Patrick Watson

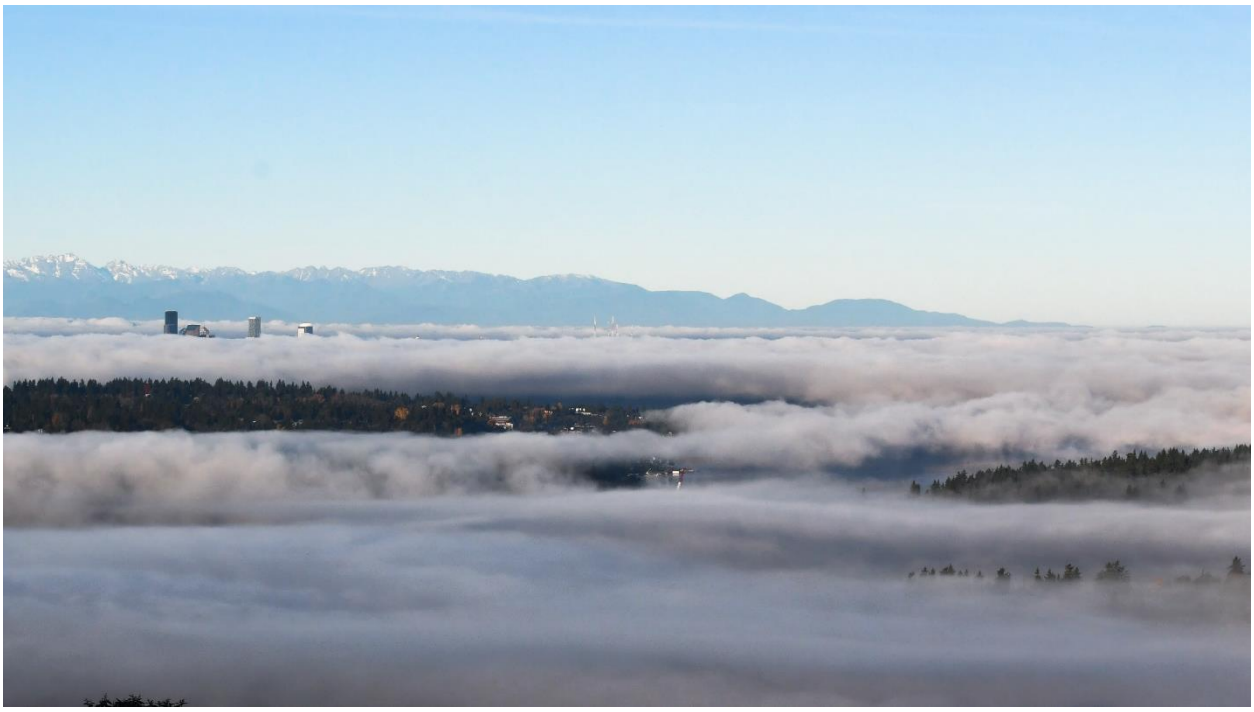
Clouds Second

MCEN 4151

12/16/23

Cloud City

November 26, 2023 8:00 AM



Purpose

This timelapse was taken for the Clouds Second assignment for MCEN 4151 “Flow Visualization” class. The goal of this project was to take a photo of clouds that have artistic and scientific study value. We were given the period between the beginning of November to early December to take pictures and evaluate the clouds. The low layer clouds formed like this throughout the entire week and many time lapses were taken. This one turned out the best because the clouds were low enough to see Mercer Island and the high rises of Seattle. In other timelapses the cloud layer was slightly higher meaning that these landmarks were not visible earlier in the day.

Context

This timelapse was taken on November 26th, 2023 while facing North-West. The timelapse was taken starting at 8:00am (PST) while overlooking Seattle, WA at an elevation of around 1,200 feet. Other landmarks in view include the I-90 freeway, Mercer island (off to the left side of the frame), Bellevue (off to the right of the frame), and Seattle with the Space Needle (in the background). In the far back is the snow-covered Olympic peninsula. The total timelapse time was 3 hours and 9 minutes. Playback is at 30 frames per second with each second equating to 2.5 minutes. The goal was to resolve the movement of the clouds. From figure 1 it is assumed that the average cloud speed is 6 mph. In the timelapse the overall direction of wind movement is north to south. This means that on average between any given frame that the cloud could have moved 44 feet. Utilizing the sensor size and focal length, the calculated field of view is 22.825 degrees. The linear distance from the timelapse location and Seattle is 7.5 miles. There is no apparent motion blur across the movement of clouds. In fact it might be beneficial to increase playback speed to 45 frames per second to see the movement of the clouds and vortices more clearly. The vortices appear to form along the straight between Mercer island and Bellevue.

