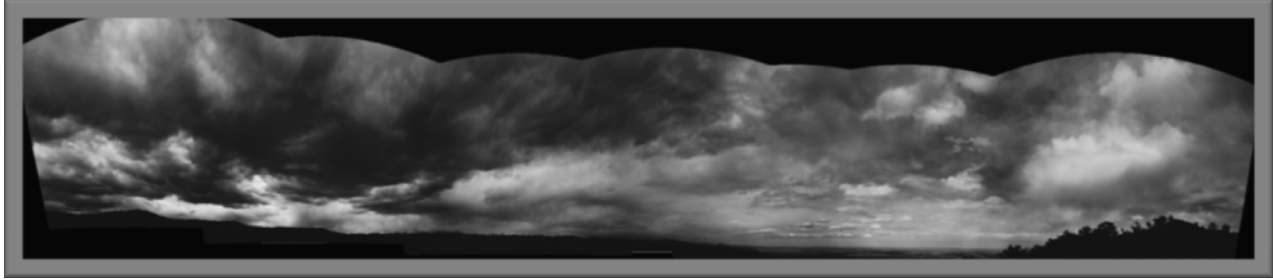


Could Image Report 2



Brian Hancz

Flow Visualization

April 15, 2009

Context & Purpose

The intent of this assignment was for each student to individually photograph clouds in the atmosphere that displayed something of interest. Time was spent hiking through the outskirts of Boulder on very sunny to fairly sunny days for observing clouds and taking pictures. The aim of the panorama image was to show the audience different types of clouds and to demonstrate the effect the Flatiron mountains have on incoming clouds from the west.

Setting of Photograph

The images chosen for the report were taken in the Boulder Mountains up Baseline Road. There is a parking area in which you can see the mountains to the west as well as Boulder Valley in the east. The elevation was approximately 7,000 feet. The images were taken on Tuesday, April 15 2009, at 4:00 pm. At the time of the image, weather conditions in the area seemed to be stable. The pressure was constant, the temperature was about 65 degrees Fahrenheit, and the wind was moving at 5 miles per hour, gusting to 10 miles per hour, in the east to south east direction (data in appendix) [1].

Cloud & Weather Interpretation

The intent of the panoramic image was successful in capturing the change in cloud types and formations across the mountainous horizon looking from the west to the east. The left hand side of the image is facing west. It appears that the clouds in that direction were cumulonimbus clouds, for they were quite dark on the bottom side and appeared fairly dense. Another reason as to why I believe that these clouds were cumulonimbus is because there looked as if there was precipitation off in the distance, and this is highly associated with this type of cloud. Looking west there were many cumulus clouds that were not dark and were much smaller in size than the cumulonimbus clouds in the west. Cirrus clouds were also scattered in the upper atmosphere, but are not well seen in the image. Many of the cirrus clouds were in the north and east from my perspective. It was interesting to see the cloud formations shift across the horizon. The west looked as if there was precipitation and gloom where towards Boulder it was mostly sunny with far fewer clouds.

Measuring the stability of the atmosphere in a location on a given day is not a perfect science by any means. There are many factors that affect the stability. The closest skew-T plot available for reference (of weather from April 14 at 4:00 pm) is from Denver and is inserted below [2].

