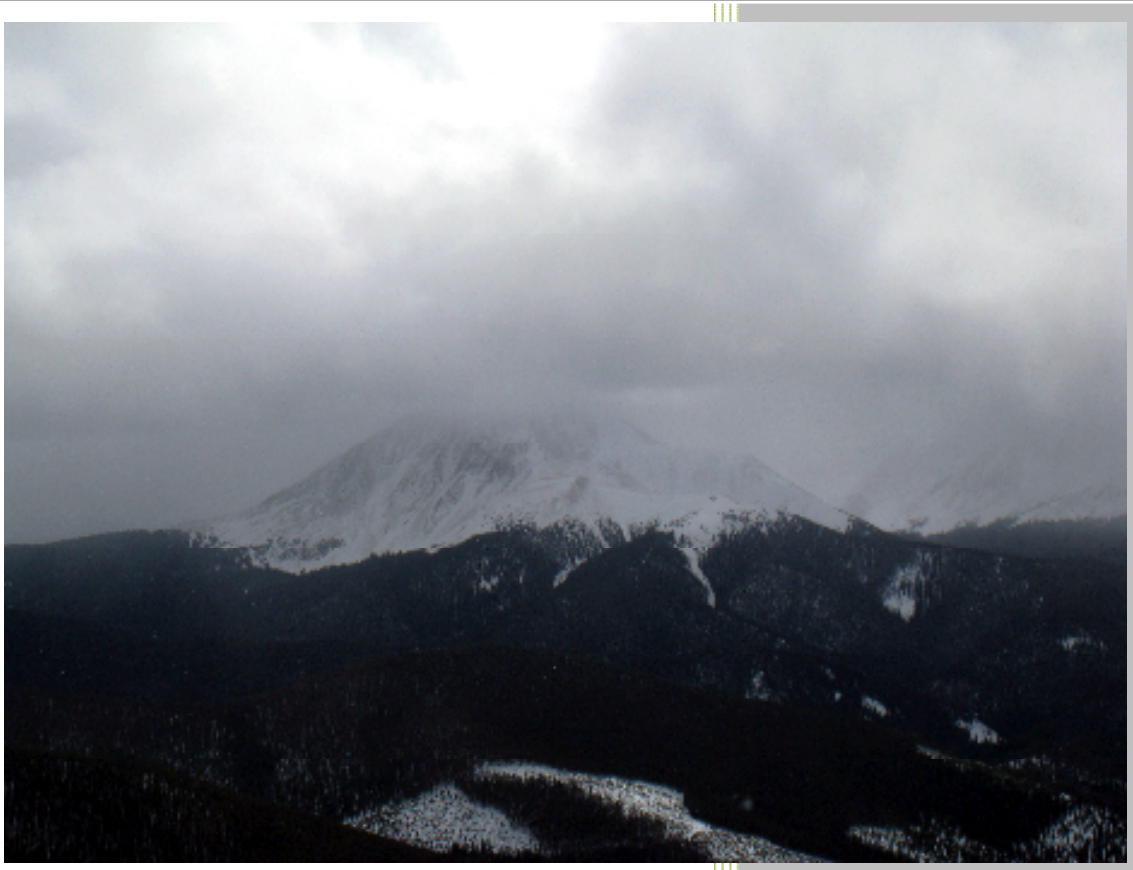
Nimbostratus Clouds



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Flow Visualization

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Context

This image is the second individual project entitled, 'Clouds 1,' for the course flow visualization at the University of Colorado-Boulder. The purpose of this assignment along with the second clouds assignment is to begin learning about the nature of clouds and weather. The idea is to snap a picture of unique, beautiful, and interesting clouds. Once the picture is taken, it is important to correctly identify what type of cloud is in the picture. The original idea for this image was to snap a picture of dark clouds surrounding a mountain top. This image was captured at the top of Keystone Ski Resort in Colorado. The mountain in this image is southwest of Keystone towards Breckenridge. The image was taken horizontally at approximately 11,000 feet in elevation.

Weather Phenomena

The picture was taken on January 20, 2010 at 3:01 pm mountain time. This corresponds to 22Z in Zulu time. Skew-T plots are only available twice daily; one at 00Z and one at 12Z each day. The closest Skew-T plot to the time this picture was taken is two hours away at 00Z on January 21. This time is fairly close and should provide an accurate assessment of the atmosphere at the time the picture was taken. Another limitation of the Skew-T plot is the location in which the data is taken. The nearest data gathered to where this image was taken is the Denver area (DNR in the Skew-T). The Skew-T for the Denver area at 00Z on January 21 is shown in figure 1 below.

