Patrick Cotter
Flow Vis Spring 2013

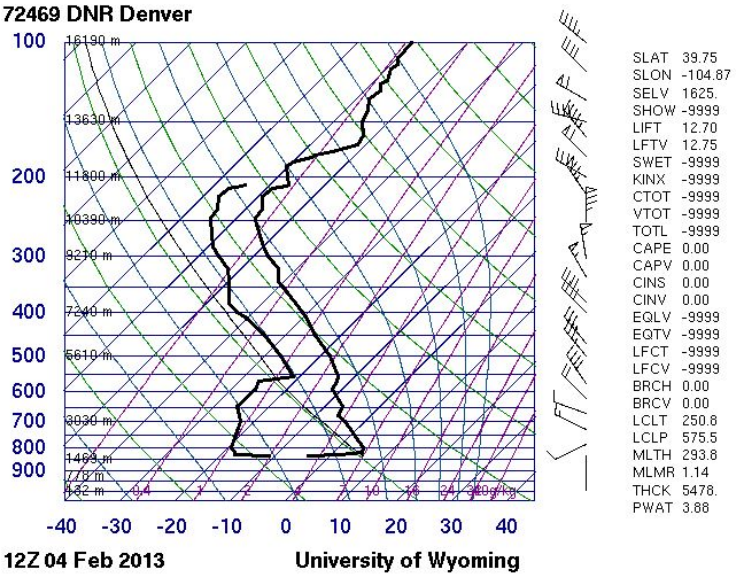
Clouds 1 Report

Figure 1: "Sunrise in Boulder" 6:30 AM Feb. 4th, facing West

The photo seen above is my submission for the cloud photography assignment in Flow Visualization Spring 2013 at the University of Colorado Boulder. The assignment was simply to capture some interesting clouds in a manner that exemplifies some cloud physics. I was particularly interested in the wispy waves of clouds that can be seen in the top right corner of the image and more so in the center cloud formation. I believe these to be altocumulus undulatus clouds. I also selected this image because of the multiple cloud types and the coloring of the clouds.

This photo was taken on February 4th just after 6:30 AM as the sun was rising behind me. I am fortunate enough to have a balcony that overlooks CU's campus and the flatirons so I was able to get out of bed, see these clouds out my window, and quickly capture some photos of them before the sun fully rose. I was facing nearly directly west, with the camera resting on the railing of the balcony pointed upwards about fifteen degrees to avoid getting buildings in the frame.

As mentioned, there are multiple types of clouds here, but I believe them all to be of the altocumulus variety. The skew-T plot shown at right indicate that clouds were likely to form above about 4500 meters (~15,000 feet). This is where I believe the observed clouds formed. The Convective Available Potential Energy (CAPE) value provides information on the stability of the atmosphere. Here, a CAPE value of 0.00 indicates low potential energy in the atmosphere, meaning it can be described as stable. The atmosphere was stable and there was no precipitation on the day the image was taken, as well as both the previous and following days. The skew-T diagram also reveals that wind speeds are near 50 mph at the altitudes where these clouds were likely to form. The shear caused by this wind likely contributed to the formation of the altocumulus undulatus clouds mentioned earlier. Another interesting type of cloud in the image is the one in the background over the front range. I believe this to be a Föhn cloud, or stationary mountain wave cloud. Over time, this cloud wall stayed put over the Front Range, I believe as a result of the wind coming over the mountains. I believe this wind is also what caused the clouds to form in the 3 defined clusters that you see in the image. Mountain wave clouds form in a stable atmosphere such as the one on the day this image was captured and it makes sense that the 3 clusters would form at the cooled crests of “wind waves” created by air flowing over the mountains.



I took this image with a Canon EOS Digital Rebel XS in aperture priority mode with the following settings:

- Shutter Speed: 1/400 second
- Aperture: F/5.6
- Focal Length: 41 mm
- ISO Speed: 200
- Flash: No
- Exposure Bias: 0

The fast shutter speed and low ISO are a result of how much light is available for the sensor. I did not want to over-expose the cloud, being the relatively novice photographer I am. I wanted to capture the color of the clouds and I did not have a tripod so I opted to leave the aperture open fairly wide and use a faster shutter speed. At first, I was disappointed about the trees included in the image but, along with the silhouette of the mountains, I feel they give the image a little bit of perspective and context. It is easier to tell what size of clouds are in the photo with these objects on the ground in frame. I did not do excessive post-production here, mostly some adjustment of brightness and contrast and a bit of playing around with color curves to really emphasize the orange color from the sunrise. I did these tweaks while the image was still in RAW format and then converted to a lossless .Tif file.

Overall, I am very happy with this image. I think it reveals a few different cloud types at an interesting time of day when many of us college students might not be awake. I particularly like the undulatus clouds and the contrast between the dark, Föhn cloud in the background and the bright orange altocumulus in the foreground. If I was to take this image again, I think I would try my hand at HDR photography. I think it would reveal more details in the clouds since the lighting is so drastically different in the background and foreground of the image. I thoroughly enjoyed observing different cloud types during the course of this project. I now often find myself looking to the sky and trying to decipher it. I look forward to improving upon my techniques and possible employing HDR techniques for more cloud photos in the future.