Shalil Jain

Clouds First

MCEN

Cirrocumulus

September 1st, 2019

Bradley, Beach, New Jersey

The final image used for the cloud first assignment for the 2019 Flow Visualization class at the University of Colorado Boulder was one of many. Of course, I decided to use the cirrocumulus cloud formation as my final but I had taken several other pictures of clouds during the time period between the start of the semester and when the assignment was due. However, I settled on this picture as the other pictures were all taken in Colorado and I wanted to showcase a cloud from another part of the country. With the overall focus of the class being targeted to capturing differing types of flows, the cloud assignment allows us to capture the behavior of water in the atmosphere and see the effects the winds, temperature, etc… has on the ever-present water in the air.

This image was captured at Bradley Beach, New Jersey, looking south along the shoreline. It was captured right around midday, meaning the angle of the sun was almost directly above the area, if not a little bit south due to the tilt of the Earth. The image was taken at about a 60 degree angle relative to the horizon and as stated on the title page, this image was captured on the sunny day of September 1, 2019.

I believe the type of cloud I captured was a cirrocumulus. This can be confirmed by both its appearance and the skew-T data accompanying this. Cirrocumulus clouds are very unique in their physical attributes. They are made up of supercooled water which is water that stays in its liquid form even below its freezing point of 0°C (32°F). They form when a turbulent current of air meet the cirrus layer[1]. This then has the effect of creating the cloud appearance as seen in my picture. These types of clouds generally appear before a storm will move in however, in the case of these clouds, no storm nor precipitation had occurred in the area in the few days before and after when this picture was taken.[2] Clouds in general form when the air temperature and dew point are at the same temperature. This is demonstrated in the following skew-T diagram. When the two black lines meet, the left being dew point and the right being air temperature, that is likely where a cloud will form. On the skew-T for this particular day, the lines do not

[1] "Cirrocumulus Clouds." Met Office, www.metoffice.gov.uk/weather/learn-about/weather/types-of-weather/clouds/high-clouds/cirrocumulus#targetText=Cirrocumulus%20cloudlets%20are%20usually%20made,creating%20the%20puffy%20cumulus%20shape.

[2] Ibid

intersect however, they do come close to intersecting at three different points: ~4000 meters (13100 feet), ~8000 meters (26200 feet), and ~13000 meters (42600 feet). However, the closest point of intersection is near the 8000-meter mark and this is where I believe the clouds I captured formed at.

