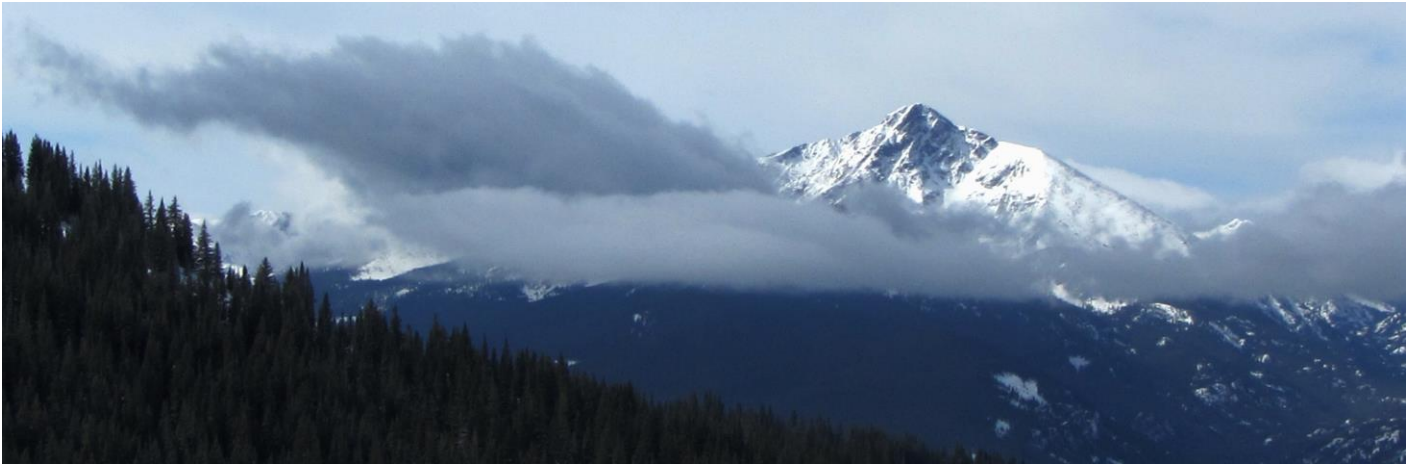


Flow Visualization: Clouds 2



MCEN 4151: Flow Visualization
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Trevor Beatty

Introduction

Photographing clouds can yield very unique and beautiful images. For this image I wanted to capture cloud formations that occur at high altitudes. I always see such beautiful clouds while skiing, so one day while skiing in Vail, Colorado I brought along a camera. Using the surrounding mountains to frame and add landscape to photographs can be very effective. I have always loved the view of Mt. Holy Cross from the top of Vail Ski Resort and decided to use it for the back drop of my image.

Clouds can be analyzed in characterized using several techniques. A key factor when determining what cloud is being viewed is to determine if the atmosphere is stable or unstable. A stable atmosphere will typically consist of a form of stratus clouds. An unstable atmosphere will typically consist of a form of cumulus clouds. The stability of the atmosphere can be determined using a Skew-T diagram. If the CAPE value is 0.00 then the atmosphere is considered stable. If the CAPE value is greater than 0.00 then the atmosphere is considered unstable. Also the altitude that a cloud is expected to be present can be determined using a Skew-T diagram. Clouds are typically present where temperature is close to dew point, the two heavy black lines converge, and the T line kinks towards being steeper.¹

Image Details

The image was taken in Vail, Colorado at 10:14 am (MST) on April 6, 2013. The image shows a low cloud resting in the valley between Vail Ski Resort and Mt. Holy Cross. The photo was taken while facing southwest.²

