Clouds 1

MCEN 5151

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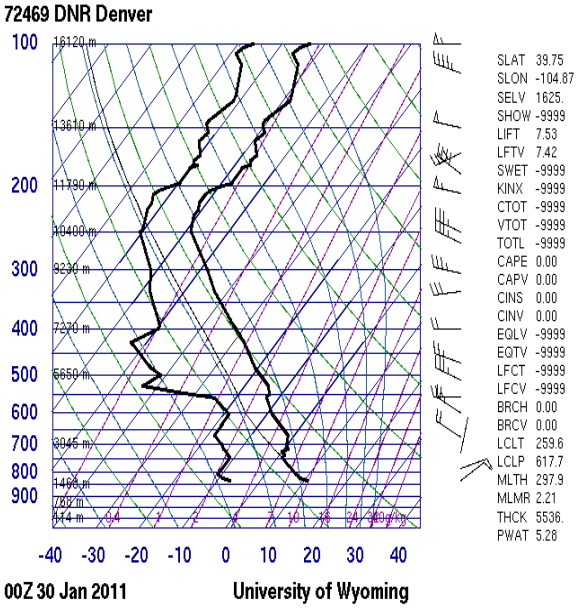
For this first clouds assignment I wanted to capture a cloud formation was that very unique in shape and stood out amongst other cloud pictures. Although the cloud type that I ended up submitting is one that is regularly seen in Colorado, the specific formation of this cloud type was quite interesting. The day this was taken, there were not many clouds in the sky, but there were enough to allow for different cloud compositions. Instead of including several clouds of similar type, I decided to zoom in and capture just a single cloud that filled the entire frame.

This image was taken from the peak of Flagstaff Mountain in Boulder, Colorado. From the top of this mountain, I was looking west into the sunset. The setting sun provided great contrast through the extent of the cloud. The peak of Flagstaff Mountain climbs to an elevation of 6,978 feet. From this elevation, the camera was raised approximately 40 degrees above the horizon and facing slightly WNW. This exact picture was taken on January 29th, 2011 at 5:07 pm.

The single cloud which is seen in the image is an Altocumulus Lenticularis cloud. As stated previously, the rest of the sky was fairly calm, and there were only a few clouds of the same type. According to the skew-T plot, it was not very windy on the mountain, but the winds were around 20 to mph at the altitude of the clouds. On January 28th and 28th the weather was very warm with highs in the 50's and 60's. The next day the weather dropped back into the 30's meaning that a cold front had actually moved in overnight just after this picture was taken. The following skew-T plot is from 00 Z time on Jan 30, 2011 which corresponds to 6pm on January 29th, 2011 in Boulder. This skew-T plot is very close in time to when the image was taken and not too far in distance either.



From the plot above, it can be seen that the atmosphere was stable at this time. The two solid black lines never cross or even touch. The CAPE number which is an indication of instability is 0.00. The best estimate for the altitude of the clouds would be around 4,000 m or roughly 13,000 ft. This altitude of 13,000 ft confirms that the cloud is in fact altocumulus which ranges from 6,500 to 23,000 ft. It's hard to tell what type of clouds might exist just based on the skew-T plot. However, since the solid black lines are far apart, it would be safe to assume that any cloud formations would be sparse and scattered. The relatively higher winds might also lead to assumption of mountain wave clouds. Lenticularis clouds are a type of 'orographic cloud'. This means they form when air is forced upwards as it passes over an obstacle such as a hill or mountain. The rising air expands as it travels up and over mountains causing it to cool and create tiny water droplets that form together to make clouds.[1] The heavy opaqueness of this cloud is caused by there being a high concentration of small cloud droplets. Meaning if the cloud were

in front of the sun, it would block the sun entirely without allowing light to pass through it. The oscillatory nature of the wind causes lenticular clouds to be trapped and formed in an elongated manner orthogonal to the wind. Looking in the direction of the wind, these clouds will appear to be very wide from side to side.

With clouds, it is difficult to estimate the size of the field of view. The entire field of view is consumed by the width of the cloud. The final image was not cropped and the size of the image is 3872 x 2592 pixels. I could only assume that since the cloud is altocumulus and roughly 13,000 ft in altitude that the distance from the lens to the object must have been about 7,000 ft. At a focal length of 55 mm this would that the cloud was quite large in size. This image was taken with a DSLR Pentax K 2000 digital camera. The mode of the camera was set to aperture priority, letting the camera dictate the shutter speed. With the aperture set to F/5.6 and ISO 200, the shutter speed was resolved to 1/1000 s. This setting provided sufficient lighting and contrast to produce a well resolved image in both time and space. Also, the focus point was set to infinity since the cloud was so far away from the lens. There was very little post-processing done on the initial RAW DNG image. The image was not cropped; the only modifications done were to increase the contrast slightly since parts of the sky seemed a bit washed out.

I was really satisfied with the final image that was submitted. There were several other images from that same day that were quite interesting but this particular one seemed to stand out because it looks like the mad hatter. Very interesting shapes can be found when watching lenticular clouds and I just so happened to come across a hat. The drastic change in contrast from the left to right is the most appealing thing about the image. The physics are shown quite well. The lens shape on the bottom is clearly evident, and the edges and inner details of the cloud are also well defined. It would have been nice to capture this cloud in the context of other clouds to give a different perspective into the size and shape of the cloud. Overall, I think this image successfully captures the essence of the Altocumulus Lenticularis cloud formation.

References

[1] Pretor-Pinney, Gavin, and Bill Sanderson. *The Cloudspotter's Guide: the Science, History, and Culture of Clouds*. New York: Berkley Pub. Group, 2007. Print.

[2] University of Wyoming. *72469 DNR Denver*. Digital image. *University of Wyoming College of Engineering*. Department of Atmospheric Science, 00 Z 30 Jan. 2011. Web. <http://weather.uwyo.edu/upperair/sounding.html>.