

Clouds Report 2

UNIVERSITY OF COLORADO: MCEN 5151

JONATHAN FRAKER

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Introduction

The purpose of this cloud assignment was to capture an image of a cloud formation of any type, determine the atmospheric conditions during the image capture, and then characterize the cloud. The particular image of this report attempted to capture the common altocumulus lenticularis often seen over the mountains to the west of Boulder, Colorado. This image also attempted to capture the effect of light refraction due to the atmosphere shortly after sunset. The image was captured on February 26, 2014 at 6 pm MST can be seen in Figure 1.



Figure 1: Captured clouds image

Image Capture

This picture was taken on February 26th around 6 pm. The location of the image capture was southeast of Boulder, just outside of Superior on Hwy 170. The camera was aimed directly west towards the mountains. The cloud stretched north to south for about 10 miles. The elevation of the ground at which the picture was taken was 5,600 ft.

Cloud Classification

The cloud focused on in this image is an altocumulus-lenticularis. When stable moist air flows over a mountain range, like the ones seen in the picture, large standing waves form on the down-sloping side of the mountains. If the standing waves hold the moisture in the air and the temperature of the air at the crest of the mountain drops to the dew point, then lenticular clouds form¹. These clouds are therefore very common in areas of high wind where a mountain range is also present. A diagram of this occurrence can be seen in Figure 2.

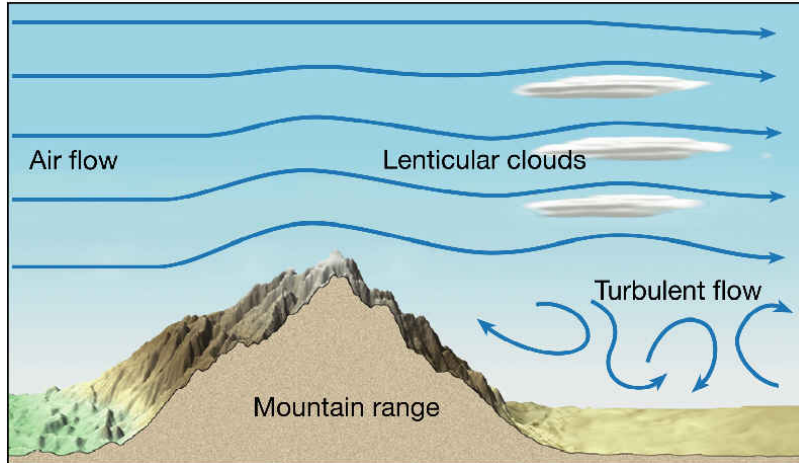
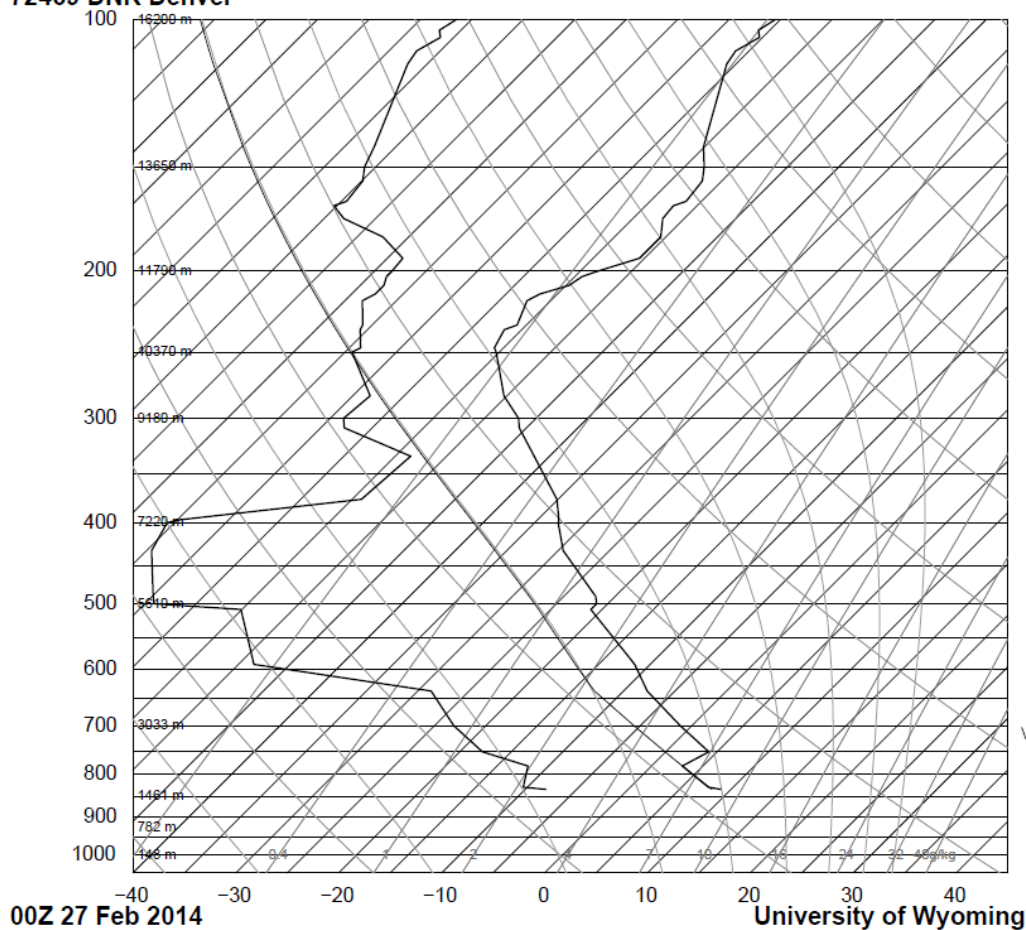


