The Perspective of Power

MCEN 4151

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Cloud Image 1

This image is of steam plumes rising from the power plant near Atlas during the cold spell earlier this semester. For this assignment, I intended to present not just any cloud, but something that had an impactful appearance. What caught my eye was how the various vents produced plumes that each looked different, some clearly more forcefully than others, yet all of the plumes just blended together into one large cloud that slowly rose through the cold morning air.

This photo was taken on Thursday, January 23, 2012 at approximately 9:45 a.m. so the sun was still low in the southeast sky. I approached the power plant from the east, so I just saw one large white cloud, but when I moved to the west side, much more detail was made evident. With the sun behind the plume, the thick sections appeared dark and the thin sections were light which brought out more depth. The light sections at the edge of the plume also help the cloud stand out against the perfectly blue sky.

In this image, the two large vents on the right expel steam more forcefully than the smaller vents on the left. This is made evident by the blue between the vents and the plume. The water vapor leaves the vents so fast that it actually takes a while for its temperature to drop to a point low enough to condense. Over all, the flow is rather turbulent creating something that very closely resembles a cumulus cloud. The structure is created initially by forced convection which then transitions quickly into natural convection. Due to turbulent convection, heat energy is dispersed quickly and relatively uniformly throughout the plume. It is because of this that the inside of the plume condenses quickly, not just the outside. This turbulent flow takes place during very stable atmospheric conditions as seen in the Skew-T diagram.

Photographing toward the sun with a constantly-moving subject made proper lighting difficult. If the sun was completely uncovered, there would be a very bright spot in the center of the image with lens flare rendering the rest of the image useless. Having the sun directly behind a thick portion of the plume yielded much better lighting, but for artistic purposes, I still wanted it to be evident that the sun was present. My strategy was to wait for the plume to move so that the sun could be seen just at the edge of the thick plume preventing any lens flare. In the end, patience paid off.

The focus of this image was taken care of automatically by my Sony DSC-W560. Since the shot was taken facing directly toward the sun, there was a lot of light incident on the camera. A low ISO of 80, 1/1000 second exposure time, and f-stop of f/10 were enough to capture a wonderful image. For increased contrast, I used my polarized sunglasses as a filter. The sunglasses are only linearly polarized, but the effect is strong enough to make the steam plume stand out slightly more. I find that the red film on the sunglass lenses also helps by filtering out some of the red, enhancing the blues. There was not much work done during post-processing besides removing tree branches. This was done by taking the color next to each branch segment and painting over them.

Overall, I am very pleased with the image. To me it captures more than just the dynamic, turbulent flow of the steam plumes as they leave the power plant. It shows the very interaction between mankind and nature. Although this is just steam, there are many other ways in which humans affect the world around them, some good and some bad. We must be careful about what effect we have.

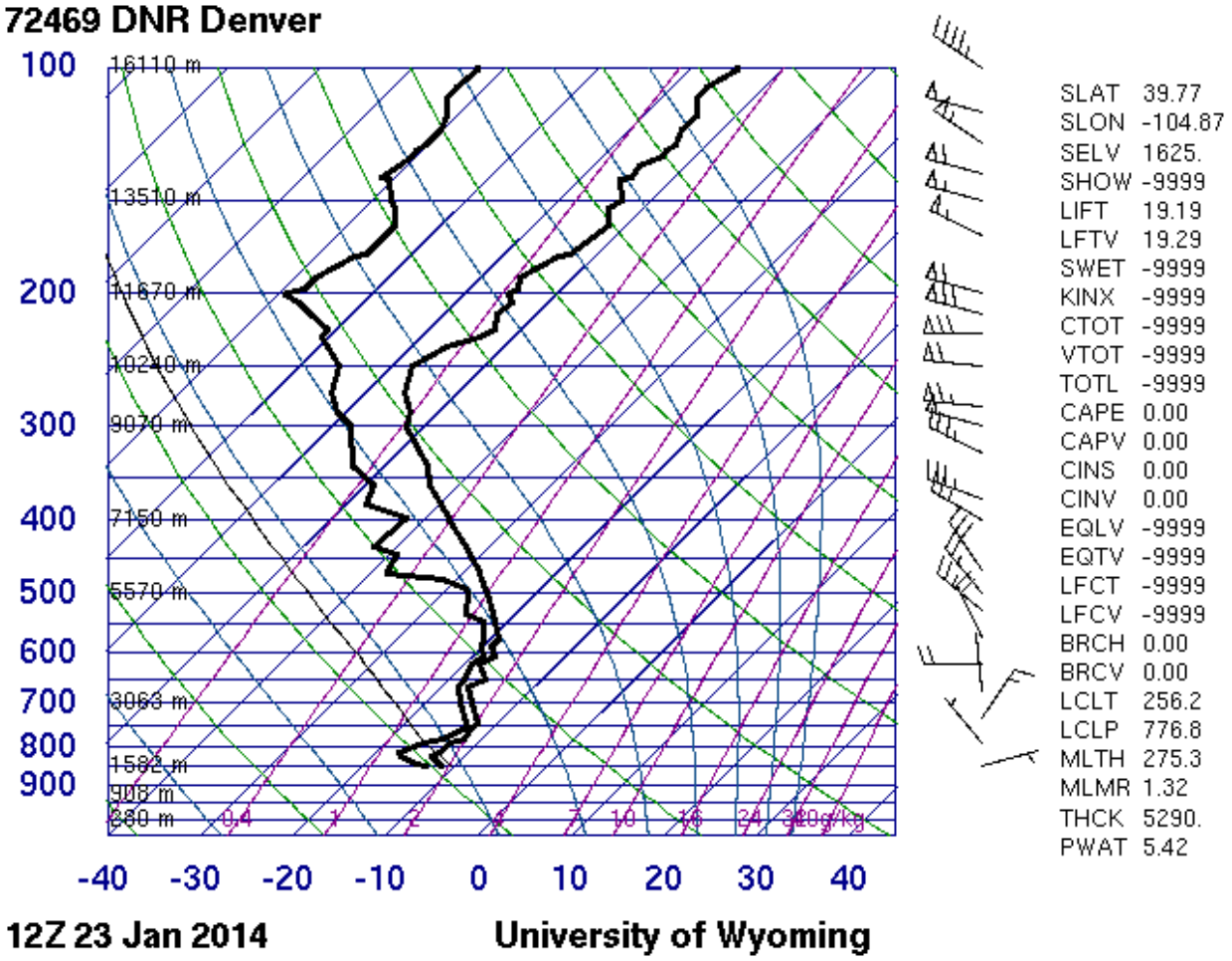
Appendix

Map

Courtesy of Google Maps

This map shows where the photo was taken relative to the steam.

Skew-T diagram



Courtesy of University of Wyoming

We see from the skew-t diagram that the atmosphere is stable at the time the time and near place that the photo was taken. Unfortunately, this skew-t diagram is for Denver, not Boulder.

Original Image

This is the original image before post-processing.