72469 DNR Denver

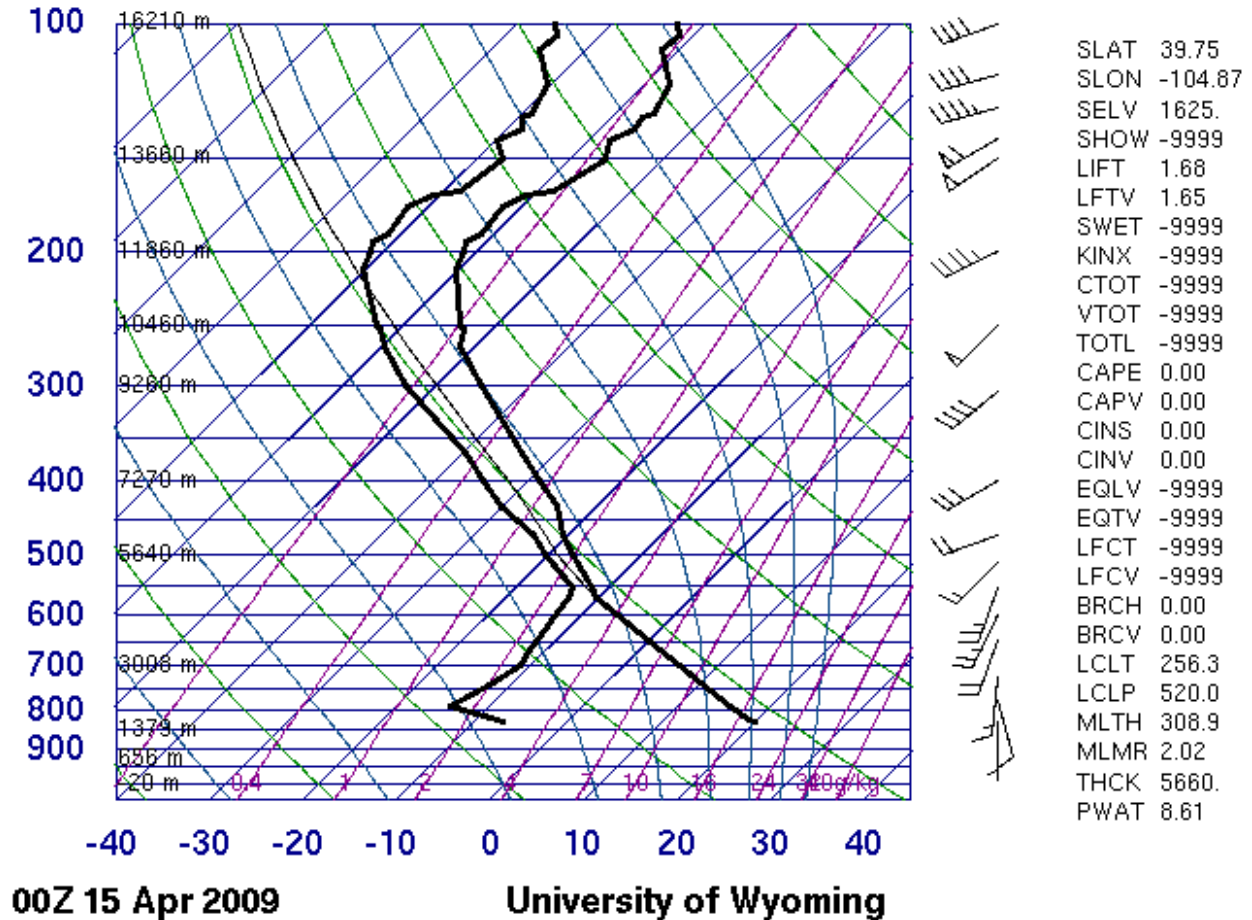


Figure 1: Skew-T Plot of Denver Area [2]

From the plot, it can be seen that the atmosphere is fairly stable because the LIFT coefficient is greater than zero, being 1.68. More quantitative information can be gathered from the plot about the clouds. It is common for clouds to form when the distance between the two representative lines at any given altitude is less than 10 degrees Celsius apart [3]. This case is true at heights of about 5,000 meters (16,400 ft) and 12,000 meters (39,400 ft). Therefore the Cirrus clouds are located at the upper height and the Cumulus clouds are situated at the lower elevation. The magnitude of the wind also varies with height, but with little pattern. Generally speaking, the magnitude increases with altitude. However these measured winds are in Denver and the image was taken about 30 miles away in Boulder. The surface level winds are only moving at about 10-20 knots, the middle and upper atmospheres experience winds up to 100 knots [4]. The sharp change in temperature, located at 2,000 meters (6,600 ft), is likely to be a boundary layer in the atmosphere.

