Flow Visualization: Clouds 1 Assignment Report

The image seen to the right is a submission for the spring semester of Flow Visualization assignment, “Clouds 1”. This assignment prompted students to maintain vigilance for great cloud photography. Since clouds are actually fluid flow visualizations extremely prevalent in every day life, it is motivating to pursue beautiful photographic representations of them for this flow visualization course. This image was selected from a collection of several dozen that were taken over a span of about a week. This is mostly due to the interesting shape of the cloud and the relative clarity of the image.

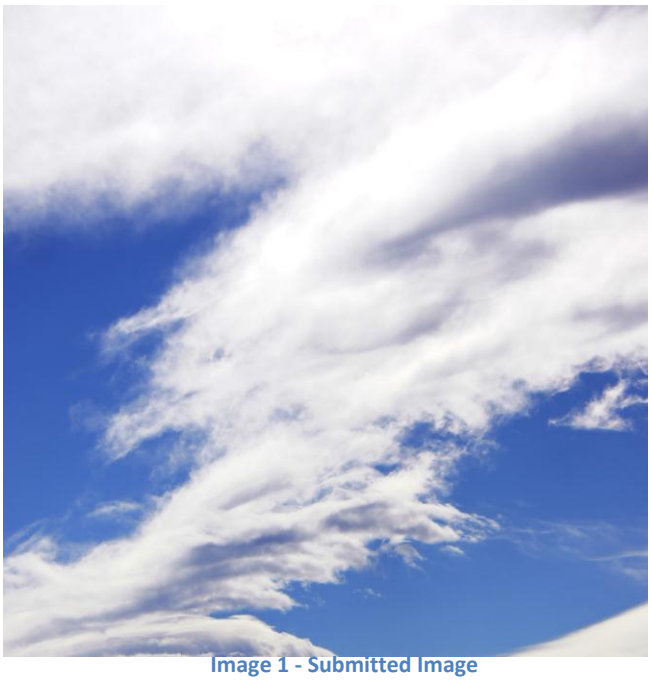

Image 1 - Submitted Image

This photograph in particular was taken at the top of Greenbriar Blvd near a Fairview High School parking lot. This location is in the southern regions of Boulder, Colorado, and provided a good vantage point with a lower number of trees or buildings impeding vision. The photograph was taken at a 25 degree incline in a southwestern direction. The date was Wednesday, February 22nd at 4 PM.

During the day of the image capture as well as the days surrounding, constant high speed winds swept the sky. The day the image was taken in particular, the gusts were strong enough to destroy trees and also made it extremely difficult to maintain a standing position while taking pictures. Despite the high winds, there was no rain or snow and sun was consistently out. According to the skew-T plots nearest to the time of image capture for the Denver area, the atmosphere was completely stable due to a CAPE of zero. The skew-T plot can be seen below.

