Cloud Image: Cumulus

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The image below in *Figure 1* is a submission for the "Clouds Assignment" for the 2013 spring course Flow Visualization. This is the first of two cloud assignments, both of which are geared towards getting the students to appreciate clouds and their formations and to understand the science behind them. The intent of this image was to capture a fluffy white cloud and all the little details that make it unique. Approximately 50 photos were taken in the initial photo-taking stage.

Figure 1: Cumulus Cloud Image

The image was taken on the 18th of February 2013 at 11:31 A.M. mountain standard time (M.S.T.). In *Figure 2* the original photo can be seen. The place where the original photo was taken, which was at a viewing area near the Flagstaff Restaurant in Boulder, Colorado, has an elevation of about 5,980 feet and the approximate coordinates of 40.01°N and -105.29°E [1]. The photo was taken facing east with minimal, if any, upward tilt to the camera.

Figure 2: Original Cumulus Cloud Image

The type of cloud seen in the image is a cumulus cloud. Cumulus clouds are typically lower level clouds, which means that they normally sit at an altitude of 6,000 feet or less from the ground [2]. They are most known for looking like white and fluffy "cotton balls" with flat bases [2]. The fluffiness comes from the air pockets found in the clouds and the winds near the cloud. The cloud's base is characteristically flat because the water vapor in the air can't condensate below a specific height [3], yet cumulus clouds form at lower altitudes. In *Figure 1* (and *Figure 2*), it can be seen

that the base of the cloud is flat and that the top is fluffy. The weather on the 18th of February was partly cloudy with winds originating from the west direction of speeds up to 28 miles per hour and the temperature was 37°F [4] at the time of the photo. The two days that preceded the 18th had similar weather with lower wind speeds [4]. Two days after the 18th Boulder, Co had snowfall of 1.4 inches [4], so the cloud formations could have been due to the cold front coming in from the west. In *Figure 3* below, the Skew-T diagram is shown for the 18th of February 2013 at 12:00 P.M for Denver. Along the left side of Figure 3, it can be seen that the convective available potential energy (CAPE) is equal to 0.00. When the CAPE is equal to zero, this indicates a stable atmosphere, which contradicts the cumulus cloud formations because they tend to form in an unstable environment.

