Cloud Second Report

12/11/2024

Peter Booras

MCEN 5151-002

Image 1: Edited Cloud Second

I took this image as part of an assignment for the Flow Visualization course I am enrolled in during the Fall 2024 semester. The assignment is titled cloud second and the goal is to capture both visually striking and informative images of a cloud as well as inform us, the students, how difficult it is to photograph a picture of a cloud. This is the edited photo and post processing that has been done to make the target region of the photo stand out as well as cropped out any additional distractions.

The image was captured in an open field in Highlands Ranch, Colorado, located approximately an hour south of Boulder. The photo was taken on October 28th, 2024, at 5:30 PM, during the late afternoon. The camera was oriented northeast and angled approximately 15 degrees above the horizon to capture the clouds in the frame. The elevation of the location was roughly 5,770 feet, providing a clear view of the sky without significant obstructions.

The observed clouds in the image were stratocumulus undulatus, known for their layered, wave-like appearance, and the data supports this identification. The Skew-T plot from October 28th, 2024, with a 00Z timestamp (valid for 6 PM local time), reveals a stable atmosphere with CAPE values at 0.00, indicating no convective activity and supporting calm weather conditions. The lifted condensation level (LCL) was around 613.5 hPa, corresponding to approximately 12,500 feet, aligning well with stratocumulus clouds, which typically form at mid-levels. The absence of a front or significant wind shear in the Skew-T data confirms the stability of the atmosphere and the lack of a storm system. The previous day's similar weather conditions likely contributed to the continuation of these cloud patterns, even though their specifics were unrecorded. Winds aloft appeared light, which, combined with stable layers and no convective activity, facilitated the formation of the stratocumulus undulatus clouds. These clouds form due to gentle undulations in the atmosphere,

often caused by slight temperature gradients and weak wind variations at mid-level altitudes. Their distinctive wave patterns arise from laminar airflow interacting with stable atmospheric conditions, consistent with what was observed and reported during this calm evening.

Image 2: Original Photo

The image was taken using a digital iPhone 14 Pro. The field of view was approximately 80–100 degrees, capturing a wide perspective of the sky. The distance from the lens to the clouds was roughly several miles, typical for atmospheric photography. The lens used was the built-in iPhone ultra-wide, at a focal length of 13 mm (35 mm equivalent). The original image resolution was 4032 x 3024 pixels, maintaining high clarity and detail, and this was preserved in the final processed image. The exposure settings included an aperture of f/1.78, a shutter speed of 1/500s to minimize motion blur from hand movement or atmospheric conditions, and an ISO setting of 50, keeping noise levels low. No video was captured, so frames per second are not applicable. The image was processed using photoshop to crop out unnecessary distractions. Adjustments included slight increases in contrast and saturation to emphasize the cloud textures and subtle tonal shifts to bring out the wave-like patterns characteristic of stratocumulus undulatus. Sharpening was applied to highlight fine details, while cropping ensured the framing was balanced. The overall processing maintained the integrity of the original capture, and no significant alterations were made. If a before image is required, it is readily available to demonstrate the enhancements applied.

The image reveals the intricate, wave-like patterns characteristic of stratocumulus undulatus clouds, showcasing the fluid dynamics of atmospheric layers interacting under stable conditions. What I like most about the image is the clarity and detail in the cloud formations, which vividly illustrate laminar flow and subtle undulations caused by weak wind variations and temperature gradients. However, I wish the image captured a broader field of view to include more context of the surrounding sky, which might better emphasize the scale and uniformity of the cloud patterns. The image effectively demonstrates fluid physics, particularly the stability and stratification of atmospheric layers, but raises questions about the specific temperature and wind profiles at higher altitudes that might have influenced the undulations. My intent to capture and highlight the beauty and physics of stratocumulus undulatus clouds was fulfilled, though there is room for improvement in composition and perhaps capturing the clouds during different lighting conditions for more

dramatic effects. To develop this idea further, I could explore photographing similar cloud formations under varying atmospheric conditions, such as during sunrise or sunset, to study how light interacts with the cloud layers. Additionally, integrating time-lapse photography might provide dynamic insights into the cloud movement and the evolution of their patterns over time, further connecting the visual aesthetic with fluid dynamics.

References

American Meteorological Society. Glossary of Meteorology. Accessed December 12, 2024. https://glossary.ametsoc.org.

Pretor-Pinney, Gavin. The Cloudspotter's Guide: The Science, History, and Culture of Clouds. New York: Penguin Group, 2006.