The Wild Blue Yonder

MCEN 4151

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Cloud Image 2

Boulder is well known for its finicky weather which is usually accompanied by interesting cloud formations. I have quite often taken note of Boulder's clouds while rushing from one class to the next, but rarely take the time to stop and photograph them. One sunny afternoon, on my way to the Engineering Center, I decided to stop and photograph the cloud combination seen in the image used for this project.

What caught my eye was the combination of cloud types in such a small area. These clouds were directly over the Flatirons which lie west of my apartment complex from where I took the photo. Conditions at the ground level were calm shown by the small cumulus clouds seen at lower altitudes. There was a slight breeze at the ground level moving from west to east as seems to be the norm in Boulder, and the winds atop the mountains were more than likely traveling in the same direction. The primary subject of the photo, the altocumulus undulatus clouds, are usually formed under wind shear conditions indicating that the air above the rippling clouds has different dynamics. From the stratus clouds seen at higher altitudes and the orientation of the altocumulus undulates clouds underneath, it is evident that the winds at higher altitudes were moving north. Despite changes in wind speed and direction, the Skew-T diagram shows stable conditions throughout with a CAPE of 0.

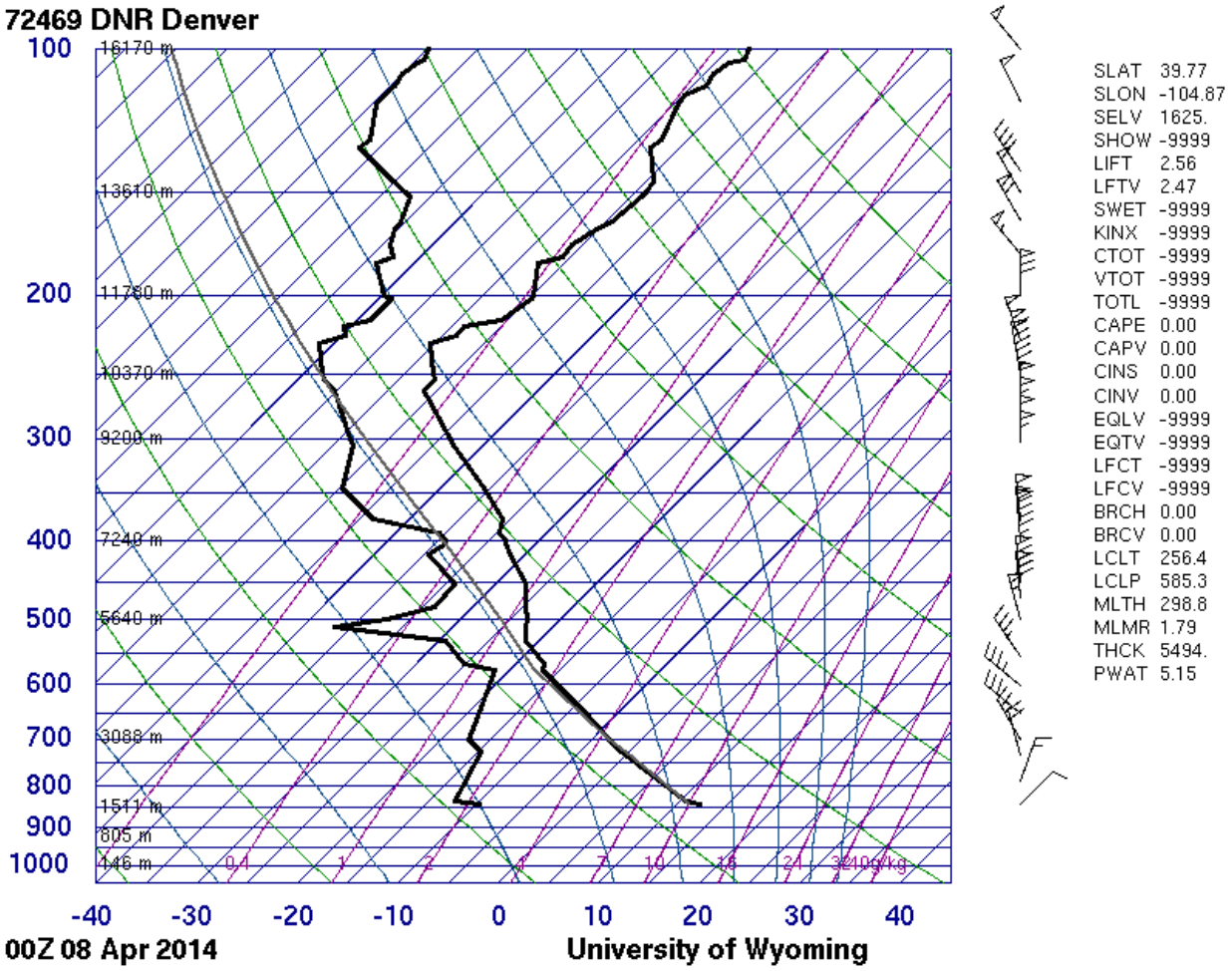
This photo was taken on Monday, April 7, 2014 at approximately 3:15 p.m. so the sun was high in the sky slightly to the southwest. The sun's position naturally increased the contrast between clouds as the altocumulus undulates clouds were illuminated from above against the dark sky or shaded against the light cirrus clouds above.

Capturing the clouds with the proper settings proved to be more difficult than expected using my Sony DSC-W560 point-and-shoot camera. I took the photo in a parking lot and the sun's reflection on the cars interfered with the automatic focus. The other challenge was capturing the clouds in such a way that they were not over-exposed, but not too dark either. It would be easy to lose detail in either direction. Since the sun's light is so naturally bright and the glare-reducing lens film had been previously wiped off, the camera's settings were set to the dark extreme to prevent the clouds from being overexposed. Despite having using ISO-80, 1/1600-second exposure time, and exposure bias of -2 in addition to an F-stop of f/8, the clouds appeared too light in the original photo. Post-processing remedied this issue nicely with the simple use of Microsoft Photo Editor. I started by cropping out the cars, trees, and apartments. Next, I increased the contrast and darkened the light and middle ranges. This brought out every little undulation of the clouds. One side-effect is that the once-light-blue sky now appears a dark, rich blue, something I find to be more of an improvement than a loss since you can better see the wispy appearance of the cirrus cloud.

This image nicely shows just how dynamic our precious atmosphere can be. Despite it seeming so deep and intense in photos such as these, I cannot help but think of just how thin and delicate the atmosphere we depend on is when seen in photos from space. Come to think of it, a photo of Earth from space is one of the most impressive displays of fluid flow. Perhaps someone in a future flow visualization class could use that.

Appendix

Skew-T Diagram



Courtesy of University of Wyoming

We see from the Skew-T diagram that the atmosphere is stable around the time and near the place that the photo was taken. Although this skew-t diagram is for Denver, it is assumed that atmospheric conditions in Boulder are similar.

Original Image

This is the original image before post-processing.