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Mountain Permafrost – a valid archive to study climate change? - Examples from the Rocky Mountains Front Range of Colorado, USA

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Mountain permafrost is highly sensitive to changing air temperatures as they affect both, thawing depth of the annual active layer as well as time and speed of the refreezing process mainly in the winter.
The long term ecological research site (LTER) Niwot Ridge and the Critical Zone Observatory site (CZO) Green Lakes in Colorado USA with their high alpine tundra climate and vegetation offer ideal conditions to study changes of mountain permafrost. The sites enable high quality climate data together with studies on permafrost since the 1970's which make these places rather unique throughout the world. We present data from our studies on permafrost distribution using different geophysical techniques to portray the shallow subsurface. The data on permafrost and soil temperature are compared with existing models of permafrost distribution and possible thermal degradation as well as with older data on the existence and distribution of permafrost at these sites.
At some locations we find large differences versus the older data and the prognostic model. Sites formerly indicated as permafrost in the 1970's merged towards sites with annual ice lenses nowadays. We discuss the results and try to answer the question if the observed change is a direct consequence of nowadays rising air temperatures.