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Flow Visualization
2/25/2009

CLOUD SPOTTING

This shot was taken in Lafayette, Colorado February 14, 2009. The shot is from ground level in a neighborhood. The shot angle was about 15-20 degree angle from the ground. That basically translated to the fact that the clouds were low to ground but far away from the camera. The estimated distance was about 3 miles. The estimated field of view is 0.5 mile by 1 mile. The distance is so far out because the clouds are so low to ground because it is of the cumulus family and because the shot angle was very small. The time the image was captured was approximately 5:30pm, just before dusk. From my research it seems to be a stratocumulus type of cloud formation.

Stratocumulus clouds are very low hovering clouds that could be anywhere from ground level up to 8500 feet. Stratocumulus clouds seemed to be the best fit for the photograph for many reasons. One, the Skew-T plot portrayed characteristics of a potentially unstable weather system that would be required of a stratocumulus cloud formation. Two, the cloud was observed to be very low to the ground. Since that was the case the other two main cloud formations (cirrus and alto) were ruled out. Mainly because cirrus clouds exist very high, 20000 to 40000 ft and alto clouds form at about 8500 to 20000 ft. Thirdly, approximately three days after this picture was taken heavy winds blew through Lafayette up 40 mph. Usually Stratocumulus clouds are fronts for various harsh weather conditions including but not limited to windstorms, thunderstorms and rain storms.

The Skew-T plot can be seen below in figure 1.

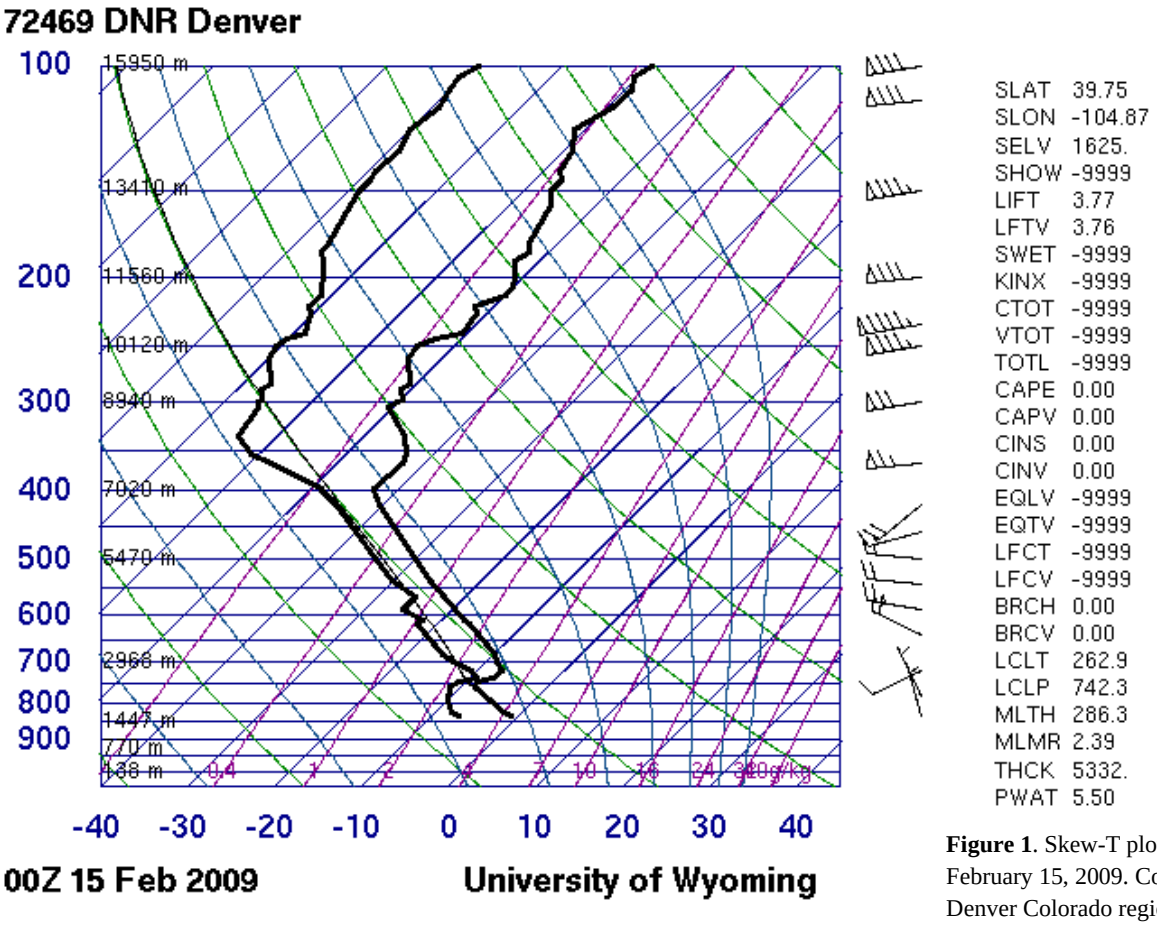


Figure 1. Skew-T plot for February 15, 2009. Covering the Denver Colorado region.

