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MCEN 5151
Cloud Report #2
4/23/12

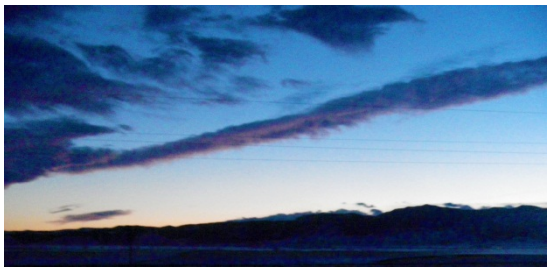


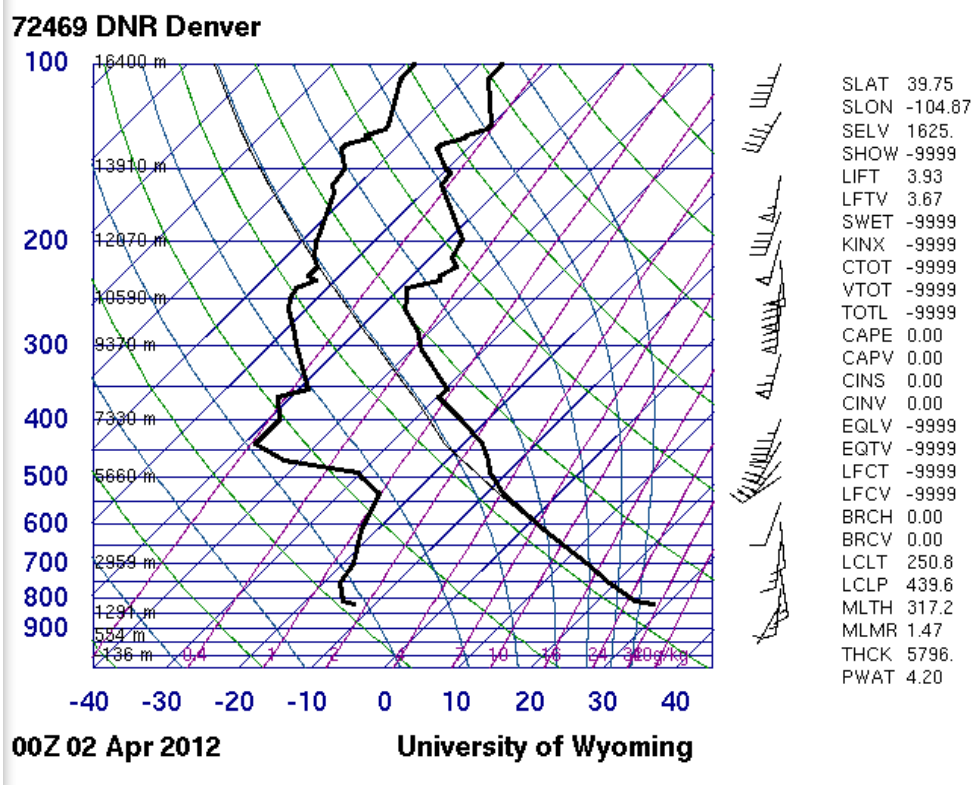
Figure 1

My intention for this cloud two image was to recreate the cloud 1 image because of the obstructions in the previous image and the graininess of the photo itself. Cloud 1 image can be seen in Figure 1 for reference. Like before my intention was to capture a mountain wave cloud or also known as a altocumulus lenticularis, during the evening hours as the sun is passing behind the front range mountains. The final cloud two image can be seen in Figure 3 for reference. The main difficulty in capturing this image was to find a location that allowed a clear line of sight to the mountain range and for the right type of weather patterns where mountain wave clouds would be available.

This image was taken on April 1, 2012 between the times of 7:00 P.M. and 7:30 P.M. The location of this image was taken in Lakewood's "Bear Creek Lake Park" and on top of Mt. Carbon summit. Mt. Carbon is at an elevation of 5,779 ft. and the camera was pointed in a North-West-West direction at 292°. The mountain in the background is Mt. Morrison which stands at 7,877 ft and by estimation the clouds were at an elevation of 8,200 m. This means the camera was pointed approximately 63.28° upwards using my location as 0°.[1]

The clouds in this image as previously mentioned are altocumulus lenticularis, with clear skies surrounding the clouds in Figure 3 and in fact were the only clouds in the sky. The previous day, 3/31/2012, there were 25kn winds coming from the West, partly cloudy, zero precipitation, and a peak air temperature of 80°F. On 4/2/2012 the temperature dropped to a peak temperature of 58°F, the winds came from the Southeast at a speed of 30 kn, overcast, and that day there was light snow precipitation with no significant accumulation. Finally on the day of the image taken, 4/1/2012, the peak temperature was 81°F, no precipitation, with winds coming from the Northeast at 35kn, and as previously mentioned very little clouds in the sky.

