Altocumulus Clouds: Castellanus

Finn Ostrem

MCEN 5151 – Flow Visualization, Fall 2015

Prof. J. Hertzberg

Introduction

To understand this image, a context needs to be described. This image was taken for Clouds 1 project in flow visualization class. The purpose of this project is to discover a new way of looking at clouds. The information given in this course, allows for a new perspective on what is actually happening in the clouds seen every day and what exactly is causing the formation in the sky. The phenomenon attempted to be captured in this image is the formation of cumulus clouds over a mountain pass. The reason this phenomenon was attempted to be captured was because this is something that residents of Colorado see all the time. It is a very common occurrence so an attempt to explain why this happens is made in this report. There were many shots taken before this image was captured. It was interesting trying to find an easy medium of the landscape that everyone in Colorado has come to love as well as capturing the information in the clouds as an attempt to explain this phenomenon.

This image was captured on the way up to Independence Pass, outside Aspen, CO. The lake in the image is called Twin Lakes and the picture is captured looking up towards the pass. The elevation up at this lake is about 9,200 ft. and the top of the pass is at 12,096 ft. This kind of altitude causes the clouds to be very close to the mountains. The mountains seen in the image are both Rinker Peak and Quail Mountain. The elevation of Rinker Peak is 13,789 ft. and this peak can be seen on the right hand of the image. The other mountain seen, Quail Mountain, is about 13,461 ft. and can be seen towards the left side of the image. The image was taken overlooking the lake and facing almost due west. It was angled a little bit towards the south as well, in order to capture both peaks in the image. To capture the clouds in the image, the camera was tilted up at an angle of about 20-25 degrees. It was taken on October 4, 2015 at approximately 2:15 PM.

Understanding the Clouds

There are many aspects of the image that must be analyzed in order to determine the type of clouds that were captured. First and foremost, the weather that day, and the days prior, give a lot of information into what type of stability was passing through the pass that weekend. The day prior, there were thunderstorms in the late afternoon and early evening. This gave a bit of information what could be going on the day this image was captured. Later in the day, some thunderstorms were experienced as well. This gives enough information to realize that the system was bouncing between stable and unstable but leaning towards an unstable atmosphere at this altitude. The clouds in the image are for the most part, connected rather than split up into smaller cloud formations. This is a big key in determining whether or not they are altocumulus clouds. The formation of clouds somewhat resembles those of a stratocumulus formation but considering the instability that was predicted during the day, the correct assumption would be altocumulus clouds.

There are two resources that can help in analyzing whether or not the clouds were formed during an unstable atmosphere. They are both a graph called a Skew T plot. This plot is created by a weather balloon that is sent up from a specific airport in order to collect data on the

current day's atmosphere. To determine the stability of the cloud formation, a plot of Denver's Skew T as well as Grand Junction's Skew T are analyzed. As seen in Figure 1, there are two lines in the plot. On the right we see the temperature line, and on the left we see the humidity line. It can be seen that there is a period of instability around the 10,000 ft. elevation mark. In Figure 2, it can be seen that there is no period of instability. This leads to a bit of a mystery of what the atmosphere was up to while this image was captured. Considering the storms prior and after, the atmosphere was most likely unstable.

