

# Clouds Second: The View from CU

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Foehn/Alto cumulus Lenticularis



*Image Taken: 24 OCT 2018 6:11pm – Boulder, Colorado*

## **Introduction**

The image associated with this report was taken as a result of the “Clouds Second” assignment for my Flow Visualization class at CU Boulder. The purpose of this assignment was to capture our second in a series of cloud images and in the process, continue to familiarize ourselves with types of clouds, as well as the physics behind clouds. Since the last clouds assignment, I have continued to take pictures of every cool cloud formation I see, with whatever camera I had on me. The image shown in this report was taken with my Motorola Z Force mobile phone camera, as I was walking home across campus in the evening. The foehn cloud wall sitting behind the mountains is what initially caught my attention as I crested the steps to the Coors Event Center but quickly noticed how beautiful the sunset was at that time and how well it was framed by the campus from where I was standing.

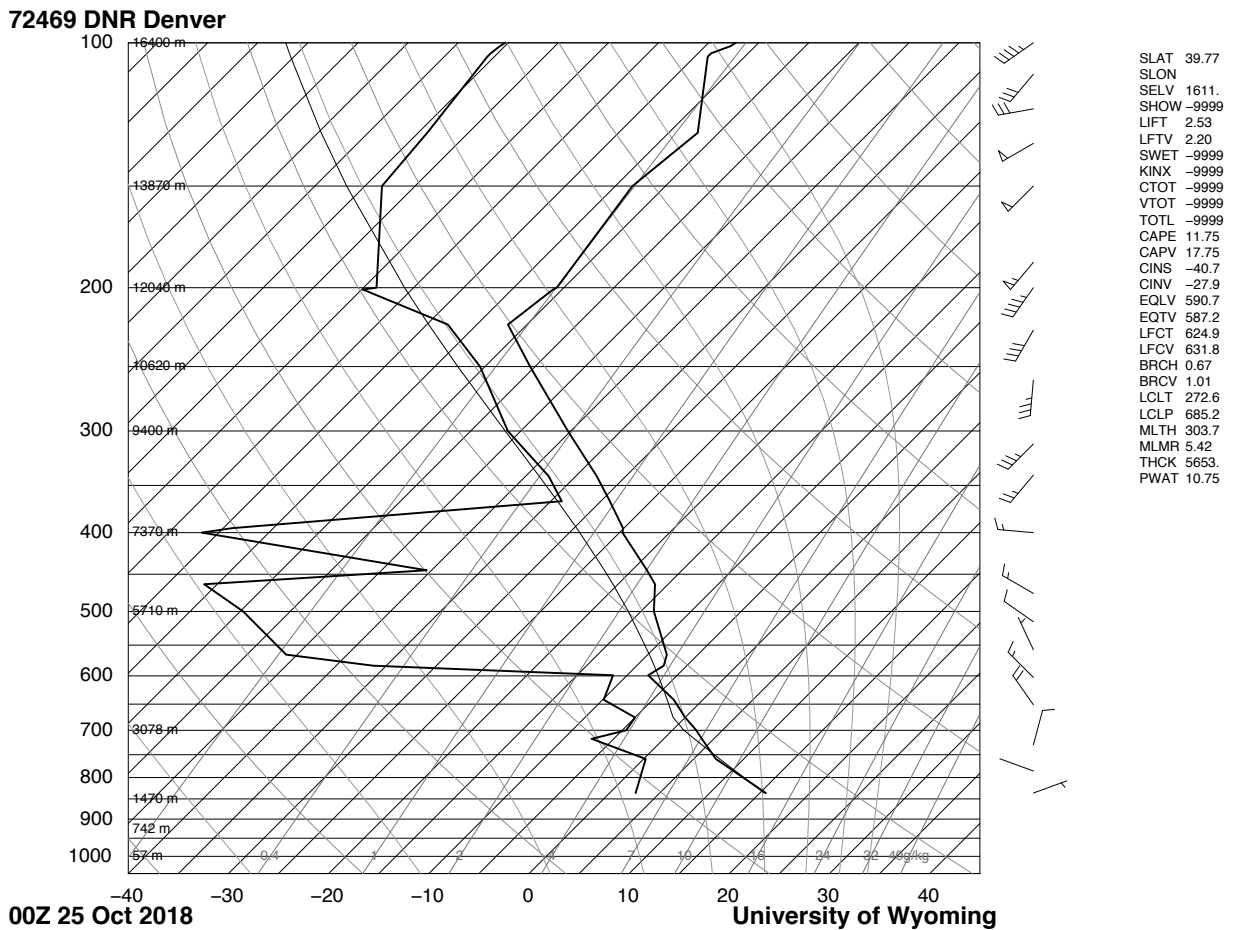
## **Background**

As mentioned previously, this image was taken standing next to Coors Event Center on the CU Boulder campus. I was facing west looking out over the mountains when I took the picture and the camera was essentially pointed parallel to the horizon, doing my best to capture exactly what I was seeing with my own eyes. It was a little after 6:00 pm on October 24<sup>th</sup> when I took the picture so the sun was already set behind the mountains and I was able to capture the last rays of light reflecting off the clouds.

## **Cloud Types**

The clouds that can be seen in the image associated with this report are the common pairing of a Foehn cloud wall and an altocumulus lenticularis (or standing mountain wave) cloud, with wispy altostratus clouds overhead. The Foehn cloud wall can be seen as a solid wall of clouds peaking up from behind the mountains. This wall of clouds is created when wind coming from behind the mountains forces air up and over the mountains. This air, which has suddenly been pushed into a much colder region of the atmosphere condenses rapidly forming a heavier cloud which is not able to be pushed over the mountain. The reason that these are commonly paired with mountain wave clouds is that after the air is shot up over the mountains, it begins to fall back down, causing it to warm and rise back up again. This effect causes the air to “bounce” until it settles in a stable region. As this air “bounces”, it passes through regions of the