Interpreting the skew-t plot will highlight a few important characteristics of the weather when the picture was taken. One, the rightmost sounding line represents temperature. As elevation increases the temperature at that time continues to get cooler and cooler. As a consequence of that weather will usually become unstable in the near future. If on the other hand the temperature of the right sounding veered to the right, meaning that the temperature got warmer as elevation increased then that would represent a stable weather system. Even though the above skew-t plot does not show aggressive cooling as the air parcel elevates it does show that it cools steadily from -40 degrees C down to -60 degrees C as it ascends. That alone is a strong indication that the system will become unstable in the coming days.

The next piece of reasoning that leads me to believe that this was a stratocumulus cloud was because it seemed very low to the ground. The strata family of clouds is the lowest of all the cloud types. In fact whenever fog appears it is actually a stratus cloud that formed on the ground!

Finally, a few days after the photo was taken heavy winds blew through Lafayette. The photo was taken Sunday evening, and three days later that week winds of up to 40 mph were recorded. See figure 2 for a wind speed chart, taken from weatherunderground.com.

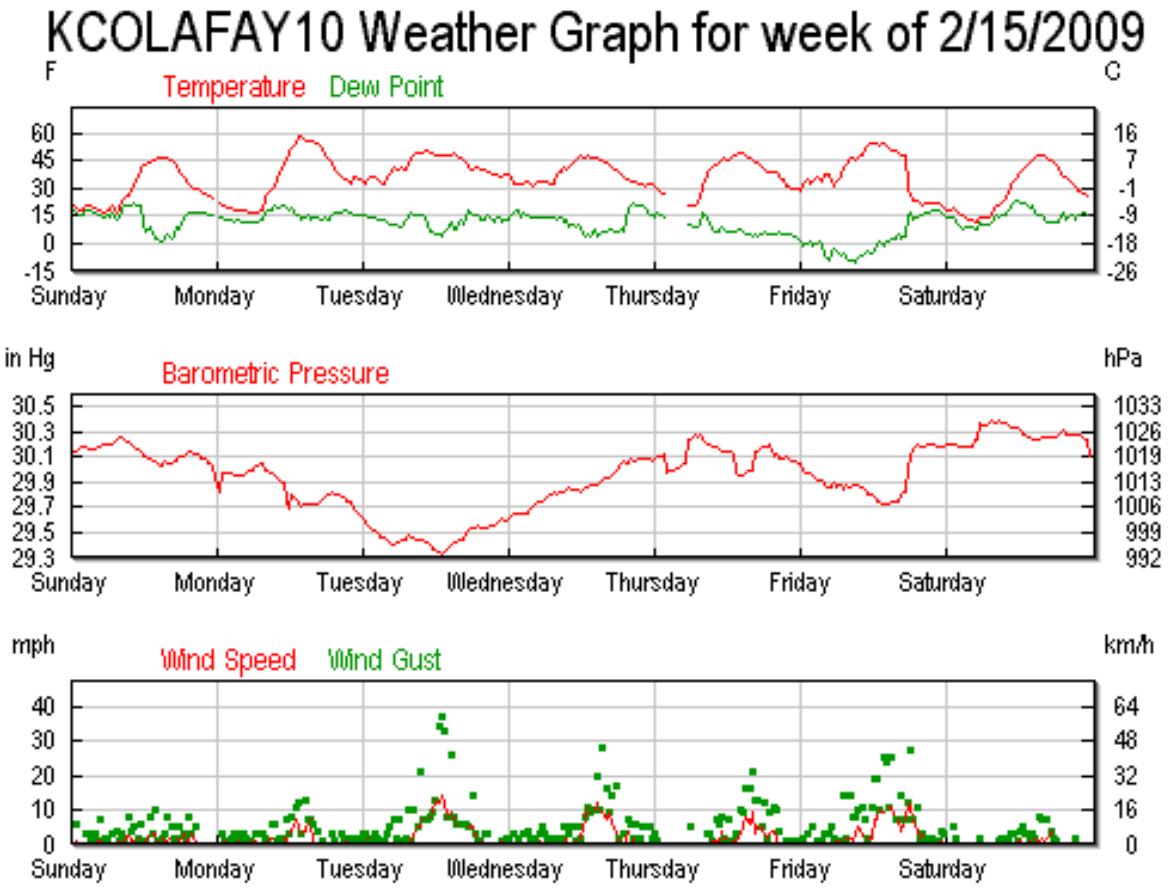
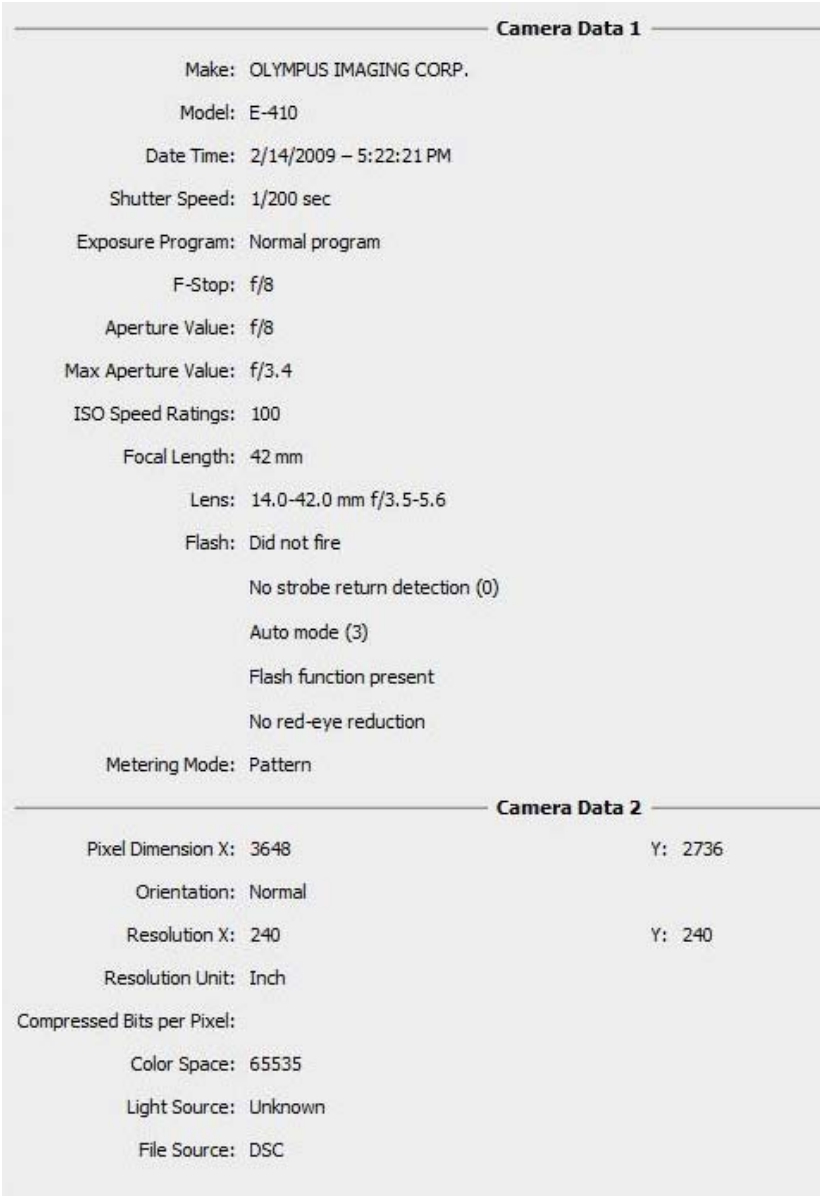


