

**Mark Voll**

**Flow Visualization**



Cloud Image

2/25/14

This image exposes some of the interplay that occurs between the clouds and the sun. In the middle of this beautiful natural phenomenon is something made by mankind, a contrail. This creates an interesting contrast between humans and nature that I liked and inspired deep thought. I like to think that this picture shows humans diverging from nature.

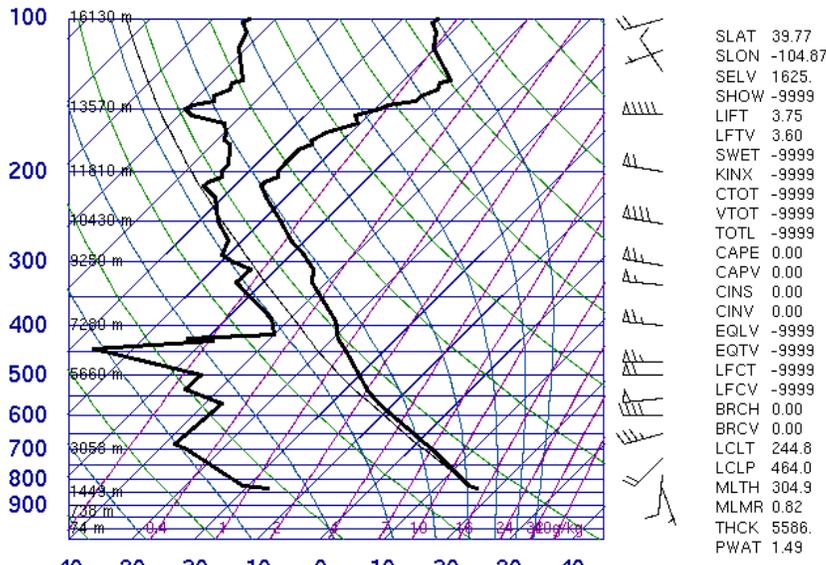
Colorado is known for an amazing sky and the evening of February 17<sup>th</sup>, 2014 did not disappoint. The clouds spilling over the Rocky Mountains were catching the setting sun in a way that produced interesting shadow play in the sky. The changing lighting in the clouds can also be seen on the contrail as some areas are being shaded and some are in direct sunlight. This picture was taken from the airport in Denver, Colorado with the camera facing the southwest direction at an elevation of 45°.

The background of the image is formulated by a large area of stratocumulus clouds. I decided this was the cloud type based on similar images in my “CloudSpotter” app. The clouds appear to be similar to cumulus clouds except they take up the majority of the sky with small gaps. This is why they are stratocumulus. Here is an image of a different part of the sky at the same time that helped me determine the cloud type.



The atmosphere was completely stable this evening with a CAPE of 0.00. This is shown in the skew-T plot below.

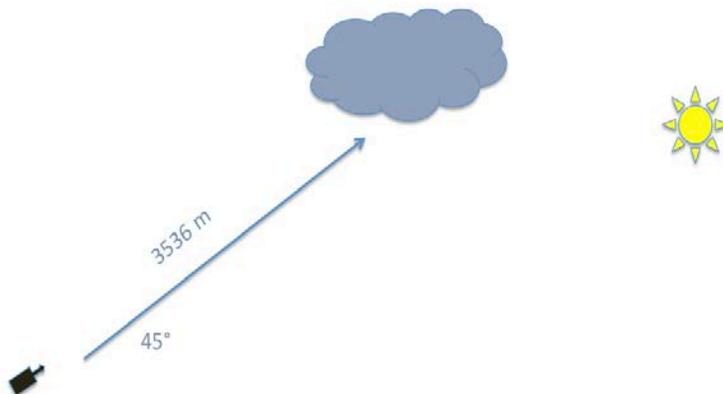
**72469 DNR Denver**



00Z 18 Feb 2014

University of Wyoming

This plot shows that the dew point line on the left approaches the temperature line on the right around 4000 m and then again at 7000m above sea level. This is the area of the sky where clouds would most likely be since it is where water can condense. Stratocumulus clouds are a lower cloud formation that occur in stable atmospheres so this skew-T plot helps confirm that this formation was possible at this time. This puts my estimate for the height of the clouds at 4000m above sea level and 2500m above the Colorado ground level. The distance from the camera lens when you take into account the angle and height was approximately 3536 meters. Since the lens I used has no zoom function the field of view is very large for this image.



More camera specs are shown below.

Dimensions: 2764 × 1843  
Device make: Canon  
Device model: Canon EOS DIGITAL  
REBEL  
Color space: RGB  
Color profile: Camera RGB Profile  
Focal length: 50  
Alpha channel: No  
Red eye: No  
F number: 5.6  
Exposure time: 1/500

The post processing for this image was done in iPhoto. I played with the light levels a lot to bring out the contrast in the clouds and contrail. This made the area where the contrail emerges from the cloud darker and the areas touched by the sun lighter. This helped add mystery of the photo and uniqueness to the photo. I cropped in on the contrail to an area that had mostly solid clouds in the background. This eliminated some of the sky that was in the bottom of the original field of view shown below.



The lighting exhibited in the picture is created by the sun. The main feature that is created by the lighting is the large gradient in the brightness of the sky. From the perspective of the camera these shadowed and light areas of cloud create a striation pattern. This makes me happy with the way the photo turned out. I think the contrail specifically is a good example of fluids flow. This is because the contrail is not a straight line, it is wavy due to variable winds in the sky. If I were to retake this image I would use a camera with a telephoto lens so that more details on the contrail could be seen.

## **References:**

- 1) [http://en.wikipedia.org/wiki/Stratocumulus\\_cloud](http://en.wikipedia.org/wiki/Stratocumulus_cloud)
- 2) <http://weather.uwyo.edu/upperair/sounding.html>
- 3) <https://cloudspotterapp.com/>