Cloud 2 Report

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Flow Visualization Fall 2024 Cloud

Captured: October 17th, 2024, 12:05 pm

~ 1/3 of the Way from Oakland, CA to Portland, OR

Context:

This is the second cloud assignment for the Flow Visualization course at CU Boulder. As always when flying, I was captivated by watching the clouds and towns pass below me. I took a multitude of photos of various cloud formations. The clouds in this area particularly struck me, as it was interesting to see them flow up and around this mountain and see the difference between the clouds upwind (to the left of) and downwind (to the right of) the mountain. Their textures, feels, and clarity are very different, and I found that worth attempting to capture, both from an artistic point of view, and a scientific one.

Circumstances:

This photo was taken out of a window on the right side of a plane on a flight from Oakland, CA to Portland, OR. The flight was between a third of the way and halfway over at that point; looking at a map and google images, I believe that the mountain captured is Mount Shasta, which is a bit over 1/3 of the way from Oakland to Portland in latitude, but slightly to the right of a straight path between the two. The stand-alone nature of the mountain, its snowy top, and the road visible in the bottom right of the image line up with Mt. Shasta. The image is, say, a 45-degree shot down at the mountain and clouds. The time of capture was 12:05 pm California time on October 17thth, 2024.

Discussion:

I believe that the clouds are primarily altocumulus clouds, possibly with some stratocumulus clouds on the left side of the image (and mountain). The clouds downwind (to the right of) the mountain are clumpy and moderately low down. They are thick, as evidenced by the thick shadows. The clouds to the left of the mountain are more fuzzy, evaporating around the edges, and flat. They still have a certain amount of clumpiness, rather than being totally smooth like mere stratus clouds. Overall, their features combine to make them seem like stratocumulus clouds

From the plane, the sky was a nice, clear blue, and it was a moderate autumn day. There had not been any precipitation in Oakland, and there didn't seem to be any when flying.

I believe that the closest sounding station was the one in Medford, OR. A Skew-T from that day can be seen below:

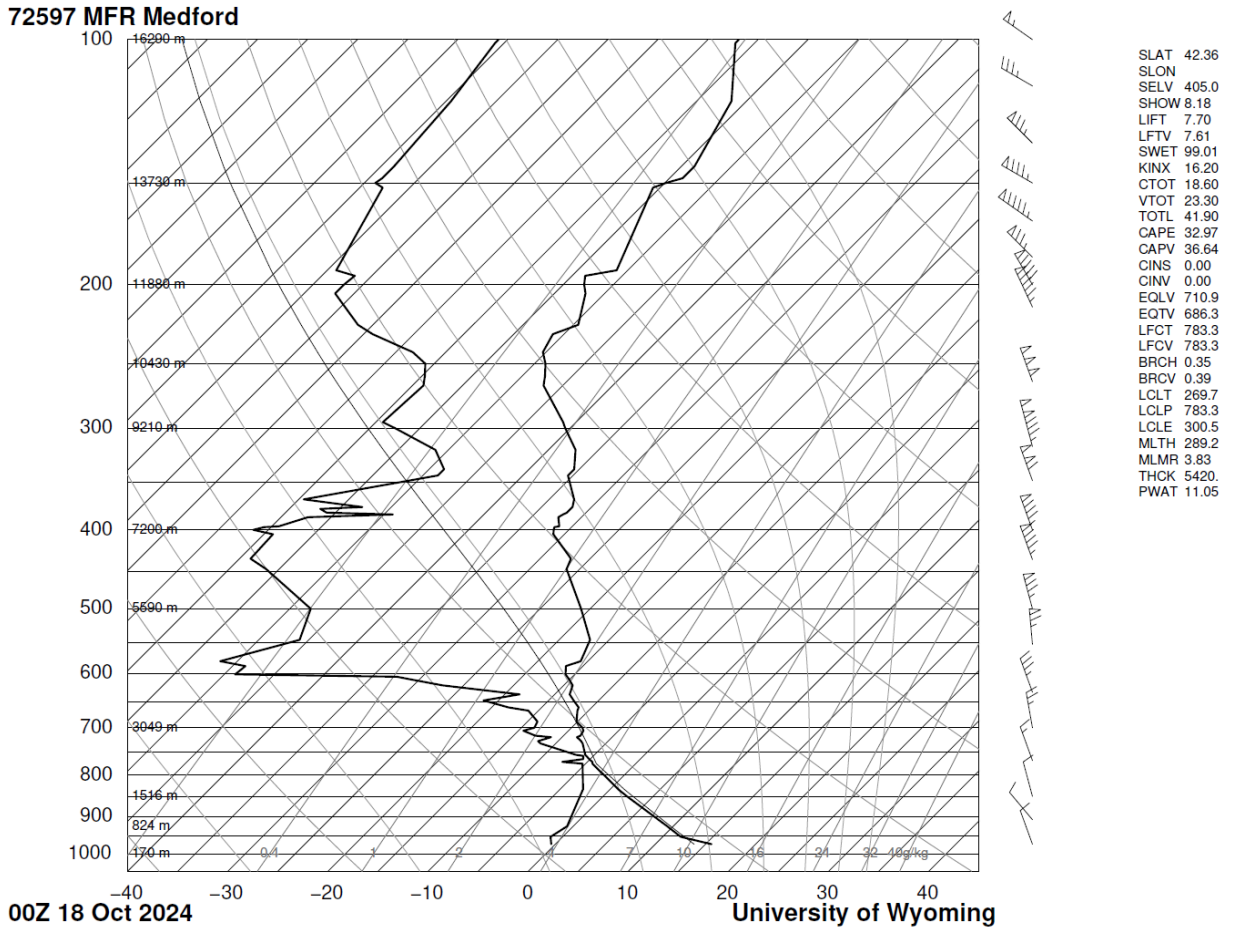

Figure 1. Skew-T Plot[i]

The clouds appear to be at an elevation of around 2200 m above the ground, which is just over the transition from low clouds to alto clouds.

The CAPE value of 32.97 indicates an unstable atmosphere. The instability in the atmosphere would have caused the lift necessary for the clouds to exist and perpetuate themselves; the relatively high CAPE number indicates that the clouds could have grown fairly quickly. The updraft of air following the mountain also seems to have contributed to the clearer edges and harshly rising altocumulus clouds downwind of the mountain.

Photographic Technique:

The field of view is large. It would really depend on how high the plane was, which is unclear/I can only speculate, so the field of view is unknown, as is the distance from the object to the lens. Mount Shasta is a bit taller than 14 thousand feet,[ii] and most planes reach a cruising altitude between 31,000 and 42,000 feet,[iii] so the height difference was, say, approximately 20,000 feet; trigonometry and the fact that the image was not taken vertically mean that the distance was, say, 20,000 feet times the square root of two, or around 28,000 feet. In all probability, however, the

distance was probably greater. I used my Samsung Note 22 (SM-S908U1 camera, according to the image specifications) to take the photo, focused on infinity, with automatic aperture, shutter speed, and ISO. The focal length was 6 mm, aperture was f/1.8, exposure time was 1/1087 sec, ISO-12, and the max aperture was 1.69. The original photo was 4000x3000 pixels, and the final photo was 2958x2563 pixels.

Figure 2. Image Before Editing

In post-processing, cropped the image to remove the plane wing that can be seen in Figure 2 above. I also used the color equalizer to make the blue of the background pop even more. I tried enhancing the contrast, but I found that that reduced some of the shadow and highlight detail, which I did not like.

Conclusion:

Overall, I am pleased with how this image turned out. I took several photos framed slightly differently from one another, and this one had the most interesting framing around the mountain. I was concerned, however, that some of the other images had more clear dynamics of the clouds flowing up and around the tip of the mountain; in this image, the clouds and the snow on the mountain top almost blur together a little bit, because the cloud was going more directly over the

saddle than in some of the other images. However, the clouds in the V behind the mountain were more dynamic in this image than the other, so I selected it… Overall, I think it turned out nicely.

References:

[i] Skew-T from https://weather.uwyo.edu/cgibin/sounding?region=naconf&TYPE=GIF%3ASKEWT&YEAR=2024&MONTH=09&FROM=1200&TO=1 200&STNM=GJT - https://weather.uwyo.edu/upperair/sounding.html

[ii] Google Maps, "CR54+W2 Mt Shasta, California," https://maps.app.goo.gl/qyV7d53tst9LVc1f9

[iii] Johnston, Matthew. "How High Do Commercial Planes Fly?," California Aeronautical University, 3 Aug 2023. https://calaero.edu/aeronautics/aircraft-performance/how-high-do-commercial-planes-fly/