Figure 2: Downslope wind diagram¹

The atmosphere was stable at the time of the picture, as seen in the cape value of zero in the skew-T plot seen in Figure 3. The estimated cloud altitude is around 20,000 ft, which categorizes the cloud as an altocumulus lenticularis, which range from 8,000-20,000 ft³. The winds were also high aloft at around 45 kts, which caused the standing waves to form on the downslope of the mountains.

72469 DNR Denver



SLAT 39.77
 SLON
 SELV 1625.
 SHOW -9999
 LIFT 6.01
 LFTV 5.88
 SWET -9999
 KINX -9999
 CTOT -9999
 VTOT -9999
 TOTL -9999
 CAPE 0.00
 CAPV 0.00
 CINS 0.00
 CINV 0.00
 EQLV -9999
 EQTV -9999
 LFCT -9999
 LFCV -9999
 BRCH 0.00
 BRCV 0.00
 LCLT 258.9
 LCLP 624.4
 MLTH 296.2
 MLMR 2.06
 THCK 5462.
 PWAT 2.88

Figure 3: Skew-T plot for Feb. 26th at 6 pm MST²

Photographic Technique

The device used to capture this image was an iPhone 4s, which has an 8 megapixel camera with an aperture of 2.4. The size of the field of view of this image is roughly 15 miles. The post processing of this image included increasing contrast by adding an s-curve to the color tone plot of the image. This darkened the darks and lightened the lights, thus improving the contrast between the dark blue sky, black silhouetted mountains, and the redish pink cloud crests. This technique gave more depth to the clouds as well, by darkening the shadows that were present. Red hues were also brought out in order to highlight the red color in the cloud to give it a warmer look. This created a nice contrast between the warm colored cloud crest, cooler colored sky, and black mountains.

Conclusions

This image turned out really well. The fact that the sharp lenticular clouds could not only be captured in the image, but also explained physically through the knowledge of down-sloping winds and the skew-T diagram is cool. The contrast of the warm cloud crest versus the cool sky creates a nice effect of colors in the image. The silhouette of the mountains truly improves in the composition of this image. The one downside to this photo is the grainy noise that was a result of the low-light conditions. With a phone camera, it could not let in enough light at the preset capture settings, thus producing the grain. A high quality post-processing denoise filter could mitigate this.

References

- ¹Wolf, Rich. "Boulder's Uplifting Lennies." Tales from the Trails. Wordpress, n.d. Web. 15 Apr. 2014. <<http://richwolf.wordpress.com/2010/12/09/boulders-uplifting-lennies/>>.
- ²"Atmospheric Soundings." *Atmospheric Soundings*. University of Wyoming, 28 Feb. 2014. Web. 5 Apr. 2014.
- ³"Cloud Types!" *Cloud Types!* UCAR, n.d. Web. 02 Mar. 2014.