Clouds 2 Report
Flow Visualization
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I. Introduction

I took this photo outside of the Adler Planetarium in Chicago, IL as the sun was setting. I would have liked to get an image that included more of the city skyline, but given where I was at the time I wouldn't have made it to a better place before the sun went down. This was a mostly spontaneous image taken on November 23rd, 2022 at 4:18 pm CST, or 10:18 Z.

II. Cloud Description

These clouds are mainly some form of stratus cloud as evidenced by their extremely thin, wispy appearance. Stratus clouds also appear as large sheets of cloud, which is similar to the clouds that appear in the image. It can be difficult to classify different forms of stratus clouds (cirrostratus, altostratus, and stratus) as they all look fairly similar. According to the flowvis guidebook[1], we can gain some insight into what kind of stratus it is by how thick the layer seems, with lower stratus-type clouds having a thicker layer due to their warmer, larger water molecules. This is easier if there are multiple kinds of stratus clouds visible at once so that you can compare them together. Given that the darker clouds in my image are of a visible thickness, it is likely that they are mostly altostratus clouds. The lighter clouds are much higher in the air, which indicates that they are some form of cirrus cloud. Their splotchy, wispy appearance indicates that they are likely cirrus intortus clouds, which occur at over 7,000 m above sea level. Below is a Skew-t diagram taken in Lincoln, IL about 2 hours after the image was taken[2].

