CLOUD IMAGE 1

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My goal of this cloud image was to expose clouds at times that most people do not really think about clouds. I began this project by taking pictures at night with long exposures, attempting to capture a unique image that nobody has seen before. In these attempts the weather in Boulder was extremely windy making it very difficult to capture the clouds without motion blur. Finally, I decided to take sunrise pictures because Boulder has wonderful east facing views that enable you to capture glorious images of the sunrise. The phenomena I was trying to capture was the contrast of light due to the refraction of sunlight through the atmosphere before the sun has even peaked above the horizon. Also, I simply wanted to capture an epic image.

This image was captured about two thirds the way up Flagstaff near the Monkey Traverse on top of those massive Fountain formation sandstone rocks protruding around the bend in the road. The camera was facing directly east in order to allow the sun to be in the right third of the frame and the camera was not noticeably tilted while taking these pictures at a possible 5 degrees from horizontal. This image taken on February 19$^{th}$ 2014 just after 6 am just before the sun came above the horizon.

There are a variety of clouds in this image. Dominating this image are altostratus radiatus and in the foreground of these clouds there are stratus fractus that are much closer than the massive radiatus formations. These clouds appear in the middle range altitude of approximately 4000 meters at the base layer of these cloud formations. If you look closely in the center right of the image you can also see gravity waves at the tail end of some of the sadiatus clouds. These cloud types tend to form in semi-stable atmospheric condition or in stable conditions where the wind is the driving factor for orienting the clouds with the wind. I know that the atmosphere on this morning was stable because the cape number is zero so the wind is what created this particular formation. The gravity waves mentioned earlier are caused by this same shearing effect on the cloud. The weather in Boulder the days leading up to this image were extremely warm and windy conditions. This warm front was on its way out of town on the 19$^{th}$ and a new cold front was anticipated to bring a dusting of snow and below freezing

temperatures that night only 12 hours after this picture was taken. The time this image was reasonably strong with the speed at the base layer of the clouds roughly 40 knots ~ 45 mph at an absolute altitude of 4,000 meters ~ 13,000 feet. I determined this cloud layer by looking at the skew-T as well by looking at the adiabat line and where this crosses the dew point line is where clouds form. The physics of this image is fairly interesting because of the stratification of the wind making shear effect felt from layer to layer of the atmosphere. Also, when analyzing the skew-T for this day the dew point line is very jagged causing interesting cloud formation at different atmospheric layers.

I wanted to have as large of a field of view as possible so I decided to have the focal length as short as possible which in the case of the lens I used is 18.0 mm. This particular lens is a Canon EF-S 18-55mm f/3.5-5.6 IS STM. I predict that the field of stretches very far for this image. I estimate that the foreground of the image spans roughly 4 miles and around the horizon it probably spans from 15-20 miles across. While vertical scope of the image probably spans above the cloud ceiling which was BLANK (cloud ceiling "look up") for the 19$^{th}$ and I could assume it extends at least another mile or two in the back of the image. The objects in this image range from 0.5 to 20 miles away which made it challenging to get a good focus on the entire image. I used a digital camera for this image and the initial image size of 5184 x 3456 pixels and the final image size is 5184 x 2184 pixels, the camera model was a Canon EOS REBEL T3i. The exposure setting I decided on was based on the lighting and the affect I wanted it to have on the person viewing this image. I wanted deep contrast in the image from light in the center right of frame to dark on the peripheries. This was achieved with relatively long shutter speed of 1/3$^{rd}$ of a second, although this seems long it was so dark that the other settings on the camera had to be adjusted to account for the low lighting. With this in mind I opened up the aperture to f/5.6 and this was still not enough like so I also increased the light sensitivity to ISO 800. With this combination I found a great balance of light and color that didn't over expose any part of the image. Finally, once the image was uploaded into Photoshop I only made three changes to it. First, I cropped the image to avoid the city lights because I really wanted to display the sky. Then I used a stamp tool to remove left over lights

that were not removed from the cropping process because I didn't want to make the image smaller than it had to be. Lastly, I used the curves tool and made an s-curve to display the amazing contrast that was hidden in the information of the image.

The image reveals beautiful cloud formations and beautiful colors in the atmosphere. My favorite part of the image is the colors and contrast of the image. My least favorite aspect of the image is the noisiness of the picture and the fact that the clouds aren't that well displayed for a cloud image. The clouds are very difficult to classify so I would like to get deeper into it and I need a better book on clouds! I definitely made an image that is pretty and I got the colors out of it that I really wanted. As far as developing this idea I want to see this in a bigger frame like panoramas it would be cool to have it the size of a mural.

## Works Cited

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