Clouds I

Alex Kelling

MCEN 5151

24 Oct. 2022

Figure 1: Cloud bounded sky

Introduction

One might imagine a typical photo of a cloud as blue sky bounding a white cotton ball. For my cloud photo, I wanted to do the opposite. Upon watching the clouds transpire on September 19th, 2022, I came upon the idea to do something different. A small window of blue sky emerged, bounded by clouds on all sides. Inverse of a 'normal' cloud photo, I was granted the opportunity to see cloud bonded sky, resulting in the seen image.

Circumstances

Leaving the lecture for MCEN 5151, Flow Visualization, on Monday September 19th, 2022, at 1:10pm, I noticed the magnificent cloud formations that daunted the blue sky above the Front Range. The Business Field at the University of Colorado Boulder offered an amazing, unobstructed view just outside the classroom. Facing southwest at bearing 209° from the location

40.00606, -105.26162 at 1:14:00pm, I could see Boulder's skyline crowned with stratocumulus clouds. The elevation angle of the camera was roughly 23° above the horizon, giving alignment to the desired window in the clouds.

The weather on September 19th was very pleasant, being 87°F with a 6 mile per hour SSW wind, and 12% humidity (Weather Underground, 2022). With no precipitation the day prior or after, there was no significant weather events experienced locally creating or following this band of clouds. At cloud level, wind must have at a higher speed than at ground level weather recording, as the zoomed-out photo take at 1:11:30pm, just before the final image was taken shows the window, shown in the red circle, is of a different shape.

