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Flow Visualization

Ominous Eye in the Sky

When the day the image was captured, clouds covered the sky but the temperature was approximately 61° F. The sun was being masked by the clouds but was bright enough to form a rainbow effect around the bottom edge. The rainbow effect is called cloud iridescence. Cloud iridescence happens when the sun is positioned behind thin clouds. The thin clouds diffract the sunlight and a rainbow is formed. The different wavelengths are diffracted different amounts and as such appear differently depending on the observers position. The intent of the photograph was to capture this effect in contrast to the clouds around the sun. It was not clear whether the image would come out clearly or not, as the camera was pointed directly at the sun. Several attempts were made to capture the rainbow effect. The image presented was not the most clear but was the best. After looking through several images, it was determined that the final image was more than the sun shining through some clouds. The sun combined with the clouds and the trees form a face. The sun is the ominous eye that is glowing in the overcast sky. The clouds above the sun are the eyebrow, they are bushy so they almost cover the eye. The tree on the lower left is the nose that connect to the eyebrow (the clouds). The trees on the bottom right of the image are the cheek of the face.

The image was taken on Monday February 23, 2009 at approximately 12:30 pm on Norlin quad at the University of Colorado at Boulder. The camera was about 80° from the horizon facing southwest. The cloud was approximately 6500 meters above the ground.

The clouds in the image are cumulus fractus. Cumulus fractus clouds are cumulus clouds that have been separated by strong winds, and usually have irregular patterns. According

to the skew t plot in figure 1 , the wind speed at that elevation is 30 knots[1] or about 15.43 meters per second. The skew t plot seems to show that the atmosphere is stable. The temperature line is steeper than the adiabatic line which means the temperature is growing cooler as the elevation rises than the neighboring air. Cooler air is more dense than warm air so the atmosphere is stable. The wind is blowing in opposite directions between 2000 and 5000 meters. These opposing winds create a shearing effect. The wind is approximately 50 knots at 7350 meters and approximately 30 knots at 5000 meters. The skew t plot seems to suggest that the clouds should be cumulus. With a stable atmosphere it would seem that foehn winds[2] account for the irregular shape of the clouds. Though, it seems that mountain wave could also account for the separation of the clouds. Mountain wave is similar to foehn winds in that they are periodic changes of atmospheric pressure, temperature and orthometric height in a current of air caused by vertical displacement[3].

[1] http://weather.unisys.com/upper_air/skew/details.html
[2] A type of dry down slope wind which occurs on the leeward slope of a mountain range.
[3] Whiteman, C., (2000). Mountain Meteorology. Oxford Oxfordshire: Oxford University Press.