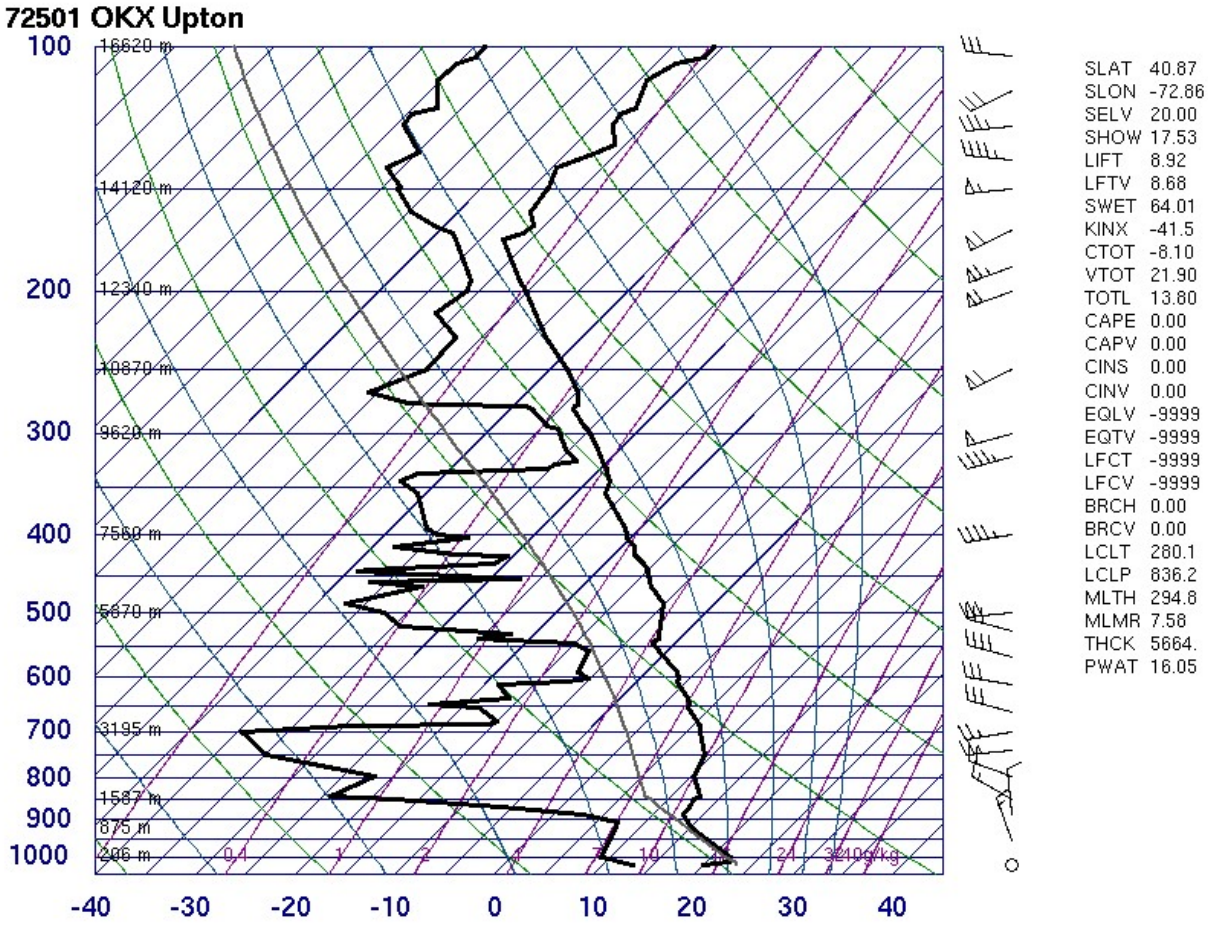

Figure 1: Skew-T diagram taken from nearby Upton, New York on September 2, at 00:00 zulu time.

Though cirrocumulus clouds form when a turbulent vertical flow of air intersects the cirrus layer, the CAPE number is 0, indicating that generally, the air was very stable. According to Figure 2, taken from the well known site in the aviation community, AOPA, and cirrocumulus clouds form at an altitude of over 20,000 feet above the ground level. This would agree with my prediction of clouds forming at about 26,000 feet above ground based off of the skew-T diagram, as well as the appearance of the clouds look similar to how the cirrocumulus clouds appear in the diagram as well. The general weather the day of the picture was calm winds, aside from a slight ocean breeze common on the coastline, and warm

temperatures at the surface. A high-pressure system had been stagnant over the immediate areas, indicating the winds aloft at that altitude were likely not severe.

