Altocumulus Lenticular Clouds Captured at Sunset

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1 Introduction

One evening on November 4, 2023, I took a walk along the Bobolink Trail in Boulder. I took a picture of the sky, especially focusing on the clouds lit up by the warm colors of the setting sun with my Samsung Galaxy A22 Android phone camera. The photo turned out to be beautiful, showing a mix of yellow and red hues in the clouds, like a natural painting in the sky during the transition from day to night.

In the picture, we can see two main types of clouds. Some are big and shaped like lenses, which scientists call lenticular clouds. These clouds form because of the winds near the mountains. There are also thin, wispy clouds known as cirrus clouds, adding a delicate feel to the overall scene. This report will explore the details of this captured moment, looking into the science behind the way light, air, and clouds work together to create a timeless and beautiful picture of nature.

Fig 1: Final Edited Image of Sunset Clouds over Bobolink Trail

2 Location and Time

Boulder, Colorado is renowned for its stunning natural beauty, and lovely trails. One such trail is the Bobolink Trail which offers outdoor enthusiasts opportunities for hiking, walking, and enjoying nature. The trail has an overall elevation of 5,284 ft. The image was captured on 4th November, 6 pm.

3 Post-Processing of the Image

The original image was edited using the Darktable software. The features used in Darktable were Crop, the RGB curve and local contrast to increase the color range of the picture. The no of pixels in the original image were 4000 x 2250 and the final edited image was 3573 x 2150 (pixels).

Fig 2: Unedited (original) image

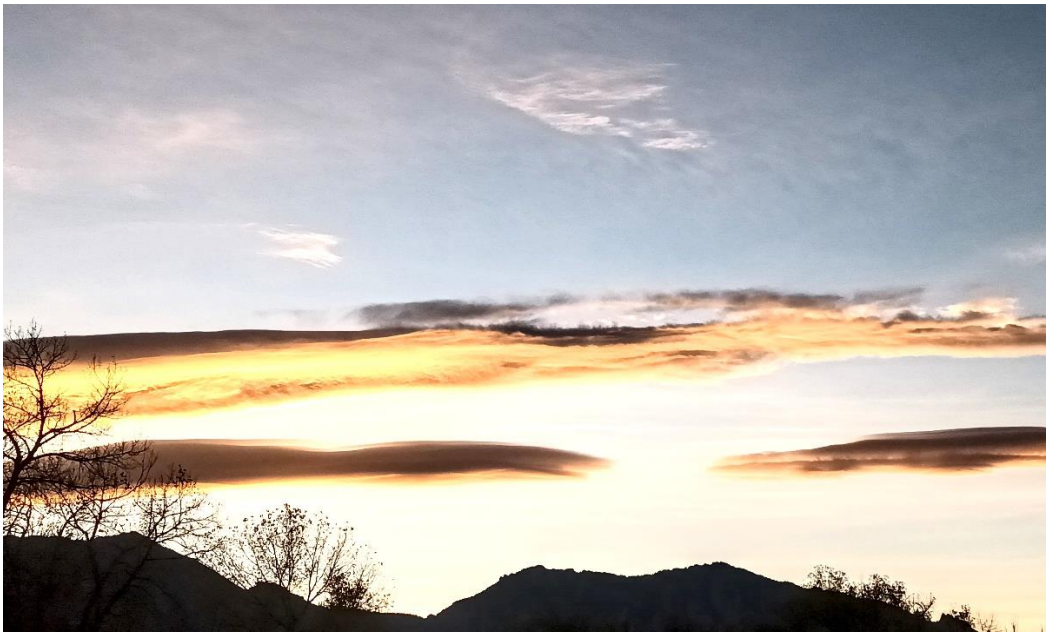

Fig 3: Edited (final) image

4 Cloud Description

4.1 Aesthetics and Light:

Clouds are a dynamic and captivating aspect of the sky, and they play a pivotal role in the aesthetics of any landscape. Their ever-changing forms and patterns can dramatically alter the mood and atmosphere of a scene. On that day in November, the clouds added a layer of drama and wonder to the already picturesque landscape. The sunset colors seen in the clouds can be explained by **Rayleigh scattering**. Rayleigh scattering is a phenomenon that explains the scattering of light by particles in the atmosphere. This scattering is responsible for various optical effects, including the blue color of the sky and the reddening of the sun during sunrise and sunset. Clouds appear white when composed of larger water droplets or ice crystals that scatter light of all colors equally. However, when clouds are composed of smaller particles, they can exhibit colors similar to those seen during sunrise and sunset.

The two types of clouds observed in the picture are the larger Altocumulus Lenticular clouds and the smaller Cirrus clouds. The properties of these clouds are described in the following sections.

4.2 Altocumulus Lenticular Clouds:

Altocumulus lenticularis, commonly known as lenticular clouds, often appears in the middle altitude range, typically between 6,500 and 20,000 feet (2,000 to 6,000 meters) above sea level. These clouds are lens-shaped or saucer-shaped, with a smooth and rounded appearance. They often have a layered structure, resembling a stack of pancakes or a series of disks.

