Temperature Inversions in Colorado – What are they and What do they mean?

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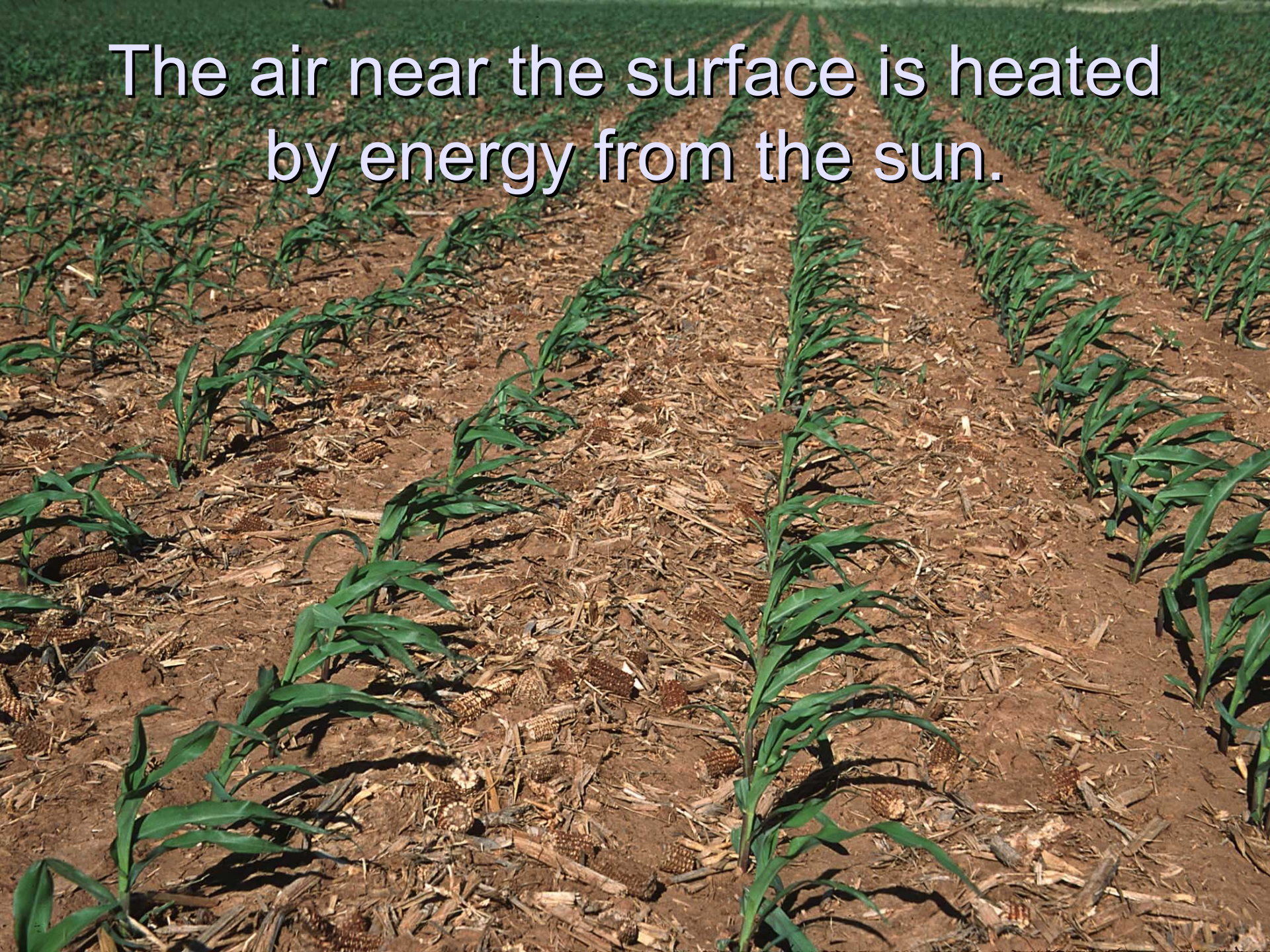
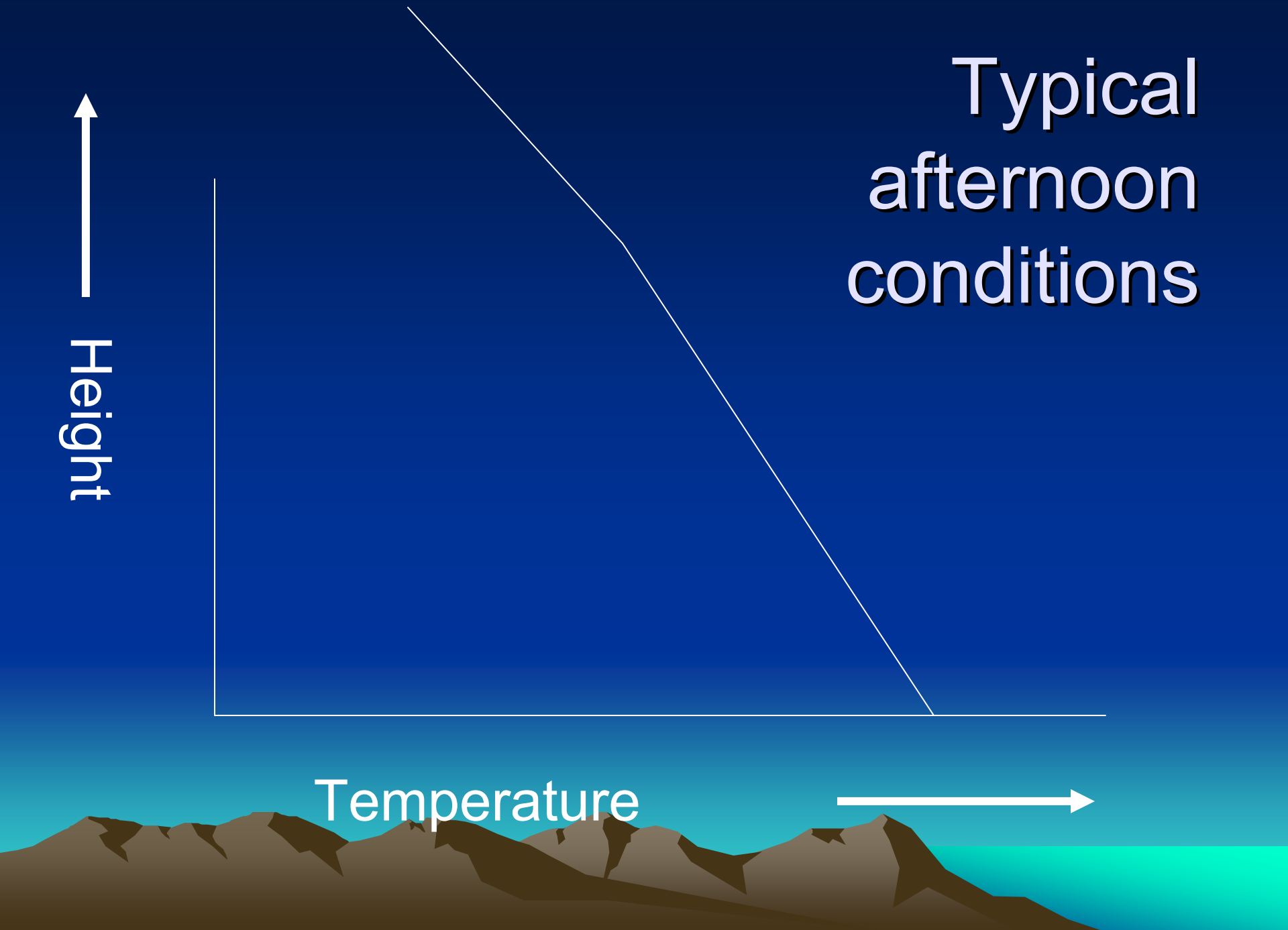
