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Cloud Image Report #1

10/17/2015

Purpose of Image:

There are many kinds clouds formed with different fluids mechanics. This assignment is to let us know the real beauty of the clouds. The cloud image above was taken on Oct.5th, 2015 at about 2 p.m. I went to the mountain called Chautauqua to capture this cloud image.

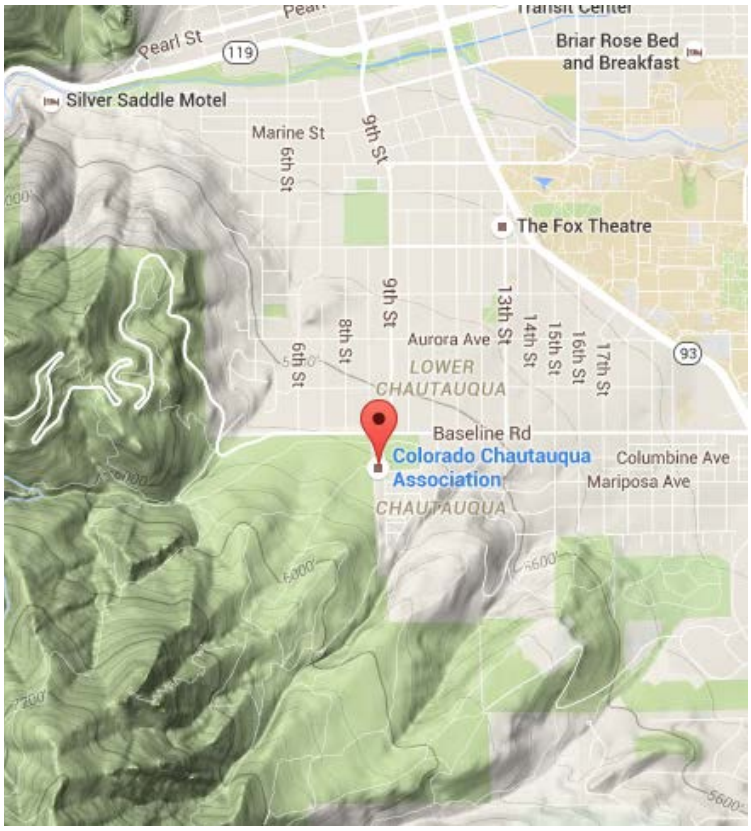

Fig 1. Location of Chautauqua

Information from Skew-T diagram

There are a lot of information can be obtained from the Skew-T diagram [Fig 2.]. Firstly, it reveals the stability of the atmosphere on that day. The CAPE is 0, which means the atmosphere is stable [1]. Also, it can be seen that in 1500-3000m range, the dew point and the temperature are very close, which means that the clouds are formed in the range of 1500-3000m.[2]

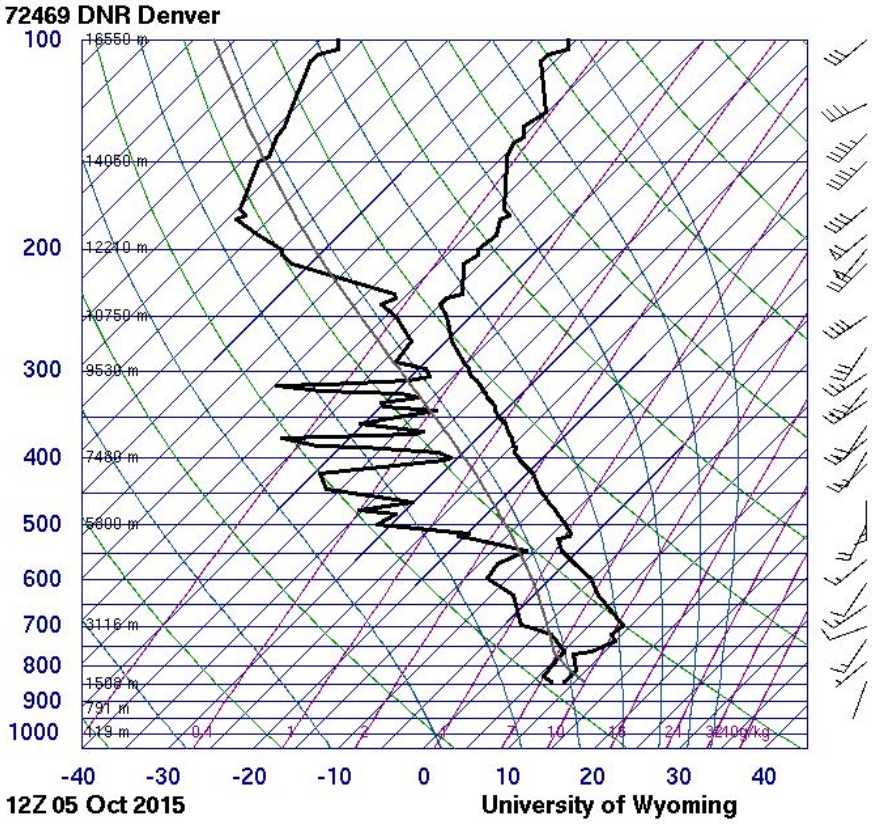

Fig.2 Skew-T diagram on Oct.5th

Cloud Identification

The atmosphere is stable on Oct.5th according to the skew-T diagram. The cloud on the bottom of the picture below is cumulus cloud [3], since the mountain has the peak of 2128m and I didn't arrive to the top of the mountain on that day so that the cloud was about 2000m above the sea level. The other clouds in the image are altocumulus clouds, since the height of them are about 2000-3000m above the sea level. So from ground level, it is about 3000-4800m height, because the altitude of boulder is about 1600m, which matches the characterization of cumulus and altocumulus clouds [3].

Photograph techniques

Camera used	Canon EOS REBEL T2i
Shutter Speed	1/4000
Aperture	F5.6
ISO	100
Focal length	55mm
Resolution	72 pixel per Inch
Focal length	42mm
Lens	EF-S18-55mm f/3.5-5.6 IS

Table 1.Camera settings

The cloud was facing west to me and the sun was on the left of the picture, which would affect the exposure of the picture. In order to get rid of the overwhelmed sunlight, I need to set the ISO at a low value. And I tried several different shutter speed and 1/4000 gave the clearest image. The actual distance between the object and camera can be determined by eqn.1. Since the aiming angle is about horizontal, the actual height calculated is also about 300m. Since the mountain is about 2000m high and the altitude of Boulder is about 1600m, the actual height from ground level can be calculated as 3000-5000m, which matches the estimation made previously.

$$x/f=X/d \quad [4]$$

Eqn.2 Pinhole projection formula

x=size of the object in the sensor

f=focal length

X=real size of the object

d=distance between the object and camera

Post-Processing

For this assignment, I didn't do a lot of post-processing. I only adjusted the picture's contrast and brightness by using curve tools, since I wanted to keep the image closer to the nature.

Fig 3. Original cloud image

Fig 4. Edited cloud image

Reference

1. http://weather.uwyo.edu/upperair/indices.html#CAPE
2. http://www.atmos.washington.edu/~houze/301/Miscellaneous/Skew-T.pdf
3. http://cloudappreciationsociety.org/collecting/
4. Richard Hartley and Andrew Zisserman (2003). *Multiple View Geometry in computer vision*. Cambridge University Press. ISBN 0-521-54051-8