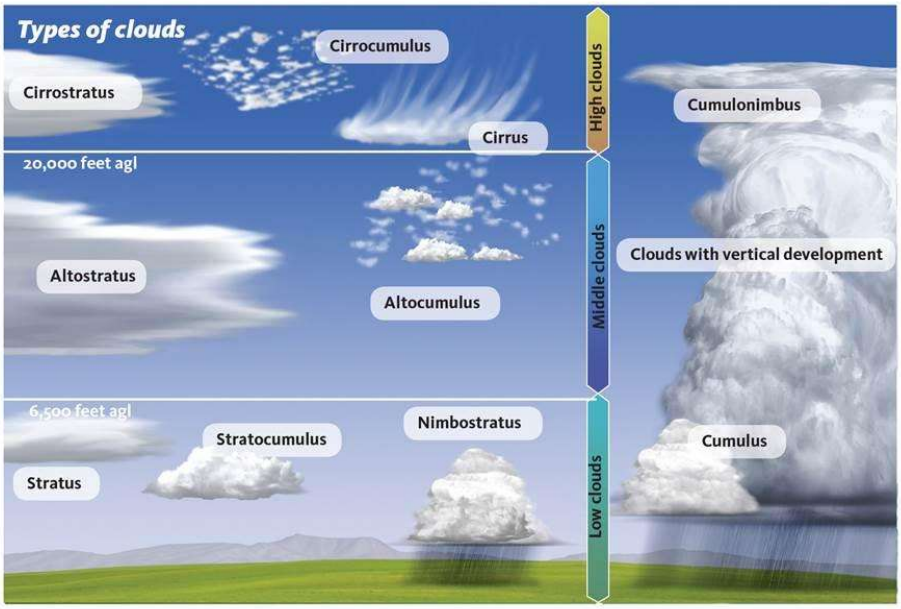

Figure 2: Diagram showing the appearance of clouds and what altitudes the clouds are typically found at[3]

I snapped this picture while standing stationary on a boardwalk. I believe this cloud is about 1 mile in width and 2 miles in length, with the approximate field of view about 5 miles by 3 miles. The vertical distance from the lens, as discussed in the previous paragraph, is about 26,000 feet. The horizontal distance, was about 81,000 feet. This approximate distance was found by taking into account the approximate angle of the cloud relative to the horizon and the vertical distance of the clouds from the ground, using the following formula:

$$\tan(60) = \frac{26000}{Horizontal\ distance}$$

This picture was taken on a Samsung Galaxy S9 with the model of the camera in the phone being SM-G950U. The dimensions of the picture was 3024 x 4032 pixels. The maximum aperture was 1.53, the focal length was 4 mm, the exposure time was 1/12987 seconds and the F-stop number was f/1.7. The

[3] "Weather: Correlating Cloud Types." AOPA, 17 June 2016, www.aopa.org/news-and-media/all-news/2016/august/flight-training/weather.

original, unedited image can be found below. The contrast curve of how the picture was edited can be seen in Figure 4.

Figure 3: Original, unedited picture

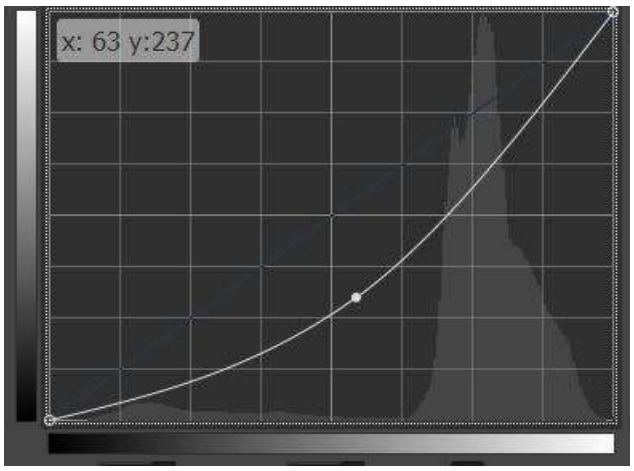

Figure 4: Contrast curve, comparing how the picture was edited from the original. The white curve represents how the image was edited from the original curve in blue

I am pleased with the image. It describes the weather and atmosphere that day very well and for me personally, makes me think of this fun weekend spent with my family over the Labor Day weekend. I am also happy with the edits I made in Gimp, as I believe I was able to make the clouds standout more but I did not take away from what was important in the image. I am happy I did not crop the tree out of the picture as I feel this helps to give a visual sense for how far the clouds truly were when this picture had been taken. The tree also helps give a sense of when this was taken, as these clouds could be formed in differing parts of the year, but the green, some with a hint of yellow, show the time period this was taken in. The only thing I think I could improve in this is getting more or less of the sky in the image. Otherwise, I am happy with the image.