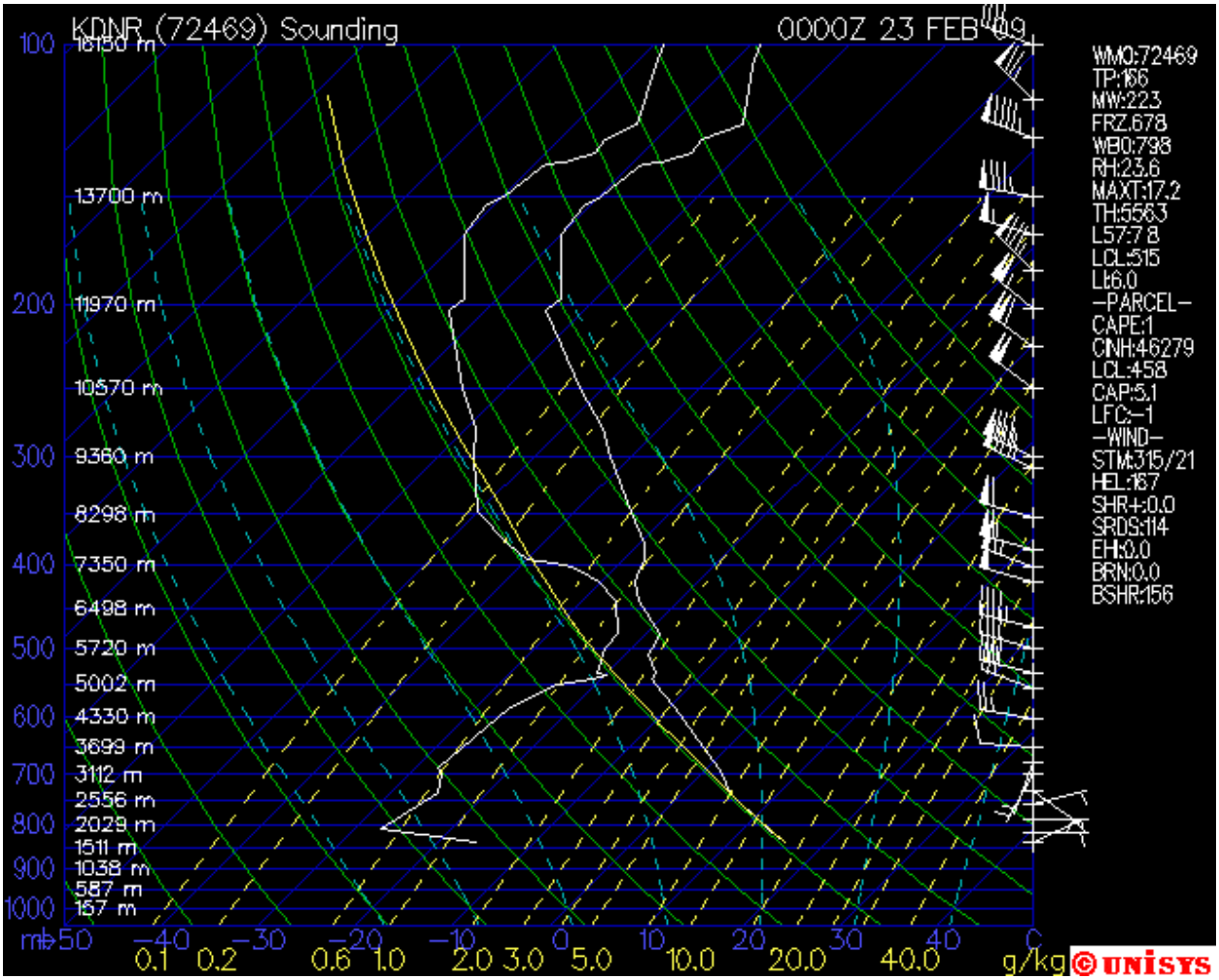

Figure 1 : Skew T from February 23, 2009

The photograph was captured with a Canon DIGITAL IXUS 700 camera. The focal length was 7.7mm. The shutter speed was 1/1600 sec with F/7.1. The ISO light sensitivity was 100. The field of view in figure 1 is 500 m X 500 m. The auto aperture is between 2.8 and 5.6. The cloud was approximately 6500 meters above the ground, thus the object was approximately 6500 meters from the camera. The pixel dimensions of the image are X: 1600 by Y: 1200. The image was darkened in order to see the rainbow effect of the sun.

The image looks to be a ominous face looking down and passing judgment at the students at the university. The fluid physics are demonstrated by the shearing of the clouds. The foehn wind is separating the cumulus fractus from the cumulus and dissipating them across the front

range. The image is odd to say the least. An face judging students seems to suggest that I have hidden guilt or that my catholic school education never ceases to follow me. My intent was fulfilled with the image. The image was darkened several times in Photoshop and it was hard to decide which image was best. Developing the idea further would be difficult, but perhaps on another overcast day we can look for the ominous eye in the sky.

References:

1. McKnight, TL & Hess, Darrel (2000). Foehn/Chinoonk Winds. In, *Physical Geography: A Landscape Appreciation*, pp. 132. Upper Saddle River, NJ: Prentice Hall.
2. Naylor, John (2002). *Out of the Blue:* A 24-Hour Sky watcher's Guide. Cambridge University Press.
3. Whiteman, C., (2000). Mountain Meteorology. Oxford Oxfordshire: Oxford University Press.