

Logan Mueller  
Flow Vis Spring 2014  
Clouds Assignment #2



**Clouds above Boulder Mountains March 2nd 2014 5:45 PM MST**

This photograph of the clouds above the mountains just north of the Flatirons was taken from a house near the intersection of Pine St and 17<sup>th</sup> in Boulder, CO. Snow had fallen on and off during the day, but at this particular time, the snow had ceased to fall and the clouds began to part allowing the blue sky to provide a brief respite from the wintry day. The reason I like this photo so much is because it fills me with a sense of hope and peace. The clouds may blot out the sun from time to time, creating bitter experiences, but in the end, light always overcomes darkness, and this theme resonates with my soul. I am also captivated by the place where the sun meets the clouds at the top of the image, making the lower clouds diaphanous and providing a subtle yet beautiful shift in colors.

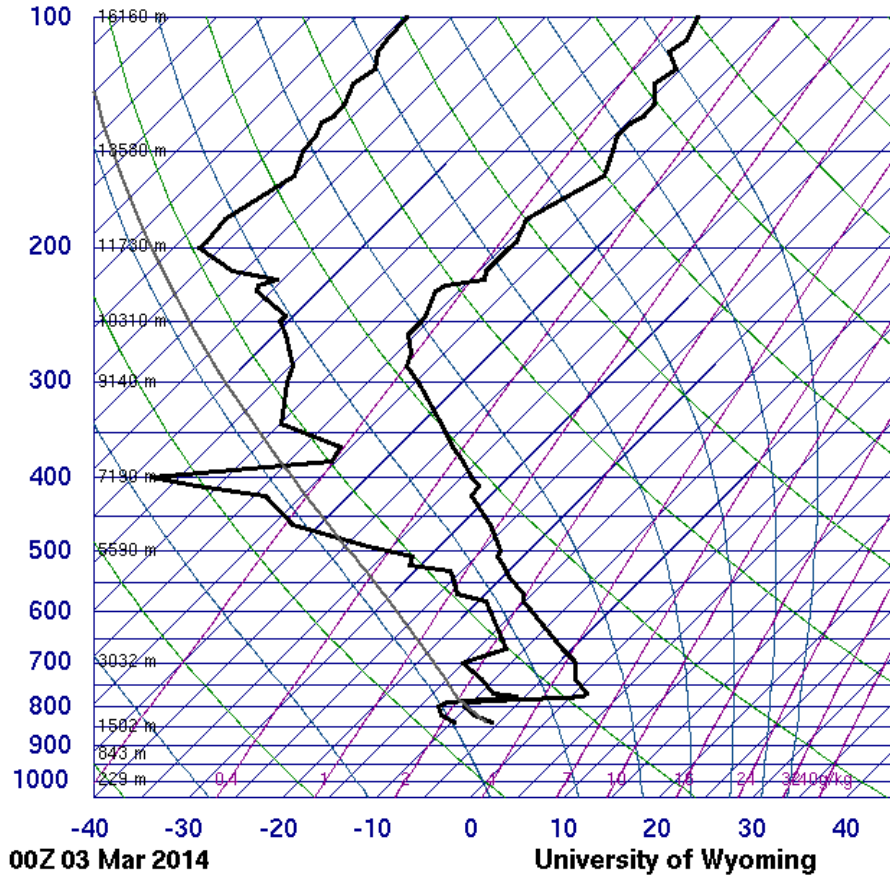
This photo was shot using my Olympus Pen E-PL5 point and shoot camera, resulting in a 4608 x 3456 pixel image. A shutter speed of 1/320 s, an aperture of f5.6, and an ISO of 200 were used by the camera. I contemplated editing the photo by cropping out the bottom portion and removing the house and chimney entirely. I also thought about bringing out the contrast in the image, but efforts in this area ruined much

of the integrity of the photo. Thus, the final version shown above is completely unedited because in my opinion it is much more visually powerful.

The main cloud types seen in this particular photo are altostratus clouds located at an elevation of approximately 14,500 feet. The elevation is estimated through two different stratagems. First, the skew T diagram shown below illustrates the location where the two lines come closest together is at an elevation of approximately 14,200 feet<sup>1</sup>. Second, I saw the clouds initially from the Boulder turnpike and they were going over Long's peak and clearing it by a little bit, so I estimated the cloud height to be slightly higher than the mountain itself. The skew T diagram below also helps determine the atmospheric stability at the time the photo was taken. Since the CAPE number was zero on this particular day, the atmosphere was stable at the location of the measurement and it can be concluded that the cloud types are most likely stratus rather than cumulus. The chart shows that there was a northwesterly wind at the time of the photo, which helps to explain the fact that the clouds were coming over the mountains at a fairly steady clip. It is interesting to look into the physics behind cloud formation for this photo. As I said, it was snowing earlier in the day, but by the time this photo was taken, the snow had petered off to nothing. The initial snow was created through the following process. Cloud droplets form when molecules of water vapor combine with cloud condensation nuclei or aerosols including dust and certain chemicals. These droplets then combine together through a process called collision coalescence that helps them become larger. However, the main way growth is achieved in a droplet is through the Bergeron process, which states that air reaches saturation and many of the droplets come into contact with freezing nuclei<sup>2</sup>. This gives a combination of super cooled water droplets and ice crystals. Then, through a fairly complicated process, the ice crystals grow at the expense of the super cooled water droplets. If the ice crystals grow large enough, they can fall out of the clouds resulting in snow or rain. Hence, the reason it was snowing earlier in the day and stopped snowing later on is that the number of water droplets in the air became much smaller resulting in smaller ice crystals and no chance of precipitation.

In general, I am very pleased with how the image turned out. It reminds me that peace can be found in all situations. I loved witnessing the transformation from a stormy day to a day that promised hope for tomorrow. If I could change anything about this photo, it would be to have a sped up video of the entire day, ending on this beautiful moment when everything seemed right in the world.

**72469 DNR Denver**



SLAT	39.77
SLOE	-104.87
SELV	1625.
SHOW	-9999
LIFT	16.11
LFTV	16.13
SWET	-9999
KINX	-9999
CTOT	-9999
VTOT	-9999
TOTL	-9999
CAPE	0.00
CAPV	0.00
CINS	0.00
CINV	0.00
EGLV	-9999
EGTV	-9999
LFCT	-9999
LFCV	-9999
BRCH	0.00
BRCV	0.00
LCLT	260.6
LCLP	772.1
MLTH	260.6
MLMR	1.92
THCK	5361.
PWAT	6.20

**References:**

[1] "Atmospheric Soundings." *Wyoming Weather Web*. Web. 13 April 2014.

<<http://weather.uwyo.edu/upperair/sounding.html>>.

[2] "The Bergeron Process." *Cloud Physics*. Web. 13 April 2014.

<<http://weather.cod.edu/sirvatka/bergeron.html>>.