Figure 2. Plots for Dew point, Barometric pressure and Wind speed in the Lafayette area during the week of 2/15/2009. It should be noted that the relatively calm winds that were on recorded on Sunday (the day the photo was shot) drastically increased when Wednesday arrived.

It should be clear that carefully observing cloud formations can give almost 2-3 days notice on encroaching weather conditions well before any “weather-man” can. The stratocumulus clouds were observed up to three days before a large wind storm formed because it was acting a boundary layer between the cooler air above itself and the warmer air below itself. The combination of those two temperature differentials is what most likely caused the wind storm that was to ensue later on that week. Below in figure 3 is information on what settings were used to take the photograph.



Camera Data 1

Make:	OLYMPUS IMAGING CORP.
Model:	E-410
Date Time:	2/14/2009 – 5:22:21 PM
Shutter Speed:	1/200 sec
Exposure Program:	Normal program
F-Stop:	f/8
Aperture Value:	f/8
Max Aperture Value:	f/3.4
ISO Speed Ratings:	100
Focal Length:	42 mm
Lens:	14.0-42.0 mm f/3.5-5.6
Flash:	Did not fire
	No strobe return detection (0)
	Auto mode (3)
	Flash function present
	No red-eye reduction
Metering Mode:	Pattern

Camera Data 2

Pixel Dimension X:	3648	Y:	2736
Orientation:	Normal		
Resolution X:	240	Y:	240
Resolution Unit:	Inch		
Compressed Bits per Pixel:			
Color Space:	65535		
Light Source:	Unknown		
File Source:	DSC		

Figure 3. Information on what aperture, shutter speed and other settings were programmed into camera.