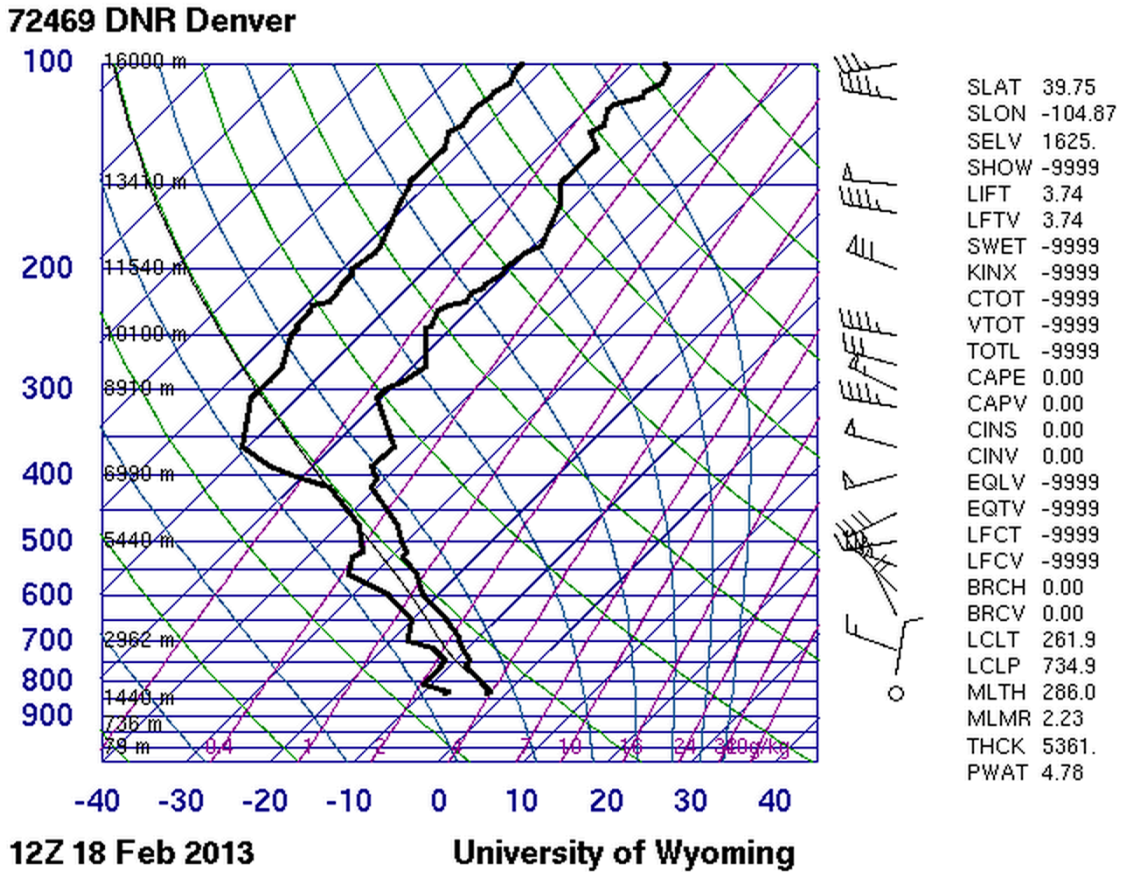

Figure 3: Skew-T diagram for Denver at 12:00PM

The image for this assignment was taken with a Nikon COOLPIX S8200 digital camera. The original image is 4608 x 3456 pixels and the final edited image is 3475 x 1403 pixels. For the image, the aperture was at f/9.8, the shutter speed was 1/1000 s and the ISO was set at 200. The focal length was at 24.4 mm. Judging from the image, the field of view for the clouds are approximately 1,000 feet from the ground below it, about 500 feet above from where the image was taken and it's estimated that the image is about 2,000 feet wide. The final edited image was edited from the original photo using the ViewNX 2 program. The brightness and the

contrast were enhanced to brighten up the background and to add more definition to the details in the clouds. The image was then cropped to focus on one cloud so that the details could be highlighted.

The image in Figure 1 shows the details that are exhibited in clouds, cumulus clouds specifically. I like how the image is striking when you look at it because the blue sky in the background makes the cloud pop a lot more than it otherwise would with a duller color. I don't like how the image is grainy, which is odd because of the low ISO and the sharpness was not enhanced during the editing stage. Because of that, I would like to improve upon the quality of the image to get a smoother looking image. In developing the cloud idea, I would really like to capture a day's worth of video that focuses on one section of the sky and play it fast forwarded to see a cloud's lifetime and the different shapes clouds could morph into. It would also be neat to see if multiple different cloud types develop in the sky over the course of a day.

Sources:

[1] "Latitude and Longitude of a Point." *ITouchMap*. N.p., 2007. Web. <http://itouchmap.com/latlong.html>.

[2] Baker, A. "Cumulus Clouds." *Cumulus Clouds*. Northern Michigan University, 2009. Web. 2013. <http://ellerbruch.nmu.edu/classes/cs255f02/cs255students/abarker/P4/cumulus.html>.

[3] Smith, S.E., and Bronwyn Harris. "What Are Cumulus Clouds?" *WiseGeek*. Conjecture, 02 Jan. 2013. Web. <http://www.wisegeek.com/what-are-cumulus-clouds.htm>.

[4] TWC. "Boulder, CO Weather." *Weather.com*. The Weather Channel LLC, 18 Feb. 2013. <http://www.weather.com/weather/pastweather/Boulder+CO+80303:4:US?s tartdate=20130218>