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CRYOSNOW – An approach for mapping and simulation of mountain permafrost distribution based on the spatial analyses of perennial snow patches

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The identification of mountain permafrost phenomena and their spatial distribution as well as the monitoring of environmental changes in permafrost areas is essential for an assessment of natural hazards in high mountain regions. For a large scale detection of permafrost areas remote sensing techniques are practicable. However, the thermal ground regime is not directly observable by remote sensing sensors, thus the mapping of permafrost rely on surface indicators.

The present approach of an identification of mountain permafrost is based upon the spatial distribution of perennial snow patches which can be easily detected by remote sensing techniques. At the end of the late summer widespread remnants of snow cover suggest low or negative ground temperatures underneath. Hence, the frequent occurrence of perennial snow patches may imply the existence of permafrost in the immediate vicinity.

In the present study the spatial distribution of perennial snow patches during different years was checked and mapped by the application of air photographs. Using a statistically approach based on parameters as topography, terrain orientation and altitude it was analysed, to what extend the spatial density of perennial snow patches is appropriate to forecast the spatial distribution of permafrost.

The quality of the simulation was tested in regard to characteristics of geomorpho-

logic, hydrological, and physical permafrost indicators as rock glaciers, ice cored debris and moraines, surface temperatures and bottom temperatures of the snow cover (BTS) as well as temperatures and electrical conductivity of melt water.

First results document that the simulation approach produces a significant approximation to determine the lower limit of discontinuous permafrost areas.

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