

The intent of this image was to capture an image that displays the natural beauty of clouds. Out of dozens of cloud images taken this particular one was chosen due to the different types of clouds present. Very little post processing was done to the image in order to maintain the natural beauty and feeling of the clouds.

This photograph was taken on March 20<sup>th</sup> at 2:22PM. The image was captured in Boulder, Colorado at an approximate photographer elevation of 5,440 feet. From the horizontal, the angle of the camera was approximately 40 degrees with the clouds being at an estimated elevation of 27,440ft above sea level. Simple trigonometric calculations<sup>1</sup> were performed to estimate the distance between the clouds and camera lens as can be seen below in figure 1:

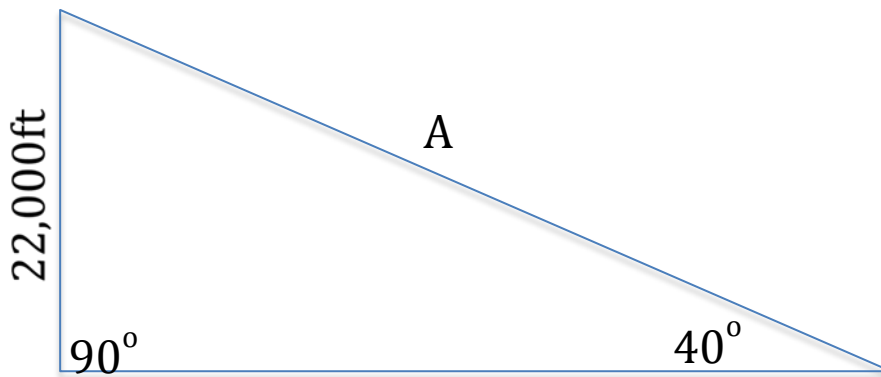


Figure 1: Experimental Set-Up

$$\text{Law of Sines: } \frac{A}{\sin a} = \frac{B}{\sin b}$$

where  $A = \text{unknown}, a = 90^\circ, B = 22,000 \text{ft}, b = 40^\circ$

$$\frac{A}{\sin 90^\circ} = \frac{22000}{\sin 40^\circ}$$

$$A \approx 34,226 \text{ft}$$

Through analysis of the skew-T plotz – seen in figure 2 – for the day the original image was captured – 3/20/2013 – it can be determined that the clouds in the image occurred in a stable atmosphere and were most likely of the stratocumulus and altostratus variety. Stratocumulus clouds normally occurz in a an altitude range from 6,500 to 23,000 feet while altostratus clouds normally occurz in an altitude range from 16,000 to 45,000 feet above sea level. By observing the CAPE value of the appropriate skew-T plot, the stability of the atmosphere can be determined; in this case the CAPE value was 0.0 indicating a stable

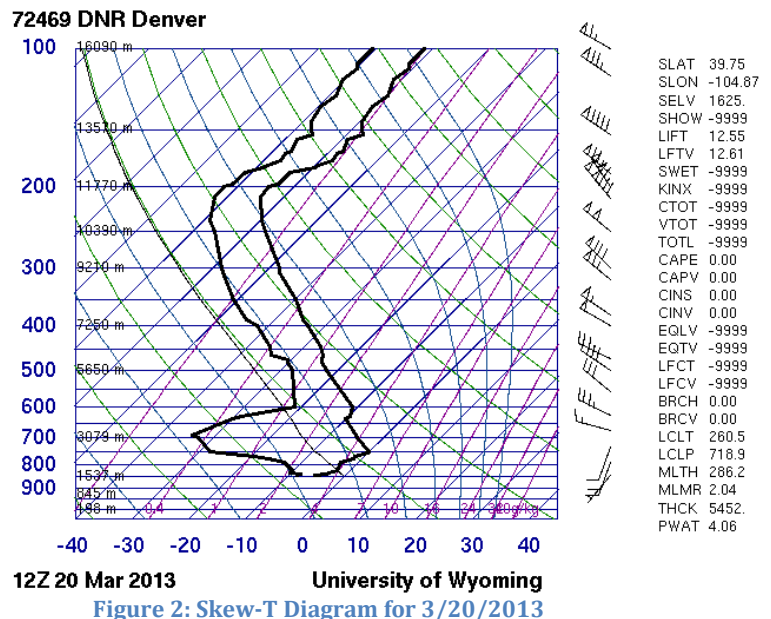


Figure 2: Skew-T Diagram for 3/20/2013

atmosphere. As both stratocumulus and altostratus clouds form in stable atmospheres, it can be determined that the assumed variety of cloud is warranted and supported. Finally, there was no inclement weather immediately preceding or following the time this image was captured.

The image was captured using a Canon EOS Digital Rebel XS with a 55mm focal length and ultraviolet filter installed. The image was shot at a shutter speed of 1/800s with an aperture of f/10 at an ISO of 400 with no flash utilized. The original image dimensions were 3888 x 2592 with the final image being cropped to 2910 x 1002. The original image was processed in Photoshop by slightly adjusting the brightness and curves; enhancing the image without making it seem unnatural. The camera used saves image files with a .jpg extension and the edited image was saved as a .tif to avoid further compression. The before and after images can be see below in figures 3 and 4 respectively.



Figure 3: Original Image



Figure 4: Edited Image

## References

1. "Law of Sines." *Wolfram Math World*. N.p., n.d. Web. 28 Mar. 2013. <<http://mathworld.wolfram.com/LawofSines.html>>.
2. "Atmospheric Soundings." *Atmospheric Soundings*. N.p., n.d. Web. 28 Mar. 2013. <<http://weather.uwyo.edu/upperair/sounding.html>>.
3. Hertzberg, Jean. "More Clouds." *Flow Visualization*. J. Hertzberg, 5 Feb. 2011. Web. 28 Mar. 2013. <<http://www.colorado.edu/MCEN/flowvis/course/Lecture2013/08.Clouds2.pdf>>.