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Late Holocene glacier advances in Revdalen, Spitsbergen *)

ABSTRACT. During geomorphologic mapping of northern seashore of Hornsund (Spitsbergen) a geomorphologic map of Revdalen and Fuglebergsletta was prepared in the scale of 1: 10 000. Distinct outwash routes and a moutonnée area was noted to the south of Revvatnet; at the same time, the destroyed marine terraces in the upper part of the valley and an occurrence of a ground moraine there, prove a Holocene glacier advance in Revdalen (about 2 400 years B. P.). The glaciers of that time slightly overcrossed a zone of the present southern limit of the Rev Lake but they did not fill entirely the middle part of the Revdalen.

Key words: Arctic, Spitsbergen, stratigraphy of Holocene

1. Introduction

In result of investigations carried through in summer 1979 by the authors a geomorphologic map of Revdalen and Fuglebergsletta was prepared in the scale of 1: 10 000; it comprised an area of about 38 km^2. All published previously maps of fragments of that are were also used (Jahn 1959 a, b; Birkenmajer 1959, 1960; Kuziemski 1959, 1968; Martini 1975; Pękala 1975; Szponar 1975). Besides, an image presented at two paper counter-copys (probably of contact prints) of air photos in the scale of about 1: 50 000, done in 1966 for the Gangpasset and Eimfjellet region, was also included after its interpretation with use of a stereo-pantometer. But the data are not still complete, particularly in the north--eastern area — between the Tuva Glacier and Skoddefjellet-Skålfjellet. In this paper, only a generalized geomorphologic sketch in a smaller scale is presented (Fig. 1); it is based on the geomorphologic original map, mentioned previously.

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*) This paper was prepared within an interdepartmental state subject MR.II.16 B "Investigation and protection of a polar environment within the Earth's sciences, basing on field works of A. Karczewski, A. Kostrzewski and L. Marks during the expedition "Spitsbergen 1979/80", organized by Polish Academy of Sciences.

2. General description of the area

The Rev valley occurs within a mountain massif composed of rocks of Hecla Hoek Formation, localized to the north of the mouth of Hornsund, Spitsbergen. Its bottom occuppies the altitudes of 20—80 m and is simply connected with a seaside plain of Fuglebergsletta that spreads from Worcesterpynten to the Hans Glacier (Fig. 1). The valley is about 5.5 km long and 0.3—1.0 km wide. In the central part of the valley there is a large dam lake — Revvatnet (2.8 km long, up to 0.6 km wide) — stopped by a rocky threshold; the lake is composed of three connected reservoirs of various dimensions and maximum depth of 27.2 m (Kuziemski 1959, 1968). The lake is of an overflow type and is drained by Revelva that 2.3 km down-stream the lake, enters the Hornsund.

In the mountain massif of the north-eastern side of Revdalen there are several side hanging valleys with glaciers i.e. Ariedalen, Skålfjelldalen and small valleys of Eimfjellet (Figs. 2 and 3). Besides, in the north-western part of Revdalen there is Gangpasset, a valley with a pass glacier to Rålstranda, between Torbjörnsenfjellet and Rotjesfjellet there is also a small cirque without a glacier, hanging about 200 m above the valley bottom (Fig. 4).

In middle and lower parts of Revdalen as well as in the mouths of side valleys ·Arie and Skålfjell but first of all in Fuglebergsletta, there is a system of marine terraces: 180—190 m, 100—115 m, 70—75 m, 60—65 m, 45—46 m, 40—46 m, 22—25 m, 16—18 m, 8—12 m, 4.5—6 m a.s.l. (Fig. 1). At lower marine terraces there are numerous storm ridges; sporadicly they were also found close to Revvatnet but they have been greatly destroyed during formation of successive marine terraces. More information of marine terraces to the north of Hornsund is presented in another paper (Karczewski, Kostrzewski and Marks 1981 b).