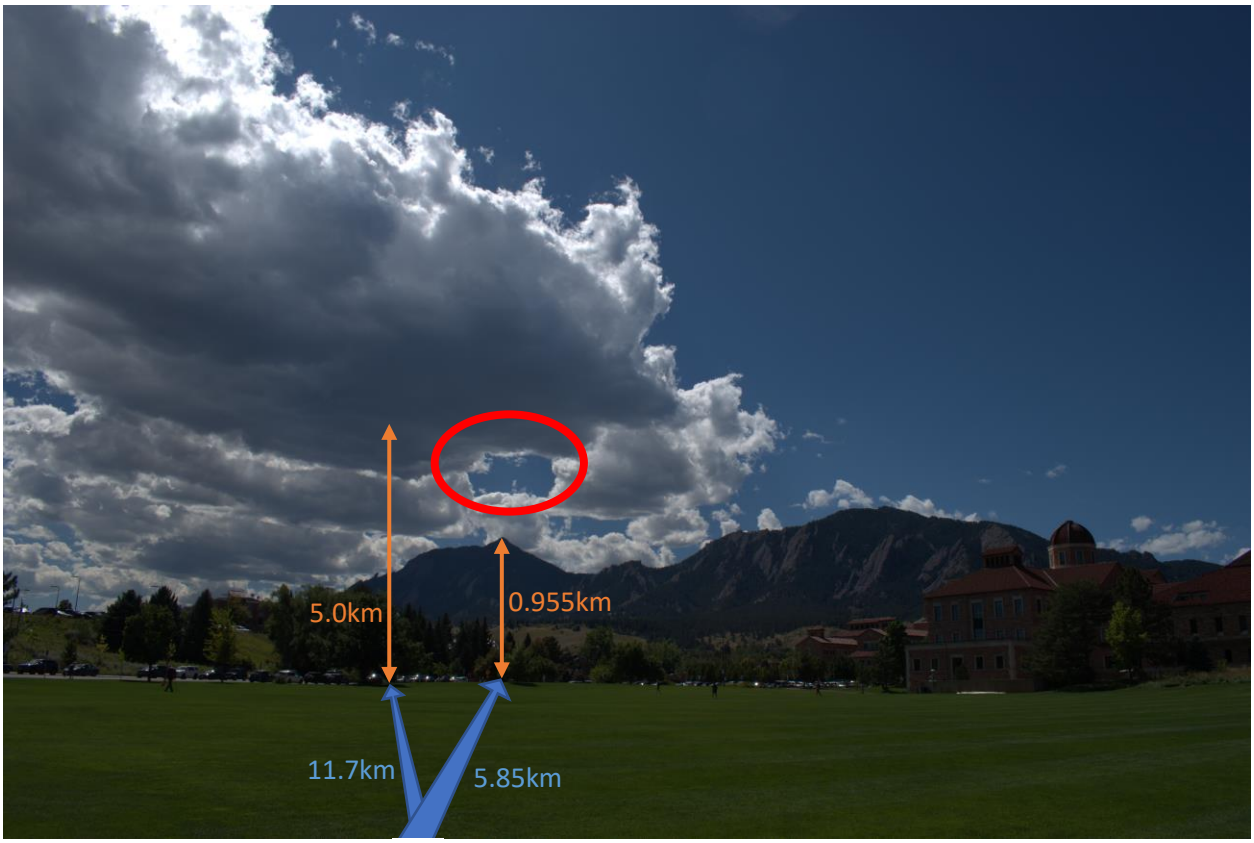

Figure 2: Previous picture, capturing the entire scene

An estimate for the distance to the clouds can be made using trigonometry. Google Maps shows that Bear Peak 5.85km away from the Business Field. I will assume that the cloud in focus was twice as far away as that, 11.7km. This is a difficult estimation to make, as the accurately prediction the distance to the cloud is not in my practiced skill. The cloud being roughly 5.0km high allows a trigonometric equation showing that the clouds are roughly 12.72km or 7.90 miles away.

$$\tan\theta = \frac{5.0km\ (vertical)}{11.7km\ (horizontal)}, \qquad \theta = 23.14°$$

$$\sin 23.14° = \frac{5.0km\ (vertical)}{d}, \qquad d = 12.72km$$

Cloud Data

The Skew-T diagram for this day at the closest location, Grand Junction, Colorado, shows the atmospheric conditions at a range of temperatures. One indication of the level of clouds is the indentation of the left line, the dewpoint, towards the right line, the temperature. This indentation occurs at 5,000m above ground level. Using the reference of Bear Peak (2579m) being 944m higher than the Business field (1635m), it seems reasonable that the clouds in question would be five times higher than that difference.

