather was relatively calm the day that this image was taken, we had gotten heavy rainfall earlier in the week, but it calmed down significantly a day or two before this image was taken. The wind speed at this time was about 8.7 mph and the temperature was about 55 F [3].

The bottom of the image features stratocumulus clouds. These clouds form in patches, sheets, or layers and are typically grey or white in color [4]. In this image, the stratocumulus clouds completely cover the ground, but in other pictures taken within about 5-10 minutes the ground is visible between patches of clouds. The top of the image features cirrostratus undulatus clouds. These clouds typically form in rows perpendicular to the direction of the wind [5] and are characterized by their white color and expanse that cover a large majority of the sky [4].

Figure 2, below, displays other images taken of the same clouds. The image on the left shows the lower layer of stratocumulus clouds, taken from the ground shortly before takeoff and 13 minutes before the featured image. The image on the right shows the top layer of the cirrostratus undulatus clouds, taken 9 minutes after the featured image. It is interesting to see an additional layer of clouds in the image on the right, that were not visible in the original image.

Figure 2: Other images of clouds. From below (left) and from above (right).

IV. Photographic Technique

This image was taken on an iPhone 13 Pro Max, with a focal length of 6 mm. The exposure was set to 1/19231, the aperture to f/1.5, and the ISO to 40.

Figure 3: Original, unedited image.

The original image, shown above in Figure 3 has dimensions of 3024 x 4032 pixels. The edited image has dimensions of 3000 x 4000 pixels. While editing this image, I increased the global saturation to bring out a little more color in the sky. Additionally, I increased the highlights to better show some of the details of the clouds.

V. Image Conclusions

Overall, I am very happy with this image. I think that it is an interesting perspective to see what it is like to be between two layers of clouds. Additionally, I found it very interesting to see the change in perspective as the plane gained elevation. When driving to the airport, it was very grey and the stratocumulus clouds covered the majority of the sky with very little detail. Once the plane got above this layer, it was fascinating to see the detail of these clouds up close and to see that there was an additional layer of clouds not visible from the ground.

Overall, I've found that through this assignment I am noticing the details and variety of clouds much more than I was before. It has been really interesting to see the changes in clouds in both a daily and a monthly timescale.

VI. References

[1] *University of Wyoming.* https://weather.uwyo.edu/upperair/sounding.html

[2] *Flattest Route.* https://www.flattestroute.com/elevation-Philadelphia

[3] "Weather in Philadelphia, November 26." *World Weather.* https://world-weather.info/forecast/usa/philadelphia_1/26-november/

[4] "Ten Basic Clouds." *National Oceanic and Atmospheric Administration.* https://www.noaa.gov/jetstream/clouds/ten-basic-clouds

[5] "Undulatus Cloud Variety: Wavelike, Undulating." *What's This Cloud.* https://whatsthiscloud.com/cloud-varieties/undulatus/