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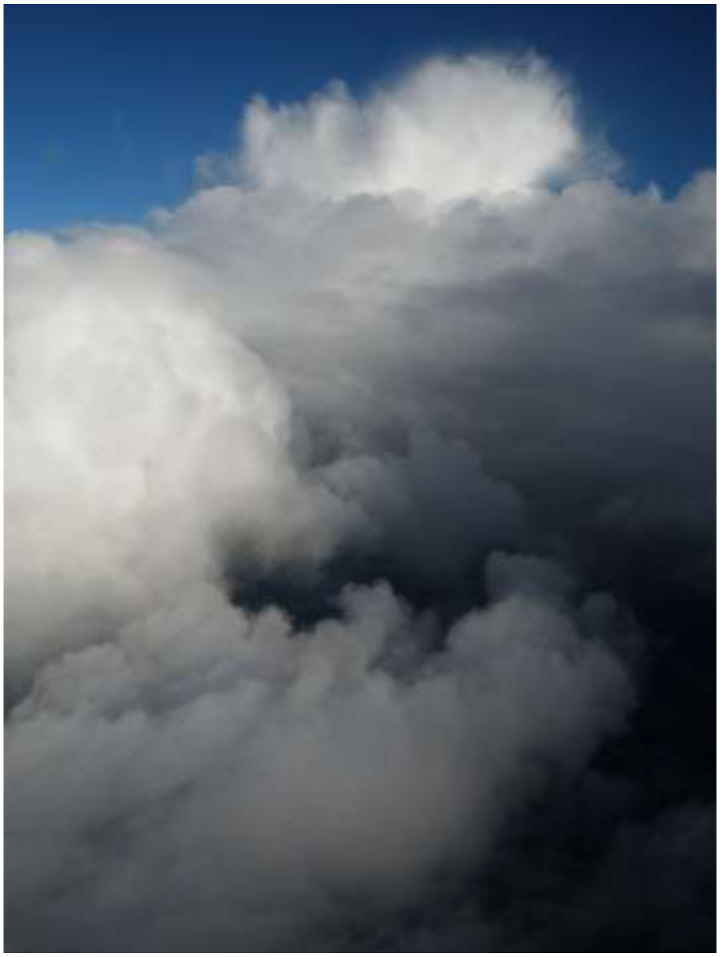
Bailey Leppek

Clouds 2 Report



Objective

I wanted to capture the vertical development of cumulus clouds. Photos of cumulus clouds from the ground are often times very lovely, but the three-dimensionality can be captured best from the air.

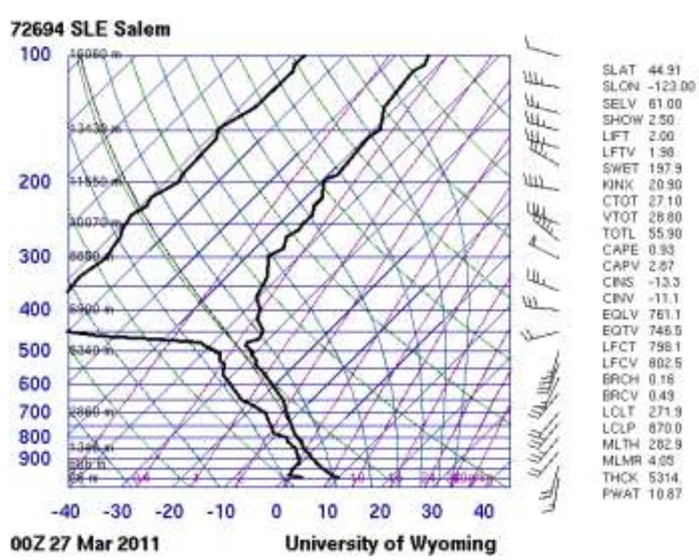
Circumstances of the Image

The image was taken from an airplane during take-off from Portland, Oregon on March 2, 2011 at 5:42 pm Pacific time. Before taking the photo, the airplane window was cleaned as thoroughly as possible with fog and a dry cotton cloth. The photo was taken through the window at an angle level with the horizon.

Physical Explanation of Clouds

Each individual cloud is a cumulus cloud. The individual clouds in the photo are very close, almost touching. The cloud formation as a whole is Stratocumulus castellanus perlucidus. The species name Stratocumulus describes how the clouds were formed from many cumulus clouds joining together. The term castellanus describes how the tops are crenulated. The term perlucidus describes how there are gaps between the individual clouds (Pretor-Pinney, 2006). If it was raining at that moment under the cloud it would have been classified as a Cumulonimbus. This is possible, as it had been raining off and on in Portland for the past few days.

At right is a skew-T plot for Salem, OR at 00Z on March 27th, or 5pm Pacific time on March 26th (University of Wyoming, 2011). This was the closest station to Portland that the archive had.