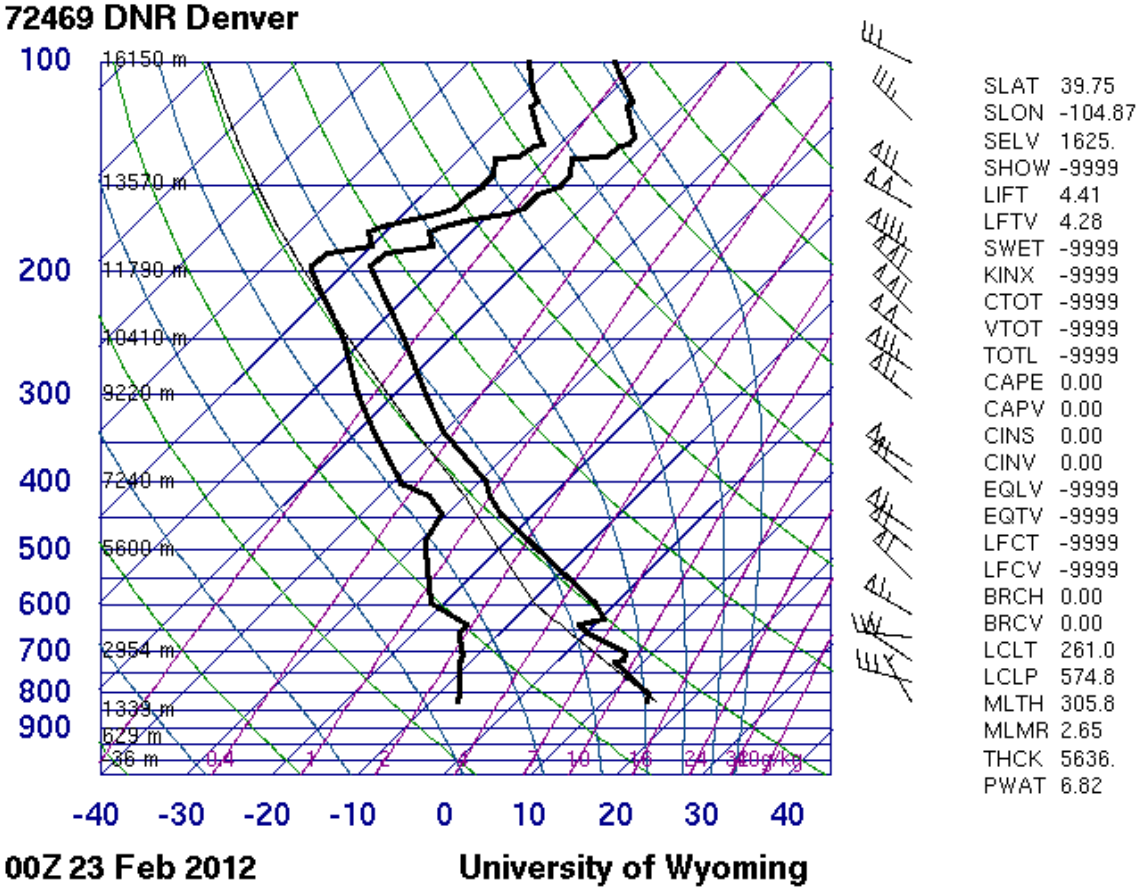
72469 DNR Denver
100
200
300
400
500
600
700
800
900
16150 m
13570 m
11790 m
10410 m
9220 m
7240 m
5600 m
2954 m
1339 m
629 m
-40 -30 -20 -10 0 10 20 30 40
00Z 23 Feb 2012
University of Wyoming
SLAT 39.75
SLON -104.87
SELV 1625.
SHOW -9999
LIFT 4.41
LFTV 4.28
SWET -9999
KINX -9999
CTOT -9999
VTOT -9999
TOTL -9999
CAPE 0.00
CAPV 0.00
CINS 0.00
CINV 0.00
EQLV -9999
EQTV -9999
LFCT -9999
LFCV -9999
BRCH 0.00
BRCV 0.00
LCLT 261.0
LCLP 574.8
MLTH 305.8
MLMR 2.65
THCK 5636.
PWAT 6.82

Image 2 - Unedited Image

Due to the angle of incline that the image was taken in combination with the skew-T plots, the clouds in the image can be estimated at an altitude around 12 thousand feet due to the distance between the plot lines at that altitude. Based on the high winds, altitude, and atmospheric stability, the clouds are most possibly stratus lenticularis and slightly shredded from the high winds. These lenticular clouds are normally lens-shaped clouds that form downwind of mountains, like seen in the image. The original image above was used to estimate the altitude.

The original image spans approximately ten feet across at the trees nearest to the camera. At that point, the tree at the center right is roughly five feet tall. In addition to not using the camera flash capability, a large set of default and custom camera properties were used in this image. The camera, a Sony SLT-A55V DSLR, was located approximately 4 inches from the glass. A focal length of 45 mm was selected in order to best capture the entirety of the cloud. Alongside the focal length, an F-number of 4.5, an exposure time of 1/4000, and an ISO of 200 were selected for the best combination of clarity and lighting. In regards to post production, a few Adobe Photoshop functions were used. The original, unedited image, at a resolution of 4912 x 3264 was cropped down to focus the middle stretch of clouds. In addition, the brightness was

decreased and the contrast was increased in order to bring the contrast within the clouds out and also darken the sky.

In conclusion, the cloud image illustrates some of the magnificent flow visualizations existing in the skies. I think the cloud itself was very interesting and shaped uniquely, however, I wish the exact reasons behind the shapes was clearer. Although high winds are a likely source of some of the cloud shape, it isn't completely definitive. For future cloud images, I hope to better contrast the cloud itself to clearly illustrate differences in shape within a cloud cluster. This would require additional Photoshop alteration in order to prevent regions of the cloud from coming across as too bright. With that capability, I think the clouds inner shapes will be shown more clearly and additional fluid physics can be understood.

Works Cited

"Atmospheric Soundings." *Department of Atmospheric Science*. University of Wyoming College of Engineering. Web. 03 Mar. 2012. <http://weather.uwyo.edu/upperair/sounding.html>.