Clouds Second Report

Artist: Hank Goodman

Course: Flow Visualization (MCEN 4151-001)

Assignment: Cloud Second

Cloud Type: Altostratus Undulatus

Date and Time: November 10, 2025 @ 5 PM

Location: Boulder, CO

Figure 1 - Final image of cloud with post-processing.

Purpose and Intent

This image was taken for the Clouds Second assignment, with the goal of capturing an expressive mid-level cloud formation illuminated by sunset light. In the days leading up to this photo, I observed several layered evening cloud decks forming over Boulder, and I intended to capture a structure that demonstrated both aesthetic color gradients and underlying atmospheric physics. The final image emphasizes the contrast between the dark foreground tree silhouettes and the vibrant, stratified cloud base glowing under the low sun. No teammates assisted with capturing this image.

Circumstances of Capture

The photograph was taken near the intersection of Colorado Avenue and 30th Street in Boulder, Colorado, on November 10th, 2025, at approximately 5:00 PM, facing west toward the setting sun. The elevation angle was roughly 20–25° above the horizon, directed toward a broad mid-level cloud deck. The rest of the sky followed a similar structure: layered, smooth, and relatively uniform, with no towering convection or isolated cumulus cells. Conditions earlier in the day were calm and dry, with no precipitation before or after the capture time, consistent with a stable atmosphere and stratiform cloud formation. Winds at the surface were light, and visually the cloud layer exhibited long, parallel undulations typical of wave-driven mid-level clouds.

Cloud Identification and Atmospheric Analysis

The cloud in the final image is best classified as Altostratus undulatus, a mid-level stratiform cloud characterized by gentle wave patterns driven by wind shear and stable layering. The dark, continuous base, smooth laminar texture, and broad horizontal extent indicate altostratus rather than altocumulus, while the elongated ripples confirm the undulatus subtype. Supporting atmospheric data comes from the 00Z 11 November 2025 Grand Junction Skew-T (Figure 2), the correct evening sounding for the region. The sounding shows a saturated layer between ~550 and 650 mb, matching typical altitudes of altostratus. The environmental temperature lapse rate in this region is weak, indicating a stable atmosphere, and wind profiles suggest moderate shear, a condition known to produce gravity-wave undulations in stratiform clouds. These data align with visual observations: a stable mid-level layer, illuminated from below at sunset, producing the

warm reds and purples seen in the photograph.

