

MCEN 4151: FLOW VISUALIZATION



Clouds from Above

Cloud 2 Assignment

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The fifth assignment in the course “Flow Visualization” is the Photography of Clouds 2. For this assignment, each student is expected to take a photo of a cloud formation between the dates of February 23rd and April 9th. In my picture, I tried to capture a cloud with as much detail as possible.

My cloud image was taken on April 1st, 2012, at 5:21pm (all times mentioned in this report are given in Mountain Standard Time). The photo was taken from an airplane which was flying from the Grand Caymans to Houston, Texas. As the flight took off at 3:45 pm and landed at 6:45 pm, the photo was believed to have been taken while the airplane was near the middle of the Gulf of Mexico. The camera was facing east, and was pointing approximately five degrees downward. Although I do not know my exact location, I believe I was near the Magnolia Oil Platform, which is located in the middle of the gulf and has weather data available. The surface weather at the time the photo was taken is shown in Table 1. There was no precipitation or unusual weather in the next couple days after April 1st, although it was consistently windy.

Table 1: Weather on the Magnolia Oil Platform, on 4/1/12 at 5 pm¹

Temperature	77 degrees Fahrenheit
Wind	9.2 mph East
Precipitation?	No

There are two types of clouds visible in this photo, the clouds towards the top of the photo, and the more separated clouds along the bottom of the photo. In order to determine the types of clouds which are present in the image, information is needed as to what is happening in the atmosphere. Skew-T plots are graphs which show the wind and temperature as a function of altitude, as well as some other interesting but less useful pieces of information. Although there is no data available in the gulf, there is data from Key West, FL, which is the closest available location. The skew-T plot for Key West, FL, on April 1st at 6pm, is shown in Figure 1.

72201 EYW Key West

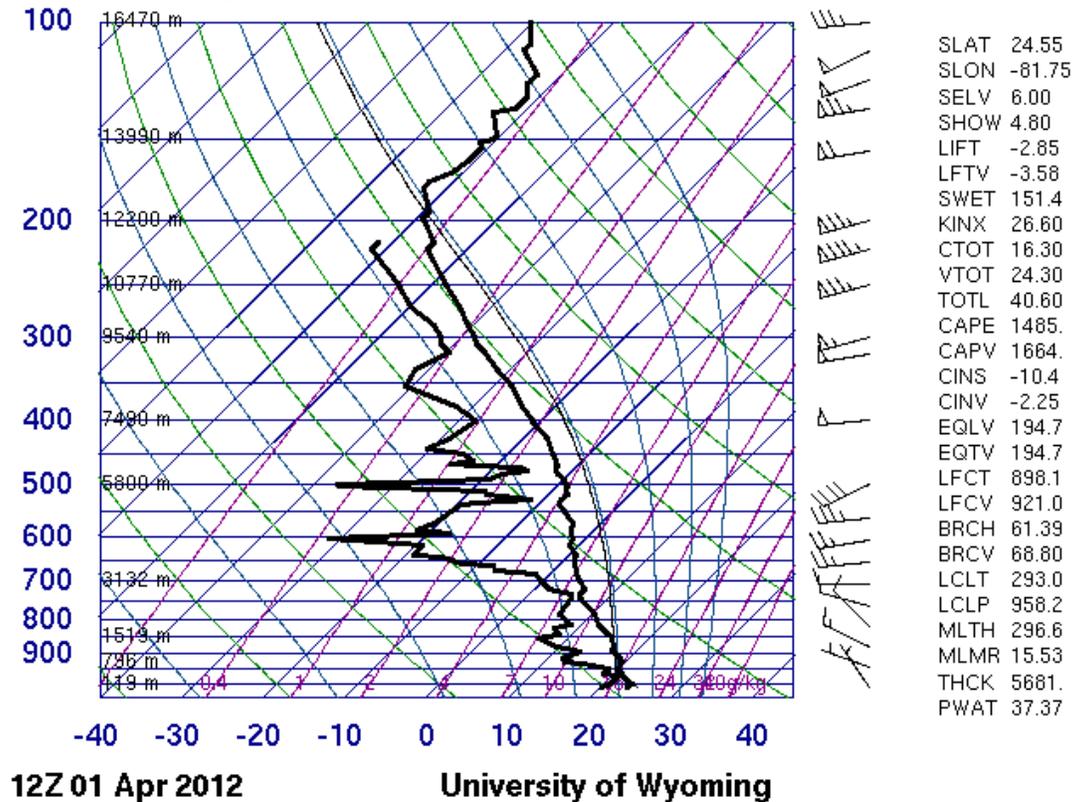


Figure 1: Skew-T Plot for Key West, FL, on 4/01/12 at 6pm²

The right most dark black line is the temperature in the atmosphere, and the left most dark black line shows the dew point temperature. When these two lines come closer together, the likelihood of a cloud increases as the moisture in the atmosphere is more likely to condense into a cloud. The two points at which the lines come closest together, and is therefore most likely to be the altitude which contains a cloud, is at approximately 3500 meters and 6000 meters. The other important number in this diagram is the cape number, which in this case is 1465. This means that the atmosphere is unstable. Because these clouds were taken at the cruising altitude of an airplane, about 9000 meters, the altitudes taken from the skew-T data seem reasonable, both clouds are slightly below the cruising altitude although it is believed that the altitudes for the clouds should be slightly higher. For the highest set of clouds covering the top of the image, knowing that the atmosphere is unstable and the altitude that they were most likely located, 6000 meters, these clouds can now be guessed to be altocumulus cloud. Again, knowing that the atmosphere was unstable, that the lower cloud was most likely located at 3500m, this cloud is most likely a cumulus cloud. These clouds are visually very similar, with a fluffy appearance, but the cloud along the top of the photo has the prefix 'alto', meaning high, as this cloud is higher in the atmosphere.

This photo captures approximately a 10 degree angle of view, and the clouds are estimated to be 2000 meters from the camera. The camera specs and settings are shown in Table 2.

Table 2: Camera Specs and Settings

Camera Body	Canon Digital Rebel XT
Focal Length	28mm
Aperture	13.0
Shutter Speed	1/400
ISO	200

The photo was digitally altered in Photoshop. The brightness was decreased and the contrasted was increased to bring out more detail in the photo. The initial image was shot in raw and the pixel size of the image is 2304 x 3456 pixels.

I feel that this image reveals the beauty and geometry in clouds. I like that this picture is focused on the clouds and shows excellent detail, which allows you to see all of the shapes which the clouds contain. The only improvement I would make would be to try to use a wide angle lens to try to include more of the surrounding cloud formation.

References

- ¹ WeatherSpark. "Weather Graphs and Maps, Magnolia Weather Platform." *WeatherSpark.com*. NOAA. Web. 10 Apr. 2012.
- ² University of Wyoming. "Skew-T: 72201 EYW Key West." [Http://weather.uwyo.edu](http://weather.uwyo.edu). University of Wyoming. Web. 07 May. 2012.