[1] Denver Post 4-20-2012



Skew-T Plot of 4/1/2012 at 6:00 P.M.[2]

As shown in the Skew-T plot above, clouds are not really expected anywhere and this is also proven by my observation of little to no clouds in the sky that day. However, by the Skew-T plot clouds may be expected around 350mar or about 8,300 m. As previously mentioned the winds came from the Northeast at about 35kn. This particular cloud is a traveling mountain wave cloud meaning that the cloud never dissipated into moisture while traveling over the mountain and remained a cloud from traveling behind the mountain until after the mountain.

As seen in Figure 3 the waves seem to experience wind shear can be seen in the lower clouds at the top of them. This large vertical wind shear helps keep the condensation static, which creates the cloud formation. This is caused by the winds coming from the lee of the mountain, Northeast, causing an initial vertical shear which pushes the moisture to higher attitudes. This is where the moisture begins to cool and condensate forming clouds. This is evident by the vertical shear causing the top of the cloud to travel faster than the bottom of the cloud. This causes the cloud to deform at the top creating the wave like formation seen on the tops of the clouds.[3] The net cloud layer radiative heat and entrainment warming and drying contribute to the mountain wave clouds thickness and liquid layer path. The other

[2] Atmospheric Soundings." *Wyoming Weather Web*. University of Wyoming. Web. 23 April. 2012. <http://weather.uwyo.edu/cgi-bin/sounding?region=naconf>.

[3] Hertenstein, Rolf F. "Rotor Types Associated with Steep Lee Topography: Influence of the Wind Profile." *Tellus.* Tellus A, 24 Feb. 2005. Web.

aspects that effect is the cloud thickness are the saturation of water in the air above and below the cloud formation.[4][5][6]

The field of view of the image is approximately 1.5 miles long by 0.5 miles wide or an area of 0.75 mi^2. The distance from the lens to the center of the long skinny cloud in the image is approximately 4.5 miles. The digital camera used was a Pentax Optio WS80 and for this image the focal length was 24.7 mm, with a shutter speed of 1/160 of a second and with a aperture value of 7.32. The ISO used to capture this image was 200. The image was manipulated using Photoshop, where the image was cropped, increased the contrast, and the vibrancy was increased by 100 which turned the pink portions of the original image to turn a bright yellow. I chose to crop the image to remove unnecessary background like the most of Mt. Morrison, the Bear Creek pond, and terrain before the Front Range Mountains begin. Below is the image before manipulation and after manipulation with the height and width, in pixels, of the image labeled below each image.

Original Image:

Figure 3

Width: 3648 pixels Height: 2736 pixels

Final Image:

[4] Pretor-Pinney, Gavin. *The Cloudspotter's Guide*. London: Sceptre, 2006. Print.

[5] Cruette, Denise. "Experimental Study of Mountain Lee-waves by Means of Satellite Photographs and Aircraft Measurements." *Tellus* 28.6 (1976): 499-523. Print.

[6] Randall, David A. *General Circulation Model Development*. San Diego: Academic, 2000. Print.

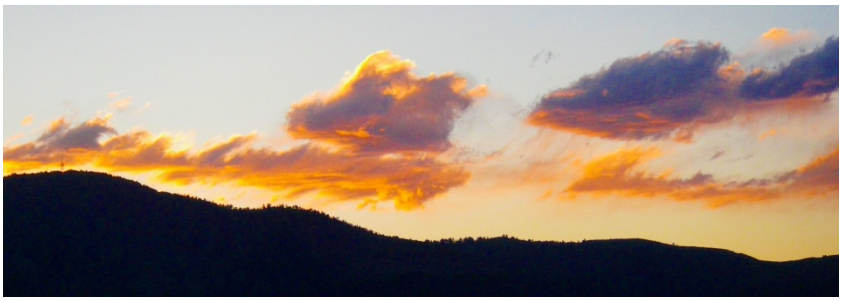


Figure 2

Width: 3648 pixels Height: 1272 pixels

I think this is a great retake of my first attempt at capturing a mountain wave cloud during the dusk hours of the day. This time it created a very unique lighting effect, where the light caused the purple cloud to appear pink and after manipulation increased the color variation. Through the manipulation the cloud was allowed to appear to have a bright yellowish tint at the bottom of the cloud before turning to a pinkish color and then finally a dark purple. I really enjoyed the process in creating this image because I spent many evenings sitting on top of Mt. Carbon on a park bench. It was a very relaxing process and provided a clear line of view to Mt. Morrison and was just the matter of finding the correct weather conditions to be able to capture an image of a cloud passing over Mt. Morrison. This was one of the better homework assignments I have had this semester and was very relaxing.