Clouds First Report

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1. Introduction

My goal for the clouds first assignment was to capture clouds present in an unstable atmosphere. These types of clouds bring a fantastic dramatic element with their dark colors and turbulent structures. I chose to take pictures around sunrise and sunset, since the angle of the light can better illuminate the depth of clouds.

2. Circumstances

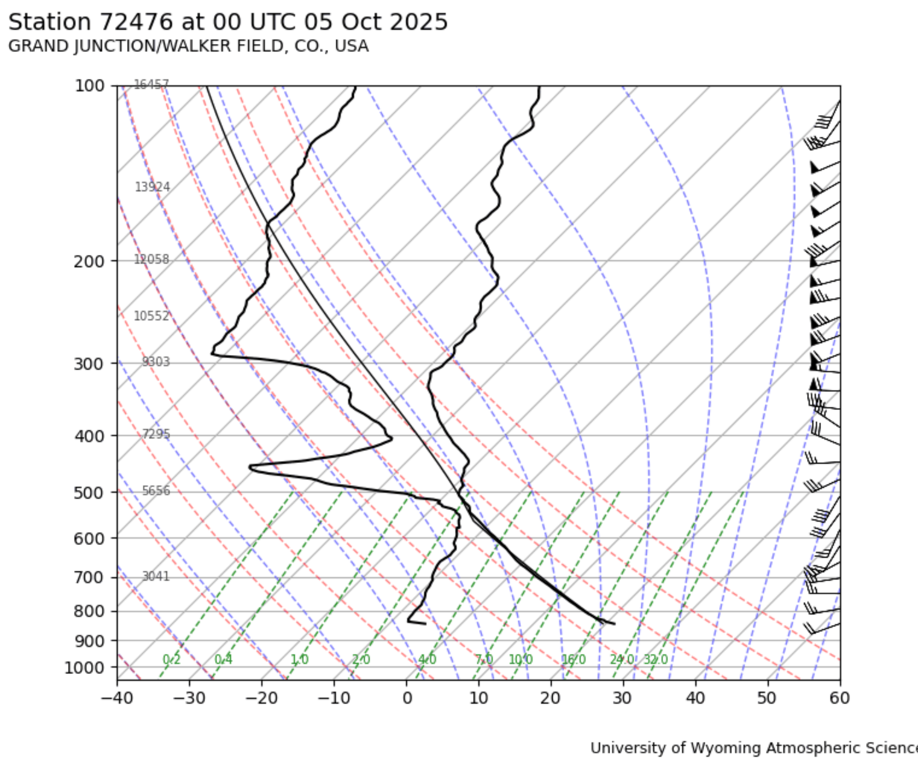
This image was taken facing east on Flagstaff Road in Boulder, Colorado at 7:30 PM. Weather was slightly windy and there was slight precipitation in some areas. Proximity to the foothills caused the foreground clouds to be shadowed, while the farther clouds were still illuminated by the sun. The slight increase in elevation allowed me to capture a large region of the sky, while only having the camera at a slight upward tilt, about 20 degrees.

3. Clouds & Atmosphere

Most of the clouds in the image appear to be nimbostratus, identifiable by their dark grey color and ragged appearance [2]. As you move towards the right the clouds appear more stable, possibly being cumulus or stratocumulus. They are still thick and fluffy, but a little more dispersed or discrete [2]. I can confirm nimbostratus since this large dark cloud extended far off the left edge of the frame, and precipitation was visible.

These types of low-level clouds are also consistent with the skew t diagram, which predicts clouds form at about 4-5 km altitude (where dew point is closest to atmospheric temp). Another piece of information we can pull out of the skew-t is the atmosphere stability. Because the sounding measurements almost exactly follow the example adiabat from about 0-5 km, the atmosphere is neutrally stable.

I also speculate that there is a Kelvin-Helmholtz instability (fluctus cloud) near the middle top of the image where there are rolling peaks in the clouds. While taking the picture, I observed the clouds moving left-to-right due to the cold air from the nimbostratus. This is consistent with the direction of the peaks seen in the image. If the clouds are moving left-to-right, shear due to slower air above them would pull towards the left [1].



4. Photographic Technique

Location and lighting were the most important aspects of my photography setup. Gaining just a little bit of altitude allowed me to get a wide angle shot free from trees and other obstacles. A tripod was not used, so I set an appropriately fast shutter speed to mitigate any handshakes. From there I simply adjusted aperture to obtain a slightly under-exposed image to preserve as many dark details as possible.

Regrettably there is some color noise in the darker areas of the image, notably the foggy layer on the bottom. A longer exposure or a bit more sunlight would have helped here.

Camera	Nikon D3000
Focal Length	55 mm
Aperture	f/7.1
Shutter Speed	1/60 s
ISO	100
Resolution	3900x2613 px

Editing for this visual was quite minimal. The height was cropped to remove the landscape at the bottom, and contrast was adjusted with a slight S-curve.

Original Image

Edited Image

5. Discussion

I like the overall composition of this image, it captures detail of the edge of a stormy system as it spreads to the right. The context may be difficult to grasp, but the fluctus cloud is a phenomenal visual of the velocity difference present here. If I were to do this again in the future, I would definitely take a time lapse to see the evolution of the system.

6. References

[1] P. K. Kundu, I. M. Cohen, and D. R. Dowling, *Fluid Mechanics*, 6th ed. San Diego, CA: Academic Press, 2016, pp. 747–749.

[2] G. Pretor-Pinney, *The Cloudspotter's Guide: The Science, History, and Culture of Clouds*. New York, NY: Perigee Books, 2006.