

## REMARKS ON THE ANNEXED MAPS

## 1 Glacier Map of Southern Norway, Scale 1 : 500 000

We are indebted for this map to Dr. Gunnar Østrem, head of the Glaciology Section of the Hydrological Division, Norwegian Water Resources and Electricity Board, P.O. Box 5091, Oslo 3 Norway. The Map is included as a location map in the first volume of the "Norwegian Glacier Atlas", which in accordance with Resolution I-12 of the International Hydrological Decade contains the detailed inventory of glaciers in Southern Norway.

Reference: G. Østrem and T. Ziegler: "Atlas over breer i Sør-Norge" (Atlas of Glaciers in Southern Norway), Norges Vassdrags- og Elektrisitetsvesen, Publication No. 20 of the Hydrological Division, 1969.—

G. Østrem describes this publication as follows:

The detailed inventory comprising glaciers in Southern Norway was initiated in January and completed in December 1969. In the Atlas the glaciers are organized in relation to selected drainage basins and listed in tables comprising information about glacier location, elevation, length, area, etc. An attempt has also been made to estimate their volumes so that a rough figure for the total ice mass can be obtained.

In addition to the lists which were prepared by means of computer techniques, maps are presented of each drainage basin, showing the glacier outline and existing water gauges. Finally a description is given of the various areas together with photographs of typical glacier types within these areas. The original Norwegian text has a complete English version, all captions and legends are also printed in English. The table heads are entirely in English.

In 1973 the glacier inventory for the whole of Scandinavia was completed by the issue of a second volume which contains two further general maps to a scale of 1 : 500 000. Reference: Norges Vassdrags- og Elektrisitetsvesen and Stockholm University, G. Østrem, N. Haaken sen., O. Melander, "Atlas over breer i Nord-Scandinavia" (Atlas of Glaciers in North Scandinavia), Publication No. 22 of the Hydrological Division, Publication No. 46 of the Naturgeografiska Institutionen, 1973.

## 2 Map of the Mattmark Glaciers, Scale 1 : 10 000

This map was used for obtaining the data given in Table 9.3.5. Particulars of surface and volume changes of the Mattmark Glaciers have previously been published in:

D. Lütschg                    Ueber Niederschlag und Abfluss im Hochgebirge, Sonderdarstellung des Mattmarkgebietes, Schweiz. Wasserwirtschaftsverband, Zurich 1926

- D. Lütschg-Lötscher Zum Wasserhaushalt des Schweizer Hochgebirges, Beiträge zur Geologie der Schweiz - Geotechnische Serie - Hydrologie, 4th instalment, I Vol., Part I, 4th Chapter, Kommissionsverlag Kümmerli & Frei, Bern 1944.
- P. Kasser Fluctuations of Glaciers 1959-1965, IAHS, ICSI/Unesco, 1967. Table 16, Parts 1 to 15 (Periods 1932-1946, 1946-1956, 1932-1956)
- P. Kasser Die Gletscher der Schweizer Alpen 1965-1966, 87th Report, 1967. Table 3b (periods 1932-1946, 1946-1956, 1932-1956)
- P. Kasser Die Gletscher der Schweizer Alpen 1968-1969, 90th Report, 1970. Table 3b (period 1956-1967).

In the evaluation of the map, discrepancies became apparent in the glaciated areas in 1956 as compared with earlier planimetering results. These discrepancies were partly caused by the scatter of errors due to the methods used in preparing the basic information for the map and in the planimetric measurements, partly by small differences in the interpretation of the glacier boundaries. No corrections are necessary in the surface and volume changes published in "Fluctuations of Glaciers 1959/1965", Vol. 1, for the periods 1932-1946 and 1946-1956. Small changes are necessary, however, as a result of the new areas determined for the 1956 survey, in the areas of the survey of 1932, 1946 and 1956 and in the mean altitude changes of the glacier surface in the periods 1932-1946 and 1946-1956. The revised values are published in "Les variations des glaciers suisses en 1969-1970", 91st Report of the Glacier Commission of the SHSN, 1972.

The mean precipitation for each year, and for winter and summer, is also entered in the map for the eleven-year period 1956-1967. Because of the large scale, it was decided not to include curves of equal precipitation. The results of stake measurements are also entered on the map. They comprise both the horizontal components of the mean annual displacement of the stakes and the mean annual net balances. Evaluation of the mean annual net balances yielded the following mean altitude for the equilibrium line for the 1956-1967 period:

Glacier	Mean altitude of equilibrium line m a. s. l.	Number of stakes
Kessjen	3030	2
Hohlaub	3190	3
Allalin	3190	7
Schwarzberg	3030	5
Tälliboden	2810	2
Ofental	2810	3