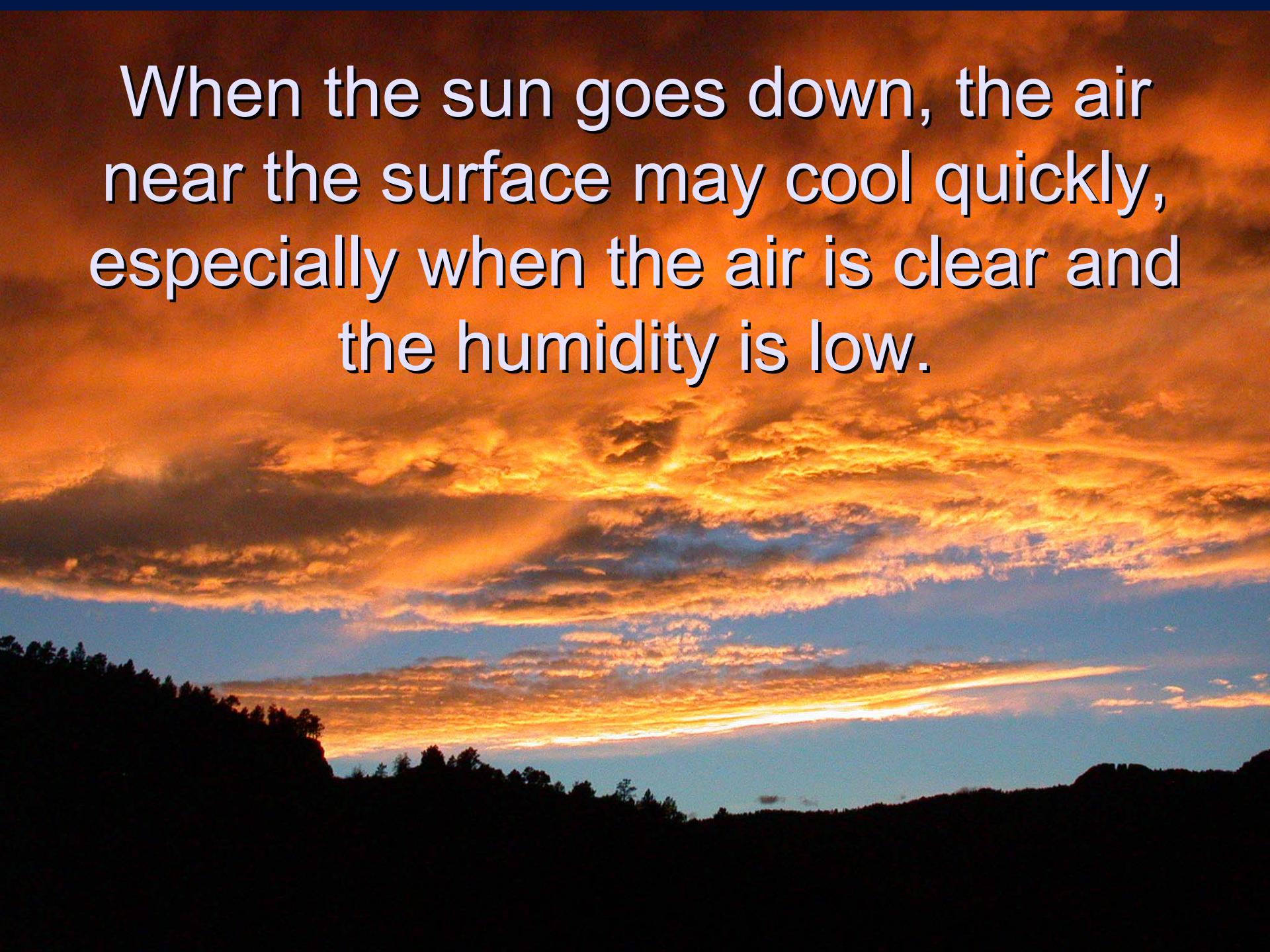
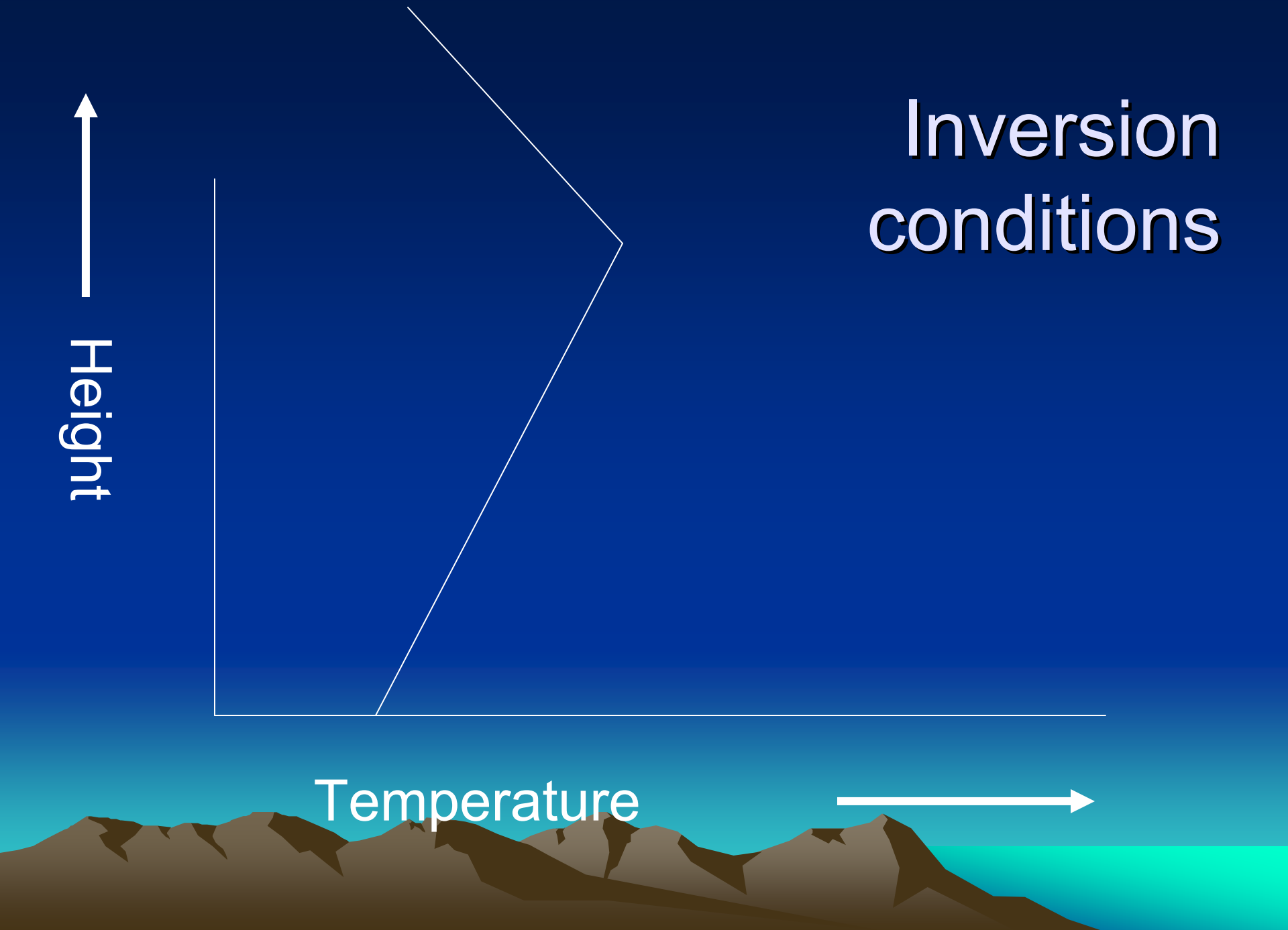

