Second Clouds Assignment

MCEN 4228: Flow Visualization

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While we can't always see it, there are all sorts of fluids phenomena going on around each of us at any given moment. However, one phenomenon that can often be seen is condensed water vapor above the ground, more commonly referred to as a cloud. In this second clouds assignment, we have been given yet another opportunity to take an image of any cloud or clouds that catch our attention in our daily lives. Then, after selecting an image, we are to investigate the physics behind our clouds by looking at an appropriate skew-T plot and extracting relevant information from it.

This image was taken on March 2, 2010 at 10:40 AM. The camera was facing northwest, and was at an angle of about 30 degrees from the horizontal when the picture was taken. In the original image there were mountains at the bottom of the frame, but the mountains were cropped out because I felt they detracted from the image.

The cloud shown in the image is of the cirrus cloud family, and I believe it specifically to be a cirrus vertebratus. The rest of the sky had similar cirrus clouds as well when the picture was taken. The previous day there had been one inch of snow fall and some chilly weather, but on the day the picture was taken it was relatively warm, with temperatures about 50 degrees F. The following day there was also warm weather with temperatures in the high fifties [1]. Below Figure 1 is a section of the skew-T plot for March 2nd 2010 at 6:00 AM, about five hours before the picture was taken. In the original image tops of the mountains could just barely be seen at the bottom of the frame. This indicates that the clouds were very high above the mountains. Cirrus clouds are generally above 6000 meters off the ground, which makes sense since the clouds are far above the mountain tops [2]. At this elevation the surrounding air is so cold that water vapor becomes fine ice particles which can contribute the wispy nature of the clouds. Looking at this elevation on the skew T plot shown in Figure 1, the temperature curve has a smaller angle between it and the horizontal isobars than the dry adiabatic curve does, indicating stability, although bordering neutral stability. Also it should be noted that the CAPE was zero. For more information on determining stability, see reference number three [3]. The full skew T plot is given later in Figure 2.

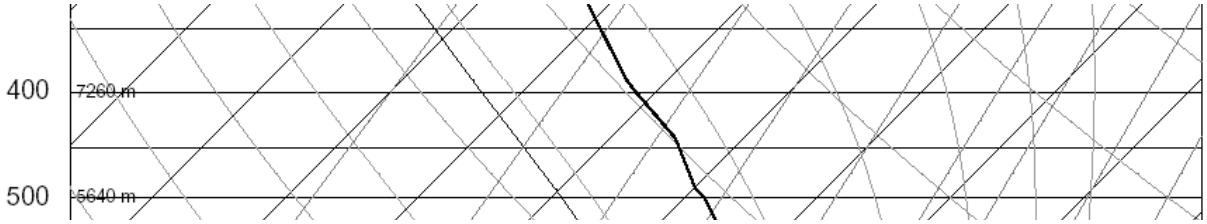

Figure 1

The field of view in this image is difficult to determine exactly, as it encompasses a vast amount of space, however I would estimate it somewhere around 5 miles, or 25,000 feet. The distance from the camera lens to the nearest cloud is also hard to determine, but I would estimate it at 30,000 feet. The original and final image height and width were 3648 x 2736 pixels and 3400 x

2670 pixels respectively. The camera used to capture the image was a Canon Powershot XS120 IS, which is classified as a digital point and shoot camera. For the exposure was obtained from the automatic setting on the camera. This was ISO 80 with an aperture of f/3.2 and shutter speed of 1/1250 seconds. The image was imported into Photoshop where the contrast and saturation were both increased, and the image was slightly cropped to remove distracting elements.

I was very pleased with the way the image came out. In my previous clouds image I experimented with a color inversion which gave the image a very dark feel. For this second image I wanted to capture the natural beauty of clouds without excessive use of Photoshop. I believe my intent on capturing a beautiful image was fulfilled, and I now feel much more confident in my knowledge about cloud formation and cloud physics. If I were to do a third cloud image I would likely try and capture an image of a stratus cloud, since I have already gotten images of cumulus and cirrus clouds. I am hoping to continue taking images of clouds so that during my stay in New Orleans I can get some more captivating cloud images.

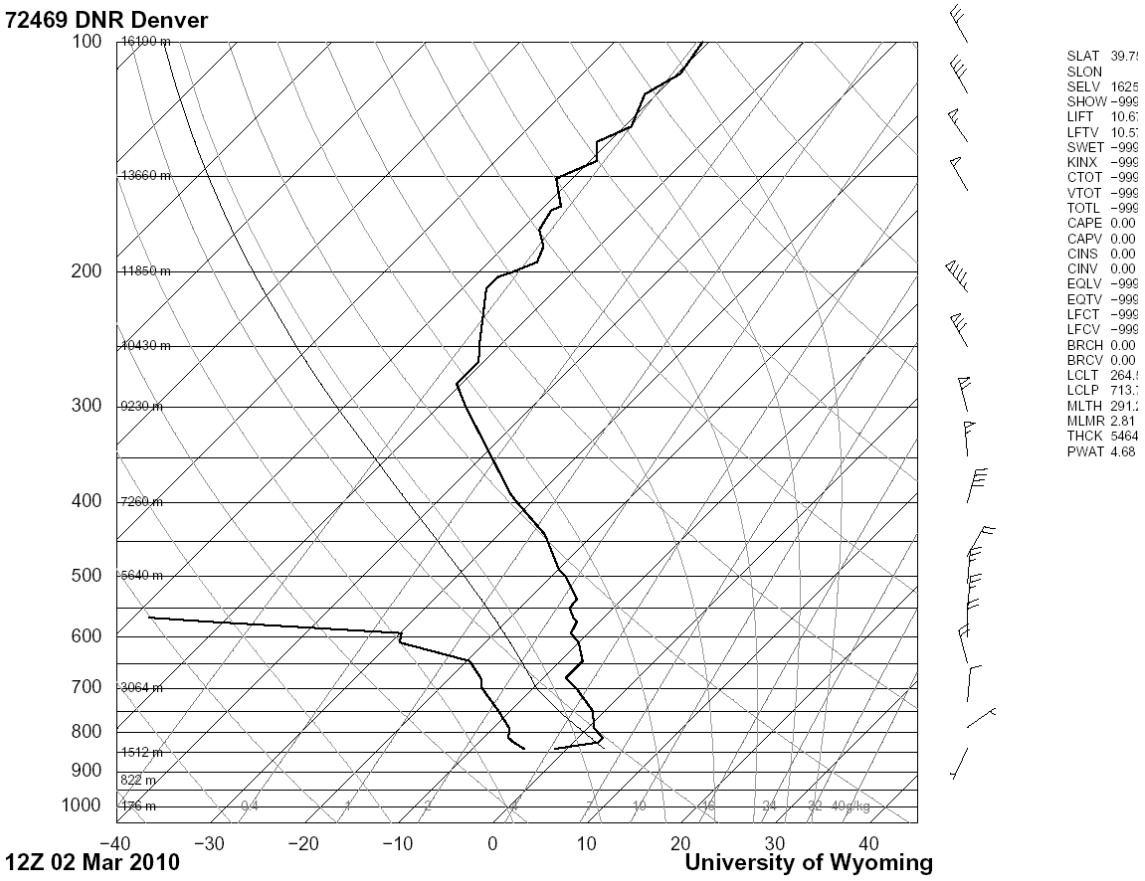

Figure 2

References

[1] http://www.esrl.noaa.gov/psd/boulder/data.daily.html#Jan10

[2] http://www.ace.mmu.ac.uk/eae/weather/Older/Cirrus_Clouds.html

[3] http://www.atmos.millersville.edu/~lead/SkewT_Stability.html