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MCEN 4151 Flow Visualization
Spring 2018

Peak Audience

Figure 1. Featured Image

Clouds Second Report
By Luke Collier

Flow Visualization Spring 2018
MCEN 4151 – Prof. Hertzberg

Cap clouds rest above Mt. Hillers in the Henry Mountain Range on the morning of Mar. 28, 2018 at 7:20 AM. Cirrostratus clouds peak through the background as well.

Special thanks goes out to the two Kyles for leading a rather picturesque Spring Break trip.

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This image was created for Prof. Hertzberg's Clouds Second assignment in Flow Visualization class. The area this picture was taken had isolated mountain ranges that produced these cap cloud phenomena that I was intent on capturing. It is very different from clouds like Foehn cloud walls because the clouds aren't sprawled across a whole range of mountains.

The picture was taken from Maidenwater Sands in Utah, about 6 miles east of Mt. Hillers. To provide context, this is north of Lake Powell. The morning sun was just peeking through over the earth from behind the camera, thus it was pointing west.

Although the clouds are not lenticular in nature, they do have a pattern of resting above the mountain and there's an oscillating pattern of clouds in the wake of the mountain. The cloud that appears above the other clouds is closer and to the east of the clouds on top of the peak, signaling a wave effect: Generally, the clouds form when air rises, such as from when it flows over a mountain peak. Then it flows down past the peak, compressing the air which causes it to rise again past the peak, causing another standing cloud. As can be observed in the skew-T plot (Fig. 2, 3), the CAPE was 0 so the atmosphere was stable. It appeared that the location of this picture was between Salt Lake City and Grand Junction, so Skew-T plots from both locations were included.

The picture was taken with a Canon 60D DSLR camera with a 55-250mm lens. The lens was zoomed all the way out to 55mm in this photo. Since the sensor of this camera is of size APS-C, the horizontal size is 22.3 mm[1]. We can take the inverse tangent of the sensor size over the focal length to find the angle of view: $tan^{-1}\left({}^{22.3}/_{55.0}\right) = 22.1°$ The sine of this angle can be taken and multiplied by the distance from the camera to the mountain, about 6 miles, to find the FOV: $(6mi) * \sin(22.1°) = 2.25mi = FOV$. The ISO was 400, aperture was set to f/4, exposure set to 1/1600 sec for a crisp photo that was well-exposed between the lightest and darkest parts of the image. Next, the original photo (Fig. 4) was slightly re-touched in GIMP 2.8 using the histogram curves described in Fig. 5. The image was cropped and re-sized in order to focus more on the clouds. The rule of thirds was considered when cropping to a 16:9 aspect ratio.

When browsing my collection, this image struck me as particularly stunning. The colors are brilliant and the composition well-considered. When the class was critiquing my photo, the resolution on FlowVis.org was too small and there was considerable foreground of desert plants. The plants may have worked if the image had a scattering of "happy little" cumulus clouds that reflected the foreground. I decided to crop it to highlight the mesas that reflect the wide and puffy cumulus mountain clouds. In addition to the higher resolution on the FlowVis site, this made for an image that beautifully highlights the weather phenomenon I was looking to capture.

[1] https://www.usa.canon.com/internet/portal/us/home/products/details/cameras/dslr/eos-60d

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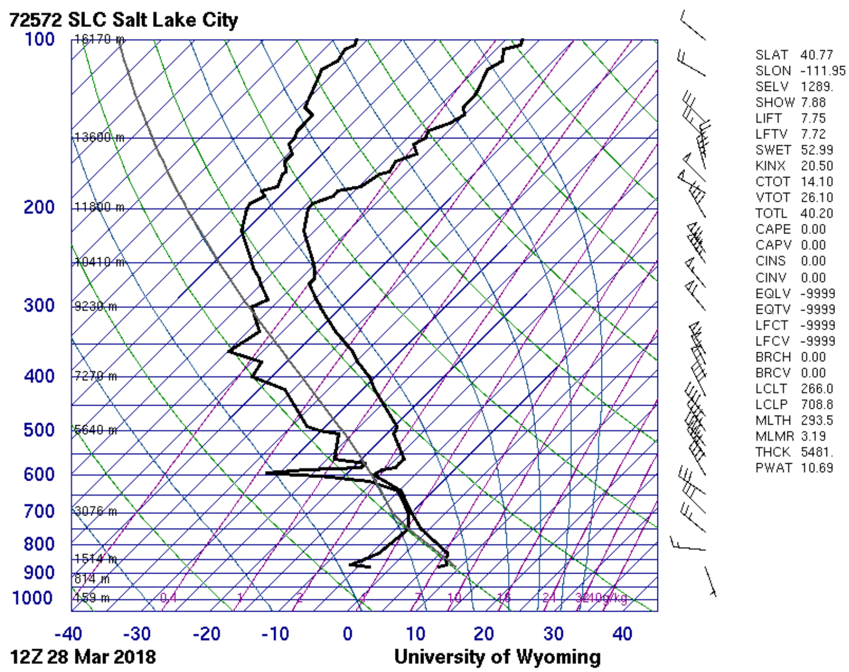

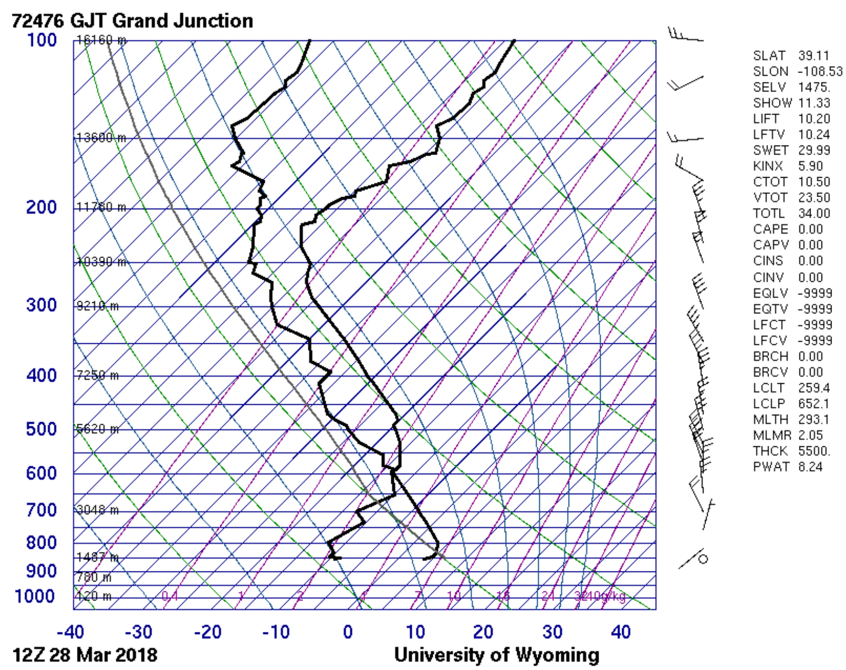

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