atmosphere that are at the air's saturation temperature, therefore leaving "waves" of clouds behind in these regions. The bright orange cloud seen in the image is a result of the initial "bounce" of the air and the first in a series of cloud "waves" extending out away from the mountains. This can be verified by the skew-T plot for Denver, shown below, which shows a cape of 11.75, indicating a stable atmosphere which is critical to a mountain wave cloud as they are the only cloud of the cumulus family to form in a stable atmosphere. The second indicator from the plot suggesting the presence of wave clouds is that the region where the atmospheric temperature (right-hand line) and saturation temperature (left-hand line) are close to each other, indication cloud formation, aligns with the region of atmosphere where altocumulus clouds form.



**Figure 1: Skew-T of Atmosphere Above Denver, CO**

### Photographic Technique

I took the image facing west while standing near the southwest corner of campus, so I would estimate the first set of mountains are roughly 3 miles away with the cloud wall sitting directly behind them. The foreground is much closer with the large building sitting roughly 150 yards

from where I was standing. I would therefore estimate the total field of view to be about 200 yards across. The image was taken with a Moto Z2 Force cell phone camera and the settings were as follows; Focal length: 3.75mm, F#: 2.0, ISO: 50 Shutter Speed: 1/130s. The original and edited image share the same size of 4000 x 3000 pixels.

All of the post-processing was done in Photoshop CS5 and manipulations were certainly a little heavier than on the last cloud submission. One major manipulation performed was to remove the light pole and flag which are directly in the foreground in the image, as well as removing the lights from the cars down below. In addition, I also increased the saturation of the image slightly and darkened it by the same amount, as well as greatly increasing vibrance. The original un-edited image is included below for reference.



*Unedited Image*

### **Reflection**

Overall I am extremely satisfied with how this image turned out. I love the way the cloud wall is framed by the school and the mountains and I think the fall red trees tie the orange clouds to the ground well and compliment the blue and white sky nicely. If I got a chance to retake this picture I would love to use a nicer camera in order to capture some of the detail in the cloud wall better but unfortunately that is something that can never happen.