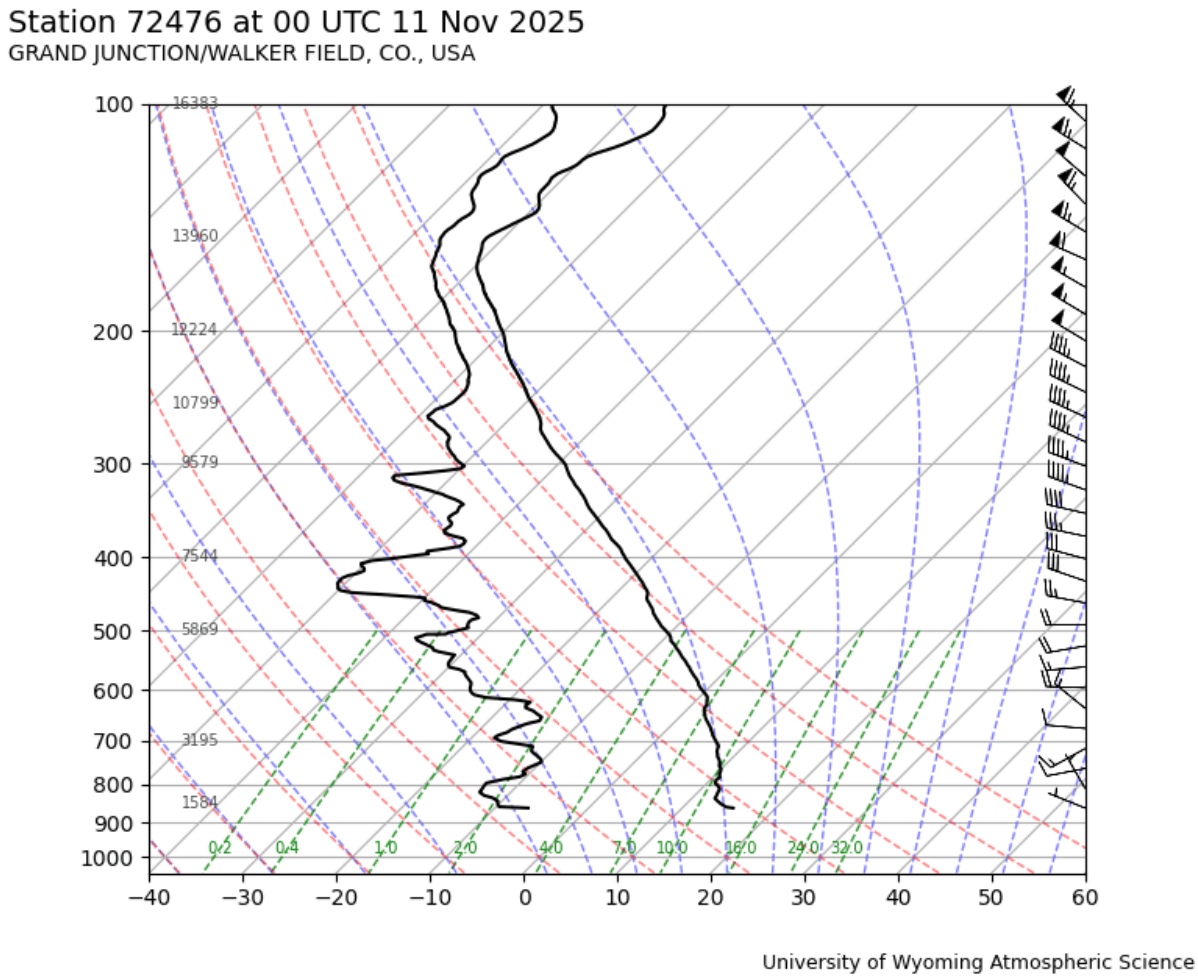

Figure 2 - Skew-T plot from Grand Junction (00Z 11 Nov 2025, University of Wyoming).

Photographic Technique

The image was taken with a Canon EOS 7D Mark II at 20 mm, ISO 8000, f/13, and 1/100 s. The high ISO was chosen to preserve detail in the dark cloud deck and foreground trees while maintaining a fast shutter speed to avoid motion blur from camera shake. The wide focal length allowed more of the horizon and upper cloud structure to be included, emphasizing the expansive horizontal layering. The field of view is approximately 65–70°, and the cloud deck was several kilometers away, effectively at optical infinity. Post-processing was done in the Nik Collection Viveza editor to enhance mid-level contrast and color balance: brightness +15%, contrast +10%, saturation +5%, reduced shadows, and selective warmth adjustment to recover the sunset glow. These global adjustments can be seen in Figure 4. A local control point was used to slightly lift the exposure in the central

cloud band, revealing finer undulation structure. The local control point adjustments can be seen in Figure 5.

Figure 3 - Original photograph (jpg) before post-processing.