The air near the surface is heated
by energy from the sun.

Typical afternoon conditions




When the sun goes down, the air near the surface may cool quickly, especially when the air is clear and the humidity is low.

Inversion conditions



Inversions

- Air temperature typically is cooler as you go away from the surface.
- When the air temperature is warmer aloft – inversion

- Stability – will the air mix or not?

Inversion conditions

- Clear skies
- Calm winds
- Dew or frost
- Smoke not rising
- Dust hanging over a road
- Often form in low areas
- Winter a regular feature

Stability

- Stability conditions affect the dispersion of spray by the wind

Stability

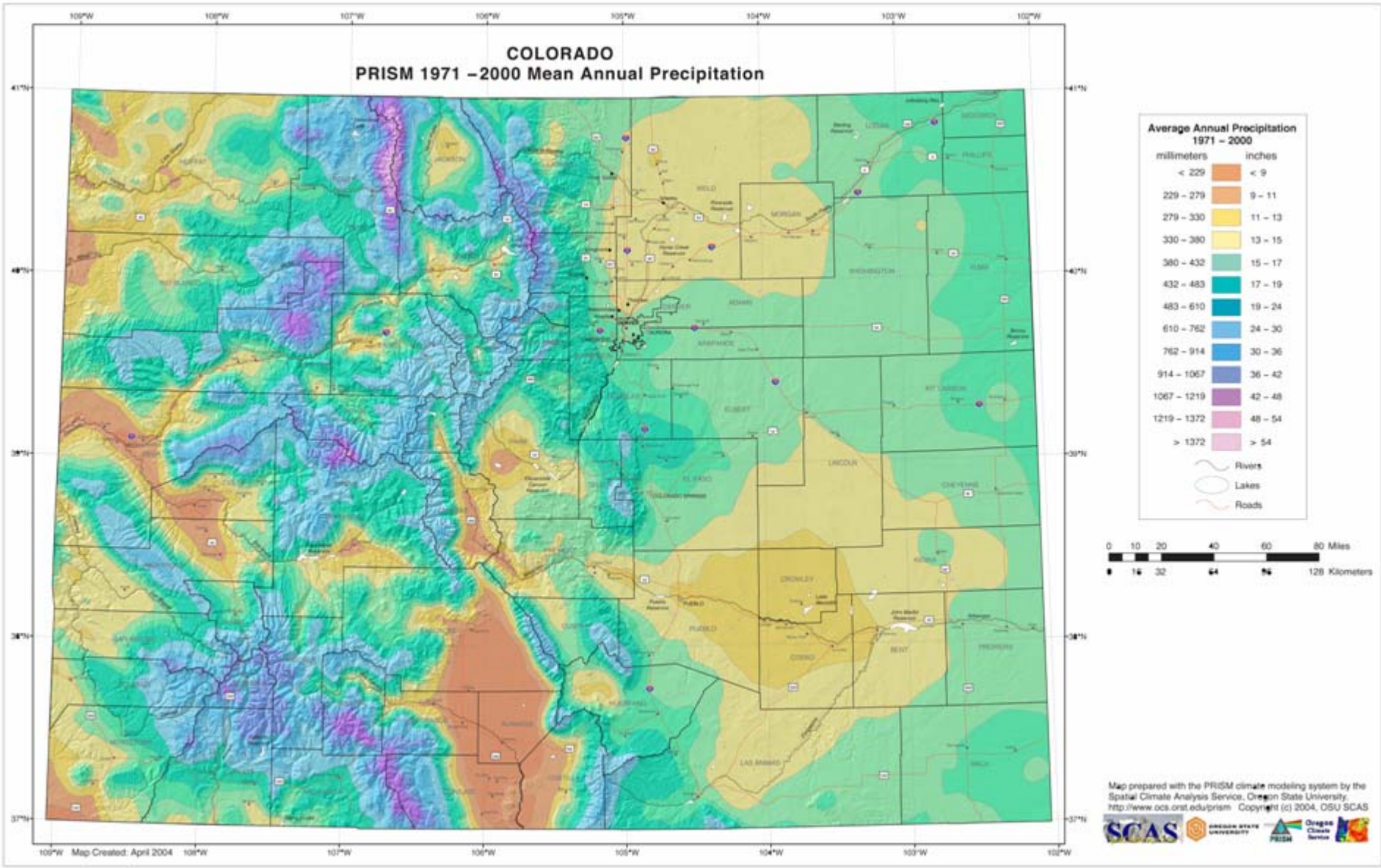
3 categories

- Unstable (air cools with height)
- Neutral
- Stable (air rises with height)

There are many situations that cause “inversions” in the atmosphere, but the ones that affect agricultural spraying the most are surface inversions – air that is coldest near the ground and warms with height for dozens to hundreds of feet.

The climate and topography of Colorado are very conducive to the formation of inversions. This is especially true in large mountain valleys such as the San Luis Valley, and in most river valleys where many of Colorado's crops are grown.

Colorado Average Annual Precipitation



The Life-Cycle of a Surface Temperature Inversion.

