

## Surface morphological types and spatial distribution of fan-shaped landforms in the periglacial high-Arctic environment of central Spitsbergen, Svalbard

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Landforms, which shape reassembles fans and cones, are a characteristic element of the mountain landscape of Svalbard Archipelago in the high-Arctic. In this research, we focus on small fans (including alluvial fans, debris-flow fans, talus cones, and different mixed types) that developed along mountain sides on Svalbard and which varied greatly in geomorphology and processes. The study was carried out in the central part of the Spitsbergen Island (Petuniabukta region).

Fan-shaped landforms developed along the valley sides and fiord margins of the Petuniabukta region. They were unevenly distributed over the study area, with the highest concentration to the east and north of Petuniabukta. In total, 297 fans were mapped and classified according to the dominant processes shaping their surface: 1) Colluvial fans (n=229) with surfaces modified by rockfalls and snow avalanches; 2) Alluvial fans dominated by debris flows (n=49), with traces of recent levees and lobes visible on their surfaces. 3) Alluvial fans dominated by fluvial flows (n=19), with morphology characterized by streams and braided channel networks. The character of the surfaces was assessed based on various remote sensing data and verified during the fieldworks.

Colluvial fans were the most common within the studied area, followed by debris-flow-dominated fans, and a much smaller number of fluvial-flow-dominated fans. The uneven spatial distribution of fans was probably to some extent influenced by the topography of the area. A larger number of fans, which were located in the eastern and northern part of the studied region, is potentially related to the existence of a larger number of post-glacial valleys, which were also longer and wider than valleys along the western coast of Petuniabukta. Therefore, the topographic conditions for fan development (i.e. space for their growth) were more favourable there.

Colluvial fans were the smallest and steepest, whereas debris-flow-dominated and alluvial-flow-dominated fans were significantly larger and characterized by a gentler slope. Moreover, the catchments of colluvial fans were much smaller in comparison to the large catchments of fluvial-flow-dominated fans. Other morphometric properties of both fans and catchments also differed according to type. The presented data will be used for a further in-depth analysis of the relationship between the surface morphology of fans, dominant processes, and morphometric variables.

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