

Cloud 2 Report Andrew Beat 4/18/11

Purpose and Background:

This image was taken for the second Cloud assignment with the goal of capturing an interesting and aesthetically pleasing fluid phenomenon involving clouds. The day of the picture was very windy which created the cloud patterns seen in the image. There were multiple opportunities for an interesting image with different cuts through the clouds but the final selection was thought to be the most impressive.

The picture was taken from Lafayette, Colorado on March 23rd around 2 PM. The camera was facing directly upwards from the top of a roof with left to right in the image corresponding to West to East geographically.

Analysis:

The clouds in the image can be labeled altocumulus stratiformisperlucidus undulatus. These clouds were roughly 4 miles in altitude (altocumulus), were spread out in an extensive horizontal layer (stratiformis), had clear spaces in between the clouds (perlucidus), and showed wave-like characteristics (undulatus). The surrounding sky had patches of similar clouds but for the most part was clear. According to WeatherSpark a low pressure system moved in the following day which likely was headed by the clouds in the image.

The most interesting phenomenon in the photo is the ripple effect. This is usually caused by shear forces from either winds above and below moving in the same direction but at different speeds or winds moving in opposite directions. A look at the skew-t plots from 6 AM and 6 PM, local time, for March 23rd gives the answer.

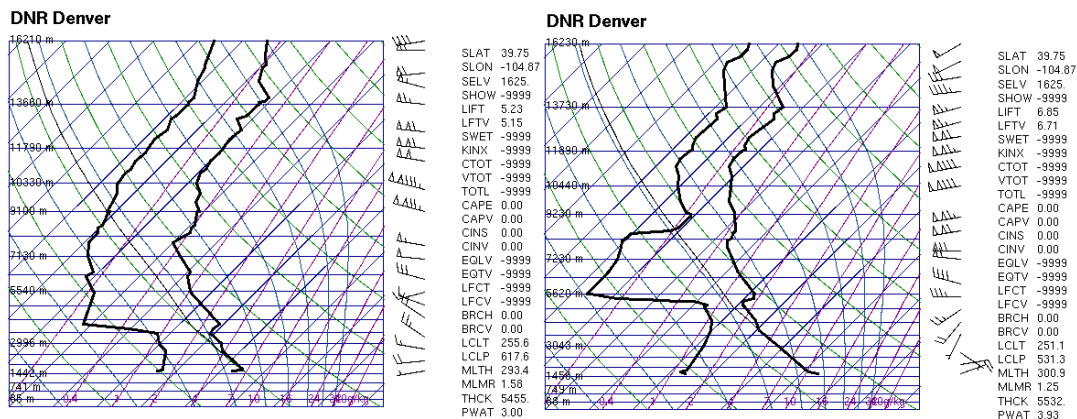


Figure 1: Skew-T plots for March 23rd, 2011.

The wind in the morning sounding is all coming from the West at about 20 knots for an altitude of roughly 4000 meters. A look at the afternoon sounding shows the winds changing direction below 3000 meters giving rise to shear forces. These forces are what cause the separation between cloud lines similar to the ripples than can be seen as the ocean washed over the beach. As the two different wind velocities pass by each other they create an instability

creating a rolling wave pattern between the layers. If the relative humidity is near saturation then clouds will form in the peaks of each wave creating the pattern seen in the image. Also seen from the skew-t plots is the stability of the atmosphere as both plots show a CAPE of zero.

Photographic Technique:

The camera used was a Nikon Coolpix L110 in an automatic mode. Table 1 gives a breakdown of the camera settings.

Shutter Speed	1/408 seconds
Exposure	Normal
F-Stop	f/4.7
ISO	80
Focal Length	19 mm
Flash	None
Final Image Size	4000 x 3000 pixels
Distance from Object	Approx. 4 miles

Table 1: Description of camera settings used for the image.

The only editing of the image that took place was an adjustment of the brightness and contrast using Photoshop.

Opinion of Image:

This image reveals the complexity of our atmosphere. Just a few miles above our surface there was serious turbulence occurring due to two opposite wind patterns and without these clouds no observer would have known. I like the contrast between the blue and white as well as the nice cloud patterns in the image. I do with the image was a little sharper to enhance the boundary between the clouds and sky.

References:

Allaby, M. (2002) Encyclopedia of Weather and Climate, Volume 1. Library of Congress.

<http://cloudappreciationsociety.org/collecting/katrin-pfeifer/>

<http://weatherspark.com/#!/graphs;q=Denver,+Colorado,+United+States>

<http://weather.uwyo.edu/upperair/sounding.html>