Close Encounters of the Cloud Kind

Clouds Second Report
Juan Orion Sanchez
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Introduction

This image was created for the 2025 Clouds Second Assignment, the last project in the Flow Visualization course offered at University of Colorado Boulder. The intent of this project was to capture visually interesting cloud structures and present them in a manner that holds both scientific and artistic value. Several photos of varying structures at varying times of day and location were taken between October 10th, 2025, and December 1st, 2025, for this project.

The photograph used for this image was captured on November 7th, 2025, at 11:53am. The photo was taken facing south on Foothills Pkwy, Boulder, CO.

Cloud Discussion

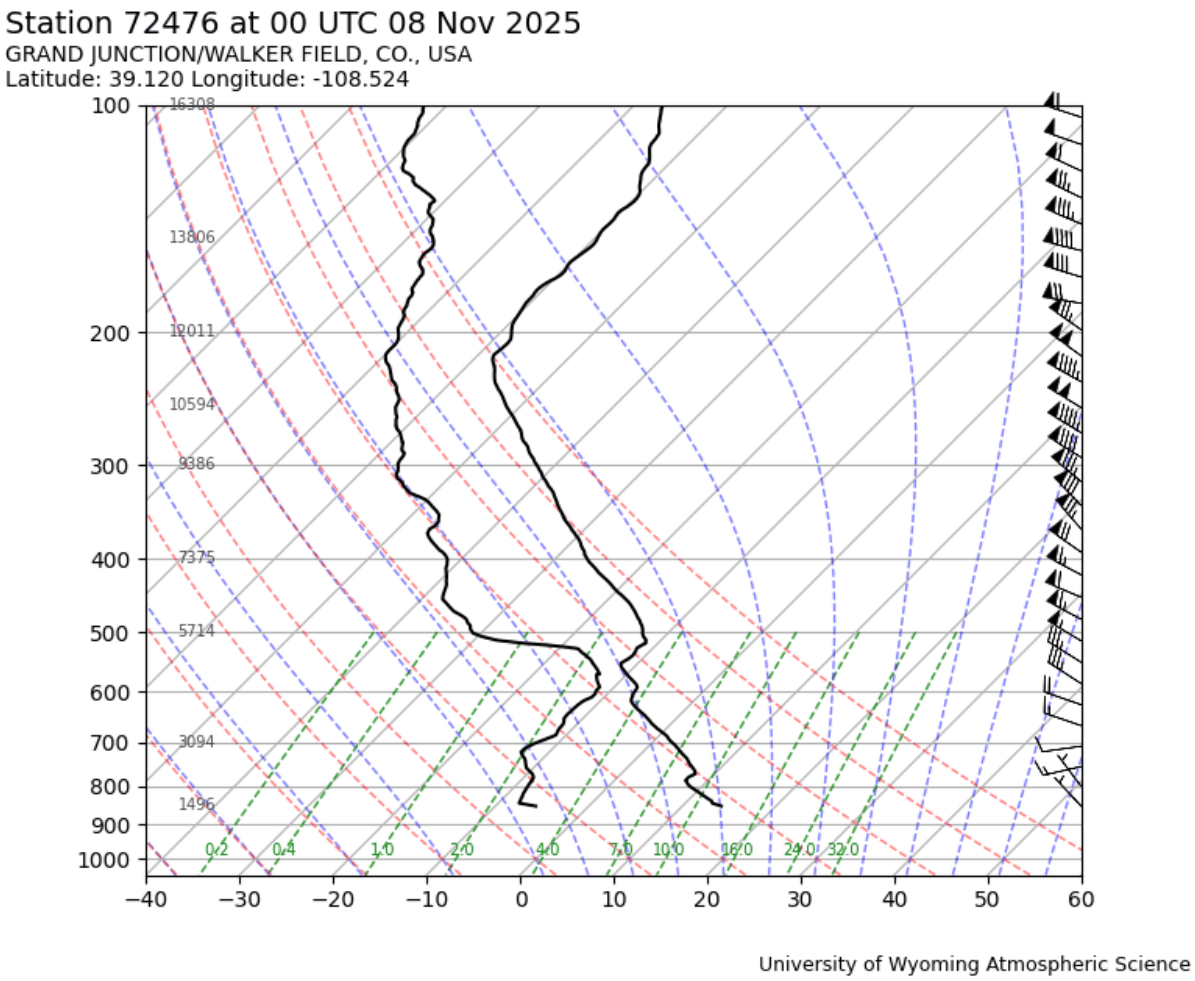

Figure 1. Skew T-diagram provided from data a the Grand Junction/Walker Field

The cloud type centered in the image appears to be a Altocumulus Standing Lenticular (ACSL) cloud. ACSL are often seen in the winter/spring near orthographic features, commonly mountains (1). Gravity waves caused by orthographic features are triggered below the level of free convection and can form ACSL clouds. In the uncropped photo, the Flat Irons, rock formations part of the Rocky Mountain range can be seen. These rock formations are the most likely culprit for the formation of the lenticular structure seen in the image. This structure typically forms in a stable atmosphere, but the clouds seen in the image at higher altitudes appear to be formations resembling alto cumulus, which form in an unstable atmosphere. The Skew-T diagram reveals that the atmosphere is more stable closer to the ground and unstable at higher altitudes, explaining the imaged discrepancy. Using the SkyWatch observatory for the day on skywatch.colorado.edu, the cloud ceiling for that day and time seems to have been around 4km. This is the lowest point at which clouds could've formed, meaning that the lenticular clouds seen were at least at this altitude or

higher. A lenticular cloud formation on the lee side of a mountain, or the side sheltered from wind, is sign of moderate to severe turbulence at low altitudes (3).

Visualization and Photographic Technique

Figure 2. Original Un-edited Photo

