

Flow Visualization: Cloud Image 1

MCEN 4151 - Flow Visualization

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Stratus cloud formation

Pacifica State Beach, California: October 2nd, 2021 at 1:35 PM

Context

This image was taken for the first cloud image assignment for MCEN 4151 and flowvis.org. For this photo, I intended to capture a unique cloud formation while I was on a trip to San Francisco. Low hanging fog like stratus formations are extremely common in and around San Francisco. I was lucky enough to capture this phenomenon while on the beach one afternoon.

Circumstances

This image was taken on Pacifica State Beach, about 15 minutes south of downtown San Francisco, on October 2nd 2021. The time was 1:35 PM during which I was hanging out and watching the surfers. I was facing south and took the photo at approximately 0 degrees in relation to the horizon.

Cloud Formation

Figure 1 below is my final image. In the image, stratus clouds are seen flowing over the distant hillside and spilling out into the ocean. Low hanging stratus clouds are very common in the San Francisco bay area because as warm air rises from the land, a low pressure zone is created close to the ground, sucking in cold air from over the ocean. This cold air from the ocean is high in moisture content and produces these low fog like stratus clouds [2].



Figure 1

The temperature was in the low 60's fahrenheit, fairly windy, and clear skies all in every direction except for the clouds pictured. The clouds persisted in this area from when I arrived at 11 AM until 5 PM, when I left. The general formation of the clouds remained constant, with varying density and speed as the winds shifted. The weather reports in the area indicate clear weather for the remainder of October 2nd, the previous day, and the next day. A skew-T plot is shown below from the closest sounding station.

