Clouds Report

Tara Fisch

Flow Visualization MCEN – 002

Purpose:

This image seeks to capture one of the many patterns that clouds can form. The image shows two distinct layers of clouds. The top layer contains small clumps that are not very dense, and the bottom layer, seen in the bottom right portion of the image contains wispier clouds.

Circumstances:

The photo was taken on a beautiful warm day facing south in Boulder, Colorado approximately 20 degrees from horizontal on October 13th at 1:13pm.

Cloud Physics:

Cloud classification initially began based on cloud appearance, but dimensions, shape, texture, and structure are affected by air movement. Physical grounds can be used to define formation and growth of clouds due to this air movement. [1] Clouds are grouped into three main categories, cirrus, cumulus and stratus. Of the three main types of clouds the image appears to have a layer of altocumulus on top of a smaller layer of altostratus. Altocumulus clouds are clumpy, but not too dense and do not create much shade because light can pass through the clouds. Altostratus clouds are wispier and can been seen in the bottom left of the photographed image. The Skew T [3] shows clouds forming around 7530 meters which is approximately 4.5 miles. Altocumulus clouds form around 3.5 miles, while altostratus clouds form slightly lower around 2.5 miles [1]. There is some discrepancy between the Skew T and the reference image shown in Figures 1. This could be due to the image being taken in Boulder rather than near the Grand Junction Station where the Skew T data is taken.

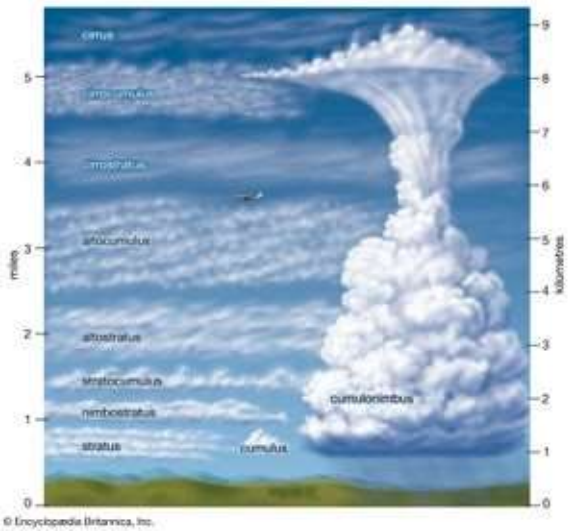

Figure 1: Reference showing cloud types and their respective elevation. [1]

Both Altocumulus and altostratus are midlevel clouds. These clouds are often produced by slow updrafts in the troposphere. Air moment is as small as a few cm per second [2]. Altocumulus clouds are dominated by droplets that give them a crisp clumpy appearance. Altostratus clouds are usually comprised of ice crystals that give them a more fibrous and diffused look [2].

Photogenic Technique:

I wanted to try using my Google Pixel 8a for this image. The aperture was 1.9, shutter speed was 1/64 and the ISO was 64. There is a before and after of the image shown below in figure 2. There was minimal post processing done on the image, mainly cropping to focus on the clouds. I also increased the contrast slightly to bring out the patterns in the clouds more, but increasing the contrast too much brings out a lot of white and some of the patterns would get lost.

Cropped: 2755 x 1524 pixels

Uncropped: 4624 x 3472 pixels

I think this image does a good job of revealing cloud patterns. I wish the sky was bluer that day so the sky would pop more, but the day seems a bit hazy, although it was a calm warm, not hot day. I think the image does a good job of showing fluid physics by showcasing multiple types of clouds and how they can layer. To take this concept further I would look for distinct horizontal layers of clouds to photograph. It would be cool to photograph similar clouds but cirrus at a different elevation and see how they compare to the mid-level clouds.

References:

[1] Enfield, David B. Et. Al. "Climate". *Encyclopedia Britannica*, 13 Sep. 2024

[2] Rangno, A.L. CLOUDS AND FOG, Classification of Clouds, Editor(s): Gerald R. North, John Pyle, Fuqing Zhang, Encyclopedia of Atmospheric Sciences (Second Edition), Academic Press, 2015

[3] University of Wyoming