Clouds First Report

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Stratocumulus Cloud on 10/17/2023 at 6:59 PM in Boulder, CO

MCEN 5151: Flow Visualization

University of Colorado Boulder

10/30/2023

Context and Purpose

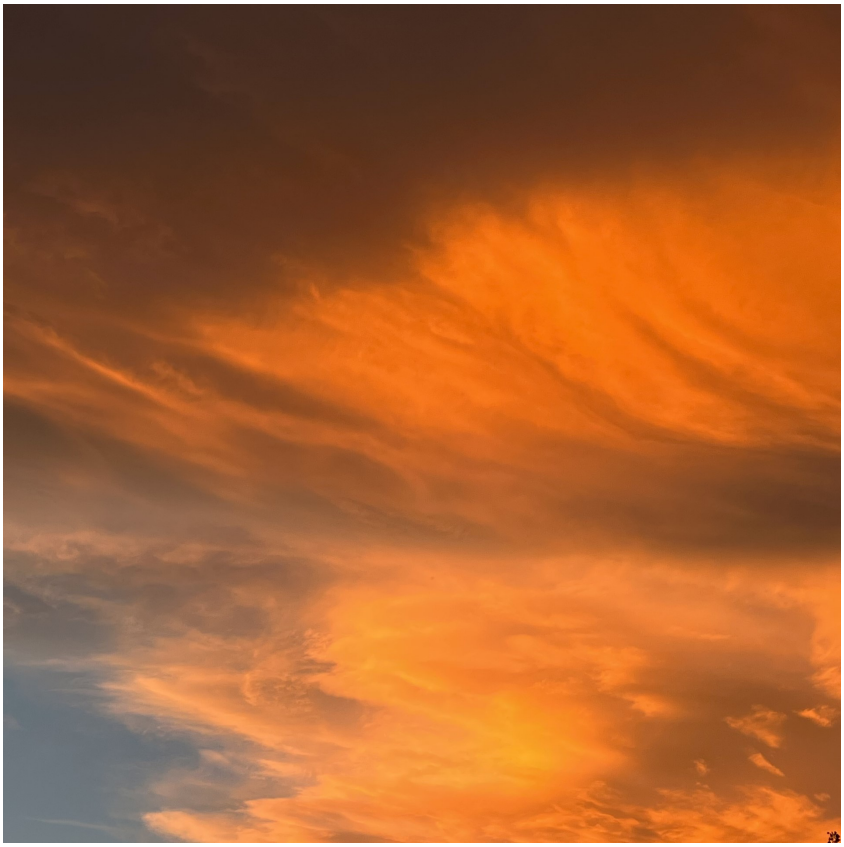

Figure 1: Stratocumulus Cloud on 10/17/2023 at 6:59 PM in Boulder, CO

Capturing a visually unique cloud photo is difficult in that many aspects such as lighting, atmospheric conditions, and cloud type must align. I was particularly excited to see the above cloud formation as it occurred at the intersection of these aspects, taken during a windy day at sunset. These conditions were perfect for demonstrating flow, as the purpose of this photograph was to demonstrate flow within clouds for the "Cloud First" assignment of MCEN 5151, Flow Visualization.

Circumstances

This image was captured at the intersection of Baseline and Broadway in Boulder, Colorado. It was taken while facing North at an angle of 30° from the ground, with the clouds coming from the East and lighting from the West. The specific point at which the photo was

taken is located at an elevation of 5421 feet above sea level. The photo was captured at 6:59 PM on October 17th, 2023, right during sunset.

Statements & Data

The cloud formation in Figure 1 is most likely a stratocumulus formation. Qualitatively, there are a number of visual aspects the clouds have that indicate they are stratocumulus. The most prominent of these is the shape. The formation has several large layers of continuous sheets with a slightly lumpy appearance. These lumps indicate the basic formation of cumulus. We can further visually categorize the formation using the color, thickness, and size of the clouds. As seen in Figure 1, the clouds are mostly gray and white. In addition, we can observe that clouds are moderately thick, however not as thick as nimbostratus, meaning that they must fall between the cumulus and nimbostratus categories in terms of thickness. Finally, we can see the individual clouds are fairly large with defined edges, but slightly smaller than altocumulus clouds. All these factors imply that we are seeing stratocumulus clouds.

There is also quantitative data to support this assumption. We can examine atmospheric conditions via Figures 2 and 3 to help categorize the cloud.