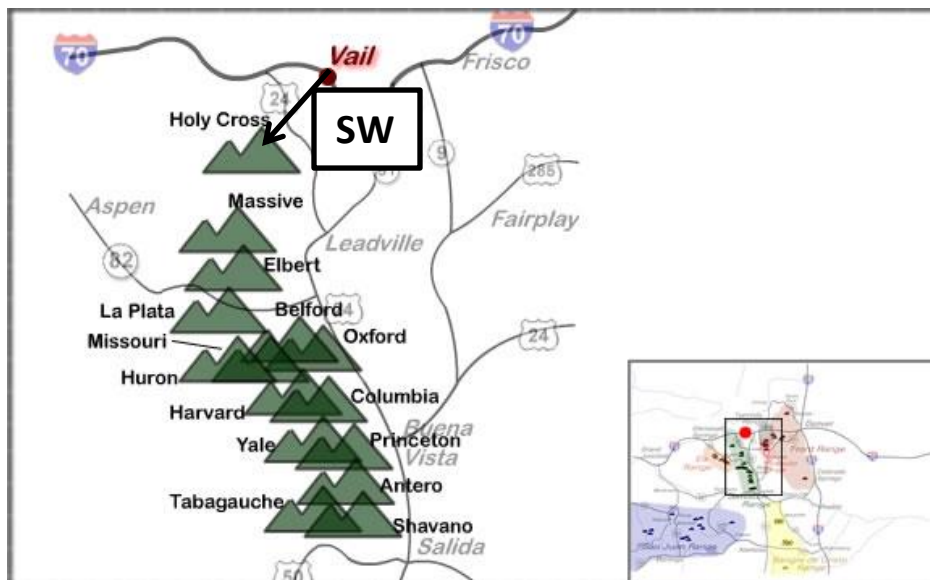


Figure 1: Direction and Location of Photograph²

Cloud Details

Interpreting the Skew-T diagram below, it is possible to see that there are two types of clouds present in the photo. Since the image was taken at 10:14 am (MST) on April 6, 2013, the best Skew-T diagram is one from 12Z on the 6th (MST to Z is +6 hrs). Since the CAPE value is 0.00, the atmosphere is considered stable.¹ Vail is

at roughly 8000 ft (2450 m), and it appears that the lower cloud was sitting at about tree-line which is nearly 11,500 ft (3500 m).³ Clouds that form very low in a stable atmosphere are typically stratus. Since the cloud is roughly 3500 ft off the ground and shows similar attributes to a stratus cloud, it can be defined as a stratus cloud. The clouds in the background and higher up in the atmosphere are determined to be altostratus with the assistance of the skew-T.³ They occur at an altitude of about 7300 m which is about 4850 m above ground.

