



Clouds First Assignment

MCEN-5151 Flow-Visualization 2024

Adiba Ashrafee

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Cloud Type: Stratocumulus and Cumulonimbus clouds

Cloud Date, Time, Location: 09/07/2024, 7:14 pm, Nederland, Boulder, Colorado

Context and Purpose: I clicked this cloud image (fig1,2) for my first cloud assignment. I took this picture right after a short-duration rainfall and before sunset. I was trying to click a cloud picture where there are different types of brighter and darker clouds at the same time. My intent was to capture the natural sky scene to showcase the beauty of the clouds from the colors created by the scattering of sunlight which would create various shades of yellow tones right before a sunset and create a contrasting effect by including darker low-level clouds in the picture as well.

Image Acquisition Details: I have clicked this cloud image in Barker Meadow Reservoir, at Nederland, Boulder, Colorado. My camera was facing in the east direction while I was clicking this picture. I took this picture on 7th September, 2024 at 7:14 pm.

Cloud Physics: I think there are two different kinds of clouds in the image, an old cumulonimbus cloud from the rainfall an hour ago on the left side and stratocumulus clouds on the right side of the edited image (Figure-1). Cumulonimbus clouds are one of the primary cloud types often present during rain and thunderstorms. And it also appears as appears in the shape of anvils with bulging parts with dark base [1]. Other than this picture submitted in the report, I also took extra photos from other directions at the same time (figure-1(c)) and from that picture, it appears that the cloud has a plume or anvil shape with bulges with a dark base, from which it can be said that visually, the clouds in the left of the edited image represent cumulonimbus clouds. Additionally, cumulonimbus clouds can have strong contrasts in luminance [1] which can cause this cloud too to appear yellow especially during a sunset and sunrise which might support the reason of observing yellow or golden hues in the clouds on the left side of the edited image. The clouds shown in the right side of the edited image are stratocumulus clouds, since they are grey or darker in color and have clumpy appearance [2]. The rest of the sky was mostly clear with scattered clouds and there was a mixture of both bright and dark clouds at the time I was clicking the picture. The weather before I took the picture was mostly sunny and I took the picture, when the weather was a bit cooler due to rainfall. On September 7th, 2024, in Boulder, Colorado, there was no significant weather front that was approaching, the weather was mostly sunny and warm in the morning and afternoon with a slight cooling after the rainfall. From the skew-T plot, it can be seen that the CAPE value is zero, which indicates that the atmosphere was stable. And if the atmosphere is stable, there is little to no potential for convective activity like rainfall, however rain can occur in stable atmospheric conditions through other mechanisms such as orographic precipitation, which causes air to rise over mountains and this lifting can cause air to condense, cool leading to rain. From the skew-T plot (figure-2) during sunset (00Z), it is apparent that the temperature and the dew point line are close together at 3300m. And, the vertical extent of Cumulonimbus ranges from 3 km to rarely more than 15 km (10 000 – 50 000 ft) [1] and that of stratocumulus ranges from 2 km to 5 km [3]. The estimated cloud height covers the cloud height range of both cumulonimbus and stratocumulus clouds. Stratus clouds, stratocumulus clouds, altostratus and cirrostratus clouds are usually expected in a stable atmospheric condition. Cumulonimbus clouds form through strong updrafts of warm, moist air and the water vapor condenses to form cloud droplets which collide and coalesce to form larger droplets eventually falling as precipitation. Stratocumulus clouds form when moist air is lifted from a wide area because of temperature inversion.

