

Comprehensive assessment of avalanche hazard in the Paratunka river basin (Kamchatka peninsula)

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Abstract [PDF RUS](#) [PDF ENG](#) [Full text](#) [PDF RUS](#)

Abstract. This paper presents a comprehensive assessment of avalanche hazard in the Paratunka river basin (southeastern Kamchatka), one of the most avalanche-prone yet promising regions of the peninsula for the development of ski tourism. Based on statistical analysis of archival avalanche data for the period 1947–2026, as well as an analysis of relief, climate, and snow cover characteristics and GIS modeling, the main patterns of the avalanche activity were identified. It was established that more than 60 % of destructive avalanches formed on the slopes of Viluchinsky volcano, where avalanche events with volumes of up to 2 million m³ and runout distances exceeding 5.5 km were recorded. An avalanche hazard map was developed using the Weighted Linear Combination (WLC) method and four predictors (slope angle, relative altitude, vegetation cover, and absolute altitude). Model verification showed that 53.9% of the basin area (812.3 km²; total area – 1507 km²) belongs to avalanche-prone zones, with high (22.9 %) and moderate (16.8 %) hazard areas predominating. The remaining 46.1% of the territory was classified as geomorphologically unsuitable for avalanche formation (with slope angles <15° and >60°). The developed map outlines the spatial distribution of potential avalanche release zones and provides a scientific and methodological basis for planning tourism infrastructure, optimizing transport routes, and minimizing avalanche-related risks.

Keywords:

snow avalanches, avalanche hazard, Paratunka river basin, Kamchatka, GIS modeling, Weighted Linear Combination, volcanic slopes

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