

## **Amplified Water Vapor Feedback at High Elevations during Winter**

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In recent decades, several high altitude regions around the globe have experienced large warming trends during winter which are often higher relative to the trends in other seasons. Increases in the atmospheric water vapor and its role in amplifying the surface longwave heating in these regions have been suggested to be partially responsible for this enhanced wintertime warming. Results from a radiative transfer model demonstrate that, during winter, much greater increases in downward longwave radiation occur in high altitude regions, relative to low altitude regions, for similar increases in the lower atmospheric water vapor. This occurs because downward longwave radiation is very sensitive to atmospheric water vapor at high elevations, owing to a greater degree of optical under-saturation in the longwave absorption at these altitudes. Also discussed are observational relationships between downward longwave radiation and humidity at high elevation sites (>11,000 ft) in the Colorado Rocky Mountains. These relationships show the existence of large sensitivities between the two variables during winter at these elevations.