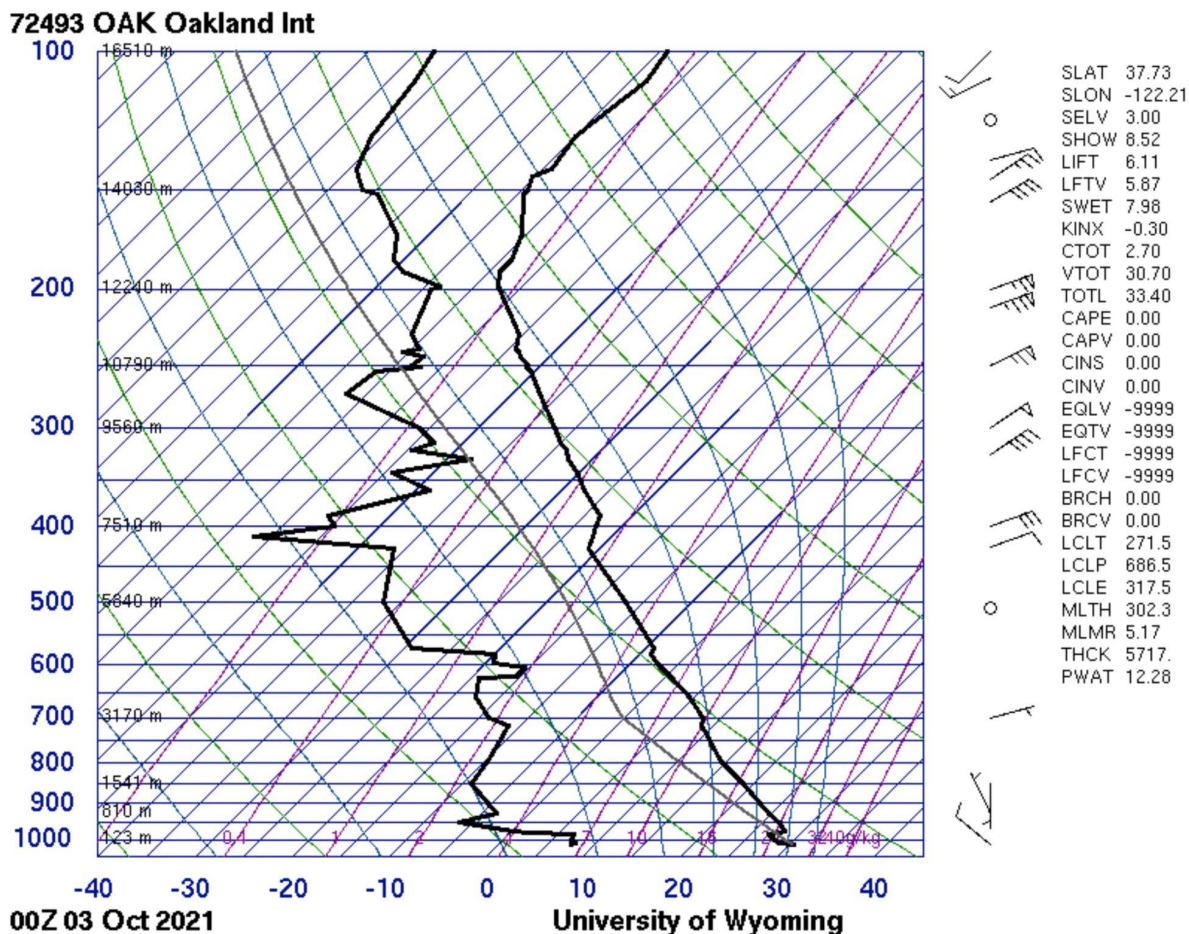


Figure 2: Skew-T plot from the University of Wyoming [1]

This weather sounding was taken at 6:00 PM October 2nd. This sounding was the closest to when I captured my image at 1:35 PM. The weather station for this sounding was at the Stockton Metropolitan Airport in Stockton, California. Stockton is a 1 hour 30 minute drive from Pacifica State Beach and the weather changes dramatically between these areas. Because of this, I wouldn't put much weight in the data of the skew-T plot. Regardless, the skew-T indicates a CAPE value of zero which usually correlates to a stable atmosphere. This agrees with my observations in my photo, a consistently clear sky with fair winds. The skew-T plot possibly indicates cloud formations at 9000 meters or more likely 12,240 meters. These are the points on Figure 2 where the temperature and dew point lines get closer together. This data does not agree

with my observations, although this is expected given the distance between the weather station and Pacifica State Beach. My observations estimate the clouds are between 50 - 200 meters. No clouds are seen any higher.

Photographic Technique

To capture this photo I used a base model iPhone 12 at 1X zoom. The camera has a 26 mm focal length which correlates to roughly a 70 degree field of view. I used the automatic settings on the iPhone camera to capture the photo, as I find this is usually the best method for phone shots. The distance from my camera to the clouds is about a kilometer. The automatic mode shoots f/1.6 aperture. The sizes of both the images are 4032 x 3024 pixels. I did some post processing on the image in order to add some definition to the layers of the clouds while maintaining the overall colors. Specifically I altered the shadows and highlights levels in the GIMP application. Below are the original and edited images.



Figure 4: Edited vs original images (left to right)

Conclusion

The final image reveals a fascinating stratus cloud formation on Pacifica State Beach on October 2nd. The stratus clouds seem to be hugging the hillside as they flow down towards the beach. This image did fulfill my intent of capturing a fairly unique cloud formation. There isn't much I would change about this shot. The field of view provides good perspective, and it is also visually appealing to me. I chose to not edit the original image much because I like the natural look of the landscape. If I could go back to this spot on this day, I would like to take another photo at a spot overlooking or within the clouds and compare that shot to Figure 1.

Work Cited

[1] Skew-T plot

<http://weather.uwyo.edu/cgi-bin/sounding?region=naconf&TYPE=GIF%3ASKEWT&YEAR=2021&MONTH=10&FROM=0300&TO=0300&STNM=72493>

[2] “Advection Fog.” *Weather Underground*,

<https://www.wunderground.com/weather-posters/advection-fog>.