The line on the left represents the dew point temperature and the line on the right represents the actual temperature at each altitude. When the dew point temperature line and the actual temperature line intersect, this indicates that the conditions are right to form clouds. On this plot, the dew point temperature and the temperature lines do not meet. This could be because the data is for Salem. The closest the lines come to touching was at about 1.4 km. The skew-T plot from 11 am that day shows the lines meeting between about1.4km and 2.0 km. Because the weather conditions were observed to be very similar throughout the day, the most likely elevation for the clouds is about 1.4 km. This elevation is reasonable for Stratocumulus clouds, which typically form between 2.0 and 6.5 km (Pretor-Pinney, 2006). It is also possible that these clouds were higher up than the skew-T suggests.

The CAPE, or convective available potential energy was 0.93 J/kg. Because it was over zero, this indicated that the air was unstable. However, because the CAPE was a relatively low number, this indicated that the atmosphere was not suitable for severe weather. This coincides with observations from earlier that day. The temperature was mild and there were short lived light showers. The weather on the day the photo was shot was very similar to the weather from the previous few days.

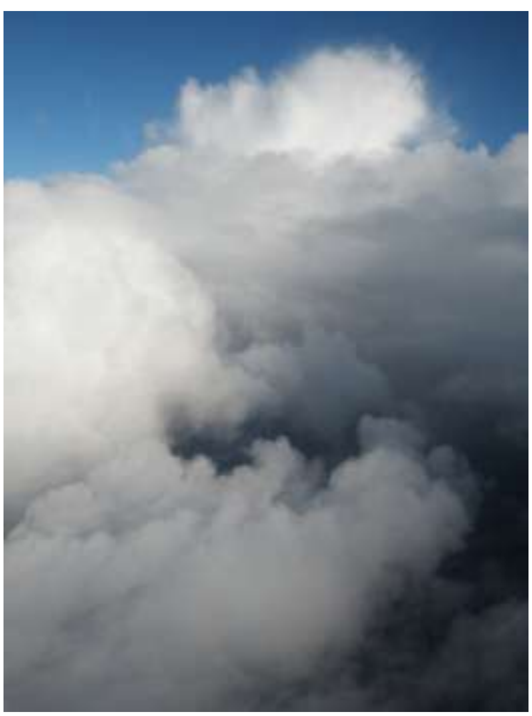
The instability of the atmosphere is also evident by the fact that the slope of the decreasing temperature line was steeper than the slope of the dry adiabats (green curves). A steep temperature line indicates that if a parcel of air rose, it would be warmer than the actual temperature of the surrounding air; thus, it would continue to rise.

Unstable atmospheres form convection cells. As the rising air in the cells cools it condenses forming clouds. When many of these clouds form and join together, they are known as Stratocumulus. The reason they join together is typically because of an inversion layer, which causes the clouds to spread out laterally at the level of the inversion layer rather than building vertically (Pretor-Pinney, 2006). An inversion layer occurs when the temperature either increases or remains constant with increasing elevation. An inversion layer can be seen on the skew-T plot between about 0.6 and 1 km, just below the level the clouds formed at. The temperature data follows the pink temperature lines, indicating that the temperature of the air is constant in this range. Because this inversion layer existed below the level of the clouds, it is unlikely that it accounted for the spreading effect. It is possible that the clouds spread out because the atmosphere was just not unstable enough to cause them to build any higher, and it was more energetically favorable to spread out.

Photographic Information

The photo was taken with an Olympus FE-340 8.0 megapixel digital camera. The shutter speed was 1/500 sec with an aperture value of f/5.6. The ISO speed rating is 64. The focal length is 6.3 mm. The original image and final images were 1536 by 2048 pixels. The zoom lens was on its widest possible angle. For a cloud image, the subject is very close the camera, roughly estimated at about 100 meters.

I did not crop the photo, but adjusted the contrast with Photoshop's "Curves" tool. The effect was to darken the image, bringing out the detail in the edges of the clouds. I also did this to deepen the shadows and create a feeling of abyss below the clouds. I did not, however, want to distort the original coloration the photo very much. The original image before editing (left) and the final image after editing (right) may be seen below.




Discussion

I feel that the intent of the image was realized. The image is well resolved and it provides enough detail to show the true three-dimensionality. I think the photo was taken from an ideal perspective to make the clouds look like a landscape. I feel as though I could scramble across the foreground of clouds and climb to the top of the tower.

Works Cited

Pretor-Pinney, Gavin. (2006). *The Cloudspotter's Guide.* New York: The Penguin Group.

University of Wyoming, College of Engineering, Department of Atmospheric Science. (2011). *Atmospheric Soundings.* Retrieved from http://weather.uwyo.edu/cgi-bin/sounding?region=naconf&TYPE=GIF%3ASKEWT&YEAR=2011&MONTH=03&FROM=2700&TO=2700&STNM=72694