

Cirrus Uncinus Clouds
Joshua Tree, California



Mechanical Engineering Students
MCEN 4228: Flow Visualization
April 19th, 2010

Intent

Clouds are merely visible masses of frozen crystals suspended in the atmosphere. The purpose of this image was to capture the hooks that take place within cirrus uncinus clouds.

Circumstances

The photo was taken on March 22nd, 2010 at 11:48 in the morning and the location was Joshua Tree, California. The camera was facing NW in the sky, and was angled at about 25° above the horizon. The elevation of the photo was between 35,000 and 40,000 ft, where the temperature is about -40-50 deg C.

Atmosphere

These clouds are very representative of cirrus uncinus clouds (1). The name cirrus uncinus popularly known as mares' tails is derived from Latin, meaning "curly hooks". They have a fibrous and hooked appearance, sometimes resembling a ski tip (2). The weather was very nice for most of the day, with an average temperature of 73°F. It was somewhat windy, blowing from right to left in the photo. The wind shear is negative, since the tails are curved up in the sky. These clouds form due to saturation of upper-level air mass combined with strong wind immediately below the cloud level. These clouds normally indicate an approaching frontal system (either warm or occluded).

The Skew-T below in Figure 1 reveals the temperature profile for the morning of March 22nd, in Sand Diego. The CAPE value is 0, revealing a stable atmosphere.

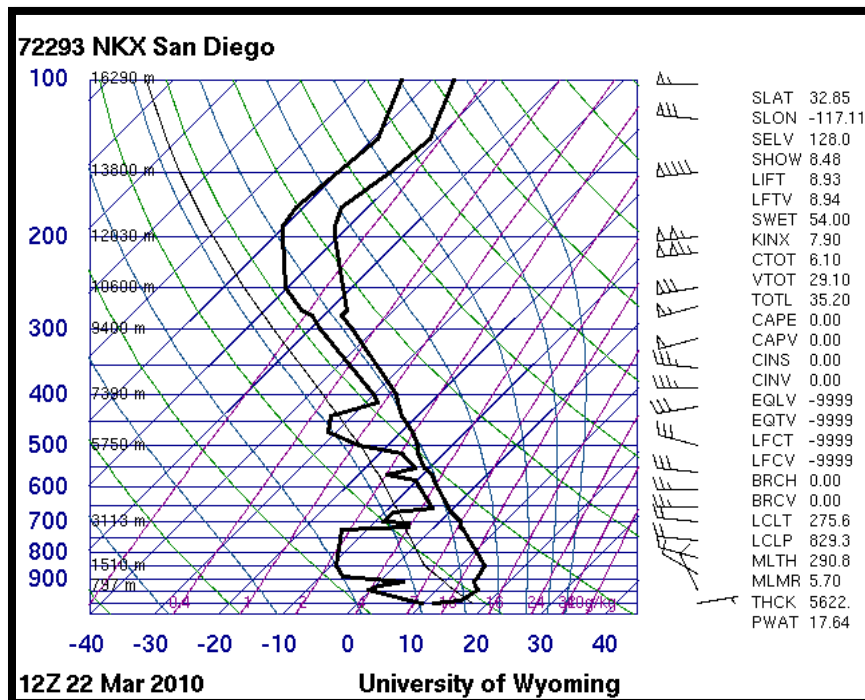


Figure 1 - Skew-T for March 22nd at 6AM

The only lighting for the photo was the light from the Sun. The photo was taken using a Panasonic DMC-ZS1 camera. Photoshop was used to crop the initial photo and to boost the contrast slightly. The photo was taken in landscape mode to ensure that the background was in focus. The resolution was 180 pixels/in resolution.

Photograph Date	March 22nd, 11:48 AM
Field of View	0.409 x 1.018 ft
Focal Length	4.1 mm or 0.013 ft
Image Size	3648 x 2032 pixels
Shutter Speed	10/10000 sec
ISO Setting	80

Horizontal field of view:

$$HFOV = d * \frac{i}{f} = 100 * \frac{1.7}{0.013} = 13,077 \text{ ft}$$

d = object distance
i = image dimension
f = film distance

Vertical field of view:

$$VFOV = d * \frac{i}{f} = 100 * \frac{0.94}{0.013} = 7231 \text{ ft}$$

d = object distance
i = image dimension
f = film distance

Image Discussion

I am very pleased with my final image. I wanted to capture the ski tip effect of cirrus uncinus clouds, which are not very common in Colorado skies. The layers of the cirrus clouds made it look like there were waves in the sky. The rocks in the foreground gave the photo good texture, and framed the clouds nicely. These clouds have a lot of personality, and the physics were clearly revealed. I would like to take a time lapse of the clouds to be able to see the motion of the clouds within the sky.

References

1. "The Clouds Collector's Reference." *The Cloud Appreciation Society*. Web. 19 Apr. 2010. <<http://cloudappreciationsociety.org/collecting/>>.
2. "Cirrus Uncinus - : The Clouds Wiki at Wikia." *Cumulopedia*. 13 Sept. 2009. Web. 19 Apr. 2010. <http://clouds.wikia.com/wiki/Cirrus_uncinus>.

Appendix



Image Assessment Form

Flow Visualization

Spring 2010

Name(s) Allison Hamrick

Assignment: Cloud 2

Date: April 19th, 2010

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

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

Flow	Your assessment	Comments
Clearly illustrates phenomena	+	
Flow is understandable	+	
Physics revealed	+	
Details visible	√	
Flow is reproducible	+	
Flow is controlled	+	
Creative flow or technique	+	
Publishable quality	√	

Photographic technique	Your assessment	Comments
Exposure: highlights detailed	√	
Exposure: shadows detailed	+	
Full contrast range	√	
Focus	+	
Depth of field	+	
Time resolved	+	
Spatially resolved	√	
Clean, no spots	+	

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