This initial photograph was captured using a Samsung Galaxy S22 Ultra smartphone. The photo was taken with the stock camera app with default settings. The focal length used for the captured image was 6mm with an F-stop of f/1.8. The ISO speed of the sensor was 12. The original photo has a width and height of 4000 x 3000 pixels (Figure 2). Using Darktable, the final image was cropped to a width and height of 1300 x 647 pixels and both cropped and rotated to center the lenticular formation. No other editing was done on the image.

Conclusion

This image reveals a cloud type that is not uncommon, but still visually striking, that forms due to dynamics involving the front range mountains near the building. I really love how much the cloud invokes imagery of a classic sci-fi UFO shape, and how the shadowing

provided from the clouds in the background gives it uncanny darkness and form. I believe that the quality of the image could have been significantly higher if a proper camera such as a DSLR was used, but for a smartphone image it is sufficient. In terms of fluid physics, these cloud type directly indicate the crest of gravity waves that are forming due to the nearby mountains (3). A better understanding of why they form predominantly in both the winter and spring would be beneficial. I fully believed that fulfilled the intent of my image, but one thing that could be improved is the sense of scale. The mountains and cars in the original photograph show how large the structure truly is, but I felt that removing those made it more profound. If I had the skills to edit the image such that the mountain range is preserved, but the road is removed I think that would've been the best of both worlds. To develop this idea further, I can try and observe the same portion of the sky at the same time of day in similar conditions to see if it leads to consistent formation.

References

(1) National Weather Service. Altocumulus Standing Lenticular Clouds. Weather.gov – Albuquerque, NM. https://www.weather.gov/abq/features_acsl

(2) Bluestein, Howard B. "Visual aspects of the flanking line in severe thunderstorms." Monthly weather review 114, no. 4 (1986): 788-795.

(3) Vieira, A. (2005, April). Mountain wave activity over the Southern Rockies. Albuquerque Center Weather Service Unit, National Weather Service. https://www.weather.gov/media/abq/LocalStudies/MountainWavesUpdate.pdf