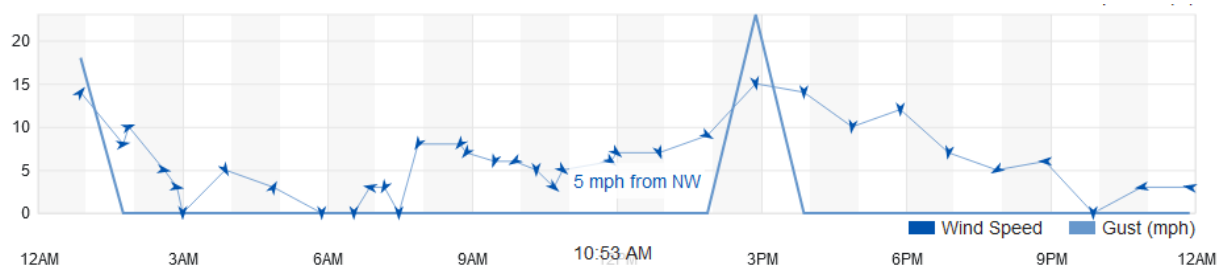


Figure 1: Wind Speed (mph) and Direction Plot for November26th, 2023 [2]

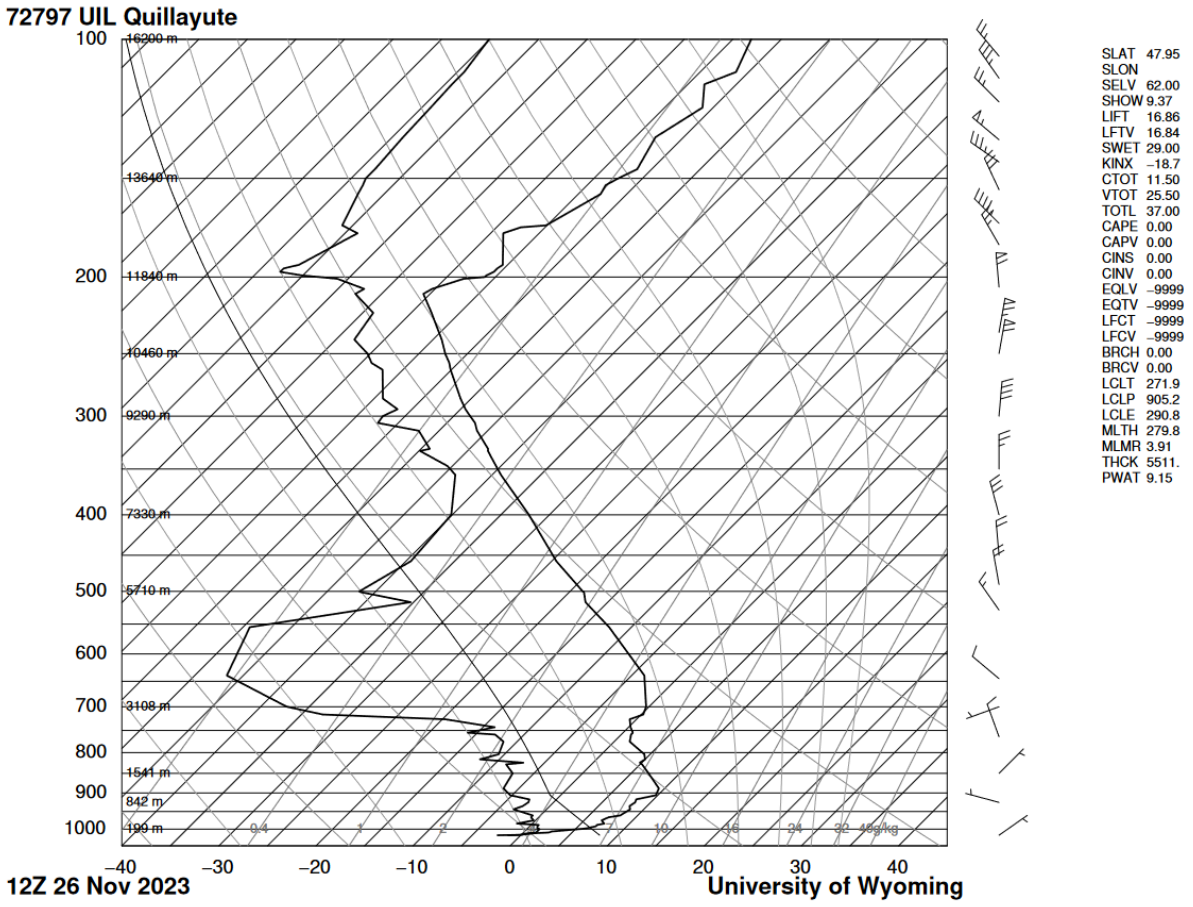


Figure 2: Skew-T Plot for November26th, 2023 12 Zulu [4]