The mountain slopes that surround the valley, are subjected to intensive physical weathering what results in a deposition of a thick cover of slope sediments at the foot. So, abundant heaped fans and locally, also alluvial fans and subslope ridges are formed (Figs. 4 and 5). The latter occur even in two horizons in the western side of the lake (Jahn 1959 b). Origin and morphology of the subslope ridges, called by the authors — the nival moraines, at the northern Hornsund seashores, are more widely described in another paper (Karczewski, Kostrzewski, Marks 1981 a). But anyway, they do not mark a previous extent of the glaciers in Revdalen as it has been many times suggested (among others: Jahn 1959 b, Birkenmajer 1960, Szponar 1975).

At a slightly inclined bottom of middle and upper Revdalen the intensive solifluction processes have developed; they resulted in a formation of many solifluction lobes as well as, suggested by Kuziemski (1959) — of a submarine solifluction terrace along the eastern shore of Revvatnet; the terrace is several dozen metres wide and occurs at a depth to 1 m.

Annex to the article by A. Karczewski, A. Kostrzewski, L. Marks, Polish Polar Research 1, 1981

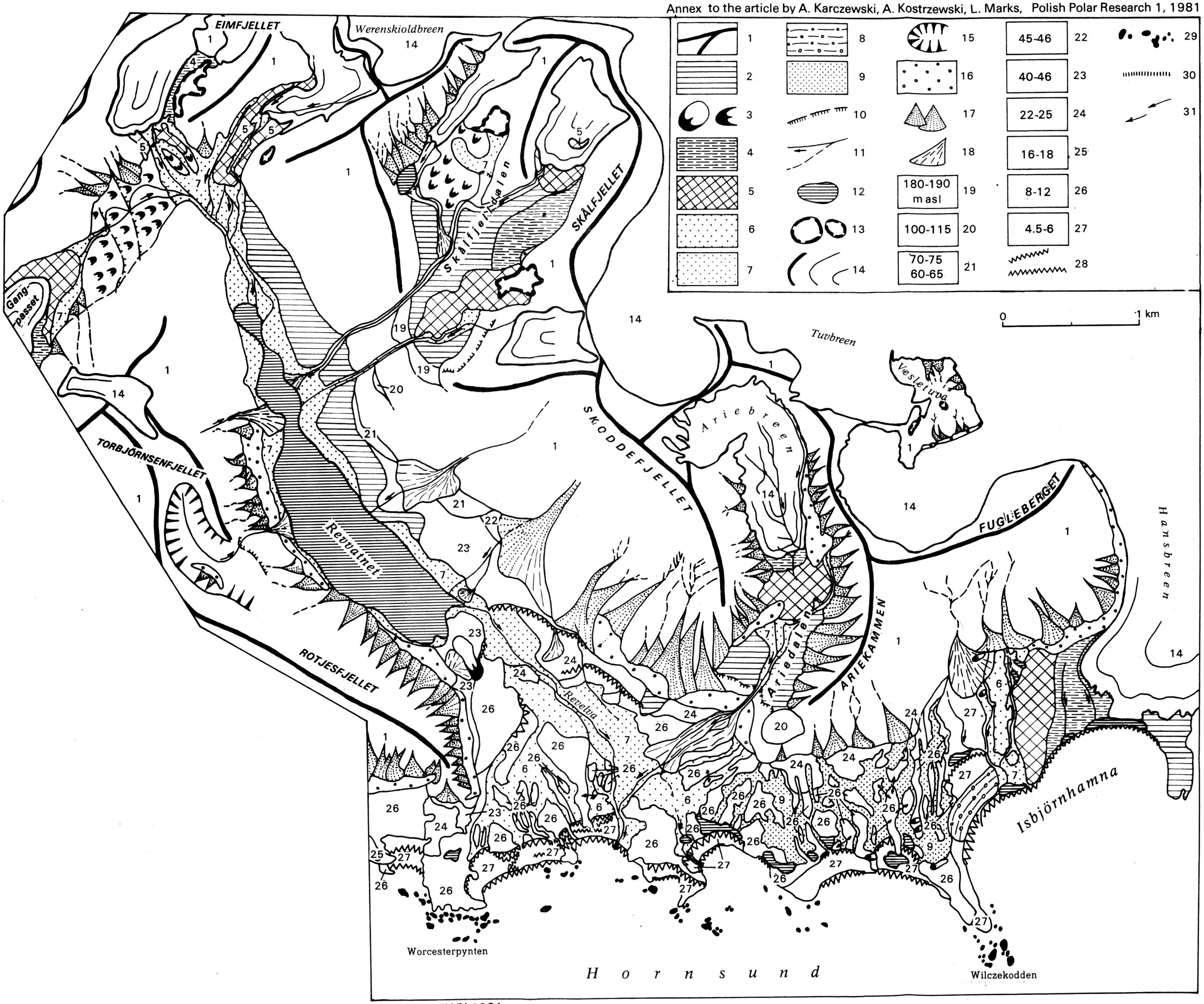

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Fig. 1. A geomorphologic sketch of Revdalen, Hornsund, prepared on the basis of published cartographic data of Jahn (1959 a, 1959 b), Birkenmajer (1960), Kuziemski (1959, 1968), Martini (1975), Pękala (1975) and Szponar (1975), air photos of 1966 (for Gangpasset and Eimfjellet area) and field data of Karczewski, Kostrzewski and Marks collected in 1979

