

Clouds First Report

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Assignment: Clouds First 2026

Course: MCEN 4151 - 001

Cloud type: Cumulus w/ Cumulus mediocris

Date w/ time: 26th Aug 2026 @ 4:46pm

Location: CU Boulder - Farrand Field

Final Cloud Photo:



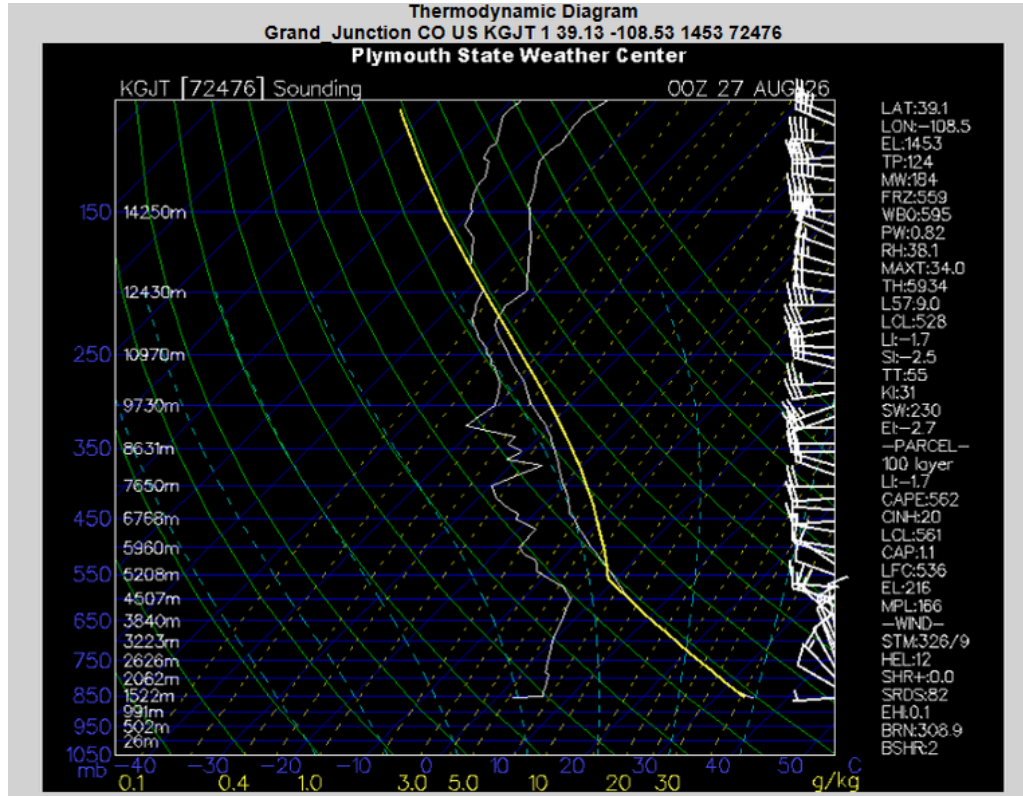
I

The rain was off and on that day, and I was outside for a few hours attending the Be Involved Fair. After a while, I noticed that the clouds started to clear up a bit and the sun began to peek through them. Since the sun was right behind the clouds, you could clearly see the sunbeams coming down toward the ground. I think the recent drizzle and light rainfall may have also made the air humid enough to help make the sunbeams more visible. Seeing this, I knew I had to take a picture because of how nice the clouds looked with the sun right behind them. Taking this picture wasn't exactly planned or purposeful; it was more of a happy accident than anything else.

II

The picture was taken on Farrand Field at CU Boulder, facing toward the Flatirons. My heading was more or less west, if not slightly north of due west. The elevation angle of my camera was fairly high, as it was pointed almost directly upward at a rough angle of 65 degrees from the horizontal. The photo was taken on August 26, 2026, at 4:46 PM.

III



Skew T Plot: From Grand Junction CO on Aug 26th, 6:00pm

Based on their appearance, the clouds seem to be primarily cumulus clouds, with potentially some cumulus humilis, stratocumulus, and possibly cumulonimbus clouds mixed in (What's This Cloud, n.d.-a, n.d.-b). At the time the photo was taken, the clouds were beginning to clear up, but earlier that day there had been very light, on-and-off rain showers. This makes me think that some of the larger clouds closer to the Flatirons may have been more developed, potentially even cumulonimbus clouds (What's This Cloud, n.d.-b). They're hard to see in the image, but the very tops of the Flatirons are visible at the bottom left of the photograph. This is also where you can see darker clouds and a greater accumulation of cloud coverage. Since the camera was pointed nearly vertically upward, it's difficult to estimate how tall these clouds were, as we're mainly looking at them from below. As the day went on, the ground continued to heat up, the air seemed to become drier, and the clouds became more separated. It didn't rain again during the rest of the afternoon, and the sky continued to clear. This separation may have been caused by some of the clouds evaporating as they mixed with drier surrounding air. Another possible explanation for the formation of these clouds is orographic lifting. Since the Flatirons are nearby and there appears to be a greater accumulation of clouds toward the mountains, it's possible that air was being forced upward by the terrain, causing it to cool and condense into clouds.

