



Orthographic Altostratus

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Clouds Second

MCEN 5151: Flow Visualization

University of Colorado Boulder

1 Introduction

One Sunday morning this fall, I walked outside to one the most interesting cloud layers I had ever seen. Although I had a lot of homework and midterms to study for, I dropped everything to document these clouds. I documented the North and South clouds using a range of images and videos taken from South Boulder. It was extremely windy this day, as the fall weather was beginning to cool down. The video in this assignment is a time lapse aimed to demonstrate the 'standing cloud' that resulted from the high winds and orthographic effects. The still image highlights the halo effect of the sun seen through smooth altostratus clouds. In addition to demonstrating the physics of smooth, flat clouds during windy days, this visual shows the beauty of Colorado's natural landscape.

2 Image Context

These visuals were captured from a parking lot off of S. Foothills Highway 93, just west of Marshall Lake. The time was between 12:00PM to 1:00PM MST on October 19, 2025. The first clip of the video is facing South, the second clip is facing North, and the still is facing South. In all footage, the camera is angled approximately twenty degrees above the horizon.

3 Cloud Analysis

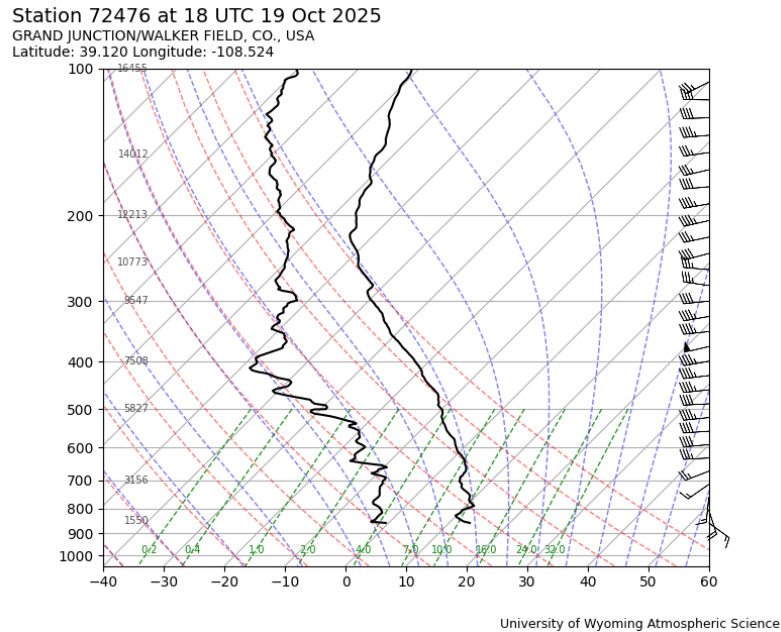


Figure 1: Relevant Skew T Diagram - Grand Junction

The cloud in this footage is suspected to be a lenticular cloud, or one that has been developed due to mountainous terrain. This type of cloud forms due to the strong westerly winds forcing the air over the mountains into Boulder, and then condensing once it reaches the higher, colder air. Although this cloud appears relatively stationary, there is constant air being forced through that condenses at the edge. This imagery was taken on a day when the temperature was cooling off rapidly, which was related to the strong winds. Additionally, given the smooth, thick appearance, it is thought to be an

altostratus type cloud. The bottom of this cloud forms at the Lifting Condensation Level pressure of 685 hPa, and the LCL temperature of 269 Kelvin (as seen on the skew-T diagram). This makes sense, as the base of this cloud layer is just above the peak of the mountains. The CAPE during this time frame was zero, indicating a completely stable atmosphere. This is visible in the clouds, with no vertical development or indications of turbulence.

4 Photographic Technique

Captured using a Nikon D810 paired with a wide angle fish-eye lens, this visualization shows a digital portrayal of the broad landscape in high-definition. The Nikon D810 is a full frame sensor DSLR, producing an image size of 7380 x 4928 pixels. The lens used was a Nikon fish-eye lens with a focal range of 8mm to 15mm and maximum aperture of f/3.5. This series was shot using a focal length of 15mm. To fully capture this cloud, it was necessary to use a wide-angle lens, although it does result in some curvature of the horizon. In this still, the exposure was set as follows: ISO 100, f/16, and 1/500 sec. Since the intent of the still was to capture the halo of the sun, it was necessary to allow minimal light on the sensor. This still was processed in Adobe Lightroom, with a final size of 6047 x 4036 pixels; the adjustments include a slight crop, brightening the exposure, balancing the highlights and contrast, and bringing the vibrance and saturation up. The original still image is displayed below for reference. The video was initially the same size of the still, with a frame rate of 60 fps, and similar exposure specs to the still, although that information could not be recovered from the file. The final video was developed using Photoshop, with a final size of 1920 x 1080 pixels and frame rate of 30 fps. The two clips of the video are each set to 64x speed, to highlight the stability of the cloud over time. Other than a slight crop, the videos have not been altered. The video and still both highlight the beauty and physics of lenticular clouds through a wide angle perspective.



Figure 2: Unedited, original photograph

5 Artists Statement

I feel that this is my stronger clouds imagery, as this strongly highlights orthographic affects as well as the beauty in mountainous clouds. The time lapse was definitely the right decision to highlight the 'standing' affects of this type of cloud. I'm glad that I also captured a still with the halo of the sun through the cloud, this was my favorite artistic element of this visual. The fisheye lens was definitely the right decision for this cloud type, it effectively showed the entire (huge) cloud as well as the beautiful landscape of Colorado. If I were to develop this further, I would consider putting a still mask over the landscape to avoid the constant motion of the cars, although this might take away from the sense of time lapse. Additionally, I would consider doing the same for the still to avoid loss of color in the grass when editing to highlight the sun's halo.

6 Citations

Atmospheric Soundings, weather.uwyo.edu/upperair/sounding_legacy.html. Accessed 1 Dec. 2025.