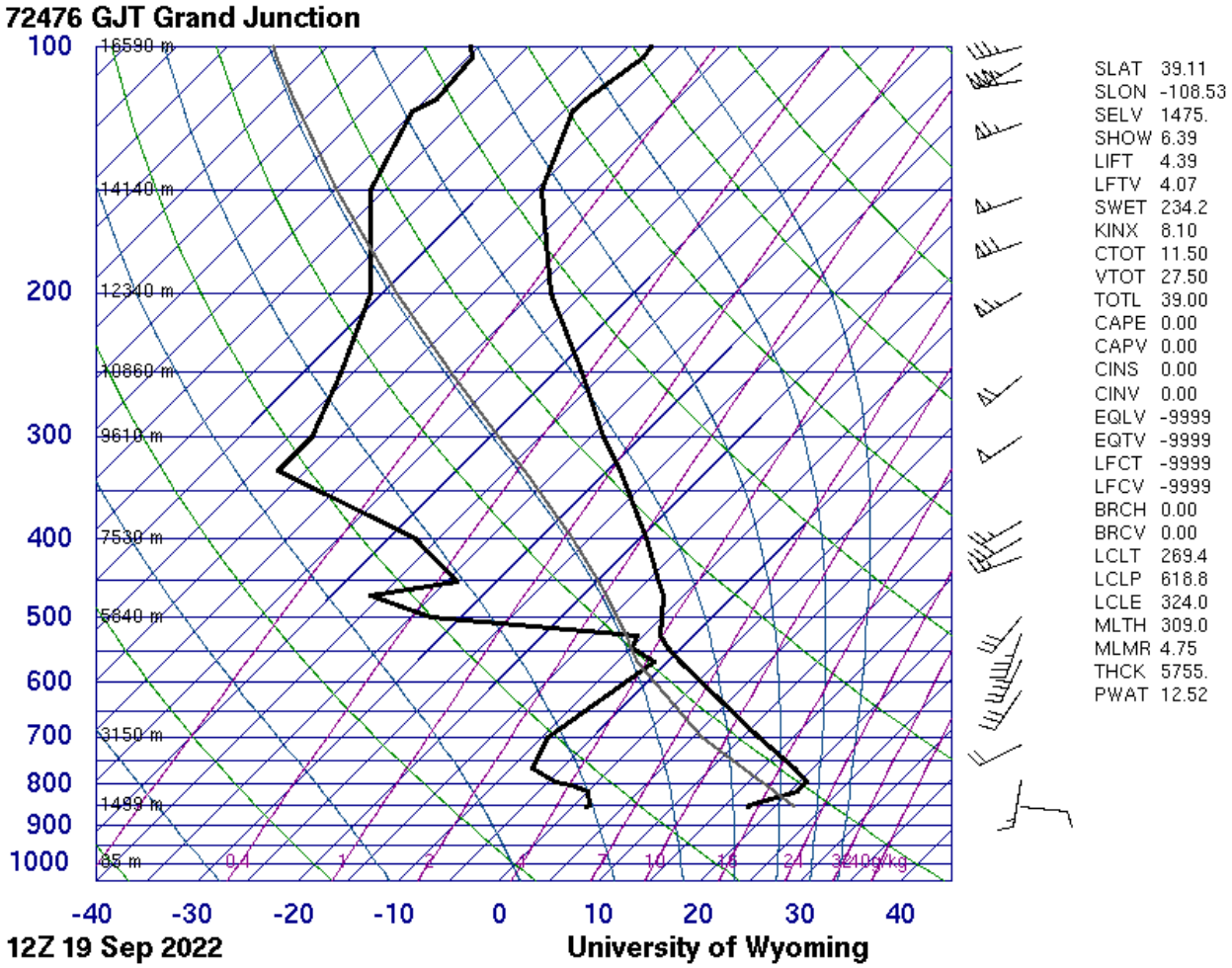

Figure 3: Skew T Diagram (University of Wyoming, 2022)

Photographic Techniques

The camera, a Nikon D3500 DSLR, was used to capture this image. The 70-300mm focal length lens was used, allowing a closer zoom for far away clouds. The F-Stop was f/8. The exposer time was 1/2000 of a second. The ISO was 180. The focal length was 185mm. The aperture was

4.8. The original image's dimensions were 6016x4016 pixels. The final image was cropped to 5775x3757 pixels to allow a tighter focus on the window of sky.

This image was edited in dark table to enhance its looks. The image was cropped to increase attention to the center sky, as well as the RGB curve being manipulated to bring out a brighter blue and whiter whites, while dimming the grey around the border.

Figure 4: Original, unedited image

Artistic Results

This image successfully captured my intent of creating the inverse of a stereotypical cloud picture of sky bounded by clouds. I like the image I created, in both for its uniqueness as a concept and for the clouds it captured. The blue sky taking a resemblance to a tiger crawling towards prey was coincidental, but upon seeing makes this image look as if would be computer generated. Although this is a minor feature, it does add another unique element to this image.

Bibliography

University of Wyoming. (2022, September 19). *Grand Junction Skew T*. Retrieved from University of Wyoming Weather: http://weather.uwyo.edu/cgi-bin/sounding?region=naconf&TYPE=GIF%3ASKEWT&YEAR=2022&MONTH=09&FROM=1912&TO=0512&STNM=72476

Weather Underground. (2022, September 19). *Denver, CO Weather History*. Retrieved from Weather Underground: https://www.wunderground.com/history/daily/KDEN/date/2022-9-19