# **Altocumulus Lenticularis**

1/29/18, 6:27pm, Boulder Colorado Clouds First: Lara Buri MCEN 5151-001



**Figure 1: Altocumulus Lenticularis Clouds** 

## INTRODUCTION

This image was taken for the Clouds First Assignment for Flow Visualization. For this image, I wanted to catch the beauty of the Colorado sunset, as well as the strange cloud shapes that often form over the Front Range. This particular cloud formation had formed early in the afternoon, and parked itself over the Flatirons for most of the day. Throughout the day I was taking pictures, but as soon as the sun went behind the mountains, the colors turned from blues and whites to brilliant pinks, oranges, and purples, and that's when I captured the image above.

#### **CLOUD ANALYSIS**

#### **Image Circumstances**

The final image (shown in Figure 1) was taken at the Bear Creek Apartment Complex in Boulder, Colorado at 6:27pm on January 29<sup>th</sup>, 2018. The camera was pointed southwest toward Bear Peak

(highest peak shown in Figure 1) and the elevation of the camera was about 5° from the horizontal. At the time the photo was taken, the temperature was 50° F and humidity was at 22%<sup>1</sup>.

#### **Cloud Identification and Physics**

The image (shown in Figure 1) shows altocumulus lenticularis clouds formed in a stable atmosphere. Figure 2 shows the Skew-T diagram for the afternoon of January 29<sup>th</sup>. This diagram confirms that these clouds formed in a stable atmosphere, as the CAPE is zero for this day. As seen in Figure 2, the temperature profile (right black line) and the dew point (left black line) come closest together around 6,000 m. This is a good estimate for how high the clouds formed. Clouds that develop in the middle of the atmosphere typically start with the prefix 'alto-.' Because this is a cloud that formed in stable atmosphere at midheight, and is sitting right above the mountains, the most likely cloud formation is altocumulus lenticularis.



Figure 2: Skew-T Diagram for January 29th, 2018<sup>4</sup>

Lenticular clouds often result from strong air flow around high mountains. The circular shape of some of the clouds is associated with centers of turbulence, interspersed with areas of calm<sup>3</sup>. These clouds are also often called wave clouds, as they are caused by wave motions in the atmosphere that occur when air comes over the mountains in to the plains<sup>2</sup>. Figure 3 below shows how these mountain wave clouds occur. Air coming off the mountains drops down into the plains, warms up, then rises, where it cools and sinks. This movement up and down creates waves in the airflow. In the upward-moving part of the wave, expansional cooling and condensation of water vapor occurs and the flat, smooth clouds are formed<sup>3</sup>.



Figure 3: Mountain Wave Formation<sup>3</sup>

The lenticular clouds are slow moving clouds. This is due to the fact that the clouds become 'trapped' within the standing waves shown in Figure 3. Below the lenticular clouds, at lower altitudes, winds can become quite variable and gusty, although usually not extremely strong<sup>3</sup>. This was observed around the time the photo was taken. The winds were calm most of the day until this large cloud formed. Starting around 4:00pm a light variable wind (about 10mph) picked up for the rest of the evening.

# PHOTOGRAPHIC TECHNIQUE

This image was taken using a Nikon D3300 DSLR camera with an 18-55mm 1:2.5-5.6 lens. The shutter speed was 1/250 second, the f-number was f/8, and the ISO speed was ISO-400. As stated in the previous section, the clouds were estimated to be about 6,000 m above the ground, and judging by the span of the cloud over the foothills, the length of the cloud in the image is estimated to be about 2 miles across from north to south. The original photo, shown in Figure 4, had the dimensions 6000x4000 pixels and the final image had dimensions 5556x4000 pixels.



Figure 4: Original Image

As one can see by comparing the original image with the final, edited image, the main changes were to the color. There were lots of pinks and purples that didn't show up in the original image that I wanted to bring out. Using Photoshop, I made minor edits to the contrast using the Curves tool, then altered the hue of the image to bring out more pink colors. I then used the Color Balance tool to further highlight the blues and purples in the image, giving the colors seen in the final image. The original photo was cropped slightly to get rid of a few distracting elements such as a streetlight and some tree branches.

# CONCLUSION

Overall, I am happy with this image. I love the bright colors in the cloud against the blue-purple sky and I like how the dark mountain adds contrast to the photo. This image shows the layered shape of the altocumulus lenticularis cloud and shows how the clouds can form in small, lens-shaped bunches, as shown with the smaller cloud in the left side of the image. I do feel as though the tree branches along the edge of the mountains are a little distracting, but they are very hard to get rid of without making it obvious that some editing and erasing was done to the image.

## REFERENCES

- Boulder Muni, Boulder, CO, CO. (n.d.). Retrieved from Weather Underground: https://www.wunderground.com/history/airport/KBDU/2018/1/29/DailyHistory.html?req\_city= Boulder&req\_state=CO&req\_statename=Colorado&reqdb.zip=80301&reqdb.magic=1&reqdb.w mo=99999
- Cloud Types for Observers, Reading the Sky. (n.d.). Retrieved from Met Office: https://www.metoffice.gov.uk/binaries/content/assets/mohippo/pdf/n/a/cloud\_types\_for\_obs ervers\_rev\_2014.pdf
- 3) Hazardous Mountain Winds and Their Visual Indicators. (n.d.). Federal Aviation Administration.
- 4) University of Wyoming College of Engineering. (n.d.). Retrieved from Department of Atmospheric Sciences: http://weather.uwyo.edu/upperair/sounding.html