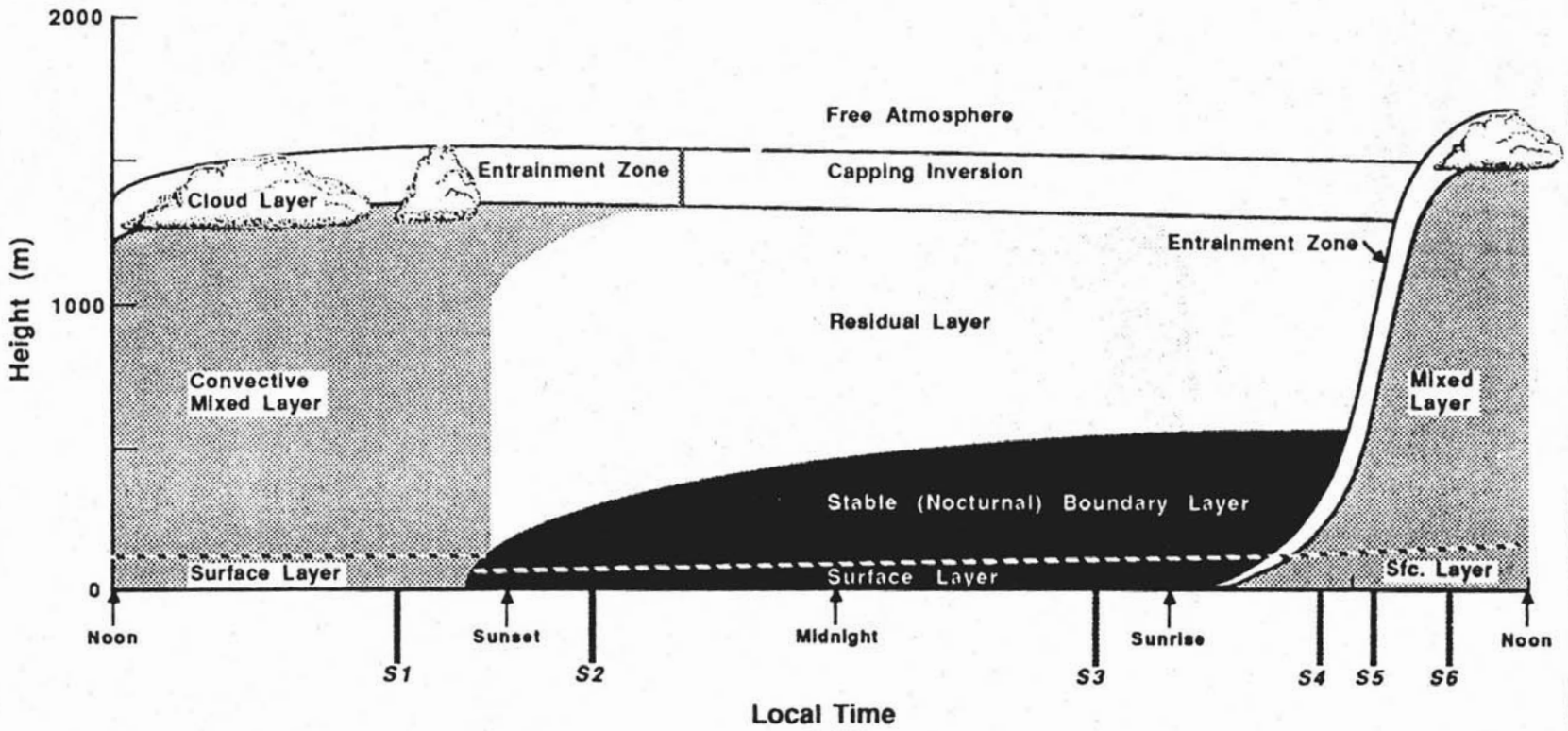
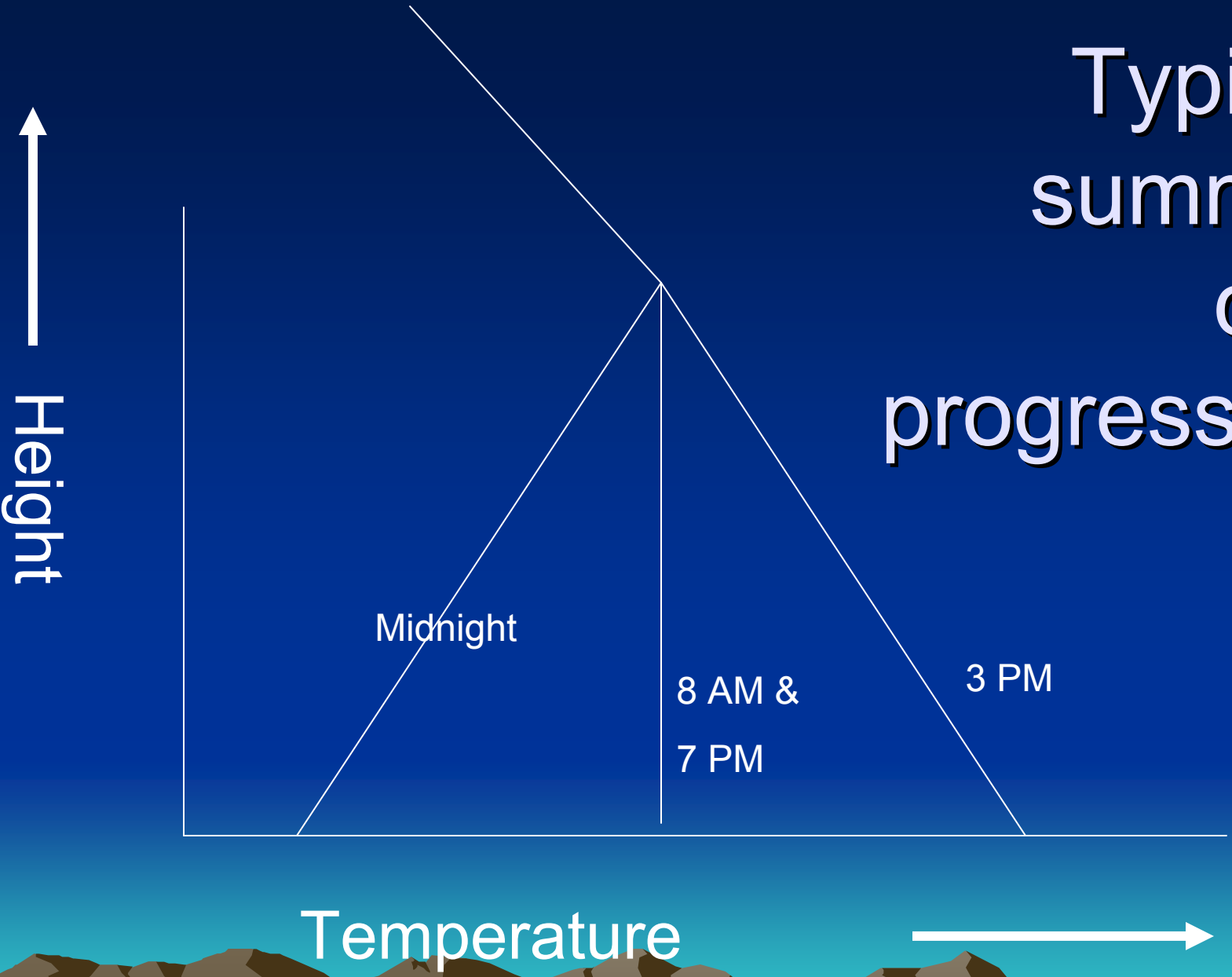


