MCEN 4151- Flow Visualization

Cloud Second Report

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Section 001
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I. Background and purpose

This image was taken on November 22nd, 2023 at 4:50 pm for the Cloud's Second assignment for MCEN 4151. The picture was taken at Eldora Mountain Resort. The base of the resort, where the image was taken sits at an elevation of 2200 ft [1]. I took this image while attending a chairlift evacuation training. I just so happened to look up at the right time when I saw these clouds. Since the clouds were close to above us, I would estimate the angle from horizontal to be about 35 degrees. The image captures a lenticular cloud, commonly form along ridges and valleys in mountainous regions.

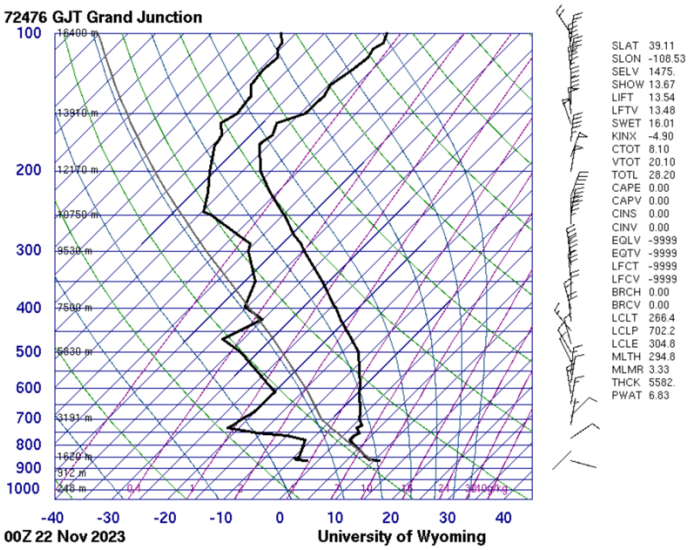
II. Flow description

Lenticular clouds are formed when wind blows orthogonally over a mountain range. Anyone who has ever skied at Eldora can attest to the strong winds. As the relatively warm air travels over the mountain range, it begins to cool. Eventually the air cools enough to condense any water droplets that are present [2].

Above the mountain peaks the air may be stable, or there the wind might be stronger than winds at lower elevations, which shears off the top of the cloud, making the top of the cloud appear sharp. One the air has passed over the mountain ridge or peaks, it starts to sink. As the air sinks it begins to warm up and some of the cloud droplets evaporate. This evaporation smooths out the cloud on the downwind side of the mountain [2].

The orange is caused by scattering [3]. Since the sun is lower in the sky when it sets, the sunlight passes through more of the atmosphere, meaning the light has more interactions with molecules in the air [3]. Since violet and blue light have shorter wavelengths than red and orange light, the blue and violet light get filtered out through the longer journey through the atmosphere [3]. Because of this, sunsets and sunrises appear red and orange.

The Skew- T diagram for November 2nd in Grand Junction is shown below:

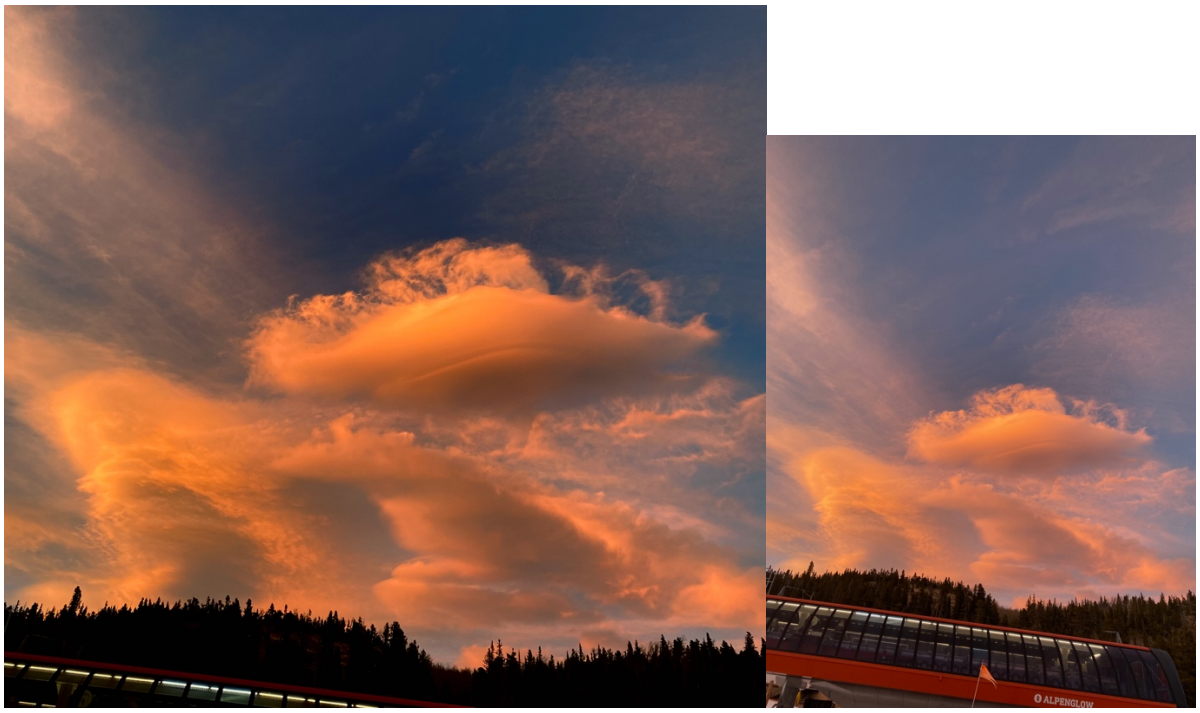


Based on the curving trend around 13,000m, I would estimate that the clouds I was looking at were at a similar altitude. Since the lift index was 13.54, I would classify the atmosphere stable at the time the image was taken [5].

III. Visualization and photo technique

This image demonstrates a marked boundary technique; you can clearly see the boundary between the clouds and the sky. I took quite a few photos of clouds over the course of this semester, but I was especially struck by this image. One of my favorite parts of my job as a ski patroller is getting to experience sunsets on the mountain. I thought these clouds were especially interesting due to all the texture in the bottom half of the image. It can be so windy at Eldora that clouds don't stick around for long.

I was trying to focus on the cloud itself, while minimizing any chairlifts or buildings. I took the photo on an iPhone 11 pro with the 26mm lens and an aperture of f1.8. The ISO was 80 and the shutter speed was 1/121 seconds. The original image was 3024 x 4032 pixels and the edited image is 2825 x 2605 pixels. Both images are shown below.



In cropping, my main goal was to focus on the cloud itself, so I tried to crop out as much of the chairlift as possible, while retaining some reference point for where the cloud was in the sky. I was also trying to emphasize the orange in the sunrise. I lightened up the image a little bit. I also increased the saturation and vibrance slightly. I also lowered the green part of the RGB curve. Finally, I increased the definition.

IV. Conclusion

I think that this image turned out well. I really like how the orange of the sunrise contrasts with the dark trees at the bottom of the image. I would have liked to take this image on an actual camera as opposed to my iPhone. I think a camera could've captured a lot of detail that my phone wasn't able to. I feel lucky to have looked up in time to see this cloud, sunsets on the ski hill rarely disappoint, but I think this one was particularly stunning.

V. References

[1] “Eldora Mountain Stats: 300 Inches of Snow Annually.” *Eldora Mountain Resort,* www.eldora.com/the-mountain/mountain-stats-policies-faqs/mountain-stats. Accessed 16 Dec. 2023.

[2] “Is That a UFO or Just a Cool-Looking Cloud?” *Lenticular Clouds: Where and How They Form*, spectrumnews1.com/ca/la-west/weather/2021/08/27/lenticular-clouds--where-and-how-they-are-formed. Accessed 16 Dec. 2023.

[3] *Curiosities: What determines the colors of the sky at sunrise and sunset?*. News. (2007, November 6). https://news.wisc.edu/curiosities-what-determines-the-colors-of-the-sky-at-sunrise-and-sunset/

[4] *Skew-T parameters*. Skew-T Parameters and Indices. (n.d.). https://www.weather.gov/source/zhu/ZHU_Training_Page/convective_parameters/skewt/skewtinfo.html