

Clouds Report 1

UNIVERSITY OF COLORADO: MCEN 5151

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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 focused on in this report attempted to capture the effects of a down-sloping wind off the eastern slope of the Front Range Mountains of Colorado. Sometimes very high winds in mountainous regions form smooth lenticular clouds, which was the effect that was desired to be captured. Therefore, a cloud formation was captured just east of the mountains on a windy day and the results can be seen in Figure 1.



Figure 1: Captured clouds image

Image Capture

This picture was taken on January 26th around 12:30 pm. The location of the image capture was south of Denver in northern Douglas County. The camera was aimed directly west towards the mountains. The cloud cover stretched from west to east from about 10-15 miles east of the foothills to just west of Denver. The elevation of the ground at which the picture was taken was 5,700 ft.

Cloud Classification

The main cloud focused on in this image is an altostratus-lenticularis. In the distance there are also altocumulus and altocumulus lenticularis clouds above the mountain range. The stark contrast of the blue and white in the sky is present because of the high winds that were occurring during the time of the picture. This created high visibility at the time at 10+ miles. The winds were sustained throughout the day ranging from 10-31 mph to the NE, with gusts up to 39 mph. These high winds were also occurring aloft as seen by the smooth leading edge of the cloud cover. This leading edge was caused by the wind sloping down off of the Front Range, hitting the ground, and then bouncing up and over the cloud bank. These winds essentially cut and smoothed out the clouds. A diagram of this occurrence can be seen in Figure 2.



Figure 2: Downslope wind diagram¹

The high winds that were occurring when the picture was taken were blowing in a storm that brought snow overnight and into the morning of January 27th. Although a snow storm was coming in, the atmosphere was still stable as seen by the skew-T plot seen in Figure 3.

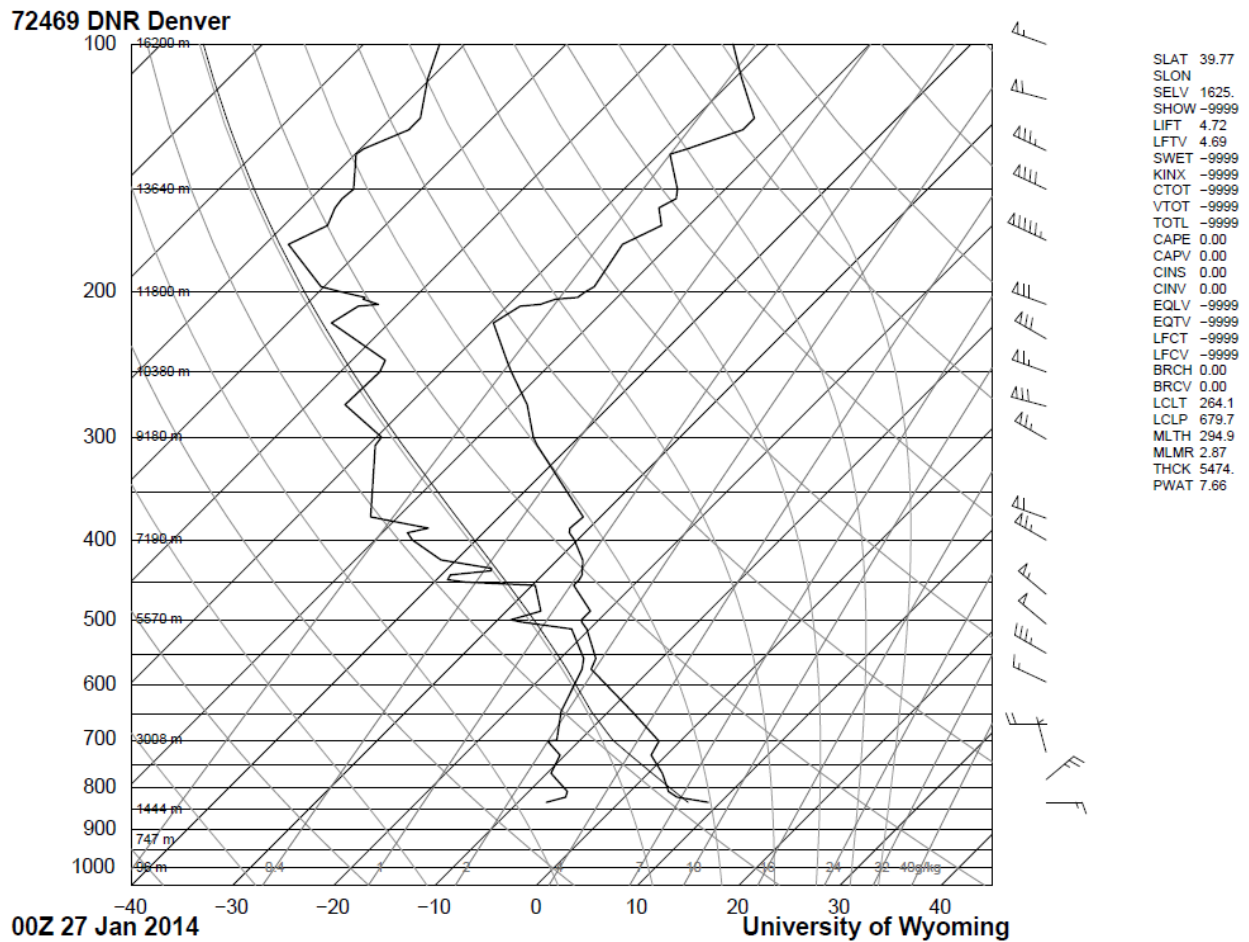


Figure 3: Skew-T plot for Jan. 26th at 12 pm²

The jagged nature of the skew-T plot shows that there were layers of moisture in the atmosphere. At around 5000 m the dew point and temperature come very close to each other, which provides evidence that there were clouds at this altitude. This is consistent with the definition of the altostratus clouds that were seen in the image, which can form in altitudes between 1800-6100 ft³. Since the atmosphere was stable, there is an absence of any cumulonimbus clouds that usually occur in unstable conditions. Instead, the stable stratus clouds are present.

Photographic Technique

The device used to capture this image was an iPhone 5c, which has an 8 megapixel camera with an aperture of 2.4. The size of the field of view of this image is very large (30+ miles) because a panoramic technique was used to capture the entire extent of the cloud. 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 and the light white clouds. This technique gave more depth to the clouds as well, by darkening the shadows that were present. Red hues were also brought out in the ground landscape to give it a warmer look. This created a nice contrast between the warm colored ground and cooler colored sky.

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 ground versus the cool sky creates a nice effect of colors in the image. The panoramic bend of the image gives it some character as well. The only aspect to improve in this image, is probably the quality, it has a slightly lower resolution due to the fact that it was taken with a phone camera, but it still looks very good on a reasonable scale.

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References

¹"Unit 7: Wind Systems." *MetEd*. MetEd, n.d. Web. 02 Mar. 2014.

²"Atmospheric Soundings." *Atmospheric Soundings*. University of Wyoming, 26 Jan. 2014. Web. 26 Feb. 2014.

³"Cloud Types!" *Cloud Types!* UCAR, n.d. Web. 02 Mar. 2014.