

David Gagne

CLOUD IMAGE REPORT

MCEN 4151 FLOW VIS



After many attempts, I captured an image of the cloud phenomenon that I desired. The image was captured in order to present and discuss with the spring 2013 Flow Visualization class, MCEN 4151, at the University of Colorado. The intent of the class is to learn about physical flow phenomenon and learn techniques on how to capture the flow occurring. The captured image is not only an excellent learning tool in order to help visualize physical events not normally seen or even possible to see with the human eye, but are often striking and beautiful, providing a dual focus for the images we choose.

My image was captured just east of Boulder Colorado, looking North West. I captured the image just before the sun completely set behind the mountains to the west, which provided a beautiful pastel of colors (a typical western sun set). The location was crucial to be able to capture this type of cloud. In Boulder we are fortunate to live at the foothills of the Rocky Mountains, which create specific and unique weather systems as winds come from the West and blow over the mountain range.

The cloud I was able to capture in my image is classified as an Altocumulus Lenticularis, and was created as warm stable air from the West moved over the mountain range (as described above). The air moving over the mountains created a series of standing waves. As the waves rise and fall, over peaks and through valleys respectively, the moist air has the potential to condense or form lenticular clouds. As the air moves back down, below the dew point, it can turn back into (evaporate) into a vapor. This is a common occurrence and is typically called the mountain wave cloud. In some instances though, as I captured, the system with its localized condensation and evaporation cycles, causes (usually circular) vertical columns of air movement, and in these cases clouds appear to be stacked vertically. Sometimes with distinct gaps in between each layer of lenticular clouds, and others that merge layers, looking not unlike a large UFO, or in French “pile d’assiettes” (a pile of plates). In this case, the cloud was most likely formed over the mountain range, and was carried out over the plains (where I was able to capture the image) by the westerly winds that created it.

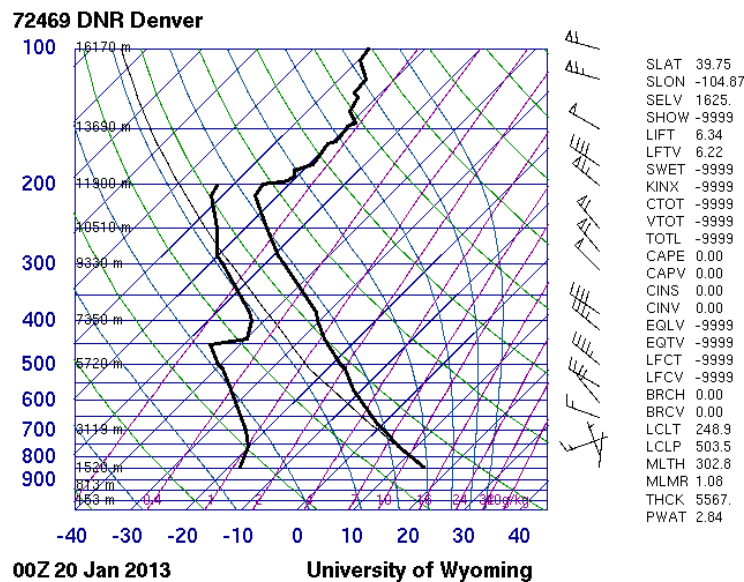


Figure 1 Skew-T

The skew-T from that time (almost exactly the same time) shows a stable atmosphere, exemplified with a CAPE of 0. We can see from the flags that the wind was blowing from the west-northwest at 25-50 knots, which supports the above stated that the cloud was formed over the mountains and was moving east. Being that this cloud was a type of Altocumulus it was most likely between 6,000-12,000 meters, and based on the skew-T, at this elevation, the winds were particularly constant (between 35-45 kts.)

Since I captured this image as I was traveling down the road (I was driving and passenger was working camera for safety), I was able to get a good idea of the scale of the image and its speed in reference to me. I believe the cloud itself is a little over $\frac{1}{4}$ of a mile from east to west, and the longer I watched it, the more it stretched. I believe this is because of the westerly winds that were motivating it. The cloud was about 8,000 m or more above me, and probably a half a mile away from me (on the ground). Since the cloud and I was moving, I used a higher shutter speed. With low light levels because it was sunset I used an elevated ISO setting in order to get a bright enough image, and capture enough light to work with. The software I used final editing was Adobe Photoshop. I used the software to manually adjust the color curve, and make small color adjustments to bring out the colors that normally exists in the white light that was available.

I enjoy the image because of what it represents to me. Living here in Boulder and watching many sun sets over the mountains, it appears not that the sun is setting, but getting chased away by the dark emerging from the east. In the image, it would appear that the night is being held back by the cloud structure allowing the sun and day to exist for moments longer. I believe I fulfilled the intent of the project by not only capturing a physical flow phenomenon, but be able to understand and describe the physics that are visualized in the image. I hope in the future to capture a similar cloud, but in the day in order to have a blue sky cloud image which could be just as stunning.

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