Cloud Second

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Fleeting Beauty
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Cloud photography presents a fascinating challenge, inviting photographers to capture the ever-changing dynamics of the atmosphere. When I began this assignment, I never expected to develop a profound appreciation for the captivating beauty of cumulus fractus clouds. My initial efforts focused on broad observations of the sky, as I eagerly sought out cloud formations that would unveil the intricate interplay between thermal energy, moisture, and variable atmospheric conditions. These cuspidate, torn clouds, with their rugged and fragmented appearances, embody fleeting moments of atmospheric turbulence that often go unnoticed by the untrained eye.

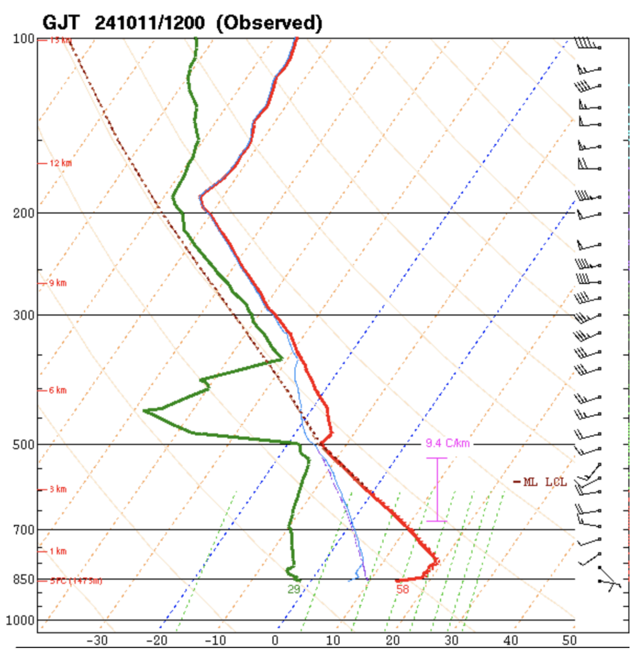
The photograph was taken from my home's rooftop in North Boulder, Colorado. I had been on the lookout for interesting cloud formations for a while, but many days had either clear skies or gray skies, leaving me with few opportunities to capture images. However, on this particular day, I was sitting in my room when I looked out the window and spotted an intriguing cloud. I immediately ran to the roof of my house to set up my camera, positioning myself westward with the camera angled approximately 45 degrees above the horizon. I captured the cloud formation at 3:11 PM on October 11, 2024. The precise positioning was critical in documenting the cloud's fleeting existence, allowing me to freeze a moment of atmospheric transformation. When I took the photograph, I had no idea what type of cloud it was. When I presented my photo, I asked the audience for help identifying it, and an expert suggested it was a cumulus fractus, formed from boundary turbulence.

Cumulus fractus clouds are a fascinating type of cloud formation that result from complex interactions within the atmospheric boundary layer. These clouds develop through a detailed process involving thermal and mechanical turbulence. On the day in question, the meteorological conditions were particularly favorable for their formation, with temperatures ranging from 50°F to 66°F, minimal wind activity peaking at 3.8 mph, and a dry, partly cloudy environment. Understanding these conditions is crucial in appreciating the intricate beauty of these clouds.

The physics behind the formation of cumulus fractus clouds involves a complex interaction of atmospheric boundary layer dynamics and thermodynamic processes. When solar radiation heats the Earth's surface unevenly, it causes thermal updrafts as pockets of warm air rise through the cooler air above. These rising air parcels expand and cool adiabatically, eventually reaching the dew point, where water vapor condenses into visible droplets, forming the initial fragments of cumulus clouds.

The irregular and torn edges that characterize cumulus fractus clouds arise from continuous mixing in the atmosphere. Wind shear introduces horizontal motion, while turbulence within the boundary layer disrupts the condensation process, leading to evaporation or dissipation in some areas of the cloud. Additionally, the interaction with warmer, drier air that becomes mixed with the cloud disrupts its uniformity, enhancing its jagged and fragmented appearance.

Temperature gradients and pressure differences within the boundary layer also contribute to the rapid evolution of these clouds. The specific atmospheric conditions observed on that day—characterized by minimal horizontal temperature variation but sufficient instability—provided an ideal environment for their formation. This delicate balance of forces highlights the ephemeral and dynamic nature of cumulus fractus clouds, which often change rapidly as they drift within the boundary layer.



Meteorological data from the Oklahoma NWS/Storm Prediction Center's skew-T plot provided additional insights into the atmospheric conditions. The plot indicated potential cloud formations at approximately 4.5, 5, and 11 kilometers above sea level. The convergence of temperature and dew point lines suggested a stable atmospheric layer, which correlates directly with the observed cloud characteristics. The fractus cloud appeared to hover just above the mountain peaks, consistent with an elevation of around 4 kilometers—a typical location for boundary layer cloud development.

For this particular cloud image, I utilized the iPhone 13 Pro camera, as my Sony mirrorless camera was not readily available. Equipped with a 12-megapixel sensor, the iPhone 13 Pro features a 15x digital zoom capability and three lenses, including a telephoto lens. At 3x zoom, the field of view (FoV) is 22.8 degrees, translating to a narrow 4.56-degree FoV at the maximum 15x zoom. This choice of equipment also highlights the accessibility of cloud photography, as it can be done with a device as common as a smartphone.

Both the original and edited images measure 4043 pixels in width and 3024 pixels in height. For this shot, I set the focal length to 140mm, an ISO of 32, an aperture of f/2.8, and a shutter speed of 1/1325 seconds. In post-processing, I adjusted the highlights and brightness while enhancing saturation, adjusting the black point, increasing contrast, and elevating shadows. These edits were made to bring out the unique characteristics of the cumulus fractus cloud and to create a visually striking image. The results of these edits are clearly demonstrated in the before and after comparisons.

The captured image allows us to study atmospheric fluid dynamics through visuals. The jagged edges of the cumulus fractus cloud show ongoing motion and change, reflecting the turbulent processes that shape the atmosphere. This uneven cloud structure, set against a clear blue sky, shows the complexity of the atmosphere. Its fragmented appearance highlights the constant interaction between heat, moisture, and atmospheric conditions, helping us understand the processes that drive cloud formation and change—processes that are often invisible to our eyes.

Works Cited

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