



Clouds 2

MCEN4228 – Flow Visualization

Nigel Gorbald

The image was taken on April 13th, 2006 at 7:00 pm in south Boulder. The camera was facing west, looking upwards and the sunlight was shining from the west, over the foothill mountains. The local ground conditions were warm and fairly stable, with the temperature around 70 degrees, and wind below 10 miles per hour. The height of the clouds in the image are estimated to be around 4-5000 feet above the top of Bear Peak which translates to a final cloud elevation of 12-13000 feet above sea level. From the Skew T plot the wind velocity at the cloud elevation is determined to be 25-35 knots and the temperature is just above 0 degrees Celsius.

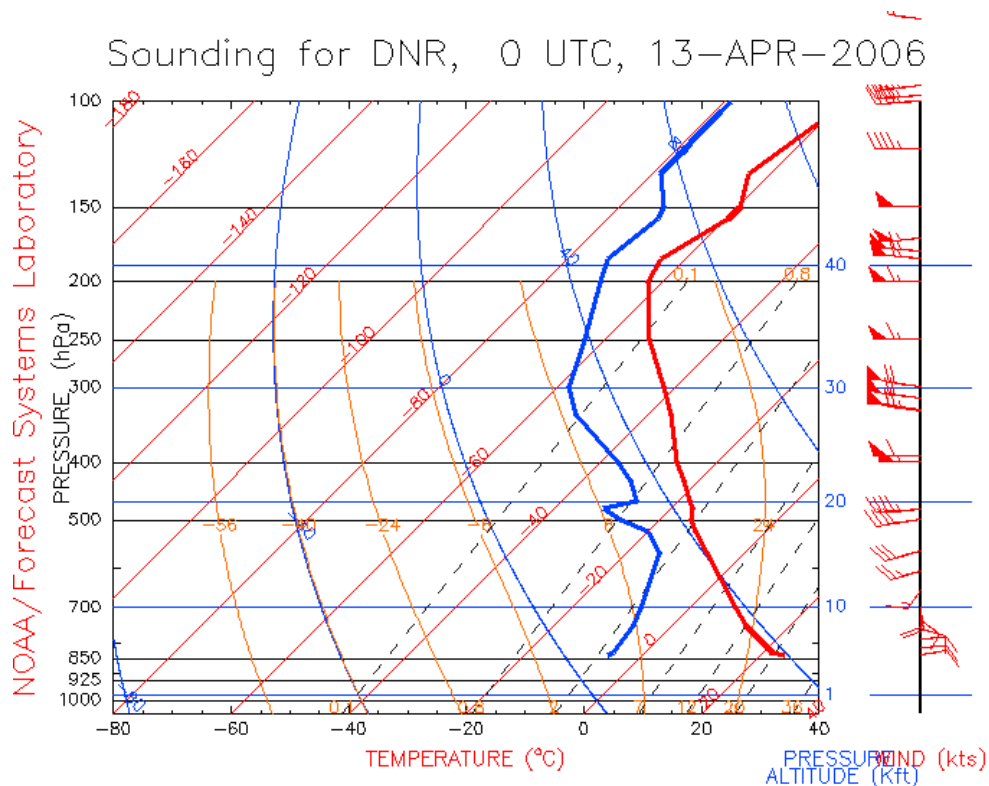


Figure 1 – Skew T plot, (1)

From the shape, elevation, and temperature at 12-13000 feet, the clouds are determined to be altocumulus perlucidus clouds. Some parallel banding of the cloud formation is indicative of an altocumulus, and the perlucidus classification refers to how the banding is broken up in sections and not quite as uniform as a typical wavy altocumulus. The Skew-T temperature reading of around the freezing point of water verifies that these clouds are made up of water vapor and ice particles. These clouds

were created as the winds coming over the mountains rapidly expanded, which cooled the surrounding water vapor. This water vapor then condensed into tiny particles.

The image was taken just before dusk which caused the light to be directed from below the clouds instead of from above the cloud formation. The camera was positioned on a tripod approximately four feet off of level ground. The field of view is approximately 2 km by 1 km and the camera is approximately 5 km from the photographed cloud. An Olympus X-3, 3megapixel digital camera was used with an exposure time of $1/640^{\text{th}}$ of second and an f-stop of 7.1. The focal length of the lens was 7.8mm.

Very minimal alterations were done to the original image. Photoshop was used to crop the image as well as adjust the contrast to bring out some of the details in the clouds. The image was also rotated to the direction that it was photographed.



Figure 2 – Original Picture, pre-Photoshop

References:

(1) <http://raob.fsl.noaa.gov/>

Image Assessment Form

Flow Visualization Spring 2006

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Assignment: Clouds 2

Date: 04/19/06

Scale: +, ! = excellent √ = meets expectations; good. ~ = Ok, could be better. X = needs work. NA = not applicable

Art	Your assessment	Instructor assessment
Intent was realized	!	
Effective	!	
Impact	√	
Interesting	!	
Beautiful	!	
Dramatic	√	
Feel/texture	√	
No distracting elements	!	
Framing/cropping enhances image	√	

Flow	Your assessment	Instructor assessment
Clearly illustrates phenomena	!	
Flow is understandable	√	
Physics revealed	√	
Details visible	√	
Flow is reproducible	NA	
Flow is controlled	NA	
Creative flow or technique	NA	
Publishable quality	~	

Photographic technique	Your assessment	Instructor assessment
Exposure: highlights detailed	√	
Exposure: shadows detailed	√	
Full contrast range	√	
Focus	√	
Depth of field	!	
Time resolved	!	
Spatially resolved	~	
Clean, no spots	!	
OK, simple print	NA	
Mat	NA	
Mounting	NA	

Report		Your assessment	Instructor assessment
Describes intent	Artistic	√	
	Scientific	√	
Describes fluid phenomena			
Estimates appropriate scales	Reynolds number etc.	NA	
Calculation of time resolution etc.	How far did flow move during exposure?	NA	
References:	Web level	X	
	Refereed journal level	X	
Clearly written`		~	
Information is organized		~	
Good spelling and grammar		√	
Professional language (publishable)		X	
Provides information needed for reproducing flow	Fluid data, flow rates	NA	
	geometry	NA	
	timing	NA	
Provides information needed for reproducing vis technique	Method	NA	
	dilution	NA	
	injection speed	NA	
	settings	NA	
lighting type	(strobe/tungsten, watts, number)	!	
	light position, distance	!	
Provides information for reproducing image	Camera type	!	
	Camera model	!	
	Field of view	!	
	Focal length	√	
	aperture	√	
	shutter speed	!	
	film type and speed	NA	
	# pixels (width X ht)	√	
	Photoshop techniques	√	
	Print details	NA	
	"before" Photoshop image	√	