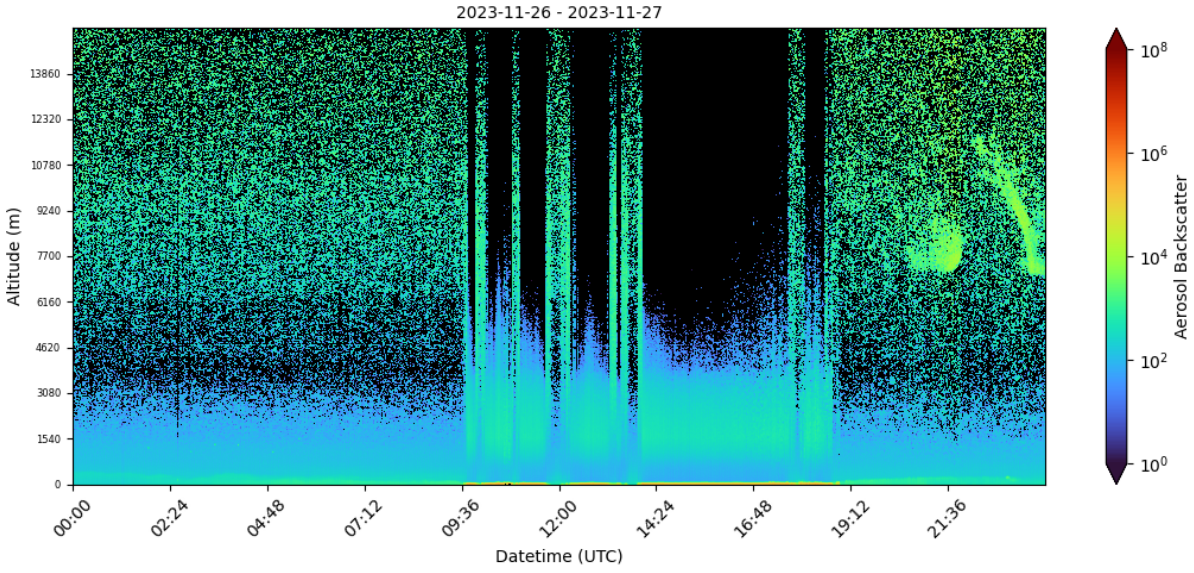


Figure 3: Ceilometer Reflectivity Data from Nov 26th, 2023 around Seattle, WA. [3]

Cloud Description

The forecasted temperature high of the day was 39 degrees Fahrenheit, with a low of 34 degrees Fahrenheit in the morning. However, it was noted that the high of the day was much higher, closer to mid-50 degrees Fahrenheit. There is only one altitude that clouds are forming and from ceilometer data, it appears to be around 100 meters. Skew-T data in Figure 2 is more than likely inaccurate due to limitations on access to local sounding plots. Local sounding data is only kept for 24 hours before being inaccessible. The author did not think to download the sounding data immediately. The closest station that had accessible sounding data was Quillayute, WA which is on the other side of the Olympic peninsula. This means that the data would not accurately match sounding data to Seattle. However, the atmosphere did appear to be stable, which corroborates the CAPE value of 0. The cloud type appears to be advection fog because the clouds quickly formed overnight and then as noon approached, the clouds would disperse. Image 1 features the clouds at night. Advection fog forms when relatively warm air moves over cold water. The water will cool the air to the dew point and form the fog layer. This type of fog is very common along the Pacific coast. Especially during spring in Los Angeles and San Francisco.