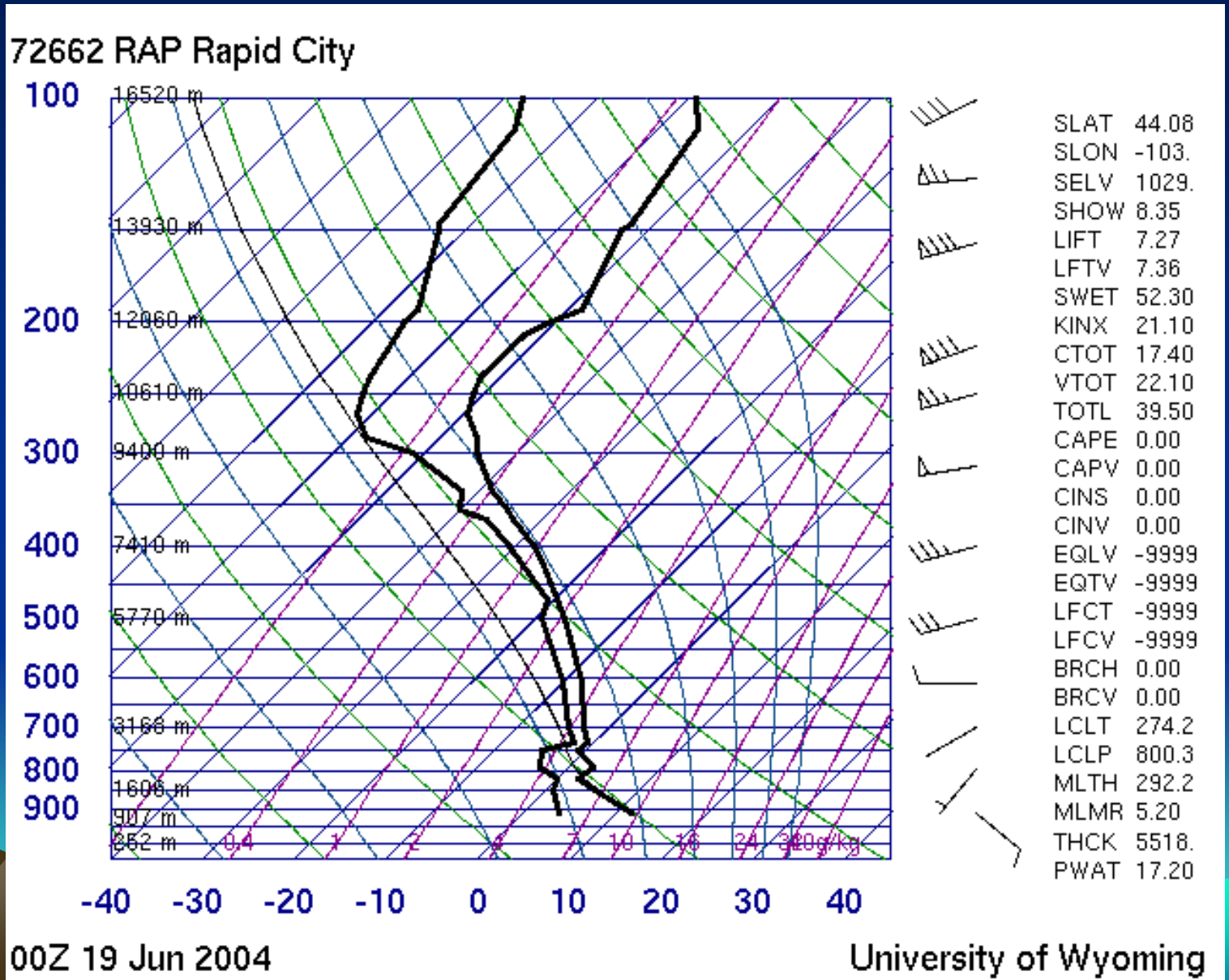
Fig. 1.7 The boundary layer in high pressure regions over land consists of three major parts: a very turbulent mixed layer; a less-turbulent residual layer containing former mixed-layer air; and a nocturnal stable boundary layer of sporadic turbulence. The mixed layer can be subdivided into a cloud layer and a subcloud layer. Time markers indicated by S1-S6 will be used in Fig. 1.12.

(from Stull, 1988)

