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MCEN 5151

Cloud Assignment #1

3/5/12

The purpose of this image was to capture a mountain wave cloud, altocumulus lenticularis, during the dusk hours to create a unique lighting effect. Many of the pictures taken at this time however were out of focus due to the camera autofocusing on the power lines in front of the cloud. This ended up being unavoidable because the best angle to capture this cloud was unfortunately behind the power lines. It also became tough to find a remote area to capture this image that wouldn't be affected by light pollution from the larger cities like Boulder or Denver or by passing traffic.

This image was captured at approximately 5,600 ft above sea level along Colorado State Highway 128 E/W on 2/21/2012 at 6:00 P.M. Mountain Standard Time. The clouds captured in this image are estimated to be about 7,000 ft. above sea level. The exact location is two miles east of the intersection of Colorado State Highway 93 N/S and Colorado State Highway 128 E/W. The photo was taken while facing southwest at an angle of 45° above the horizon.

The clouds in this image as previously mentioned are altocumulus lenticularis, with clear skies to the east of the clouds, over the Front Range Mountains, and dark overcast to the west, over the city of Denver. The previous day, 2/20/2012, there were high winds coming from the northwest with a partly cloudy sky and approximately 0°C. On 2/21/2012 it was expected to be a day with a high of 8°C with high winds coming from the northwest and a storm system approaching that would bring a light snow fall. However, that evening no snow ended up falling and the next day, 2/22/2012, experienced very similar weather. These three days of 2/20, 2/21, and 2/22 all had very similar clouds during the evening hours with high winds coming from the northwest.[1]

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[1] Denver Post 2-20-2012
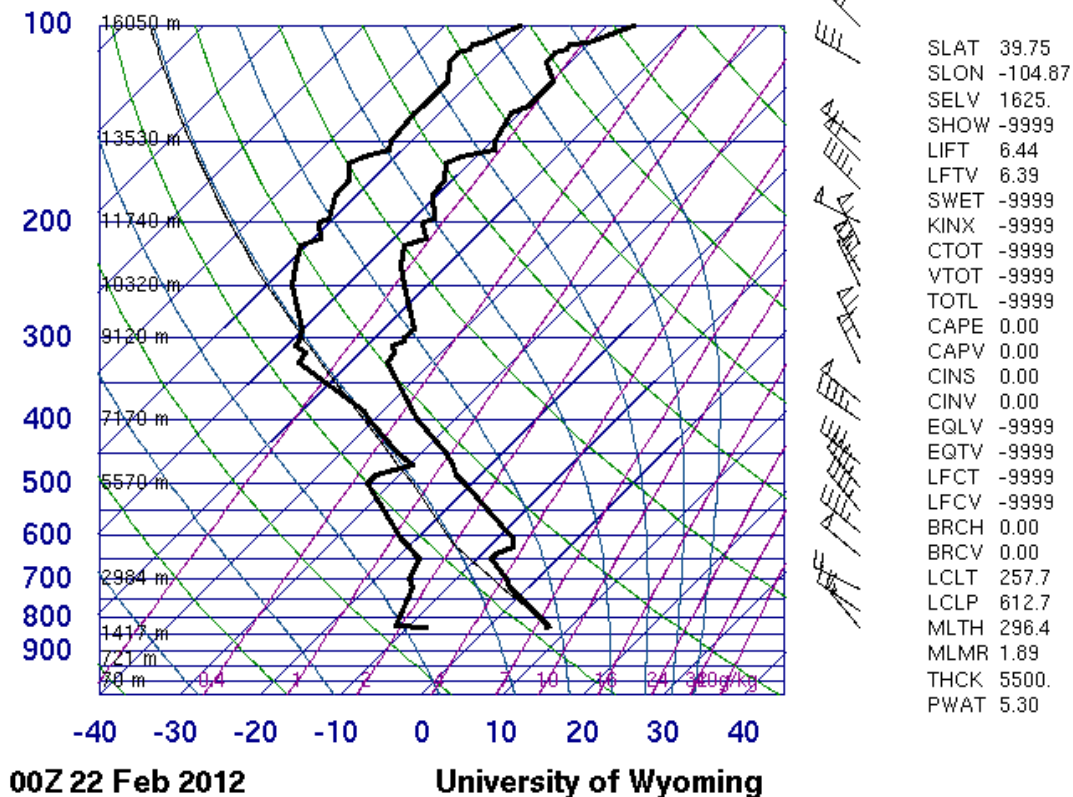
Skew-T Plot of 12/21/2012 at 6:00 P.M. [2]