[1] Flowvis Guidebook
[2] University of Wyoming

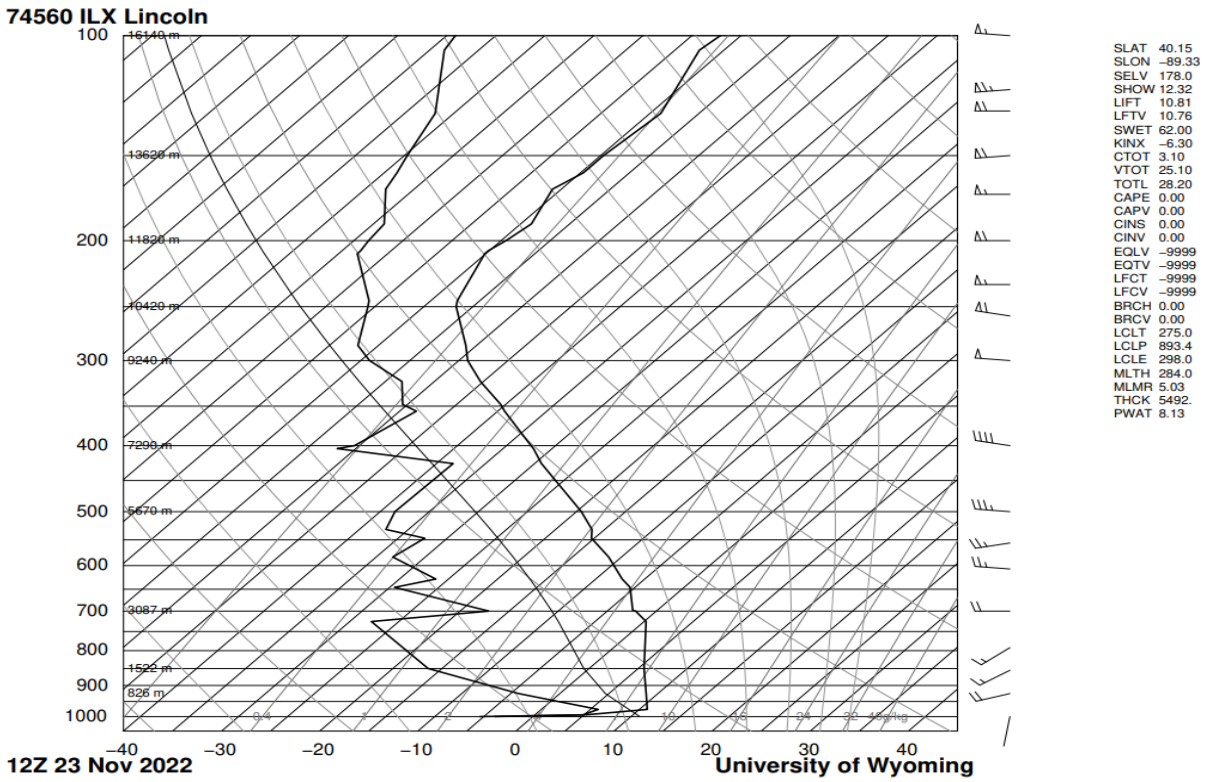

Figure 1: Skew-t diagram taken on November 23rd at 4:18 CST

We can tell a few additional pieces of information from this diagram. First, we can tell that these are stable clouds as the CAPE value listed on the diagram is 0.00. This means that at this time, the air below these clouds was generally cooler than the air above them. This is common in the winter months as the ground absorbs more heat, causing the air closer to the ground to cool off. We can also see from the diagram what altitude most clouds were forming at on that day by examining where the dew point line is nearest to the temperature line. This situation will result in more water condensing at that altitude, which will in turn lead to cloud formation. Looking at the skew-t in figure 1, we can see that clouds are mostly forming at 6,000m and above. 6,000m is within the range that altostratus clouds typically form (2,000m - 7,000m), which further corroborates the claim that these are the cloud types visible in the image. Another interesting piece of information that the skew-t displays is the wind direction around the altitude that the clouds are forming. This data was taken roughly 170 miles away from where the image was taken, which could result in some discrepancy between any information in the skew-t and the image, but the skew-t still gives a decent approximation. Another piece of information that we can estimate from the skew-t is the wind speed. According to figure 1, the winds are blowing mostly west at speeds of 20 knots and 35 knots for the stratus and altostratus, respectively.

III. Photographic Technique and Post-Processing

This image was taken by a Samsung Galaxy S9+, which automatically sets most of the camera specifications. The following table shows the camera specifications that were automatically set for this picture.

Table 1: Camera Specifications

Specification	Value
Focal Length	4 mm
ISO	50
f-stop	f/2.4
Shutter Speed	1/239

The following image shows the unedited image before it was brought into darktable.

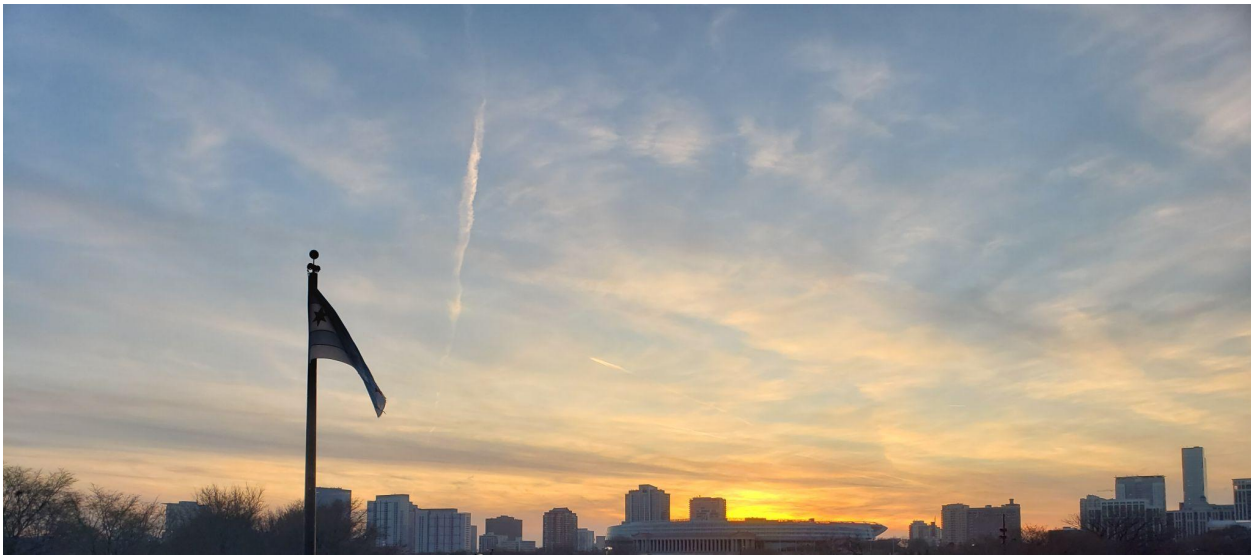

Figure 3: Raw image

Once the image was brought into Darktable, a moderate RGB s-curve was implemented to give the image a more consistent light range, which was then increased in saturation to bring out the color of the sunset. A moderate tone curve was then added in order to make the silhouette of the city darker and the cloud shapes more prominent and distinguishable from each other.

Figure 3: Final image

IV. Conclusion

I was very happy with this image, I love the shadows that you can see mixed in with the layer of clouds. The sun at the bottom adds a nice glow to the whole image and brings out a really dramatic flare to the whole composition. If I were to take a similar image again, I would have liked to find a better spot in the city where the skyline wasn't so uniform. I think that would add some more interesting contrast to the clouds on top. I also had to crop this image pretty significantly before even bringing it into Darktable to remove some people's faces that got in the way, which was a consequence of me trying to get somewhere on time when I took this picture. So, it would have been nice to have some more time to line up the shot.

V. References

Hertzberg, J. (N/A). *The Flowvis Guidebook*. N/A. https://www.flowvis.org/Flow%20Vis%20Guide/introduction-to-the-guidebook/

University of Wyoming. (1974, January 1). *Atmospheric Soundings*. Wyoming Weather Web. Retrieved November 27, 2022, from https://weather.uwyo.edu/upperair/sounding.html