

HANS GLACIER, SVALBARD 1:25,000

(Aerial photogrammetric map)

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The Hans Glacier is a grounded tidewater glacier which lies at the northern shores of Hornsund, South Spitsbergen, in the vicinity of the Polish Polar Station. The glacier extends from sea level to approximately 600 m a.s.l. and covers an area of about 57 km². Its length is about 16 km, the mean slope angle 1.5°. The glacier tongue is about 2.5 km wide and terminates as a 1.5 km long ice cliff. The lateral parts of the front are based on land. The glacier thickness increases gradually from the lower part of the ablation area zone (150–200 m) towards the middle part of the glacier, where it is about 300 m. The maximum ice thickness exceeds 400 m.

The mass balance of the Hans Glacier has been measured since the winter season of 1988/1989. The average net balance of the Hans Glacier is -0.52 m w.e. (including mass losses due to calving). Mean winter balance of the glacier surface is +0.9 m w.e. and mean summer balance -1.14 m w.e.

The dynamics of the lower part of the glacier has been monitored systematically by means of terrestrial photogrammetry since 1982. The glacier surface velocity in the profile located ca. 0.5 km from the ice cliff is about 60 ma⁻¹ (averaged for the profile). In the upper part of the ablation zone, the velocity is about 30 ma⁻¹ at the center-line. The average velocity near the calving front exceeds 210 ma⁻¹. The mean annual calving speed is about 250 ma⁻¹ and annual calving flux amounts to 22 x 10⁶ m³. The mean annual retreat of the terminus, averaged over the whole ice cliff, is about 40 m. Glacier fluctuation and later mass balance data were repeated in the previous edition "Fluctuations of Glaciers" and "Glacier Mass Balance Bulletin". The glacier surface has decreased by about 2 km² due to cliff recession in the period 1936–1990, and farther 2.5 km² until 1994. The volume loss due to this recession is 0.13 km³. The major decrease of the glacier volume by 1.2 km³ has resulted from a general lowering of the glacier surface. The mean decrease rate of the ice thickness averaged over the whole glacier is 0.44 m of ice per year. This indicates a prevailing negative mass balance in the observation period of 54 years.

The results of ice temperature measurements in shallow and deep (to bedrock) boreholes (1979–1997) and radio-echo soundings (July 1979, April 1997) on the Hans glacier show a subpolar polythermal structure. The glacier accumulation zone consists – with the exception of the uppermost layers which show seasonal temperature fluctuations – within the entire vertical profile of ice at the pressure melting point. However, a cold ice layer is found in the upper strata of the ablation zone. This ice layer varies in thickness and may even be absent in the western lateral part.

The upper layer of cold ice gets thinner along the glacier center-line from the equilibrium line altitude down to the glacier front.

The map of Hans Glacier was prepared from infrared false colour aerial photographs which belong to the Norwegian Polar Research Institute and were taken on the 12th August of 1990. The slides were taken by a Wild aerial camera of the RCZO-type (UAGA-F No. 13138; camera focal length 152.83 mm) at a scale of 1:50,000. Three stereomodels (4058–4055) were applied to compile the map sheet.

The geodetic net was drawn up using the block aerotriangulation method which consisted of 8 models (the block was elongated northwards so that it could be used for the photogrammetric control of Amundsenisen). Identified topographic details of known coordinates were used as matching points. The coordinates of all the points were converted from the Gauss-Krueger system into the UTM system (zone 33X – central meridian 15°E). To adjust the aerotriangulation, 16 points of xyz coordinates, 2 points of xy coordinates and 14 points of z coordinates were used. The following accuracy of aerotriangulation was obtained:

- inner accuracy of the block: $m_x = 3.1$ m, $m_y = 2.95$ m, $m_z = 1.66$ m
- accuracy of the control adjustment: $m_x = 5.65$ m, $m_y = 5.84$ m, $m_z = 2.17$ m, $m_p = 8.13$ m.

The map content was elaborated using analogue methods and a 13-Zeiss-Jena topocart at the scale 1:20,000. The following contour intervals were applied: 10 m for the area not covered by snow and ice, 5 m for the glaciers and snowfields. The following details are marked on the map: ice cliffs, glacier crevasses, glacier moulins, streams and lakes, glacier and snow limits, debris-covered ice, moraines, additional altitude posts. The map also contains the location of marked permanent posts for terrestrial photogrammetric surveys (8–44, 106–107, 201–202, 601–602, 608–609), meteorological stations, environmental and meteorological monitoring stations, hydrometric gauging stations, glacier mass balance stakes, glacier temperature measurement points, the Polish Polar Station. For better demonstration of the relief of the glacier's surroundings a method of "no generalization" of contour lines was used. It means that every contour line on land (and ice) was plotted, even those on very steep slopes. They are so dense in some areas that an effect occurs which allows the simulation of a shadowing technique representing mountain relief.

The autogrammetric fair copy was transformed into slides using the engrave method. The slides were then reduced to a scale of 1:25,000. The geographical names were applied according to the names on topographical maps of the sheets "Torellbreen" and "Van Keulenfjorden" (scale 1:100,000). The map includes some new geographical names (in brackets) proposed by the 1957–1992 Polish expeditions and regularly used in field works.

The map was produced in two colours using raster techniques. The map has got two editions, the first one in 1993 and the re-edition in 1997 especially reprinted for the 7th Volume of the "Fluctuations of Glaciers".

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