Looking at the Skew-T diagram from Grand Junction, taken on August 27, 2026, at 00Z (6:00 PM on August 26), we can see that the atmosphere was slightly unstable at certain altitudes (Plymouth State Weather Center, 2026). As a parcel of air rises, it initially follows a dry adiabat until it reaches saturation, after which it begins following a moist adiabat. Around an elevation of 5,200 m, the parcel appears to

transition toward the moist adiabat, where it begins cooling more slowly due to the release of latent heat during condensation. This allows the parcel to become warmer than the surrounding atmosphere at certain elevations, making it less dense and allowing it to continue rising. However, this instability is relatively weak, suggesting that the atmosphere was conditionally unstable. Given the Skew-T diagram, I would estimate the cloud bases to be roughly around 4,000–5,000 m above sea level. This seems reasonable given the appearance of the clouds in the photograph, although their exact elevations are difficult to determine from the viewing angle. It's also worth noting that the Skew-T was recorded in Grand Junction rather than Boulder, so the atmospheric conditions may have been somewhat different at the location of the photograph

IV

The diagonal field of view (FOV) can be obtained from the specifications of my phone. According to GSMArena (2025), the CMF Phone 2 Pro's ultrawide camera has a field of view of approximately 120°. This corresponds to an estimated horizontal FOV of approximately 108° and a vertical FOV of 92°. The ultrawide camera has an 8 MP sensor with a 1/4-inch sensor size, a physical focal length of 1.6 mm, a 35 mm equivalent focal length of 15 mm, and an aperture of f/2.2. To find the distance from the phone to the clouds, we can roughly estimate it using the camera's elevation angle of 65°, the estimated cloud elevations of 4,000–5,000 m above sea level, and the elevation of Farrand Field, which is approximately 1,650 m above sea level. First, we can calculate the vertical distance between the camera and the clouds:

$$\begin{aligned}\Delta h &= h_{clouds} - h_{camera} \\ \Delta h_{min} &= 4000m - 1650m = 2350m \\ \Delta h_{max} &= 5000m - 1650m = 3350m\end{aligned}$$

Since the camera was pointed approximately 65° above the horizontal, we can then estimate the distance along the camera's viewing direction using:

$$\begin{aligned}d &= \frac{\Delta h}{\sin(65)} \\ d_{min} &= \frac{2350}{\sin(65)} = 2593m \\ d_{max} &= \frac{3350}{\sin(65)} = 3696m\end{aligned}$$

This gives us a rough distance of 2.6–3.7 km from the camera to the clouds near the center of the image. Using this distance and the estimated horizontal FOV of 108°, we can also estimate the physical width of the field of view:

$$\begin{aligned}W &= 2d \tan\left(\frac{108}{2}\right) \\ W &= 2(2593) \tan\left(\frac{108}{2}\right) = 7138m \\ W &= 2(3696) \tan\left(\frac{108}{2}\right) = 10174m\end{aligned}$$

This gives an approximate horizontal field of view of 7–10 km at the estimated cloud distance, assuming a plane perpendicular to the camera's viewing direction. These estimates depend on the assumed cloud elevations, so the actual distances and field of view may differ. The camera used was digital, and both the original and final photographs have a resolution of 3264 × 2448 pixels. From Darktable, I was able to obtain the exposure specifications, which were a shutter speed of 1/9615 seconds, an aperture of f/2.2, an ISO of 135, and a focal length of 1.6 mm. As for image processing, I edited the photograph using my phone's built-in image editor. I adjusted nearly every setting available, including the brightness, contrast,

tone, white point, highlights, shadows, black point, saturation, warmth, tint, and blue tone. Since I edited the image on my phone, most of these adjustments were made using sliders ranging from 0–100, so I don't have the exact values of the changes I made.

Original Cloud photo:



V

Mainly, the image reveals the beams of light coming from the sun down toward the camera, with roughly half the picture being white because of the clouds and the other half being mostly blue as the clouds disperse. What I like most about the image are the beams of light that seem to pierce through the clouds and the deep blueness of the sky. I remember the sky looking very blue that day, but my original picture didn't quite capture what I was seeing. I'm happy that, with some editing, I was able to get the image closer to what it actually looked like while standing on Farrand Field that afternoon. Since the camera was pointed nearly straight up, it's difficult to see the tops of the clouds, which makes it harder to analyze the fluid physics involved, particularly their vertical development. Because of this, I think the picture is definitely more useful as art than it is as science. If I could change anything about the photograph, it would be the elevation angle of the camera. I wish I had been able to capture more of the height of the clouds while still getting those beams of light piercing through them. To achieve this, I would probably try taking the picture from a mountaintop or somewhere at a higher elevation next time, possibly for the Clouds Second assignment. Overall, I really like the picture; I just wish I had captured more of the vertical elements of the clouds that day

References -

- AI was used for fluidity and grammar correction of each paragraph.
- [What's This Cloud. \(n.d.-a\). Cumulus clouds: Low, puffy heaps. What's This Cloud.](#)
- [What's This Cloud. \(n.d.-b\). Cumulonimbus clouds: Thunderstorms. What's This Cloud.](#)
- [Plymouth State Weather Center. \(2026\). Atmospheric sounding for Grand Junction, Colorado \(KGJT\), August 27, 2026, 00Z \[Skew-T diagram\]. Plymouth State University.](#)
- [GSMarena Team. \(2025, May 5\). Nothing CMF Phone 2 Pro review. GSMarena.](#)