Photographic Technique

It is estimated that the field of view is 50 miles. The distant objects (Cirrus clouds) are approximately 7 miles away in the y axis and 10 miles in the x axis, so therefore approximately 13 miles from the lens of the camera. The dimensions of the panorama image are 16,681 x 3446 pixels with 96 dpi. The type of camera used was a Canon EOS Digital Rebel XT. The focal length, exposure time, and aperture values were automatically set by the camera for each of the six images taken which together make the panorama.

There was some Photoshop processing to the original stitched panorama image. At first I played with the colors to increase the contrast and overall effect of the image. I decided to try converting the picture to black and white and was pleased at how well the grayscale displayed the information of the clouds. I then greatly increased the contrast and made an 'S' shape in the curves option of Photoshop. Next I decreased the brightness to get more dark grey and black colors in the image. The sun was actually shining most strongly on the dark clouds on the left. I thought the effect was neat to darken the image because the sun was still strong enough to appear almost white in between the clouds. Looking to the east you can still see the small clouds and a bright sky.

Conclusion

In my opinion this photo is a good image of the unique atmospheric conditions we have here in Boulder. The panorama photo conveys a lot of information to the audience. I took dozens of individual pictures but could not integrate both the west and east views into one picture. This is when I went through my images and decided to integrate them together to make a panorama. There were some nice colors in the original photos (trees, sky, mountains) that I lost due to the grayscale effect but I think it works out for the better because it really puts the emphasis of the image onto the clouds. I like how the bright sun light can still be seen between the dark clouds in the west. Also the way the clouds seem to transform from rain clouds to small cumulus clouds is quite dramatic. I fulfilled my intent, but would have approached my style of photography differently in order to make a better panoramic picture. I would have taken more pictures at different angles to the horizon so that more of the atmosphere was captured. This would give me many more pixels in the y axis to work with so that the picture was not so skinny. Then I would be able to crop out the image I wanted and not have to create a black framework to surround the image.

Appendix

History for MNCARF

NCAR Foothills Lab NCAR, Boulder, CO — [Current Conditions](#)

The data provider for this station: INTERNET

Daily Summary for April 14, 2009

[« Previous Day](#)

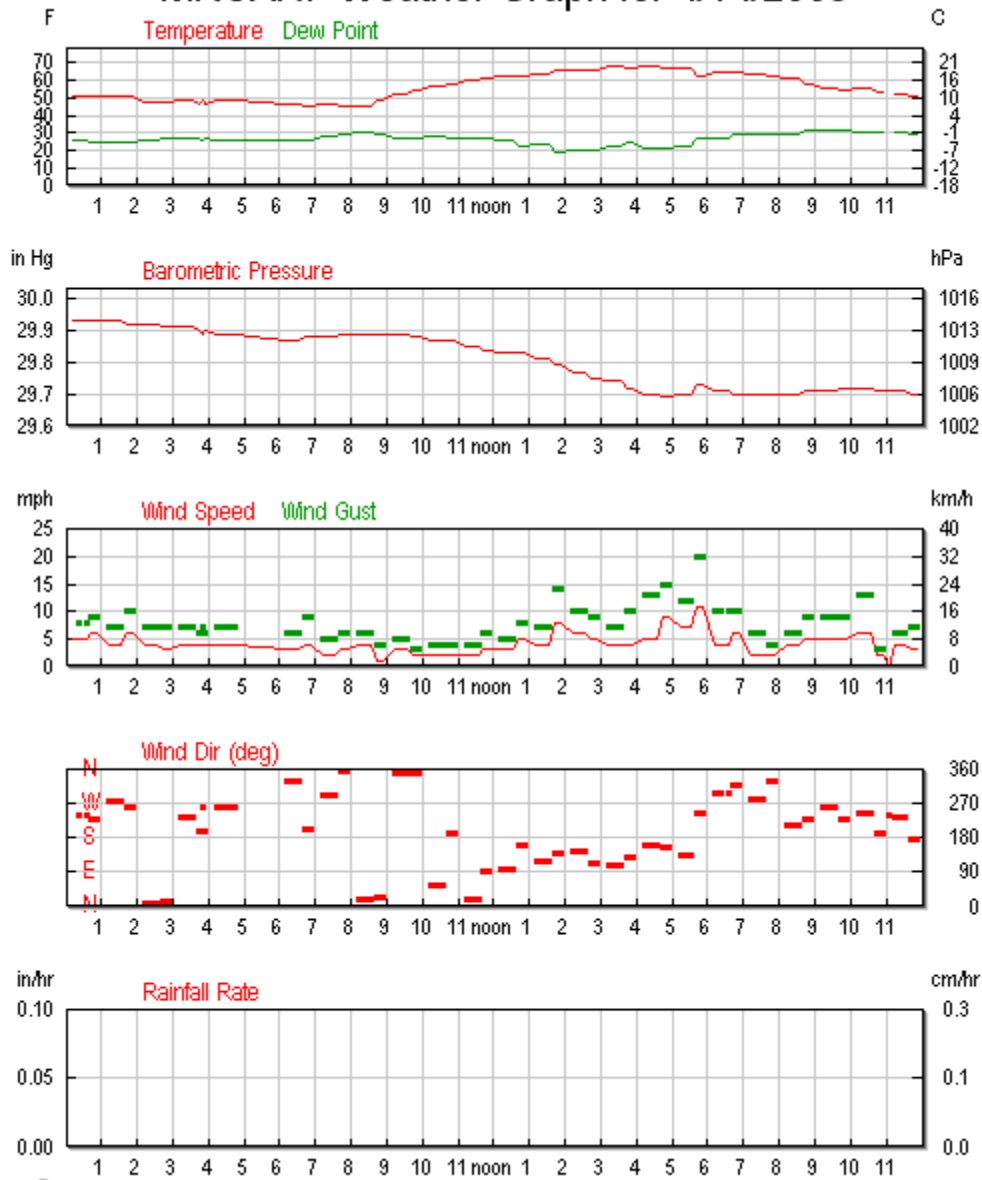
[Next Day »](#)