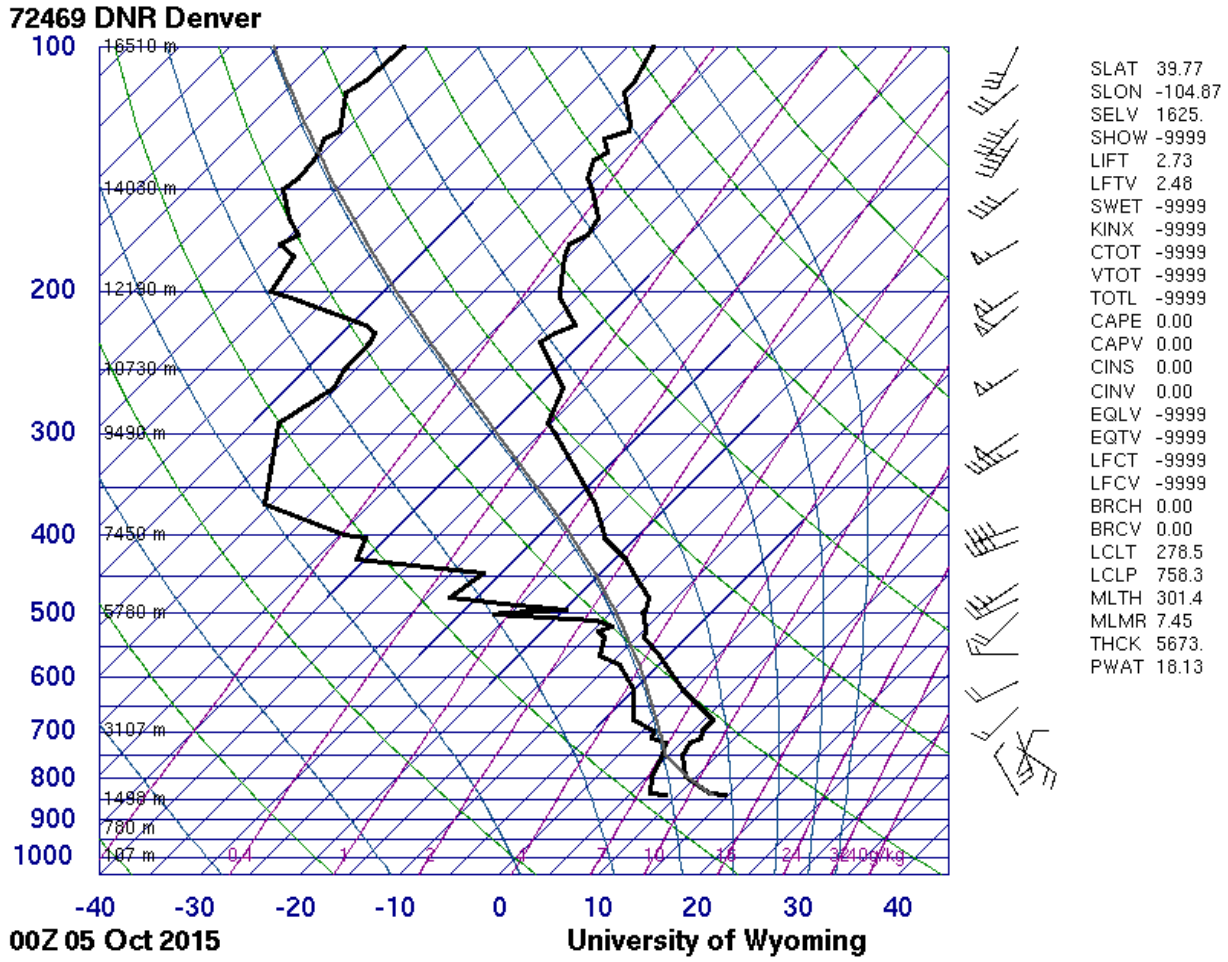

Figure 1

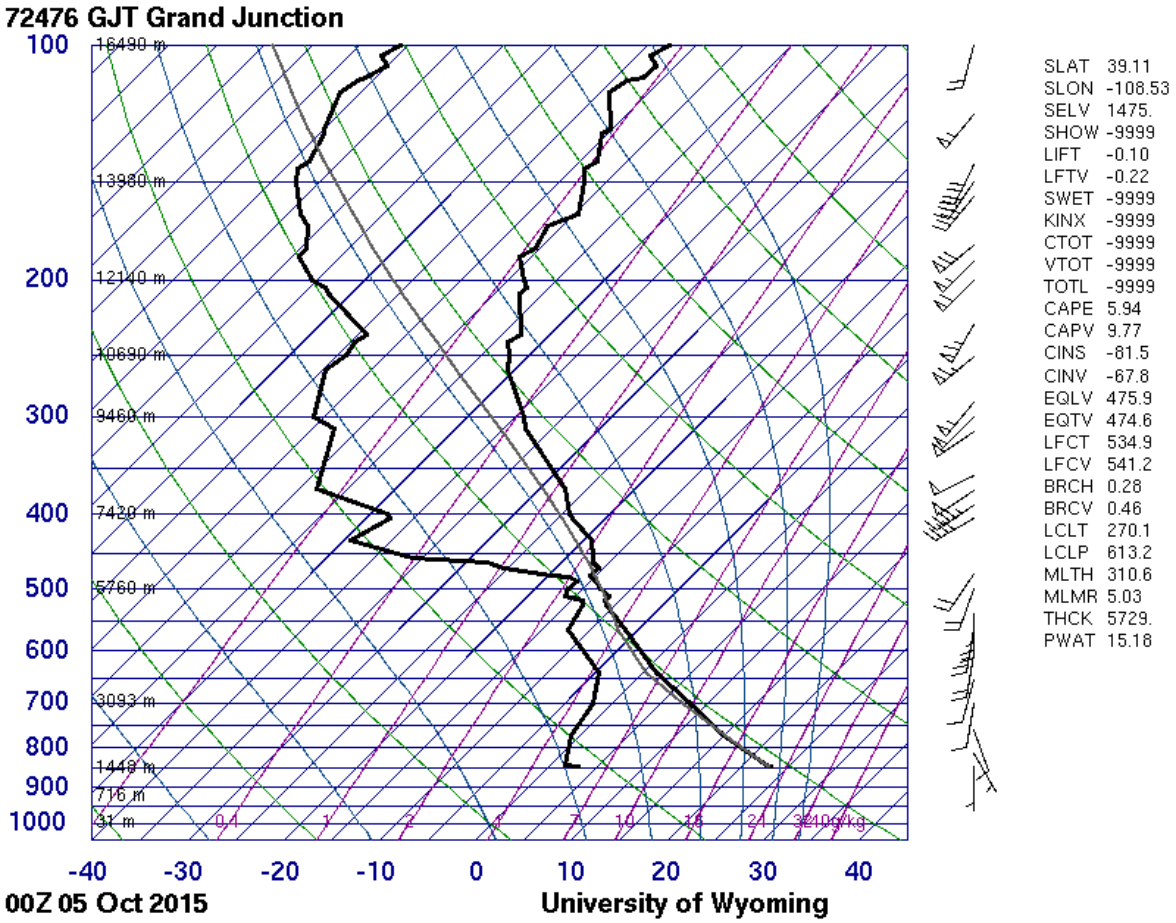

Figure 2

Another piece of evidence that the clouds in this image are altocumulus clouds, is the elevation. Considering the size of the cloud formation, it can be determined that the clouds were very close to the point where the image was captured. At an elevation of about 13,500 ft. at the top of the passes shown, the clouds must not be at much higher elevation than the peaks. An estimation of about 16,000 ft. can be made of where the cloud formation was captured. When looking at clouds forming at that elevation, it can be determined that these are altocumulus with a structure called castellanus.

Photographic Technique

Field of View: The height difference between the position of the camera and the clouds is about 6,800 ft. Estimating that the clouds are 2,000 ft. tall, the image has an approximate vertical field of view of 8,800 ft. Using the aspect ratio, the horizontal field of view is about 8,738 ft.

Distance: To calculate the distance from where the image was taken, the angle of capture, and cloud altitude are used. With a height difference of 6,800ft. (from position of capture to cloud height) and an angle of 22.5 degrees, the distance from camera to clouds is about 17,769ft.

Lens Focal Length: 25mm

Camera: Canon EOS Rebel T5

Aperture: 5.6

Shutter Speed: 9, 1/500

ISO: 100

Image Size: 3456x3432

Post Processing: The only thing done to edit this image was a bit of cropping in the vertical direction to cut out some distracting objects.

References:

Figure [1]:
http://weather.uwyo.edu/cgibin/sounding?region=naconf&TYPE=GIF%3ASKEWT&YEAR=2015&MONTH=10&FROM=0500&TO=0500&STNM=72469

Figure [2]:
http://weather.uwyo.edu/cgibin/sounding?region=naconf&TYPE=GIF%3ASKEWT&YEAR=2015&MONTH=10&FROM=0500&TO=0500&STNM=72476