As shown in the Skew-T plot above, clouds can be expected to be seen between 6,000 m and 7,300 m. (475mar) with winds coming from the northwest at 40kn. The clouds expected from this Skew-T plot suggests unstable clouds because of the high winds and the air parcel is warmer than the neighboring parcels. During my observation, it seemed the clouds were about 7,000 m. and the wind was indeed coming from the northwest. Altocumulus lenticularis clouds are formed by winds pushing air over a mountain rise causing the air to cool and water droplets to form. As the air moves down the opposite side of the mountain, it begins to become warmer causing water droplets to reform into water vapor. With consistent winds it can appear that the altocumulus lenticularis cloud to appear stationary because it is continually renewed as water droplets are warmed and become water vapor. [3]

The three main factors that can contribute to stable constant-altitude atmospheric layer which produces a reflection of the waves motion, large vertical wind shear that keeps condensation static, or static stability of air at some elevation. The frequency at mountain wave clouds are produced can be

[2] "Atmospheric Soundings." *Wyoming Weather Web*. University of Wyoming. Web. 05 Mar. 2012. <http://weather.uwyo.edu/cgi-bin/sounding?region=naconf>.

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

determined by the spacing of the horizontal clouds are from one another, the wind speed direction and velocity, and the altitude of the underlying area.[4] The net cloud layer radiative heat and entrainment warming and drying contribute to the mountain wave clouds thickness and liquid layer path. The other aspects that effect is the cloud thickness are the saturation of water in the air above and below the cloud formation.[5]

The field of view of the image is approximately 3 miles long by 2 miles wide or an area of 6 mi^2. The distance from the lens to the center of the long skinny cloud in the image is approximately 2.4 miles. The digital camera used was a Pentax Optio WS80 and for this image the focal length was 10.2mm, with a shutter speed of 1/15 of a second, and an aperture value of 4.1. The ISO used to capture this image was 800. The image was manipulated using Photoshop, where the image was cropped, the contrast was darkened, and the vibrancy was enhanced to 100. I chose to crop the image to remove unnecessary background like the highway 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.
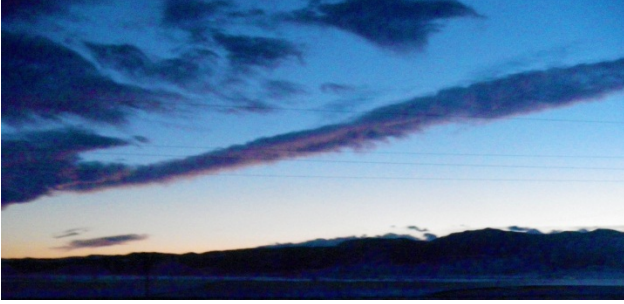
Original Image:

Width: 3648 pixels   Height: 2736 pixels

Final Image:

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

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

Width: 3648 pixels   Height: 1758 pixels

I think this image is a good representation of a mountain wave cloud and I like the how the image is during the dusk creating a unique lighting effect. The glow of the sun behind the Front Range Mountains creates a unique orange/red glow on the cloud and increases its contrast to the sky behind it. However, I do not like how the cloud is not in focus and instead the power lines are in focus. It made the clouds to appear very grainy and isn't the intention I wanted to create for this image. To improve this image I would like to find an area that doesn't have an obstruction in front of the clouds. It also would have been helpful to use a camera that doesn't only have an auto-focus function, but a manual focus function. I would like to recreate this image for the second cloud assignment because I really do enjoy the lighting effect created by taking this image as the sun is behind the mountains. Would that require using a camera that isn't a point and shoot but a DSLR type of camera?