

Clouds I Assignment Write-Up

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I. Introduction

A still image can successfully display a cloud type, cloud formation, the lighting of the clouds, and more. However, a still photograph cannot show the flow of the clouds and how they are changing at that exact moment in time. It is for this reason that I decided to utilize timelapse photography, which can best be described as a technique where still images are taken at a constant interval over time and then played back as a seamless video to show a longer period of time in roughly thirty times the speed. This technique takes processes that are very subtle and slow to the human eye, and makes them much more noticeable, for example, the movement of the clouds over time.

For this series of images, I wanted to employ timelapse photography to bring out the movement of the clouds in order to better view the flows and motions that occur everyday, which we rarely notice. The Flatiron Mountains that the clouds were flowing over added very unique flow circumstances and cloud types that will be discussed in this write-up.

II. The Circumstances

Two separate sunsets were filmed; timelapse #1 was taken on January 24th in Boulder, Colorado on highway 93 in-between Boulder and Golden. It was taken facing west-southwest for the period of roughly one-hour in-between 4:15 and 5:15 pm. The camera was fairly level in order to capture equal parts of sky and the foreground landscape.

Timelapse #2 was taken on January 25th in Chautauqua Park in Boulder over approximately the same time period, 4:15 and 5:15 pm. The camera was facing north-northwest and slightly upwards in order to place emphasis on the clouds, with the horizon placed in the lower one-third of the frame.

Both days were moderately overcast with enough clouds to sparsely fill the sky, allowing for two excellent sunset scenes as can be seen in Figure 1.



Figure 1 – Timelapse #1 (left) and timelapse #2 (right)

III. The Clouds

The clouds were very similar on the two days. On January 24th, for timelapse #1, the clouds match the description of that of stratocumulus clouds, characterized by large, dark clouds that commonly are found in groups and waves ^[1]. They are low-level clouds that are at roughly 5,000 feet and form in primarily stable atmospheres and rarely produce any precipitation. In comparison to the flatirons, which rise up about 1,200 feet, the clouds fit the height range common for stratocumulus clouds.

