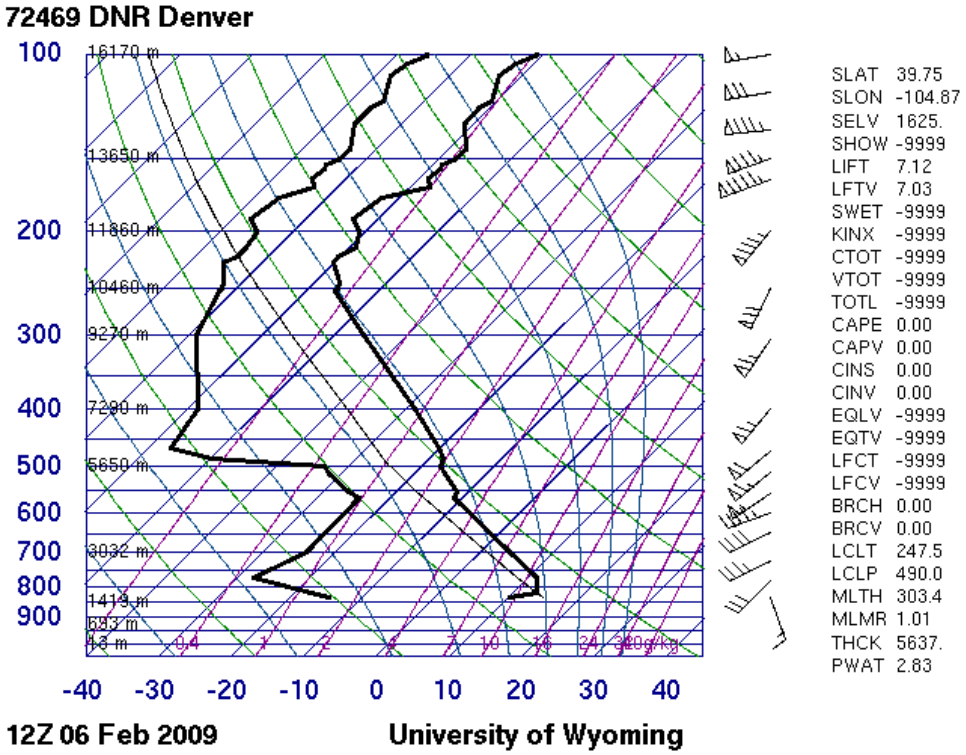
Kevin McCoy
Flow Visualization
Cloud Project

The image portrays altocumulus clouds laced across the sky of the Front Range with trees gracing the foreground. After witnessing the clouds on that particular day, the feature that caught my eye was how flat they were on the underside. I decided I would love to capture this phenomenon and hopefully be able to determine the cause later on.

The photograph was taken at approximately 30th and Colorado in Boulder, Colorado. The camera was pointed north-west and elevated at approximately 25 degrees from the horizontal. The photograph was taken on February 6th at approximately 11AM.

The clouds visible in the photograph are altocumulus due to their puffy nature and their midlevel height of approximately 15,500 ft. The rest of the sky is blue indicating fair weather and no other serious weather patterns. Due to the slope of the air temperature line being steeper compared to the adiabatic line in the skew T plot for Feb 6 the atmosphere should be stable which is not exactly conducive to weather patterns such as clouds but we witnessed clouds nonetheless. The plot's stability helps to explain the clear blue skies and otherwise calm atmosphere. There may have been more unstable behavior at the exact time of the photo since the skew T plots are only available every 12 hours and the closest one to our shoot time (below) was still off by 5 hours. Therefore the behavior of the lines in the plot could be very different at 11AM then they were at 6AM. The skew T plot is also for Denver and while Boulder is close to Denver, the weather patterns may certainly be different. The point where the dew point line and the air temperature line come closest is most likely where the clouds are occurring, thus the estimate of the cloud elevation of 15,500 ft.



Skew T Plot of Denver on Feb 06 at 6AM.

Size of the field of view	44,814 X 30,000 ft.
Distance from object to lens	36,676 ft.
Lens focal length	66mm
Lens specifications	18.0-135.0 mm f/3.5-3.6
Type of camera	Nikon D80 Digital SLR
Original Image Size	3872 X 2592
Final Image size	3872 X 2592
Aperture	F/6.3
Shutter Speed	1/640 second
ISO Setting	100

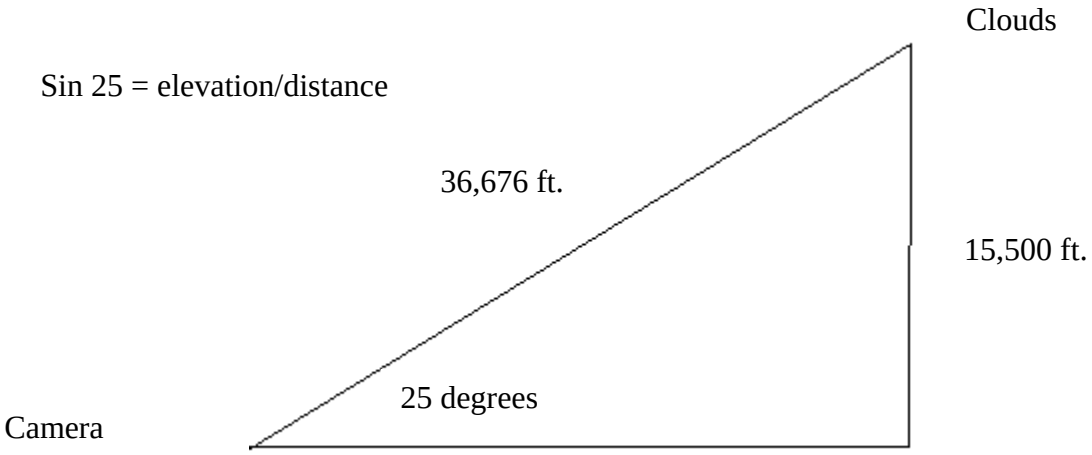


Diagram describing how distance from object to lens was calculated.

The photo was not edited in any way in Photoshop or any other photo modification software.

I thought the image captures the flatness of the bottom of the clouds quite well and fulfilled my intent. The lifted condensation level represents the height at which air being lifted dry adiabatically will become saturated because of adiabatic cooling and condense into clouds. This level approximates the level of the cloud base. This consistent factor caused the elevation of the base of the cloud to be similar across its span, thus creating its flat appearance.

I like the clouds themselves, but I also like their setting above the tree line and mountains in the background. I also like how the trees came out so dark, contrasting with the white clouds. I think the mountains could have been more pronounced as they almost blend into the trees. For future improvements, I think framing the clouds with either trees or the mountains, rather than trying to combine both will enhance the image and decrease confusion. I also believe the image could have been improved by trying to include even more of the skyline, attempting to show that more clouds have the same base elevation. In order to develop this idea even further, a superior vantage point would help immensely. It's incredibly difficult to estimate elevation from ground level but if the photo were taken from LCL height in an aircraft, then the phenomenon could be captured with much more vivid detail.

References:

Lifted Condensation Level, http://en.wikipedia.org/wiki/Lifted_condensation_level

Skew T Plot, http://weather.uwyo.edu/upperair/sounding.html

Cloud Information, http://www.colorado.edu/MCEN/flowvis/links/index.html