

Figure 1: Cloud First image.

Clouds First Report Lea Mattson

Altocumulus lenticularis wave cloud. Taken 1:45pm, Feb 11th 2018 on top of Mt. Sanitas.

3/18/2018

MCEN-4151 Flow Visualization: The Physics and Art of Fluid Flow This image was one of many taken on February 11th, however this one was the most striking. All the other clouds were thin and wispy with small ripples in them. This one was the odd one out. The cloud itself was so big that the whole thing would not have fit into the camera frame. I found the square geometry of the cloud especially fascinating since it is rarely seen in clouds.

This image was captured from the top of Mt. Sanitas just west of Boulder, which has an elevation of 6,843 ft. The camera was facing north-west with an angle to the horizon of approximately 35 degrees. It was early afternoon, around 1:45pm, on Sunday February 11th, 2018.



Figure 2: Skew-T diagram for February 11th 2018.

The cloud is classified as an altocumulus lenticularis wave cloud. I classified it as a wave cloud based on the prevailing wind and geometry of the wave. From the CAPE value in the skew-T diagram, fig. 2, it can be seen that the atmosphere was stable at the time of capture. This cloud appeared to be relatively high, and according to the skew-T the LCLP was at 720.2 mB which is approximately 9154 ft above ground. This is a reasonable altitude for this cloud. The winds at that altitude were blowing at 15 mph from the north-west. Winds from this direction often cause

mountain wave clouds to form. Mountain waves clouds form due to air bouncing back up after flowing down the mountain once it has crossed the continental divide. When the winds are high, multiple rows of these wave clouds can be seen parallel to the mountains. The split in the cloud is likely due to wind shear or changes in the ground topography causing the air to rise unevenly. The other clouds in the sky were cirrus clouds, and were sparsely scattered across the sky.

The camera used was a Canon EOS Rebel XSi. The image was taken with and an 18mm focal length, an f stop f/10, an ISO of 100 and a shutter speed of 1/250 seconds. The image was edited in Photoshop and was cropped from 4272×2848 pixels to 4174×2848 pixels. In Adobe Photoshop, the saturation was slightly increased and the color balance moved to plus 20 blue. No other edits were done to the image. The original is shown in fig. 3.

This image fulfilled the first cloud image assignment for Flow Visualization, and captured a unique flow phenomenon. Mountain wave clouds can only form in the presence of mountains, and even then, the winds need to be blowing the right direction. Here in Boulder, they are rather common and are more often seen in the winter. This particular cloud is interesting because it is very square and there is the split between the two clouds. It would be easier to determine the physics if the entire cloud could have fit into the image. The tree adds some sense of scale and difference in texture from the sky and cloud, however it may be a bit distracting from the flow phenomenon. Personally, I like the effect it has on the whole image.



Figure 3: Original image.