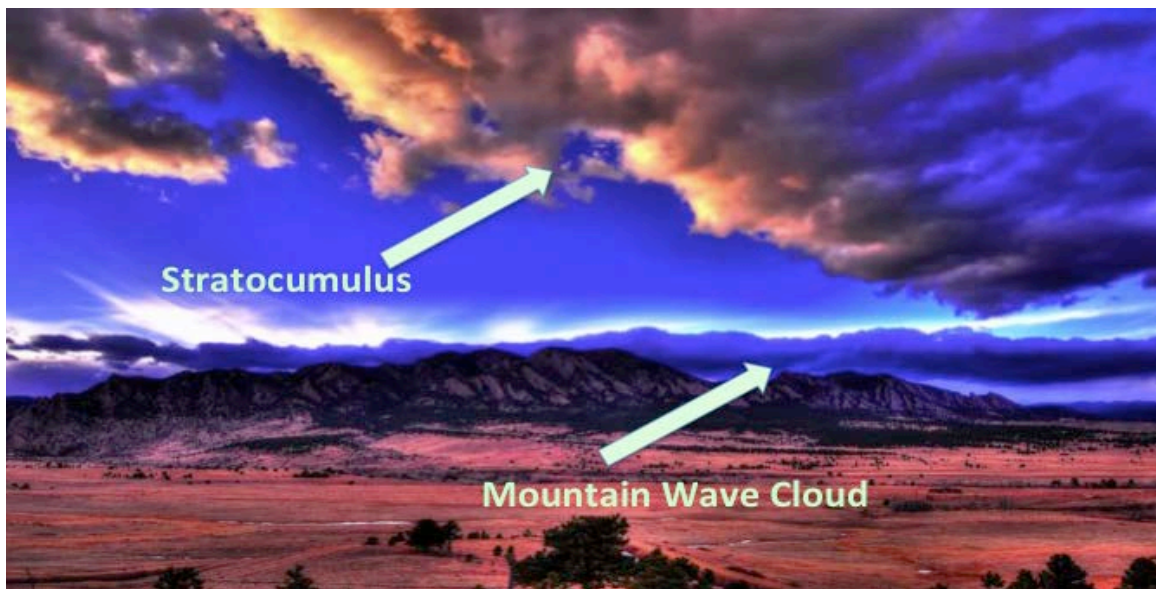


Figure 2 – Cloud formations in Timelapse #1

The other primary cloud type seen in this timelapse is the Altopumulus Standing Lenticular, or Mountain Wave cloud. The mountain wave cloud is primarily composed of “waves in the atmosphere that develop when relatively stable, fast moving air is forced up and over a topographic barrier” ^[2]. Upon watching the timelapse, the mountain wave cloud appears to remain stationary while rolling as the winds went over the mountains. This continually

developing and dissipating cloud formation in the vicinity of the crest is why they appear to remain stationary even though winds are quickly moving through the entire cloud [2].

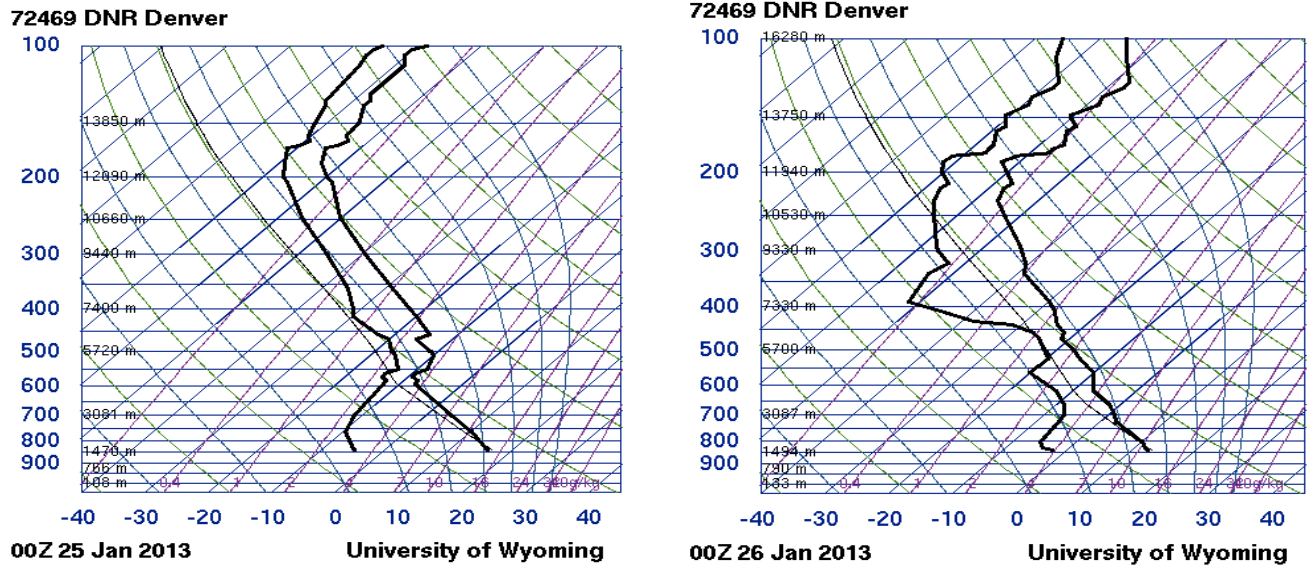


Figure 3 – Jan 24th (left) and Jan 25th (right) Skew-T Diagrams

The days leading up to January 24th and the following day were very calm with no storms. The atmosphere was stable, which can be seen in the left Skew-T diagram in Figure 3. The slope of the black temperature gradient line is steeper than that of the dry adiabatic line shown in green. The CAPE value, which is a measure of the available potential energy of the air, was given with the Skew-T diagram to be 0, indicating a stable atmosphere [3].



