

Name/s: _____

Facets and hoar: I got 99 problems but a low temperature gradient is not one of them

A concept story problem

Fill in the blank or select the right term

Faceted snow crystals form in the snowpack when there is a high (or large) temperature gradient. A temperature gradient is simply how fast temperature changes over a certain distance within the snowpack. This is important because warm air holds more (more/less) water vapor than cold air. This means that temperature gradients also create vapor pressure gradients- more water vapor in one place than another. When gas is concentrated it wants to diffuse--move from areas of high (high/low) concentration to areas of low (low/high) concentration. When water vapor rapidly (rapidly/slowly) diffuses it changes rounded crystals into faceted ones, or strong (strong/weak) snow into weak (strong/weak) snow. In other words, temperature gradients create potential unstable (unstable/stable) layers. That's why we need to pay attention to the temperature and vapor pressure gradient.

Surface hoar forms at the snow surface under clear (cloudy/clear) skies, calm (gusty/calm) winds, when the air is humid (dry/humid), and when the snow surface radiates more longwave (longwave/microwave) radiation than is incoming from the atmosphere (typically in the shade or at night). This results in a temperature inversion (conversion/inversion), where the snow surface becomes very cold (warm/cold) relative to the air above it. We now know that warm air holds more water vapor than cold air, and therefore the vapor from the air above the snow will condense (deposit/condense) onto the surface of the snow, forming surface (surface/depth) hoar.

vapor to

We all know that cold air, which is denser than warm air, sinks (sinks/rises). So, on cold, clear nights cold air will pool (pool/hot tub) in the bottom of a valley or a mountain basin. When an air mass cools, it becomes more humid (salty/humid), and therefore surface hoar tends to form more at lower (lower/higher) elevations - and not nearly as much on mountaintops or ridges. This is a tricky situation (tricky situation/risky business), because normally we expect higher avalanche danger the higher we go on a mountain because there's more snow and more wind (wind/reindeer). But with surface hoar as a weak-layer there's counter-intuitively more danger at lower elevations.