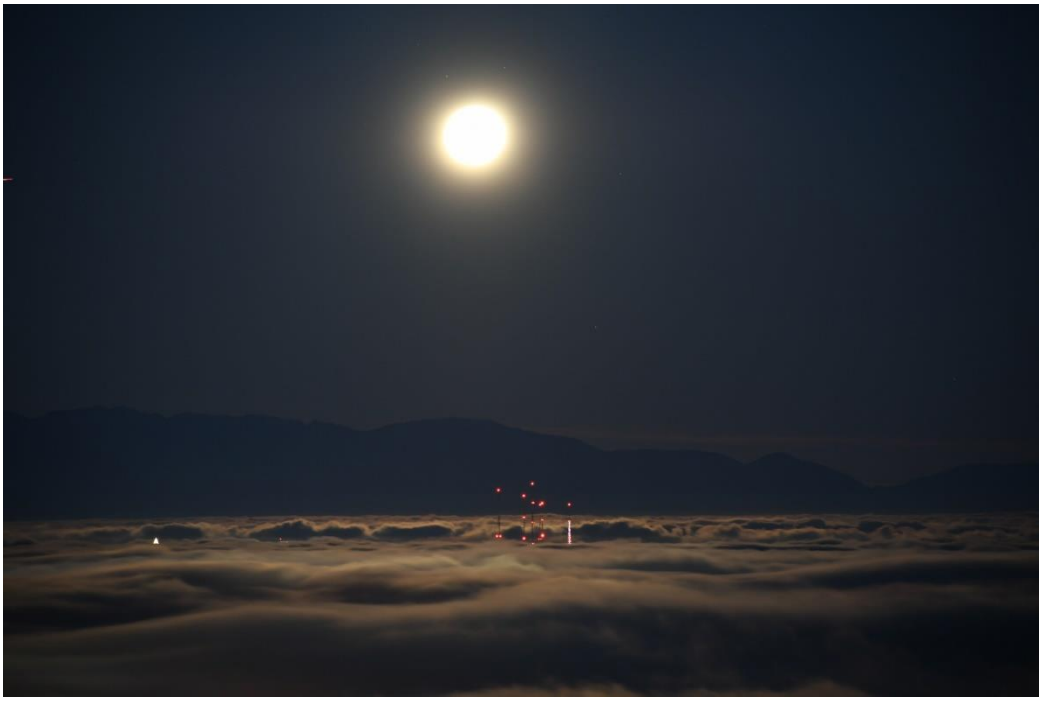


Image 1: Night photo of the clouds over Seattle.
(Note the light triangle in the left of the frame that is peering over the clouds is the tip of the Seattle Space Needle.)

Imaging

The timelapse was taken on a Nikon D7500 with automatic settings. Automatic setting was necessary to make sure the camera could adapt to the changing lighting conditions and focus on the moving clouds. Image settings are in Table 1.

Camera	Nikon D7500
Focal Length	70mm
ISO	80
Exposure Value	0
Aperture	f/1.78
“Shutter Speed”	1/60 second
Seconds per Frame	5 seconds
Video Playback (Frames per Second)	30
Image Size (Pixels)	3840 x 2160

Table 1: Camera Specs

No imaging post processing was conducted to protect the shaded regions and not oversaturate the brightness of the clouds. The dynamic range felt to be within a satisfying region to be left unedited. I put in a tremendous amount of effort on setup to include all critical elements within the frame so that cropping would be unnecessary. Same with straightening. Afterall the timelapse period was taken over 3 hours and could not be reproduced as I am not a god of clouds which made the setup vital to the timelapse success.

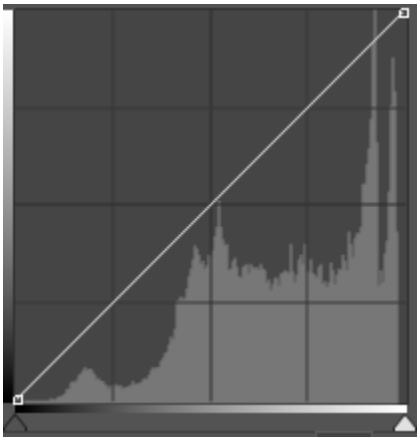


Figure 3: Premier Pro Unaltered RGB Curve

Figure 4: The video and images were not edited.

Conclusion

I am incredibly happy with the success of this timelapse. It was a highlight of my Thanksgiving break and really let me take in the environment. I took 4 different timelapses to choose the best one. This one turned out the best because it had so much going on in it and felt that no matter how many times I would rewatch, there was always something new within the frame.

References

[1] Hertzberg, Jean. "Clouds 3: Skew - t and Instability." *Flow Visualization*, 10 Aug. 2023, www.flowvis.org/Flow%20Vis%20Guide/clouds-3-skew-t/.

[2] "Seattle, WA Weather Historystar_ratehome." *Weather Underground*, www.wunderground.com/history/daily/us/wa/seattle/KWASEATT2590/date/2022-11-28. Accessed 15 Dec. 2023.

[3] "Seattle, WA." *UCN*, www.ucn-portal.org/site/sewa/. Accessed 15 Dec. 2023.

[4] *Atmospheric Soundings*, weather.uwyo.edu/upperair/sounding.html. Accessed 30 Oct. 2023.