Altostratus and Altocumulus Clouds over Colorado Springs

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Taken at 16:40 on 11/27/22 near Pueblo, CO

Figure 1: Altostratus and Cumulus Clouds over Colorado Springs

For this second clouds assignment, students were once again tasked with taking photos of different types of clouds, but this time during the winter months to capture different weather systems. The specific requirement was that the photo had to be taken between the range of late October-December 2022. The intent behind this particular image was to capture a beautiful sunset shining upon a cloud system leaving the mountains.

This photo was taken while driving North from Pueblo towards Colorado Springs. The camera is facing directly North, with the cloud system covering the Eastern part of the sky. It was taken at 16:40 on November 27th, right around sunset.

This image prominently features altostratus clouds, with some mountain wave and altocumulus clouds thrown in as well. Figure 2 depicts the Skew-T diagram most closely associated with the location:

As seen in the Skew-T from Figure 2, the dew point temperature and actual temperature lines are quite close together from 1400-4500m of elevation, indicating that the cloud height is also likely within this region. The CAPE number is 1.84, which is slightly unstable but not enough to be indicative of an extreme weather system. If this number is greater than 0 the atmosphere is typically unstable. The cloud system in figure 1 captures the tail end of the system leaving the mountains, and the slight instability is backed up by the weather data which states that it was snowing during this day.

For the clouds depicted, the typical altitude at which these types form begins at approximately 6-12000 feet above ground level. [1] This makes sense, as in the skew-T diagram, we can see the clouds should begin forming around 6000 feet. Additionally, one can see that the atmosphere was is primarily stable, as the rest of the sky is relatively clear.

Altostratus clouds typically form in horizontal layers, and are more common in cooler months such as November. Figure 3 fro Platt, 1976, provides a useful visualization of a cross-section of one of these clouds:
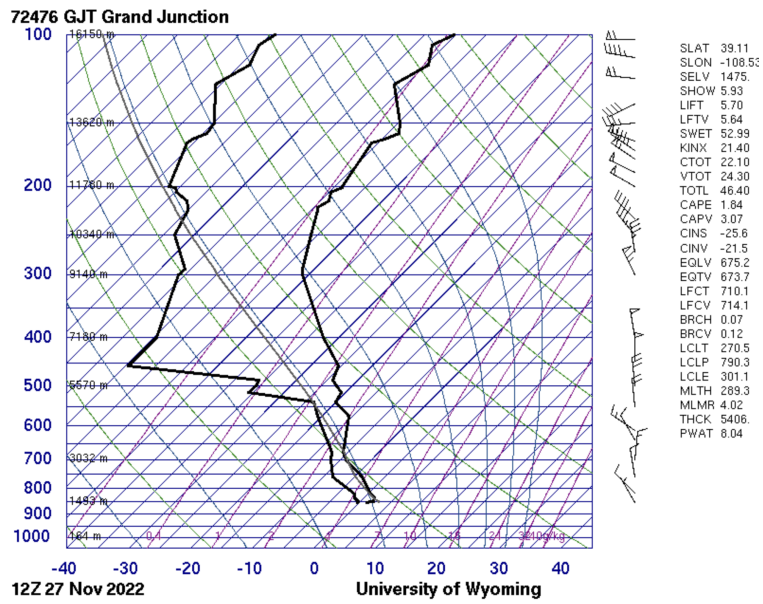
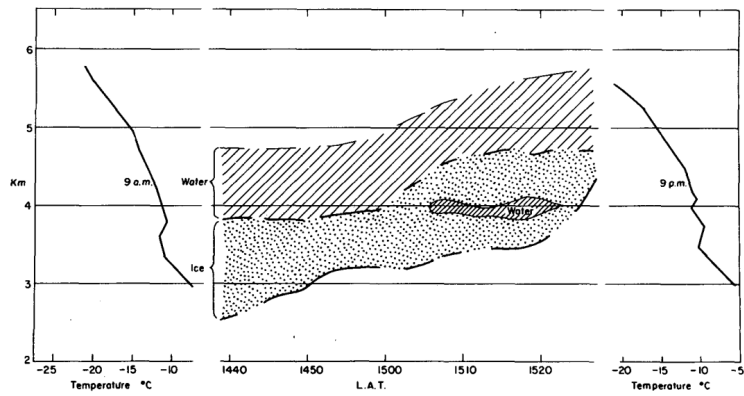Figure 2: Skew-T Diagram of Grand Junction on 27 November 2022

Figure 3: Platt (1965): "Time height representation of the altostratus clouds over the total time of observation."

This image was taken with a Nikon D3400 DSLR camera, using an 18-55mm lens. The photo was taken with a focal length of 55mm at aperture f/11. The shutter speed was 1/320s, at ISO 1600. The goal of the framing of the image was to capture the clouds on the horizon illuminated by the last bit of daylight. The FOV of the image spans a region of approximately $10x5$ miles (at 6000x4000 pixels originally, edited down to 5216×3131), and the cloud system subject was approximately 8 miles away from the lens. Lastly, a de-noise algorithm was run to reduce some artifacts.

Lots of digital alterations were added to the image to emphasize the clouds passing overhead. The dark range in the image was darkened with the RGB curve, and the light range slightly increased. I increased the saturation to make the color of the clouds pop, as well as the blue sky. I also used the retouch tool to edit out some distracting signs in the lower third of the image. Figure 4 depicts the original vs. edited photo.

(a) Original Photo   (b) Edited Photo

Figure 4: Original vs. Edited Photo

In conclusion, this image depicts a pretty sunset of the tail end of an unstable system over Colorado Springs, including altostratus and altocumulus clouds. I am happy with the way the image turned out, although I wish that there was less noise in the actual image so that there were less artifacts in the edited one. I was successful in fulfilling my intent!

References

[1] "Cloud Classification." Cloud Classification
    (Centre for Atmospheric Science - The University of Manchester),
    http://www.cas.manchester.ac.uk/resactivities/cloudphysics/background/classification/.

[2] Platt, C.M.R. \Lidar Observation of a Mixed-Phase Altostratus Cloud."
    Journal of Applied Meteorology and Climatology, 8 Sep. 1976,
    https://doi.org/10.1175/1520-0450(1977)016<0339:LOOAMP>2.0.CO;2