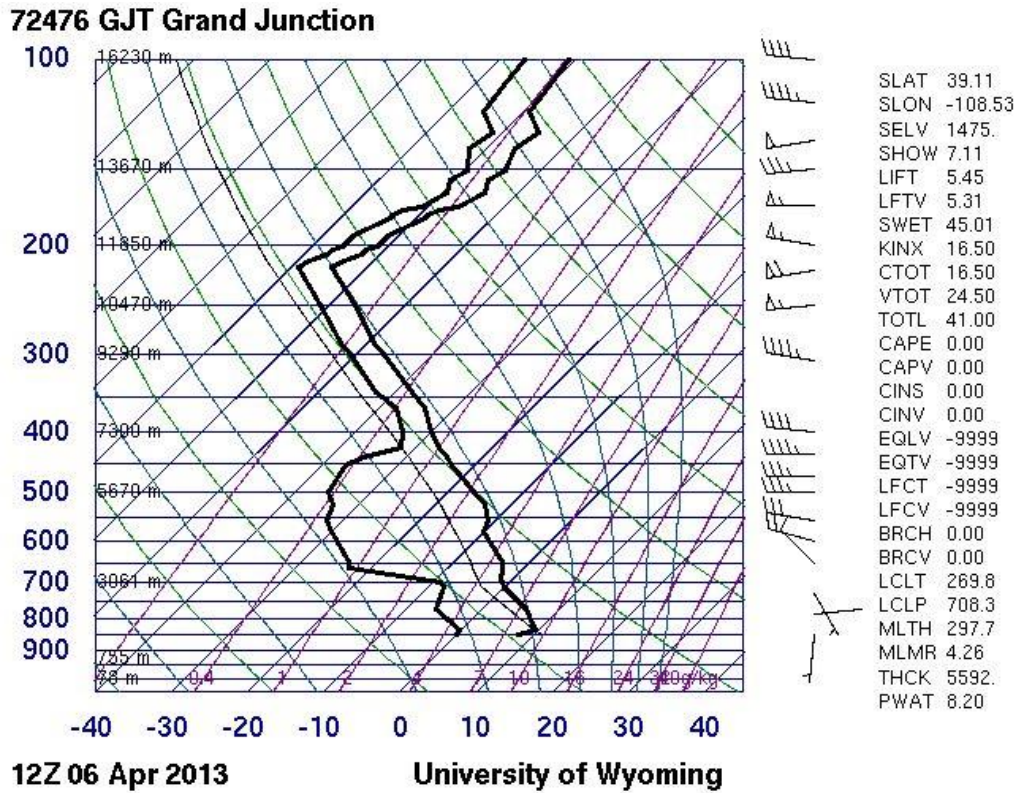


Figure 2: Skew-T Diagram³

Photographic Technique

The camera used was a point and shoot: Canon PowerShot SX230 HS (12.1 megapixels, 14x optical zoom, f3.1-5.9, 28-392mm (35mm equiv)).⁴ The original photograph is 12 megapixels (4000 X 3000). The ISO was set at 100 (low sensitivity) to remove noise and ensure a clean image. The shutter speed was set to 1/2000 of a second which limited the amount of light entering on the bright day and yielded a clean focused image. Aperture was f/4 which allowed an effective volume of light to enter the lens.⁵ Very little post processing was done using Photoshop. I cropped the image vertically to better frame the main cloud formation. I also changed the contrast slightly to enhance the detail and colors. A before and after of the image are shown below.

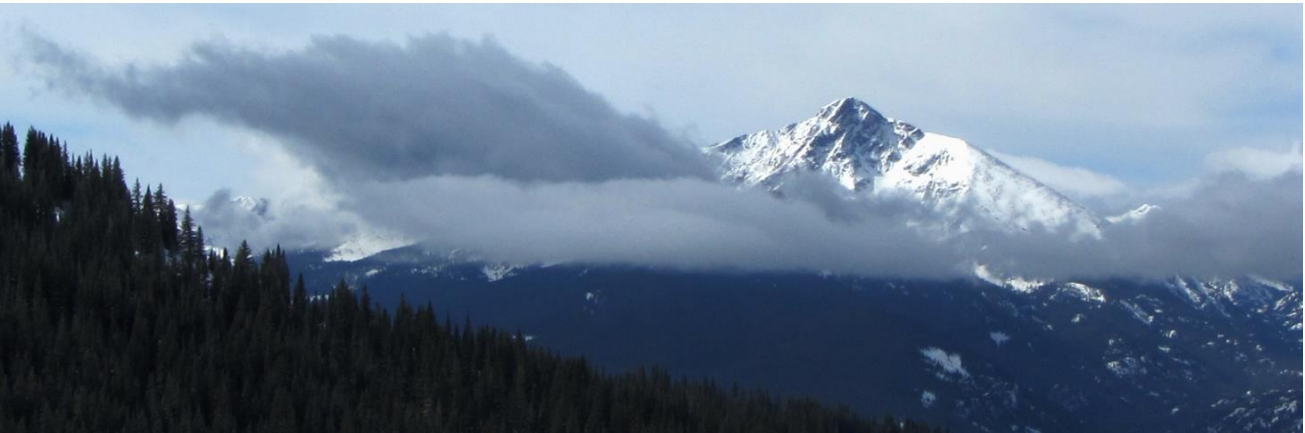


Figure 3: Before (top) and After (bottom) of Image

Conclusion

Every time I am skiing in the Rocky Mountains, I am always amazed by the beauty of the clouds with the surrounding landscape. I feel that this image captures both a unique cloud and a magnificent mountain. Mt. Holy Cross is one of the more famous Colorado Mountains and the stratus cloud resting in front of it was framed very well. I am pleased with the outcome of the image.

References

[1] "SKEW-T BASICS." WEATHER PREDICTION EDUCATION. N.p., n.d. Web. 27 Feb. 2013. <<http://www.theweatherprediction.com/thermo/skewt/>>.

[3] http://fourteeners.org/14er_main.htm

[3] "Atmospheric Soundings." Wyoming Weather Web. N.p., n.d. Web. 27 Feb. 2013. <<http://weather.uwyo.edu/upperair/sounding.html>>.

[4] "Canon PowerShot SX230 HS: Digital Photography Review." *Digital Photography Review*. N.p., n.d. Web. 12 Feb. 2013. <http://www.dpreview.com/products/canon/compacts/canon_sx230hs/specification>.

[5] Date. "Basic Photo Tips: Aperture, Shutter Speed, and ISO - photo.net." Photography community, including forums, reviews, and galleries from Photo.net. N.p., n.d. Web. 27 Feb. 2013. <<http://photo.net/learn/basic-photo-tips/aperture-shutterspeed-iso/>>.