

KESSELWANDFERNER 1971; 1:5'000  
(Aerial photogrammetric map)  
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The enclosed map is an intentionally simple topographical map in the scale of 1:5'000 with 5m equidistance of the contour lines. Since the map is to serve as a basis for mass balance and movement studies on the Kesselwandferner (Oetztal Alps), the surveying signals and stakes used have also been entered in the map. The geodetic data, in particular the adjustment of the trigonometric network conceived in 1966 as well as the supplementary surveying for the map have been discussed by Schneider (1976). The coordinates of the signals and stakes appearing on the map with numbers are also contained in the above-mentioned publication.

The composition of the map is based on the photogrammetric survey of Kesselwandferner, carried out on 18 August 1971 as part of an aerial photographic flight of the entire Tyrol by the Bundesamt für Eich- und Vermessungswesen, Vienna, at a medium altitude of 5700m a.s.l.. The evaluation of the aerial photographs and the cartographic processing took place in the photogrammetric institute of the Tiroler Landesregierung, Innsbruck, and were supervised by W.Giersig. The contour line plan for the map was conceived on a WILD A7 autograph, evaluating a total of six stereomodels out of three flight strips. Since only about half of the signals entered in the map could be used as fitting points, additional points had to be taken, evaluated from the aerial photographic flight of all the Austrian glaciers, carried out for this particular region at a medium altitude of 7070m a.s.l. on 7 October 1969. Of an average of 13 fitting points per stereomodel approximately 6 are based on the 1969 flight.

The map contains all the signals and station points of the glacier area; However, only the main points of the network have been denominated. The remaining signals are contained in the supplementary sketch. The positions of all the accumulation and ablation stakes used for movement studies in the 1970/71 budget year have also been inserted on the map. Those stakes which are set back into their original positions in the trans-

verse profiles and the centre-line profile respectively every year have been specially marked. The exact denomination as well as the coordinates of the signals, station points and stakes are given in the above-cited paper.

Since the map is also meant to be a working basis for mass balance studies on Kesselwandferner, characteristic zones of crevasses and marginal crevasses which cannot be identified from the contour line plan have been indicated by thin lines. In addition, the margin between ice and snow and the area free of ice are marked by short strokes, also taking into consideration several areas of snow in the neighbourhood of the glacier. The same holds true for the separation of bedrock and scree or moraine material. The snow line and the firn edge at the time the aerial photographs had been taken have also been evaluated and marked by broken lines and dots and strokes respectively.

In order to keep production costs of the map as low as possible no hatching or shading was applied in the cartographic processing. The contour line plan shows relief due to the small distance between the contour lines and the very steep slopes bordering the glacier. Areas of ice, firn and old snow as well as zones of rock and debris were not tinted particularly and it was, therefore, possible to use two colours only. The ice-free area was printed in a flat black tint, the glaciated region in a lightish blue tint. The areas of old snow and firn outside the glacier were also marked by blue contour lines.

Two foils were, therefore, sufficient for printing because of the simple cartographic representation. So as to save further costs, the entire inscription was made by means of adhesive letters, having the advantage that they can be fitted directly onto the foils. Apart from an orthophoto with printed contour lines the map in question can, therefore, be regarded as one of the possibilities of evaluating and composing simple topographical glacier maps with additional glaciological and geodetic evidence.

In order to underline the glaciological contents of the map, some of the earlier positions of the tongue of Kesselwandferner are represented in the annexed sketch in the scale of 1:25'000 in so far as they allow

comparisons with positions of the tongue of nearby Hintereisferner. Above all, older maps were used for this purpose and where necessary supplemented by data obtained from direct surveys of the glacier fronts, carried out on behalf of the Oesterreichischer Alpenverein and within the framework of the movement studies.

Since the last maximum position around 1850, when the tongue of Kesselwandferner was united with that of Hintereisferner over a distance of 1,4km, there was a continuous recession of the glacier front until 1966. The only exception was an advance of approximately 130m between 1914 and 1922. An essentially stationary state between 1966 and 1969 was followed by a slight advance of 14m until 1971. From 1971 onwards the glacier showed an ever-increasing activity. In 1972 already it had overflowed station point HP 3(33) and in 1974 the two station points HP 1(31) and HP 2(32). A comparison of the state of Kesselwandferner in 1971 with the position of the snout in autumn 1975 gives on average an advance of 66,5m, at the front even of 81m, whereas Hintereisferner shows a recession of 125m for this period of time.

#### REFERENCE

Schneider, H., 1976: Die Karte des Kesselwandfeners 1971 und die Grundlagen der Vermessungen, Zeitschrift für Gletscherkunde und Glazialgeologie, BD XI/2 (1975), p.229-44.