

Fog



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MCEN 5228 – Flow Visualization

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Abstract

This cloud image was taken for the second cloud image assignment of the University of Colorado at Boulder Mechanical Engineering course MCEN 5228 – Flow Visualization. The objective of this assignment was to observe and photograph clouds in order to gain a better understanding of the fluid dynamics of our atmosphere. This cloud image was intended to show the fog cloud type. The image was taken in the hope that with this visualization more individuals will be able to appreciate and understand the complex fluid relations behind this commonly seen phenomenon.

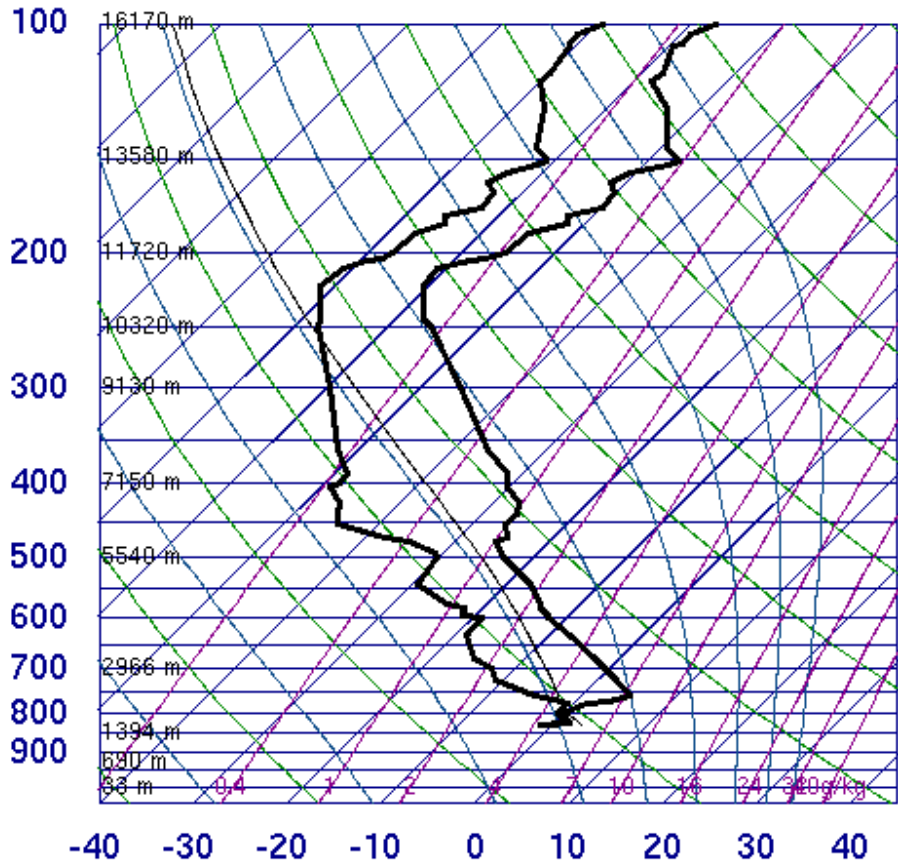
Location

The image of the altocumulus and altocumulus undulatus clouds was taken outside the security gate at the National Wind Technology Center in south Boulder, Colorado. The National Wind Technology Center is located on West 120th avenue near the intersection of Colorado state highways 93 and 128. The image was taken facing South-South-East at an inclination of roughly 0 degrees on March 5th, 2010 at 8:30 am MDT.

Cloud Information

The cloud presented in this image is only one example of many possible types of clouds. The formation and location of this particular cloud type puts it into the fog category. The rest of the sky, particularly when viewing north, was almost entirely clear and void of clouds, though one or two isolated altocumulus clouds were spotted. The previous day was mostly clear with scattered altocumulus clouds and the following day saw a mostly clear sky. The atmosphere was stable at the time of the image as well as at least 12 hours before and after the image capture as seen in Figure 1.

72469 DNR Denver



SLAT	39.75
SLON	-104.87
SELV	1625.
SHOW	-9999
LIFT	2.41
LFTV	2.36
SWET	-9999
KINX	-9999
CTOT	-9999
VTOT	-9999
TOTL	-9999
CAPE	0.00
CAPV	0.00
CINS	0.00
CINV	0.00
EQLV	-9999
EQTV	-9999
LFCT	-9999
LFCV	-9999
BRCH	0.00
BRCV	0.00
LCLT	272.5
LCLP	791.2
MLTH	291.4
MLMR	4.66
THCK	5507.
PWAT	7.63

12Z 05 Mar 2010 University of Wyoming

Figure 1: Skew-T plot for Denver at 6:00 am MDT on March 5th 2010.

From this skew-t plot we would expect that there would not be any clouds at elevation though there could be clouds, or fog if touching the ground, at ground level because of the proximity of the dew point line to the temperature line. The formation of fog requires all of the elements that normal cloud formation requires. The elements consist of, most importantly condensation nuclei, in the form of dust, aerosols, or pollutants for the water to condense upon and very humid air. When there are excessive amounts of condensation nuclei in the air, especially hygroscopic particles like salt, then the water vapor may condense below 100% relative humidity. In addition, fog can form suddenly, and can dissipate just as rapidly, depending what side of the dew point the temperature is on.

The fog seen in this image is most likely an advection fog or an evaporation fog though evaporation fog usually does not produce such large fog formations. Advection fog on the other hand can produce fog formations that can be quite large. Advection fog occurs when moist air passes over a cool surface and is subsequently cooled. This can occur often in the spring when a sunny day melts snow, after a snow storm the previous day, creating lots of moisture in the air and then the next morning the humid air passes over parts of land still covered by snow, thus cooling the air and producing fog.

Camera Settings

The photo was taken as a digital image with a Casio EX-Z600 set with a focal length of 18.6mm in order to capture the entire sky filled with clouds and not just a single cloud. F-Stop of 8.3, exposure time of 1/400 sec, ISO of 50, size of 2816x2112 pixels, and an aperture value of 2.8 was chosen to capture the clearest image of the clouds while at the same time remaining focus on the foreground for size comparison. Only cropping of the image was done in order to preserve and present the original beauty of the clouds to the viewers.

Conclusions

This image shows the beauty that clouds can have and the physical phenomena needed to produce these events. Overall the image that was captured came out very well. The photo clearly presented the style of cloud attempted to be captured and it was done in a visually pleasing way. Though overall the image came out well, in the future it would be nice to be able to use a higher quality camera that would allow for better focus on the clouds. Also, a camera that would allow for more zoom so that a more detailed image of the cloud itself could be observed would be appreciated.

Works Cited

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<http://www.bbc.co.uk/weather/features/understanding/fog.shtml>

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Original Photo:

