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Clouds 1

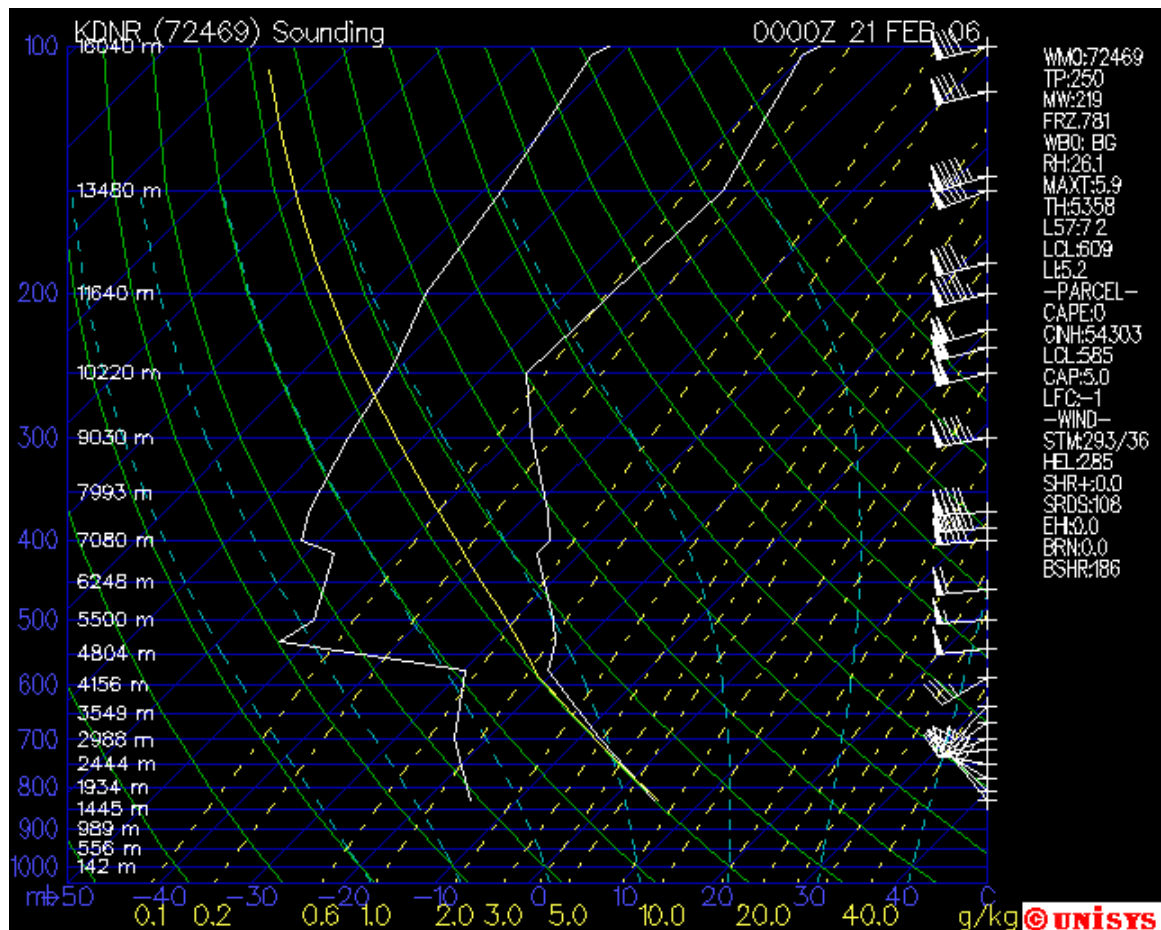
The intent of this photograph is to show the phenomenon of mountain waves common to the Front Range, while doing so in a dramatic way. The picture was taken on February 21st, 2006, around 2:30 PM, from the visitor information center off of Highway 36 coming into Boulder. This vantage point provided a view reasonably free of obstruction and allowed most of the original image content to be retained. The camera used was a digital Nikon D50, 6 Megapixel with a focal length of 38 mm, an f number of f11, and an exposure time of 1/500th of a second. Time and Spatial resolution were not an issue since the clouds were very far away and were moving slowly relative to their distance from the camera.

Once the original was taken, it was modified using Adobe Photoshop to create an increased amount of contrast and color using the Equalize feature and the Underwater Filter at 25% density. The picture was then cropped to a final size of 3008 X 1959 pixels.



The formations shown are altocumulus clouds at a height of about 4.5 kilometers from the ground as indicated by the Skew T plot below. The clouds are caused by air moving East over the mountain ranges. As the air rises above one ridge line, the temperature drops with the increased altitude, and the water stored within the air mass condenses,

forming a cloud of water droplets. The air then drops into the lower elevations, regaining some of its former moisture. This region can be seen as a space between the clouds. The moving air mass carries quite a bit of momentum along with it in its downward motion, so overshoots the optimum elevation for its density. As a result, an upward restoring force is generated, pushing the air mass back to such a height that water again condenses and forms another cloud mass. This behavior of climbing and falling continues, creating the formation of clouds known as mountain waves. This phenomenon can be thought of in mechanical terms as being a 2nd order damped mass-spring system. According to the Skew T plot for that day, the sky was stable at low altitudes where these clouds were to be found.



http://weather.unisys.com/upper_air/skew/skew_KDNR.html

- used to gather Skew T information and plot