Airplane Clouds

Stratocumulus Stratiformis / Mountain Wave

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Cloud Assignment 2

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Introduction

Airplane Clouds was created as the second and final cloud image for the Flow visualization course. This project was not only used to further promote students to investigate the art of cloud photography and cloud viewing, but also as a reinforcement in the concepts of atmospheric physics that cause many atmospheric phenomena. The original intent of *Airplane Clouds* was to capture one of my favorite atmospheric phenomena, the marine layer, which is usually present in the early morning hours of the coastal regions of Southern California, but was then changed due to the atmospheric conditions on the day of my flight. Mainly, I wished to capture a cloud formation at a reasonable altitude in order to give perspective to the height of even relatively low lying clouds, such as Stratocumulus clouds.

Circumstances

The original image for *Airplane Clouds* was created in the morning of March 29, 2014 around 10:10 am over Denver, Colorado. The camera was facing almost directly northwest from the airplane from which it was taken, with an elevation of nearly zero degrees from the horizontal.

Description of Cloud Physics

The primary cloud formations featured in *Airplane Clouds* are a large and a small Stratocumulus Stratiformis in the foreground of the image, which will be the primary focus of the analysis within this report. In the background of the image are also good examples of both Mountain Wave clouds, to the left of the small Stratocumulus Stratiformis, and an Aviaticus cloud, also known as jet engine exhaust contrails, directly below the small Stratocumulus Stratiformis, but they are not the intended focus of this image.

This type of cloud formation is commonly mistaken for Cumulus, as they look very similar; after all Stratocumulus does contain Cumulus within its name. Furthermore both cloud formations resemble large, puffy cotton balls with dark, gloomy undersides; especially this species of Stratocumulus known as Stratiformis, which is distinctive for its extensive flat, yet fluffy sheets. However, the primary distinction between these cloud formations is atmospheric stability. Due to the fact Cumulus clouds are formed in unstable atmosphere, they are far more likely to

precipitate than their Stratocumulus counterparts. This distinction can be proven through simple analysis of a Skew-T diagram, shown below[1].

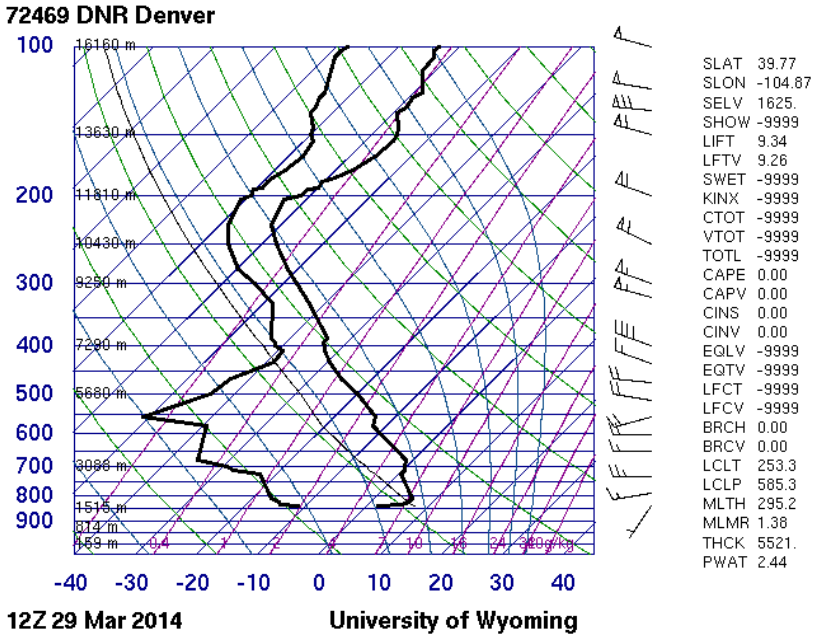

Figure 1: Skew-T Diagram for March 29 [2]

Not only is the CAPE number for these atmospheric conditions zero, suggesting complete atmospheric stability, but the dew point line (the bold, black line on the left) never contacts the temperature profile line (the bold, black line on the right), suggesting no current chance of precipitation. However, it is also important to note that these lines do come very close to intersecting, suggesting that a storm may be approaching the area, which does not only concur with the large, lumbering shadow that can be seen approaching within the image itself, but also the weather forecast for the evening of the same day, which predicted a chance of rain.

The Skew-T can also be used to confirm the height of the clouds present within the image. This is done by observing the closest point of intersection between the dew point and temperature profile lines, which in this case is about 7000 meters, or 23000 feet from sea level. Due to the elevation of Boulder, Colorado the expected cloud line begins at 17500 feet respectively. This compares nicely to the height of the landing airplane from which this photo was taken, which is most likely at around 8000 feet, and appears to be at roughly half the altitude of the cloud layer within the atmosphere.

Photographic Technique

To take the original JPEG image of *Airplane Clouds* an 8 megapixel iPhone 5 iSight camera was used. Although this was not the original intent, as my digital camera was available, this photo had to be taken discreetly due to the situation in which it was taken. Mainly, the plane was in

full descent, and the time to put away all electronic devices had long passed. Due to these factors, the ISO, aperture size, and shutter speed were all recommended settings from the camera itself. To be exact, these settings were an ISO of 50, an aperture value of 2.4, and a shutter speed of 1/1250 seconds. Luckily these settings did work fairly well, although the total resolution of the image did suffer slightly.

For the post processing of the image, Adobe Photoshop CS5 was used. First, the photo was cropped from 2448 x 3264 pixels to 2448 x 1550 pixels. This was to remove the wing of the airplane from the image, as well as to better conform to the rule of thirds. This did not reduce the field of view of the image, which remains roughly 160000 x 30000 feet. Then minor adjustments were made to the levels and contrast of the image, as well as the sharpness to increase the visibility of the features of the clouds, as well as provide a dark ground to contrast the blue sky.

Figure 2: Pre-processed image (Left), Post-processed image (right)

Conclusion

Airplane Clouds not only shows a good example of Stratocumulus Stratiformis clouds, but also gives a great perspective on the height of low lying cloud formations, which can only be achieved from a high altitude. Although this image came out fairly well, I unfortunately will always be disappointed I did not have the opportunity to photograph the marine layer as I had intended. I am very surprised at this bout of bad luck, as the marine layer is present on nearly every Southern California morning year around. Furthermore, a storm front was one the way out of the area, which should have supplied ample conditions for the layer to form.

References

[1] Tierney, K. P. (2014). *Flatiron Clouds*

[2] "Atmospheric Soundings" *Wyoming Weather Web.* Web. 30 March 2014.

<http://weather.uwyo.edu/upperair/sounding.html >.