



Permafrost investigations in the Rila and Pirin Mountains, Bulgaria

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This study assesses the possible occurrence of permafrost in the Bulgarian highest mountains using thermal and geophysical measurements. Although both Rila and Pirin Mountains rise to nearly 3000 m, the possibility of permafrost occurrence in these mountain ranges has not been investigated so far. Generally, in marginal periglacial environments, permafrost occurrence is patchy and highly dependent on site-specific characteristics. However, the conditions of enhanced preservation of permafrost in marginal periglacial environments as in the case of the highest mountains in the Balkan Peninsula, are still poorly understood.

A total of 20 thermistors were scattered on the surface of ten selected rock glaciers in the Rila and Pirin Mountains to examine the near-surface thermal regime and to determine whether the microclimatic factors at the ground surface are suitable for hosting permafrost. Measurements of the bottom temperature of the winter snow cover were performed at the end of cold season, whereas the temperature of several springs seeping from rock glaciers was measured in late summer. All the thermal measurements were conducted during two different hydrological seasons (2016-2017 and 2017-2018). Conventional geophysical investigations (electrical resistivity tomography and ground penetrating radar) were used to get subsurface information regarding permafrost occurrence within the selected rock glaciers and talus slopes.

The preliminary thermal and geophysical results revealed that patches of relict permafrost may occur at altitudes above 2400-2500 m where the pronounced shadow effect of the ridges and the actual climatic conditions allow the preservation of long-lasting snow patches. Based on our observations and measurements the sites where permafrost is probable to occur are characterized by large boulders at the surface, reduced income of solar radiation and a very efficient cooling effect of the blocky surface.

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