Lenticular clouds form when moist air flows over elevated terrain such as mountains. As the air encounters obstructions like mountain ranges, it is forced to ascend. When this air reaches a level where it is cooled sufficiently, lenticular clouds can develop. The stationary nature of these clouds is due to the balance between the uplifting force of the terrain and the tendency of the air to sink back down. These clouds are usually not associated with precipitation. Instead, they are often an indicator of atmospheric instability and the presence of strong winds at higher altitudes. Pilots often take note of lenticular clouds as they can signify turbulence in the air.

4.2 Cirrus Clouds:

Cirrus clouds are high-altitude clouds that form above 20,000 feet (6,000 meters) in the Earth's atmosphere. They are characterized by their wispy and feathery appearance, often resembling delicate strands of hair or mare's tails. Cirrus clouds are primarily made up of ice crystals rather than water droplets

While cirrus clouds themselves do not bring precipitation, their presence can indicate changes in the weather. The appearance of cirrus clouds may precede the arrival of a warm front or signal the approach of a developing storm system.

5 Skew-T and Atmosphere

The Skew-T plot, a meteorological diagram for analyzing atmospheric conditions, provides valuable insights into the atmosphere's stability and potential for cloud development. The skew-T plot for the time of the cloud capture is as follows:

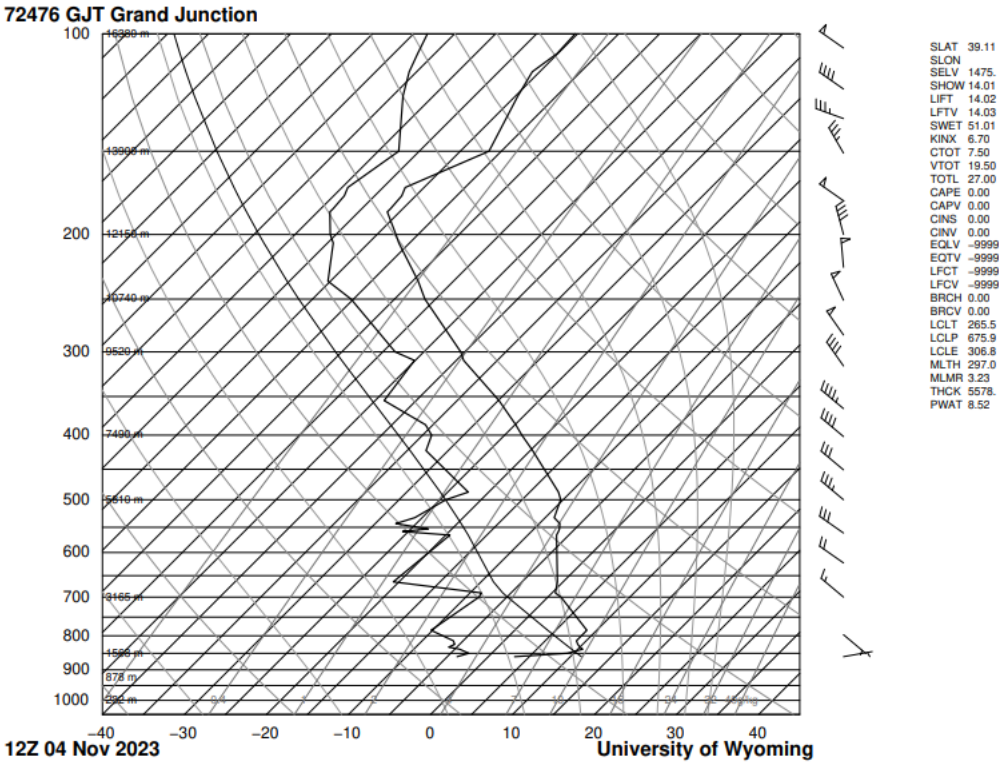

Fig 4: Skew-T for Grand Junction on 4th November

CAPE (Convective Available Potential Energy) measures the amount of energy available in the atmosphere to support vertical air movement and convection, which is essential for cloud formation and the development of thunderstorms. The CAPE Number at 2000 to 6000 meters altitude is a low negative value of -100 in our case, indicating a stable atmosphere. This atmosphere is conducive to the formation of altocumulus lenticular clouds. On the other hand, cirrus clouds can form in both stable and unstable atmospheric conditions.

6 Observations and Conclusion

The current images were taken using an Android camera, which, while adequate, has limitations regarding image resolution. My future goals include upgrading to a DSLR (Digital Single-Lens Reflex) camera. A DSLR camera will provide me with better image quality, allowing me to capture more detail in the cloud photos. It also offers greater control over the photography process, with settings like aperture, shutter speed, and ISO.

While I have captured the beauty of lenticular and cirrus clouds, I aim to photograph diverse cloud types. This includes capturing cumulonimbus clouds, nimbostratus clouds, etc. as each cloud type offers a unique aesthetic.

We should be aware that the Skew-T plot I referenced is based on data from Grand Junction in Colorado, some distance from the Boulder location. This geographical separation can lead to variations in atmospheric conditions.

In summary, my future in cloud photography involves upgrading my equipment and exploring diverse cloud types. This approach will enable me to capture the beauty of the sky with improved clarity and versatility.

References

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