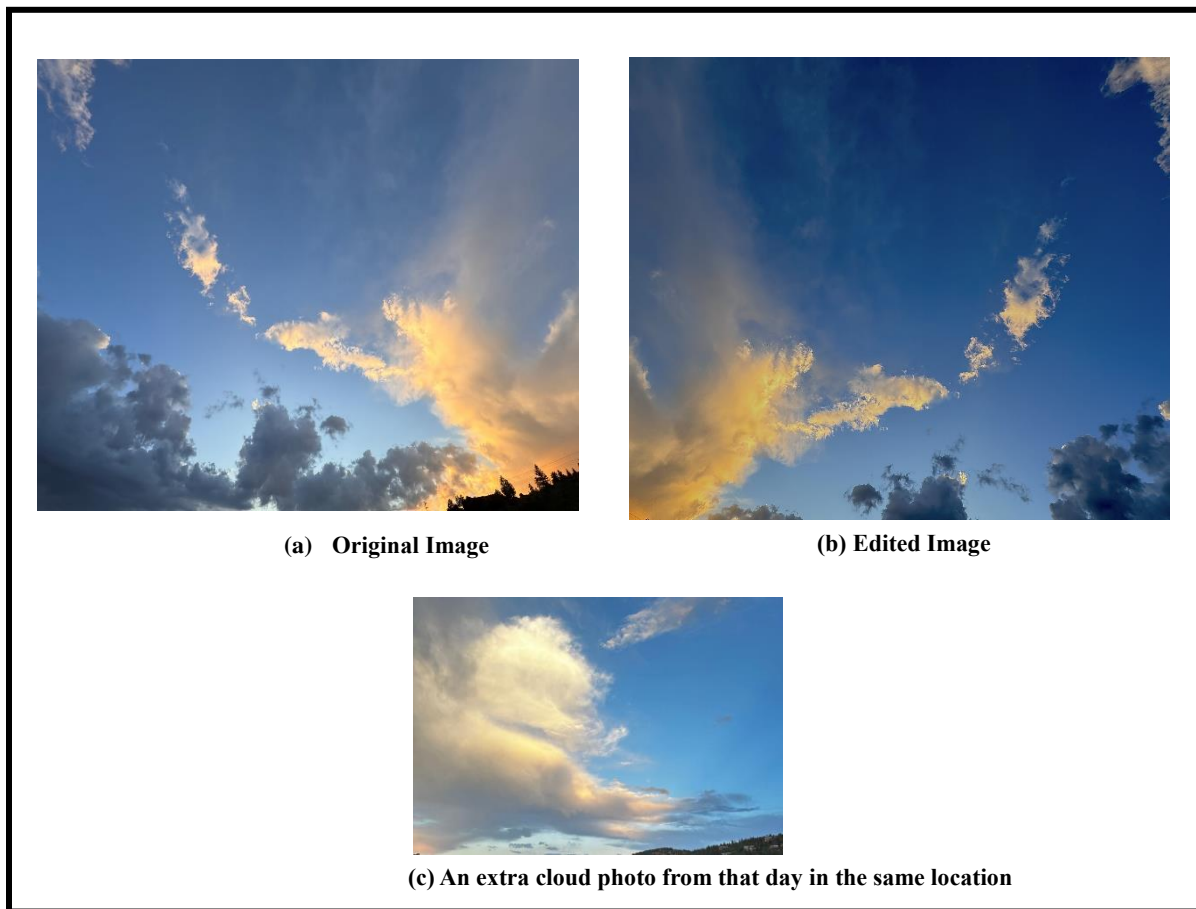


Figure-1: Original and edited version of the cloud image clicked at 7:14 PM in Boulder, Colorado

Photographic Technique: I took this photo with the ultra-wide-angle lens of Iphone-15 pro and the lens has a focal length of 13 mm, aperture of f/2.2 with a field of view of 120 degrees. The type of camera I have used here is a digital camera. The original image width and height are 4032 px and 3024 px respectively. The final edited image has an image width of 3533 px and a height of 2834 px. The picture was shot with ISO 40, focal length of 15 mm, 0ev exposure, f/2.2 aperture and a shutter speed of 1/251s. As for image-processing, I cropped off the trees and some of the dark clouds from the image, I did reverse rotation to the image to focus the yellow clouds more, decreased the exposure to make the blue sky darker so that I can focus the clouds better, and enhanced the sharpness of the image.

Conclusion: The image reveals the beauty of both dark and bright clouds. I like how the cumulonimbus clouds make a visually striking appearance due to having yellow or golden hues in them and how the stratocumulus clouds create a contrast. I wanted to have both dark and bright clouds in a single picture, and I think I have fulfilled my intent. However, I think I have cropped the picture a little too much, keeping the dark clouds would bring out more details about the dark clouds and would make the overall composition of the picture better.

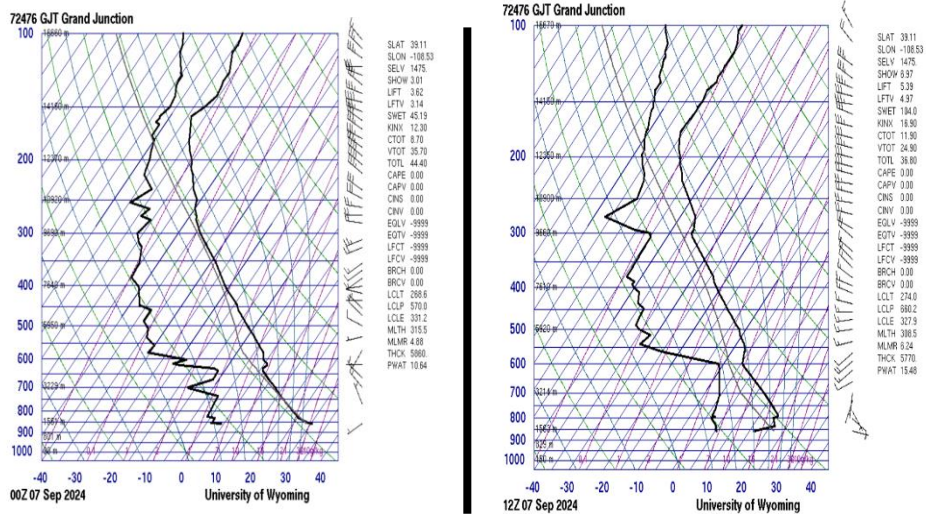


Figure-2: Skew-T plot on 7th September,2024 during sunset (00Z) (left figure) and sunrise (12Z) (right figure)

References:

- [1]. [Cumulonimbus | International Cloud Atlas](#)
- [2]. [Ten Basic Clouds | National Oceanic and Atmospheric Administration](#)
- [3]. [List of Cloud Types - Cloud Classification](#)