The Photography of Clouds

Introduction

The purpose of this assignment is to capture a picture of clouds in order to observe the atmospheric conditions around the earth. Clouds are formed when air containing water vapor is cooled below a critical temperature called the dew point and the resulting moisture condenses into droplets on microscopic dust particles in the atmosphere [1]. The goal of this assignment is to visualize the formation of clouds due to certain particular atmospheric phenomena. The clouds formation can be classified into different categories and each category has its own behavior which will be identified later on in this report.

Information of Image

Figure1: Original image of clouds

The picture shown in figure 1 is the original image of clouds which was taken on Tuesday, the 21st of February, at around 12:00 in the afternoon. The location of the image that was taken was at the top floor of the parking structure of lot 436 near by the engineering center on the University of Colorado at Boulder. The image was taken facing the south west direction from lot 436. The weather on Tuesday was clear and sunny in the morning and turning slightly cloudy around noon. The average high temperature on that day is 50^{o}F and low temperature is 23 ^{o}F.

Classification of Clouds

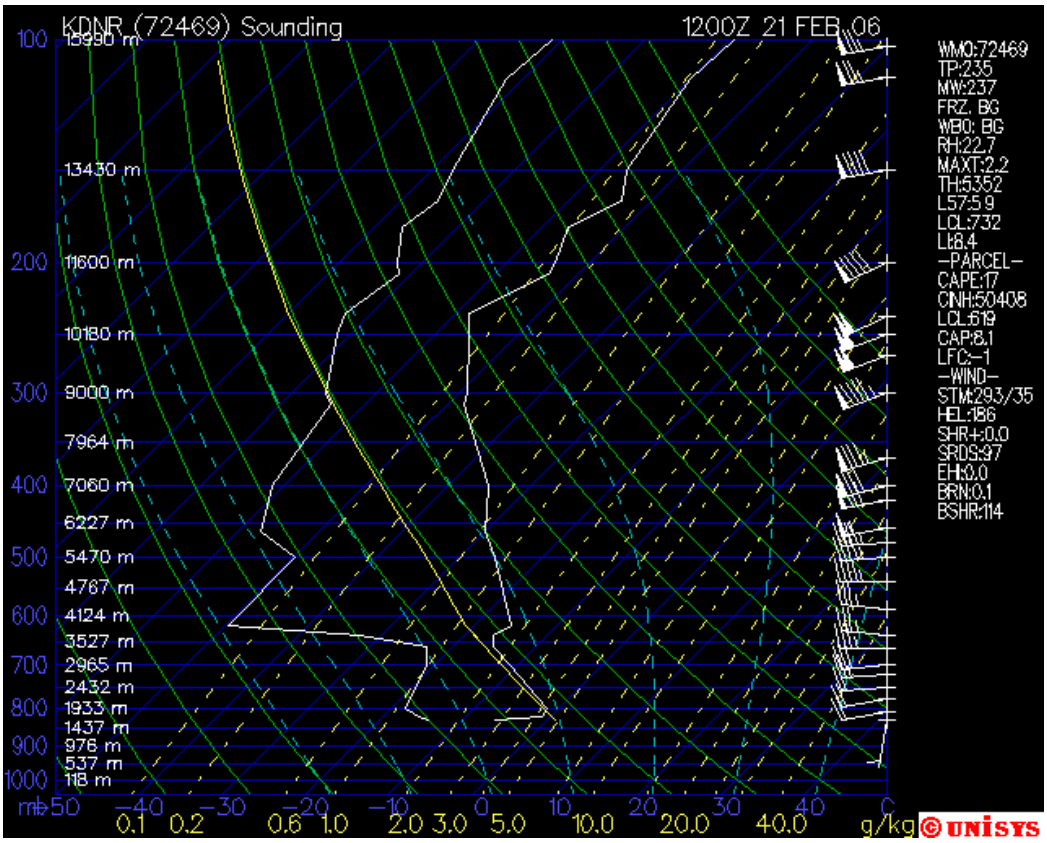

Figure2: Skew-T plot on the 21st of February at 12:00pm [2].

The clouds shown in figure 1 is most likely to be a mountain wave clouds which is formed by wind flows across a mountain range and tends to form air waves on the lee side of the mountains. The height of the clouds in figure 1 is estimated to be approximately 3,500 m. This estimation is based on the height of the mountain and the skew-T plot. The skew-T plot, which is shown in figure 2, shows the temperature profile in the atmosphere on the 21st of February at noon, which is the time of the image that was taken. The temperature lines of the Skew T plot are in blue; the green lines are called dry adiabats; the light blue dashed lines are saturation adiabats; and the yellow dashed lines are lines of constant mixing ratio. The sounding is plotted as two white lines where the right line is the temperature profile and the left line is the dew point profile. The yellow line in figure 2 seems to transition at about 3,500 m, which suggests the formation of clouds at this level. Clouds at this range of height are usually said to be middle clouds. By comparing with other documented clouds formations, the image of clouds shown in figure 1 can be classified as cumulus. Also, on the Skew-T plot, the temperature (white line on the right) is steeper than the adiabatic cooling line (solid yellow), therefore the atmosphere is stable and the clouds can be identified as laminar.

Photographic Techniques

The camera used to take the image was a Sony Digital Still Camera DSC-P9 with 4.0 Megapixel. The focus of the camera was manually set to infinity for better view of the image. Some of the details of the photographic techniques are listed below:

- Size of field of view – 500 ft by 500 ft
- Distance from object to lens –15,000 ft
- Lens focal length and other lens specs:
  - Focal length – 8 mm - 24 mm
  - 2 x Digital Zoom
  - ISO light sensitivity of 100
- Type of camera – Digital, Sony DSC-P9 4.0 Megapixel
- Exposure specs
  - Aperture – auto aperture between 2.8 and 5.6
  - Shutter speed – 1/2000 second

Adobe Photoshop is used to process the image shown in figure 3, which is the final image. The bottom of the image on figure 1 is trimmed for any unnecessary distraction of the image. Some adjustments have been made to create a more dramatic image, and they are:

- Color balancing – Color level of blue is increased to maximum in order to bring out a better distinguish between the blue sky and the white clouds
- Contrast – Contrast level is increased to +30 to bring out the contrast of the clouds

Conclusion

The image in figure 3 clearly illustrated the middle level cloud formation in the atmosphere which is identified as cumulus cloud types. The most I like from the image is the clear contrast between the blue sky and the white clouds. The fluid physics shown are the mountain wave clouds which are formed by wind blowing across a mountain range and tend to form air waves on the lee side of the mountains. I was able to examine a particular clouds type in this assignment so I have fulfilled my intent of the image. For improvement, I would like to have more time in order to observe and capture more different clouds formation for comparison purposes. Further work can be done in the future is to capture more other clouds formation and compare the physics between them.

References

[1] Information Please, updated on 2-26-06.
http://www.infoplease.com/ce6/weather/A0857399.html
[2] Unisys Weather, updated on 2-28-06
http://weather.unisys.com/upper_air/skew/skew_KDNR.html

Figure3: Final image after Photoshop