In this research, the importance of the avalanche hazard zoning implementation in Russian Arctic mountain regions is discussed on the example of Khibiny Mountains. First, we applied internationally-accepted Swiss avalanche hazard zoning approach (BFF/SLF, 1984) when avalanche hazard zones were indicated according to avalanches return period and impact pressures. Second, avalanche risk in the large scale was assessed using the approach developed by Komarov et al. (2016).The avalanche hazard zoning and risk maps was developed through the following steps: (1) analysis of terrain using large-scale topographic maps and DEMs; (2) analysis of climate and snow data; (3) analysis of historical and recently obtained avalanche events since 1930th; (4) analysis of remote sensing data (5) winter and summer field work: detailed topographical and forests structure and state check; identification of snow conditions and avalanche activity; (6) avalanche release zones and the corresponding avalanche fracture height indication depending on the avalanches return period; (7) analysis of applied avalanche protection measures and their reliability; (8) numerical simulations of snow avalanches using avalanche dynamics program RAMMS; (9) avalanche hazard and risk zones indication depending on the avalanches frequency and intensity, type of the land use. The numerical simulations were performed for understanding the avalanches dynamics (runout distances and impact pressures) and were applied as a basis for the avalanche hazard zoning.

The developed large-scale avalanche hazard zoning and risk maps were analyzed in respect to already constructed infrastructure and applied avalanche protection measures. The criteria for determination of the boundaries between the zones with different level of avalanches hazard and risk can be discussed. However, incorporation of avalanche hazard and risk zoning as a component of land use planning in Russian Arctic fulfills the requirement of legislation and helps to increase safety of people and decrease avalanche risk and consequences of emergency situations.

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Geophysical and glaciological investigations for safety arrangements in the area of Progress and Mirny stations and the Bunger Oasis field base (East Antarctica) during the field seasons of the 63-64 RAE (2017/2019)

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The principle task for the Russian Antarctic Expedition (RAE) as well as for all logistic organizations, which work in Antarctica, is related to the safety of personal, vehicles and aviation. The most important point is connected with applied investigations near the stations, field bases and along the glacier routes, including ice and snow-strip. RAE pays special attention to the safety issues. For this reason, since 2012 multidisciplinary investigations, including GPR, have been performed in the area of Russian stations Progress and Mirny (East Antarctica). These works were focused on to study crevasses, especially their revealing, studying and future evaluation. For solution of this complicated practical and scientific problem GPR technique is believed to be the most reliable geophysical method. Some works based on this methodology were accomplished in the area of stations Progress and Mirny and, in addition, in Banger Hills oasis in the period of 63 and 64 RAE (2017-2019). The research was focused on safety arrangements for using the snow-strip, which was built nearby the Mirny Station in the area of crevasses. Moreover, it was related to finding the reliable place for the new snow-strip. In Progress Station our investigations were connected with searching of a new way on Dålk Glacier around the dip that was formed due to the outburst of the intraglacial lake. This depression destroyed the route between the station, the aerodrome and start point of the logistic traverse of the Vostok Station. Geophysical works in the Banger Hills were carried out in 2019 in order to find the reliable place for new airfield.

The role of avalanches in the restoration of the Kolka glacier

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The object of study - the Kolka Glacier - is located on the side ridge of the Central Caucasus. The glacier is known for its catastrophic events — large-scale moves and glacial landslides. This glaciological object can also be considered unique due to the fact that despite the general degradation of the Caucasus glaciation, the Kolka glacier is rapidly gaining mass. Due to the rapid recovery of the glacier, the repetition of previous catastrophic events is possible, and that is why it is necessary to constantly monitor its condition. It's safe to assume that such rapid rates of recovery occur due to the significant share of avalanche feeding that the glacier receives from the steep rock framing of the town of Dzhimaray-Khokh.