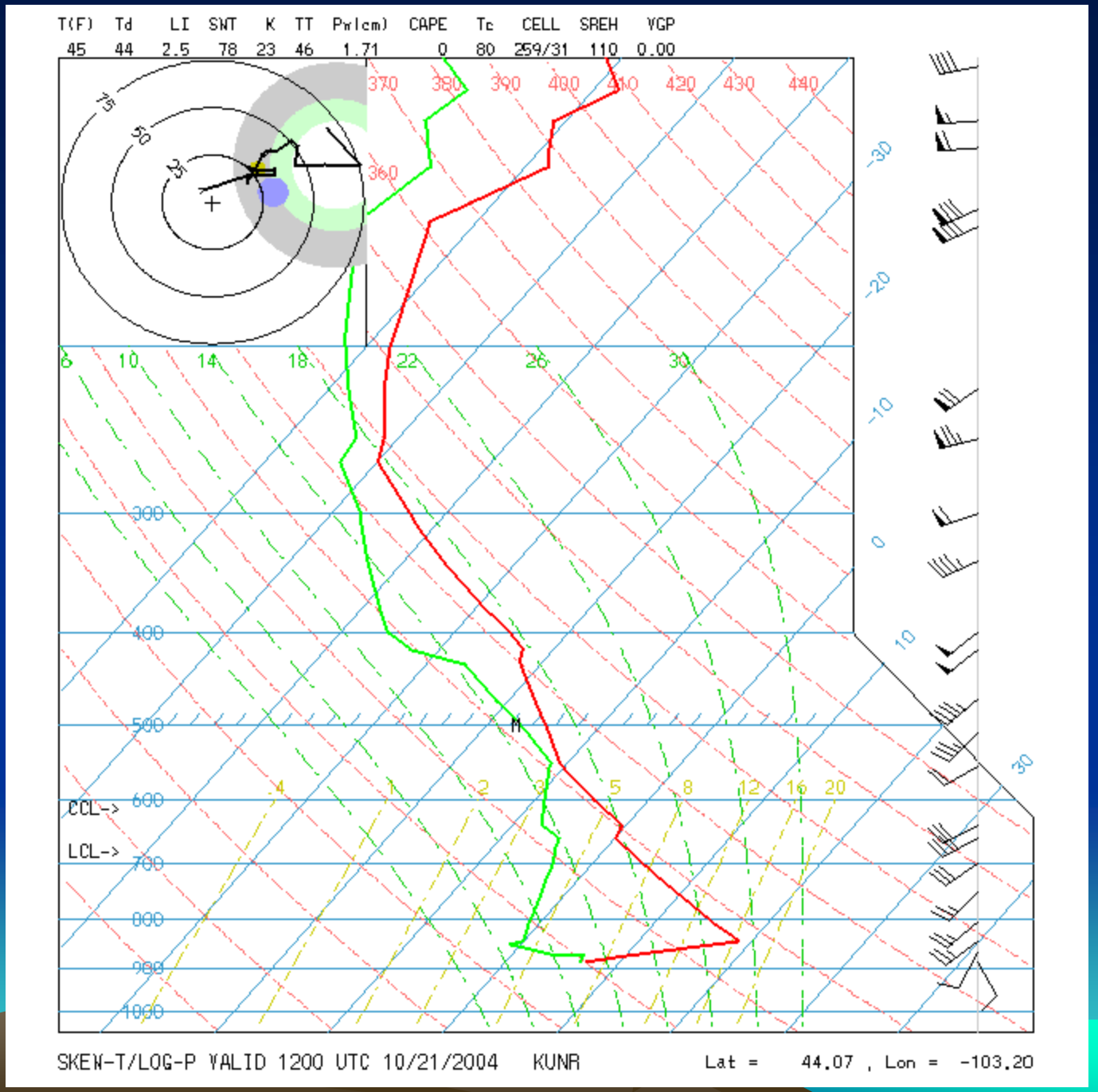
Typical summer day progression



Non-Inversion



Inversion condition

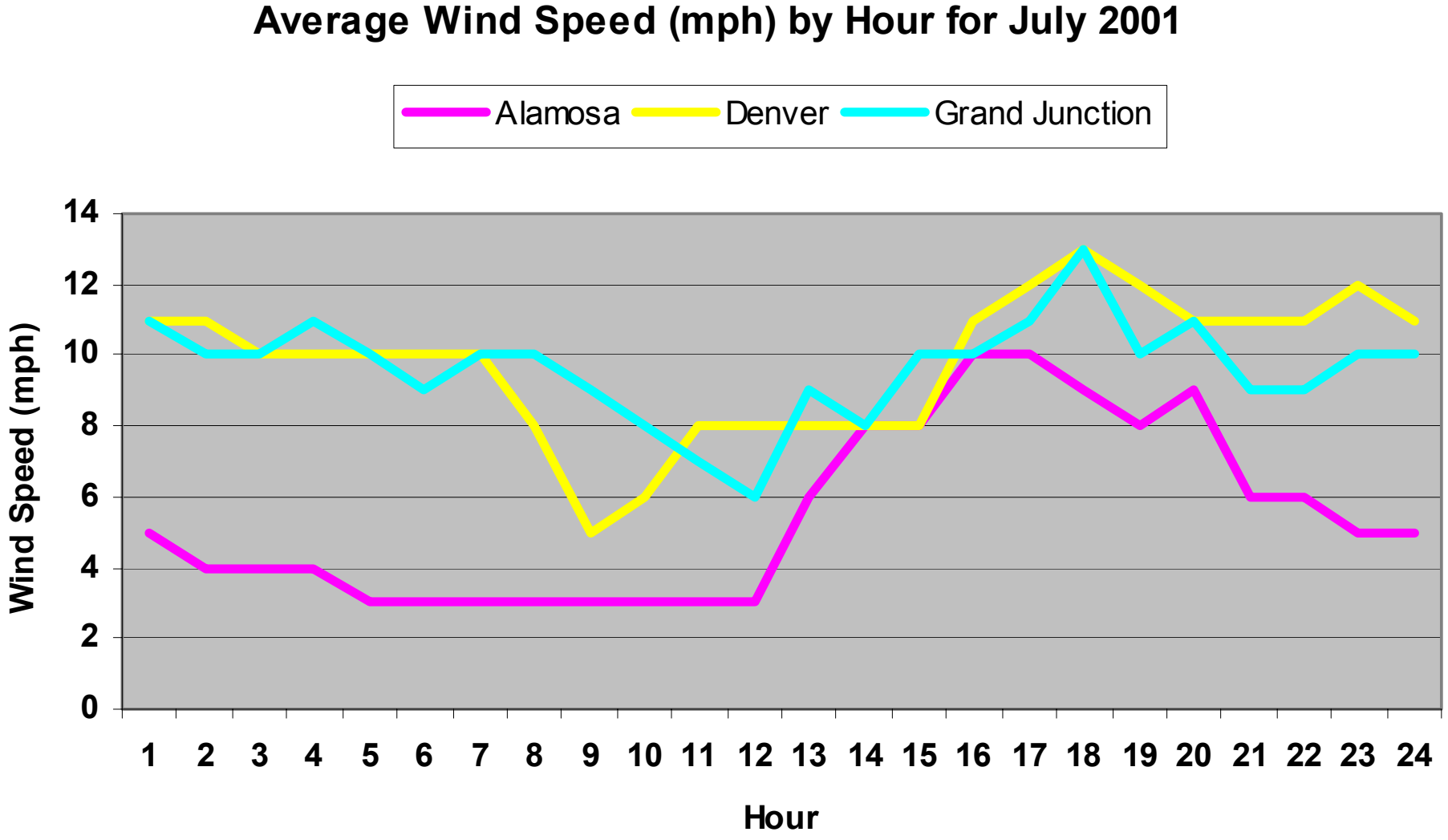


In Colorado, balloons are launched twice daily at Denver and Grand Junction. These data are publicly available online.

