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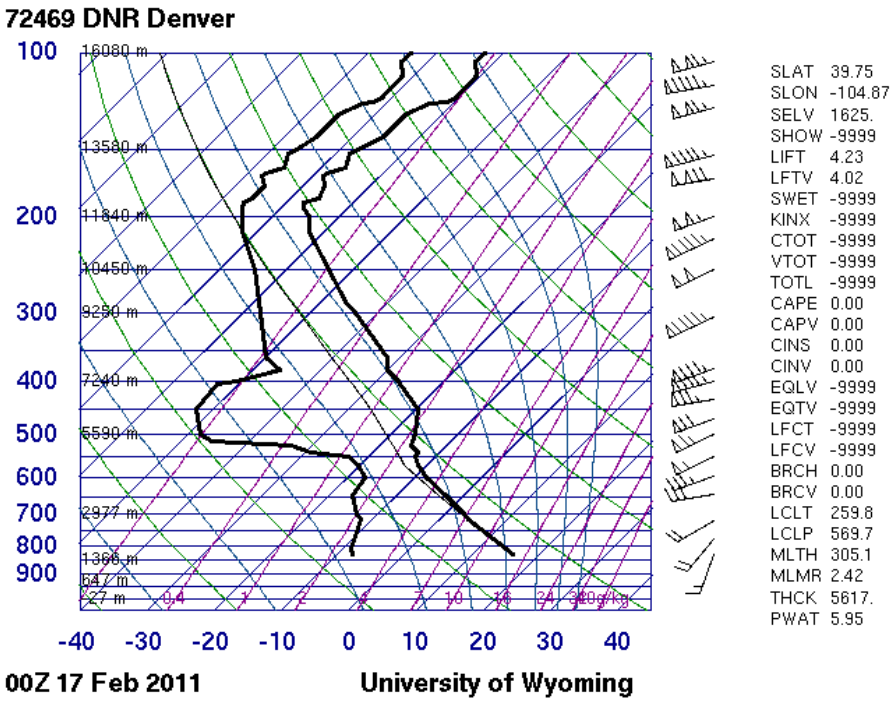
This image was produced as an assignment for a flow visualization class taken at the University of Colorado. The specific assignment was to investigate the appearance and underlying atmospheric conditions that create clouds that we see everyday. This is the first clouds assignment assigned by Professor Hertzberg. This picture was taken on a particularly sunny day with a very blue sky background and nice wispy clouds which will be investigated both scientifically and aesthetically in the following sections.

The cloud image was taken from the 3rd floor of 1005 Broadway. The image was taken facing due west and from the vantage point the clouds appeared to be directly over the University Memorial Center of the University of Colorado at Boulder. The image was taken at approximately 35-40 degrees from horizontal. The image was taken in the early afternoon (approximately 1 or 2PM MST) on February 16, 2011. The original image the CU's University Memorial Center, but was later eliminated to make the focus be the clouds.

The clouds visible in the image are cirrus spissattus clouds[i]. The image was taken on a primarily clear day with no major storms or fronts approaching. This is the main reason why the cirrus clouds are so contained and not elongated with the tails that are typical of cirrus fibratus and cirrus unicus clouds. The clouds are cirrus spissatus due to their dense and gray looking appearance. The mild weather which occurred from February 15 to February 17 allowed for the clouds to stay rather compact as the water vapor was not subject to varying flow. The especially blue appearance of the sky in contrast to the white sheets of cirrus clouds was appealing to the eye.

As observed in the skew-T plot below, the weather on February 16 was relatively mild. The dew point curve does take some erratic movement between 5500 and 7200 m, and then drastically increases at around 8,000 m.[ii] This is most likely the elevation at which the cirrus clouds occurred. When the dew point rises significantly the humidity in the air often condenses and crystallizes to become visible to the human eye as clouds.[iii] Cirrus clouds typically contain 30 ice crystals per liter and the length of each of these ice crystals is usually 25 micrometers long. [iv] While the 8000m is a little low compared to the 9000 m average height of cirrus clouds, the overall appearance and lack of significant moisture suggests that the clouds are more closely related to cirrus clouds rather than stratus clouds.[v] Also Boulder's high elevation and corresponding dry climate may result in slightly atypical cloud elevations and characteristics as compared to sea level.



In this photograph, the field of view is approximately 100 yards across at where the UMC is visible and possibly 20 miles at the elevation of where the clouds occurred. The clouds occurred at ~8000 meters, correlating to a total distance of about 11,000 m (45 deg. Angle). The specific lens used is a 100mm macro lens present on the Cannon 5D MarkII. The camera is of course a digital camera and the aperture was f4, Shutter Speed was $1/125^{th}$ of a second and ISO settings were 250. The image was further processed using Adobe Lightroom 2 in order to increase the contrast, crop the image to its final size, increased the exposure slightly, and gave the image a slightly warmer feeling light.

This image reveals the science of pressure, temperature, humidity and dew point that allows the atmosphere to contain lots of water but only visibly show it in certain occasions. In this instance the dew point was high enough at a certain range of elevations for the water vapor to condense and freeze to become visible water particles. In other occasions it is interesting to think that lots of cumulonimbus clouds can fill a sky and then only when an exact threshold is crossed will the water precipitate into rainstorms that are commonly observed. In the case of the present image no such combination of storm fronts and high pressure or low pressure systems existed. The atmosphere over Boulder was in a mild state. If I was to redo the image I might have left the UMC in the building as the contrast between the red building, blue sky, and white clouds was rather remarkable. Also I may have tried to take a picture at sunset as the clouds at sunset were particular beautiful for the days surrounding the time of the picture. Also I was hoping to do a traditional shot of lightning while leaving the lens open for a prolonged period of time, and unfortunately the dry cold weather of Boulder did not afford me the possibility in the time span requested.

[i] "Cirrus - Clouds Online." *Cloud Atlas - Cloud Classification, Cloud Pictures*. Web. 01 Mar. 2011. <http://www.clouds-online.com/cloud_atlas/cirrus/cirrus.htm>.
[ii] *Unisys Weather*. Web. 01 Mar. 2011. <http://weather.unisys.com/upper_air/skew/details.php>.
[iii] "The Water Cycle: Condensation, from USGS Water Science for Schools." *USGS Georgia Water Science Center - Home Page*. Web. 01 Mar. 2011. <http://ga.water.usgs.gov/edu/watercyclecondensation.html>.
[iv] "Cloud Liquid Water Content, Drop Sizes, and Number of Droplets." *UWyo Dept. Atmospheric Sci*. Web. 01 Mar. 2011. <http://www-das.uwyo.edu/~geerts/cwx/notes/chap08/moist_cloud.html>.
[v] Palmer, Chad. "USATODAY.com." *News, Travel, Weather, Entertainment, Sports, Technology, U.S. & World - USATODAY.com*. 16 Oct. 2005. Web. 01 Mar. 2011. <http://www.usatoday.com/weather/wstratus.htm>.