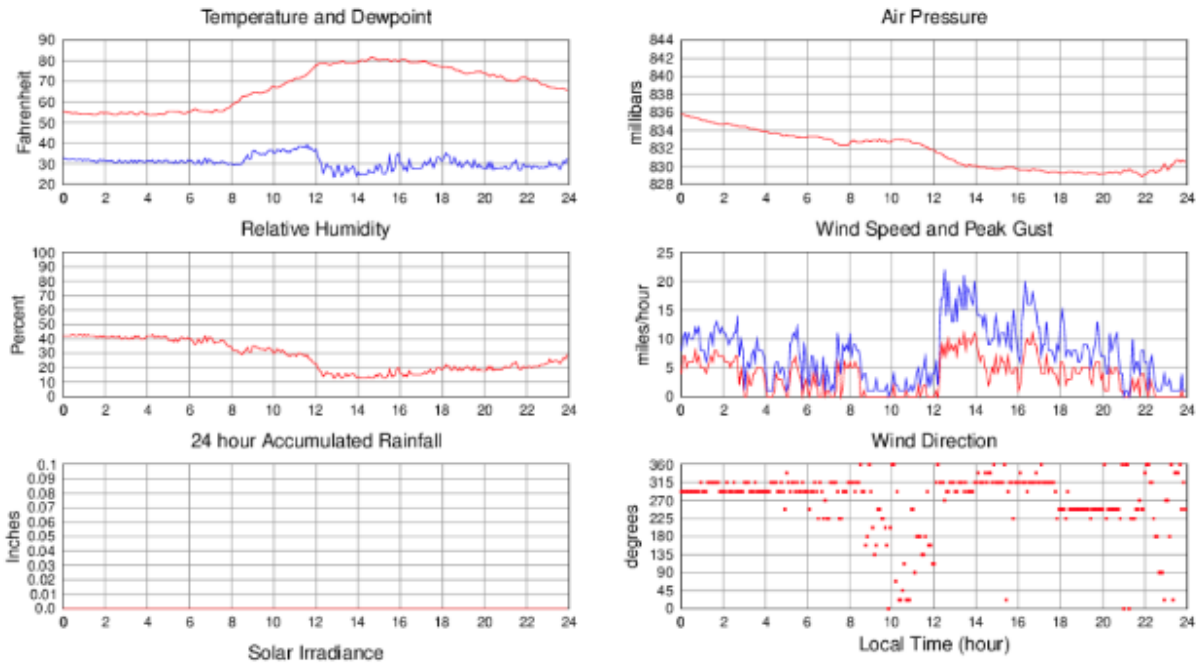

Figure 2: Weather data via ATOC for Boulder, CO, on 10/17/2023

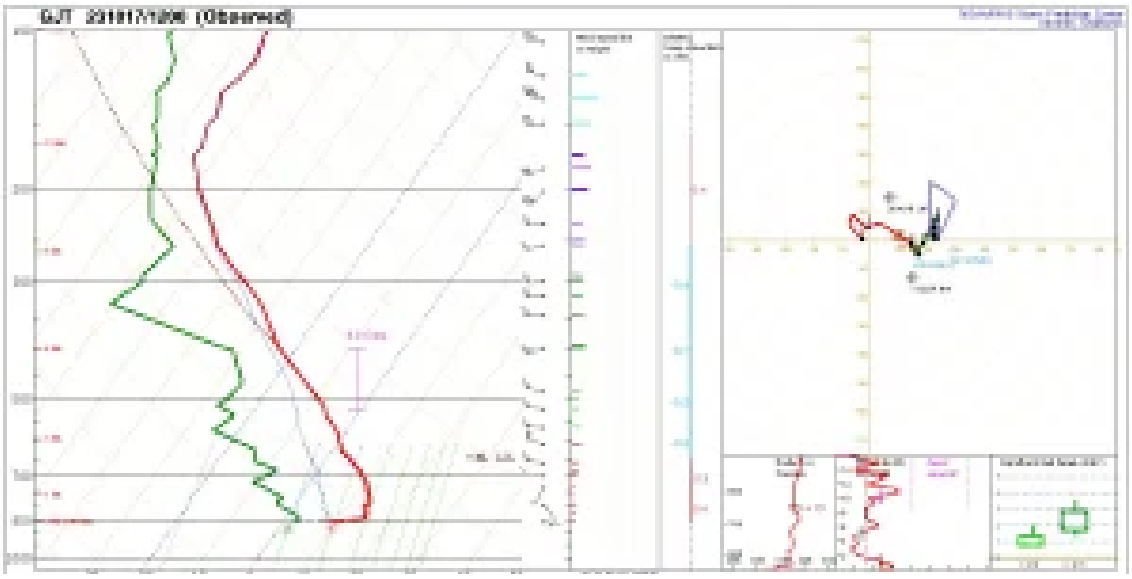

Figure 3: Skew-T diagram from Grand Junction, CO, on 10/17/2023

We can gather information regarding weather conditions from Figure 2. The most significant information is temperature, precipitation, humidity, and wind speed. Stratocumulus clouds form in a temperature range of 5-20°C, a range that is relatively cool yet not cold enough to cause ice crystal formation. We can read from the graph that the temperature was about 19°C. We can also see that there was a low chance of precipitation and low humidity at the time the photo was captured. The cool temperature, low humidity, negligible precipitation, and mild wind speed are all conditions that cause stratocumulus cloud formation.

There is also important data provided by the Skew-T diagram in Figure 3. It must be noted that the diagram was generated in Grand Junction, Colorado. This location is at a significantly lower elevation, and over 250 miles East of Boulder, Colorado, meaning that this data may not be an accurate representation of the conditions in Boulder. However, it can still provide relevant information regarding altitude and wind. The Skew-T diagram indicated that the region that contains the most cloud development is between 7,000-12,000 meters. This is interesting in that stratocumulus clouds typically form around 2,000 meters. This discrepancy can be attributed to the data being gathered at a significantly different geographic location from Boulder.

Photographic Techniques

Mild edits were made to create the final image. The color grading was adjusted to highlight the edges of the clouds. The white balance was adjusted to compensate for the dim lighting conditions from the sunset lighting. Finally, the image was cropped to cut out power lines and trees.

Figure 4: Original Image

Camera information is listed below:

- Camera: iPhone 13 Pro (Editing via Lightroom)
- ISO: 40
- Focal Length: 37mm
- Exposure: f1.5
- Object-to-Lens Distance: ~2500m
- Image Dimensions: 1462 x 1462px (1:1)

Comments on Image

Overall, I thought that the image was quite interesting, as it was able to effectively capture a stratocumulus cloud formation. The dynamic range did a good job highlighting the physical characteristics of the cloud. Most importantly, I enjoyed how well this photo captured the flow occurring with the clouds. There are a few aspects of the image that I dislike, however. Some of these factors are image quality, as I'm not satisfied with the ability of the final image to demonstrate the conditions of the whole sky. I would remedy this in a future photo by using a wider lens.

References

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