- http://www.rap.ucar.edu/weather


But you don’t need weather balloons to detect inversions.

Knowing local wind patterns is also key to understanding inversions.



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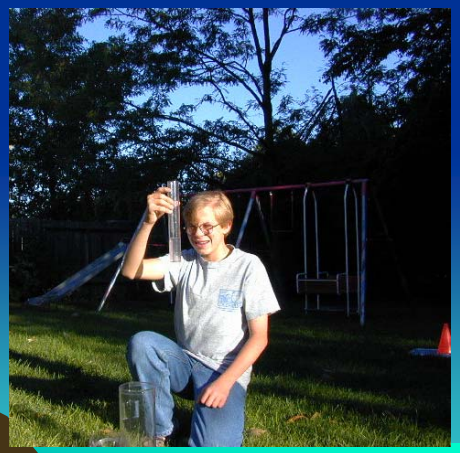
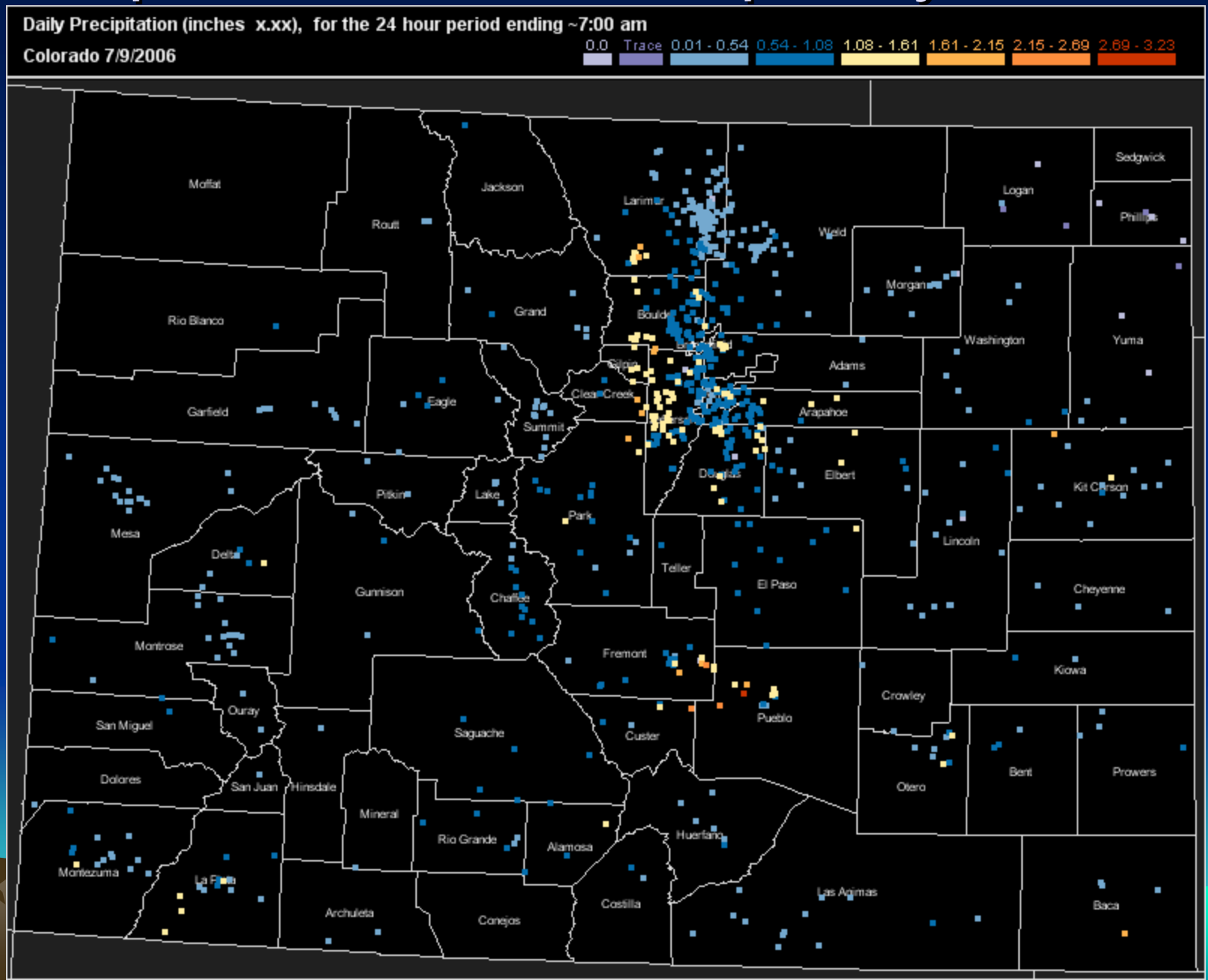
Community Collaborative Rain, Hail and Snow Network

www.cocorahs.org



Example CoCoRaHS Map, July 9, 2006



Colorado Climate Center
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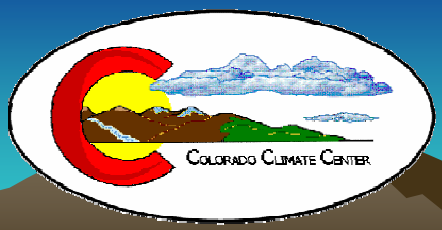
- ***Data and Power Point Presentations available for downloading***
- http://ccc.atmos.colostate.edu

  click on "Drought"

  then click on "Presentations"



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