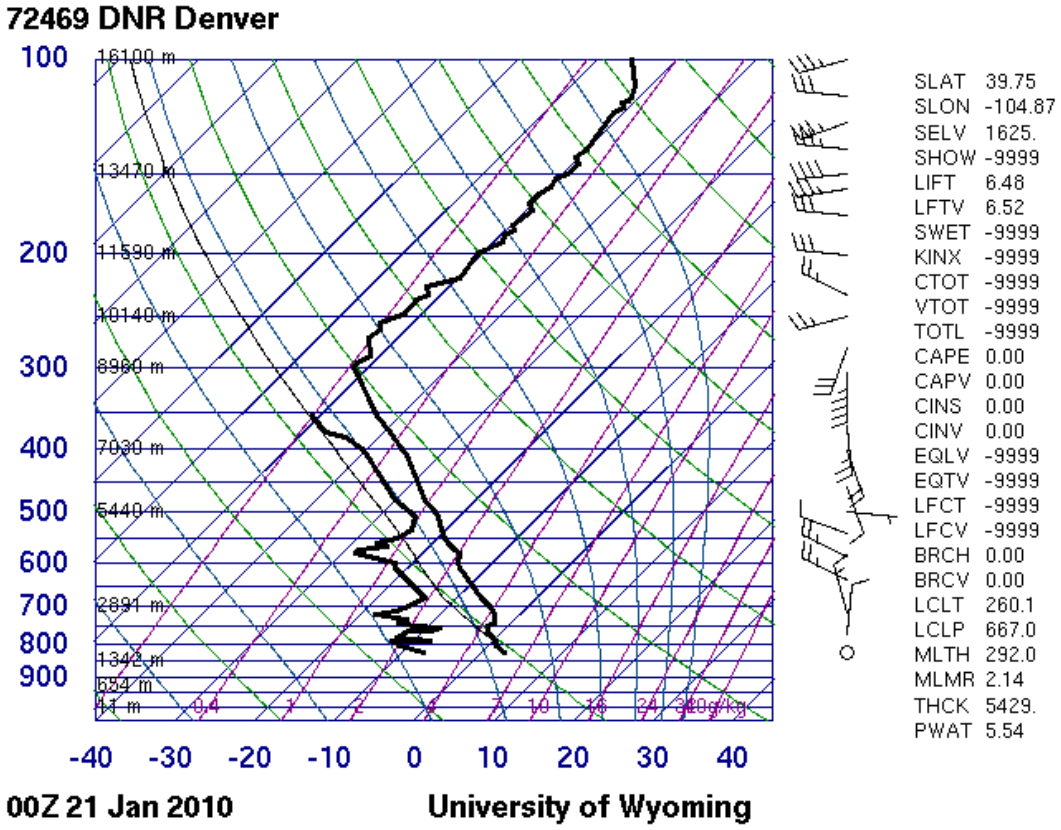

Figure 1: Skew-T Chart (00Z 21 = 5 pm 1/20 Mountain Time)[1]

Based on the data provided in this Skew-T plot, the atmosphere seems stable at the time the image was taken. Although the clouds in the picture seem dark and ominous, potentially indicating an unstable atmosphere, the Skew-T seems to suggest a stable atmosphere at the time. The slopes of the parcel line and the local air temperature line indicate a stable atmosphere. If you lower a parcel of air it is less dense than its neighbors and it will rise. If you raise a parcel of air it is denser than its neighbors and will sink. These are indications of a stable atmosphere.

The cloud in the image looks most like a nimbostratus.[2] 'Nimbo' comes from the Latin word nimbus and means rain or precipitation. Stratus clouds sit very low in elevation and are typically very thick. Nimbostratus clouds are dark-gray, sit very low, cover the sky, and usually precipitate.[3] Nimbostratus clouds, "are responsible for long periods of light precipitation in all seasons."[4] The clouds in the picture fit this description and seem to be precipitating. The elevation of the clouds in the image is approximately 12,000 feet above sea level. The clouds directly overhead were much higher and lighter in color. The clouds in the image seemed to be moving eastward and bringing precipitation with them. There was a slight breeze the entire day. Later in the evening this weather front moved eastward to Denver and caused snow for the remainder of the evening.

Visualization Technique

The main technique used in this image is getting as close to the clouds as possible. Being on top of a mountain provides incredible views of clouds and the surrounding weather. Mountains produce a great deal of precipitation and weather, so the clouds seen around them are usually large and beautiful. This image attempts to capture the ominous looking clouds over a large mountaintop. This gives the viewer a sense of doom or danger. The weather on the mountain where the picture was taken from was perfect; sunlight present, little wind, and no precipitation. The image came out a little dark because the flash did not fire, but the image was altered in Photoshop to bring out more light.

Photographic Technique

The original image was much darker than the image shown here. The intent of the image was to show contrast in the cloud and the mountain peak. The focus of this image was to capture one mountain peak and the clouds on top of and surrounding it. The camera was several miles away from the mountain peak in the image. The field of view was miles across.

The image was taken with a digital *Canon Powershot* SD870 IS. The image size is 3264 pixels wide x 2448 pixels high. The camera exposure specifications for the photograph were; an aperture equal to 5.6, the shutter speed at 1/1000 s, and ISO speed setting at 80. The focal length was 14.7 mm. The flash did not fire. The image was processed in Photoshop and saved as a .TIFF file. The only changes made to the image in Photoshop were adjusting the contrast by using the 'Levels' and 'Curves' features. The darker colors were made slightly brighter.

Revelations

The image reveals a nimbostratus cloud sitting over a large mountain peak. Several pictures of the clouds and the mountaintop were taken, with this one being the most interesting. The darkness of the clouds shows the precipitation taking place on this mountain peak. I like this image because it reminds me of the mountain scene in the movie, "*The Lord of the Rings: The Fellowship of the Ring*." During the fellowship's adventure they have to cross a large mountain in inclement weather. The picture I took reminds me of this scene in the movie. The image shows a large mountain with precipitation and 'doom-like' feel to it. I think this is a very scary and ominous image.

The one thing I dislike about the image is the lack of contrast. It is difficult to see fine details in the clouds over the mountain. This is partly attributed to the photographic technique and partly due to the clouds being very dark and uniform in color. To develop this idea further I would take more high quality images of the dark nimbostratus clouds sitting over the mountains.

References

[1] Skew-T Plots. University of Wyoming. Department of Atmospheric Science. Online. http://weather.uwyo.edu/upperair/sounding.html.

[2] Cloud Guide. Utah Education Network. Online. http://www.uen.org/weather/clouds.

[3] Low Clouds. The Physical Environment. Online. http://www.uwsp.edu/geo/faculty/ritter/geog101/textbook/atmospheric_moisture/clouds_3.html.

[4] Wolde, M. and Vali, G. Cloud Structure and Crystal Growth in Nimbostratus. Atmospheric Research. Vol. 61 Pgs. 49-74. 2002.