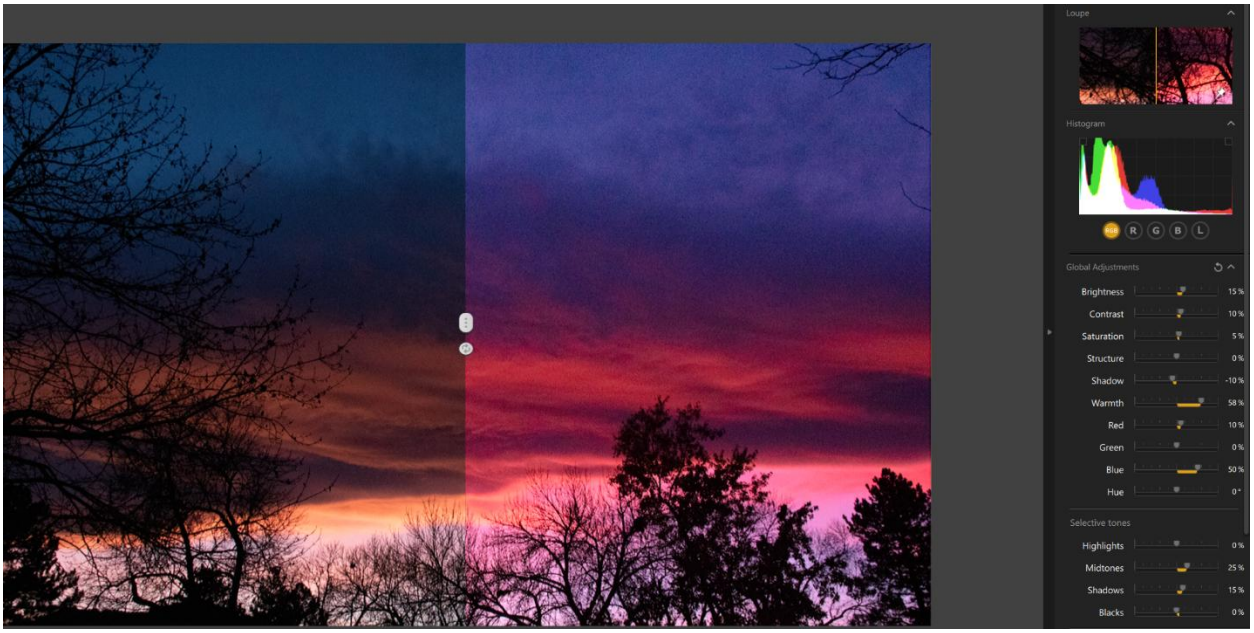

Figure 4 - The global adjustments performed on the image using Nik Collection Viveza.

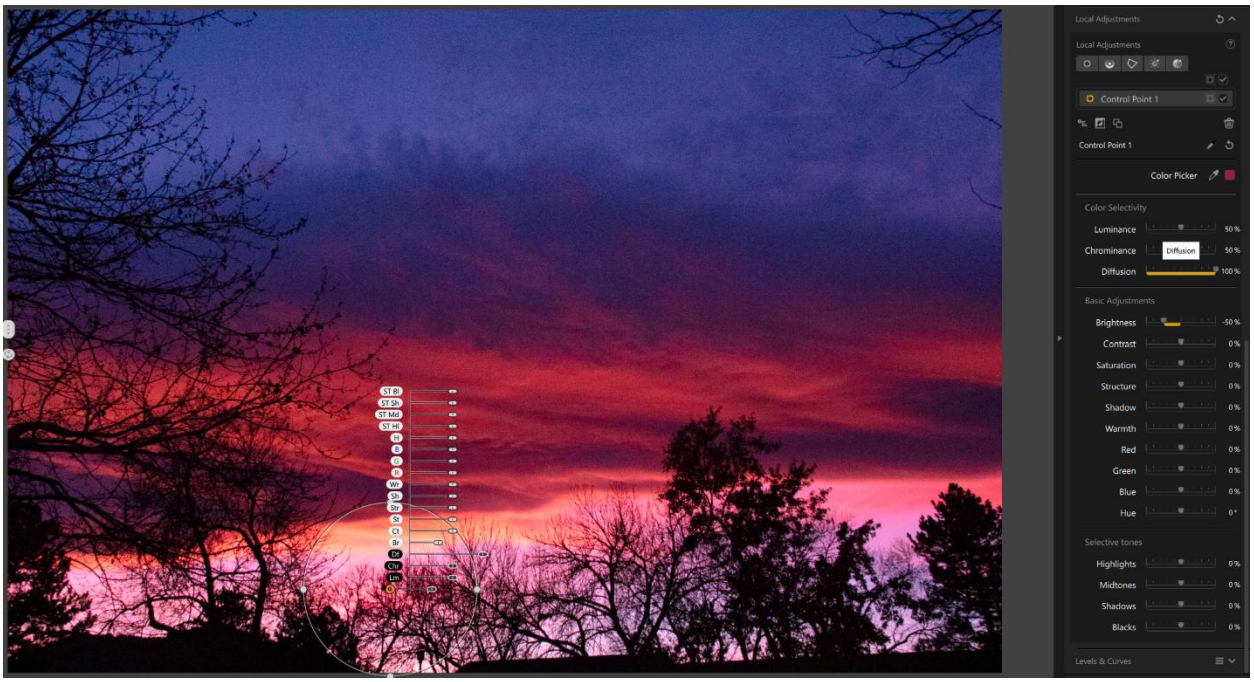

Figure 5 - A local control point is used to adjust a small section of the photo, done using Nik Collection Viveza.

Conclusion

The final image reveals how stable, stratified atmospheric layers can generate visually striking wave structures when disturbed by terrain or shear. The undulatus pattern highlights vertical oscillations in the air parcel motion, while the smoothness of the cloud layer demonstrates the absence of strong convection. I particularly like the gradient transition from deep blue upper levels to fiery reds near the cloud base; this shows how sunlight refracts and scatters through the stable, optically thick layer. One limitation is the noise introduced by the high ISO, which is visible upon close inspection, though it does not detract significantly from the overall effect. If I continued this idea, I would experiment with longer exposures on a tripod or attempt a time-lapse sequence to capture the evolution of the gravity-wave structure.

References

University of Wyoming Atmospheric Soundings – Grand Junction, CO (00Z 09/22/25)
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Flow Visualization – Cloud Classification Guide (Clouds 1–6). University of Colorado Boulder, FlowVis Course Resources.
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