	<u>Daily</u>	<u>Weekly</u>	<u>Monthly</u>	<u>Yearly</u>	<u>Custom</u>
Temperature:	62.0 °F	Current:	High: 68.0 °F	Low: 45.0 °F	Average: 56.0 °F
Dew Point:	30.0 °F	30.0 °F	31.0 °F	-99.9 °F	25.3 °F
Humidity:	29%	29%	55%	17%	33%
Wind Speed:	3.0mph	3.0mph	11.0mph	-	-
Wind Gust:	6.0mph	6.0mph	20.0mph	-	-
Wind:	SSE	SSE	-	-	SW
Pressure:	29.64in	29.64in	29.93in	29.69in	-
Precipitation:	0.00in	0.00in	-	-	-

Statistics for the rest of the month:

	High:	Low:	Average:
Temperature:	68.0 °F	20.0 °F	42.9 °F
Dew Point:	41.0 °F	-99.9 °F	22.9 °F
Humidity:	96.0%	6.0%	52.5%
Wind Speed:	30.0mph from the East	-	4.7mph
Wind Gust:	46.0mph from the NNE	-	-
Wind:	-	-	SW
Pressure:	30.42in	29.39in	-
Precipitation:	0.00in	-	-

MNCARF Weather Graph for 4/14/2009



References

1. "History for MNCARM." Weather Underground. Available at:
<http://www.wunderground.com/weatherstation/WXDailyHistory.asp?ID=MNCARF&month=4&day=14&year=2009>
2. "Denver Sounding." University of Wyoming College of Engineering Department of Atmospheric Science. Available at: <http://weather.uwyo.edu/cgi-bin/sounding?region=naconf&TYPE=GIF%3ASKEWT&YEAR=2009&MONTH=04&FROM=1500&TO=1500&STNM=72469>
3. "Introduction to the Skew-T Diagram." Available at:
http://airsnrt.jpl.nasa.gov/SkewT_info.html
4. "Introduction to Skew-T Diagrams." Downunder Chasing: Thunderstorm Forecasting Guide. Available at:
<http://www.downunderchase.com/storminfo/stormguide/PDF/Storms07.pdf>