Figure 4 – Timelapse #2 cloud formation

On January 25th, the clouds present during sunset were very similar, stratocumulus and mountain wave clouds were present, along with the addition of some altostratus clouds. Altostratus clouds frequently appear as parallel bands as they do here and can form at 6,500 feet ^[4]. They can all be seen in Figure 4.

The clouds that were seen on timelapse #2 most frequently form in stable atmospheres, which can be seen in the right Skew-T diagram in Figure 3. The CAPE value was zero on this day also, providing further support of the stability.

IV. Photographic Technique

Both timelapses were taken with a Nikon D90 digital SLR placed on a tripod using a Phottix intervalometer to click the shutter at continuous intervals. Both timelapses are high-dynamic range (HDR) timelapses, meaning that each time that the intervalometer clicked the shutter, three photos were taken at varying exposure levels (-2, 0, +2). Later in post-processing, these three photo brackets were then combined into one photo, creating a series of HDR images. The D90 takes 12.3 megapixel images each time (4288 × 2848 pixels). Both timelapses were taken using a Tamron 10-24 mm wide-angle lens.

Photomatrix Pro was the program used to combine the images into HDR images. Photomatrix Pro has a batch-processing mode that applies the same settings to each HDR image to ensure their similarity after processing is done. During this process, changes were made in saturation, curves, contrast, and brightness. After obtaining several hundred HDR images for each timelapse, the frames needed to be combined into a video to show the movement of the clouds and the changing of the light over time. For this task, a Mac-only program called Sequence was used. Sequence contains a de-flicker tool, which removes the flickering caused by the changing light conditions between each frame to ensure seamless transitions as time progresses. Sequence combined the HDR images into videos using a frame rate of 30 frames per second. The final video was created using iMovie 2011 which combined the two timelapses into one video and added the title screens.

Timelapse #1 was composed from a total of 2,421 images. As mentioned above, the 3 image brackets were then combined into one image each, yielding a total of 807 HDR images. As Each 3 image bracket was taken at an interval of five seconds over a one-hour period. The

images were taken in manual mode at a focal length of 17mm a constant shutter speed of 1/320 of a second and f/4.2 to ensure a dimming light exposure as the sun set. The aperture would ideally be around f/8 for proper depth of field for an image such as this, however this would cause slower shutter speeds than 1/320, which could cause a problem with underexposure. The ISO was kept at 400 in order to prevent noisy pictures but allow for brighter pictures than at a lower ISO.

Timelapse #2 was made from 2,790 still photos, giving 930 HDR images. The time interval between each picture was taken at a shorter interval of every 4 seconds to ensure smooth transition between frames. The images were taken at a wider focal length of 13 mm, a shutter speed of 1/320, an f-stop of f/3.8, and an ISO of 400 for the same reasons as in timelapse #1.

V. The Video

The video successfully demonstrated the flow of the clouds above the flatirons over time, which was my original goal. It showed the continually dissipating and developing mountain wave cloud, the parallel altostratus clouds and the low level, dark stratocumulus clouds that helped create the great colors in the sunset. What was shown in the video showed more than a still image could have, and I believe was very valuable to see in order to better understand the flow of clouds. For improvement, I would have liked to film one timelapse of a stable atmosphere and one of an unstable atmosphere for a visual comparison between the two.

VI. Sources

1. "Stratocumulus." *Windows to the Universe*. N.p., 12 Aug 2008. Web. 27 Feb 2013. <<http://www.windows2universe.org/earth/Atmosphere/clouds/stratocumulus.html>>.
2. "New Mexico's Winter Cloud." *National Weather Service*. N.p., 5 Jan 2011. Web. 27 Feb 2013. <http://www.srh.noaa.gov/abq/?n=features_acsl>.
3. Haby, Jeff. "Skew-T Basics." *theweatherprediction*. N.p.. Web. 27 Feb 2013. <<http://www.theweatherprediction.com/thermo/skewt/>>.
4. "Altostratus." *Clouds Online*. N.p.. Web. 27 Feb 2013. <http://www.clouds-online.com/cloud_atlas/altostratus/altostratus.htm>.