1 — mountain crests and slopes (usually with a weathering cover), 2 — ground moraine, 3 — roche moutonnée and moutonnée zones, 4 — ablation moraine, 5 — ice-cored moraines, 6 — older outwash levels, 7 — younger (recent) outwash levels, 8 — "pitted" outwash, 9 — routes of pronival outflow, 10 — rocky thresholds, 11 — outwash and nival streams, 12 — lakes, 13 — dead-ice patches, 14 — compact glacier ice, 15 — glacial cirque, 16 — nival moraines, 17 — heaped fans, 18 — alluvial fans, 19—27 — marine terraces, 28 — storm ridges, 29 — skerries, 30 — approximate position of fissure zones within the glaciers (at rocky thresholds), 31 — direction of outwash outflow

Fig. 2. Rocky threshold of Ariedalen cut by an outwash stream (Ariebekken); at the fereground — a rubble of the older outwash level

(Photo L. Marks)

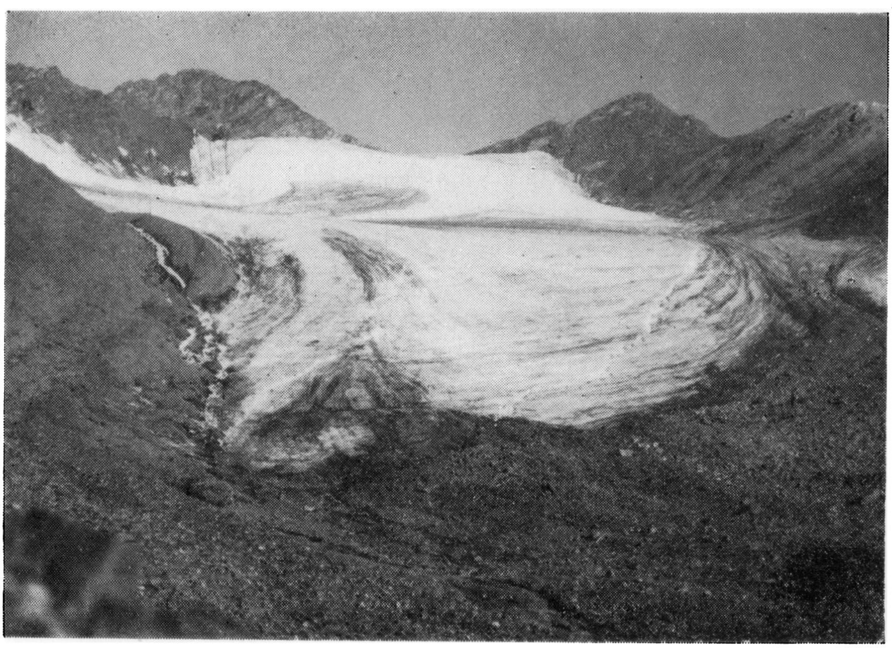

Fig. 3. Marginal zone of a southern glacier tongue in Eimfjellet, at the foreground — an outwash stream

(Photo L. Marks)

Fig. 4. Glacial cirque without a glacier at the eastern side of Torbjörnsenfjellet, at the foot of the slope by Revvatnet — a subslope ridge formed of connected heaped fans; the lake is partly covered in the north with patches of winter ice (Photo L. Marks)

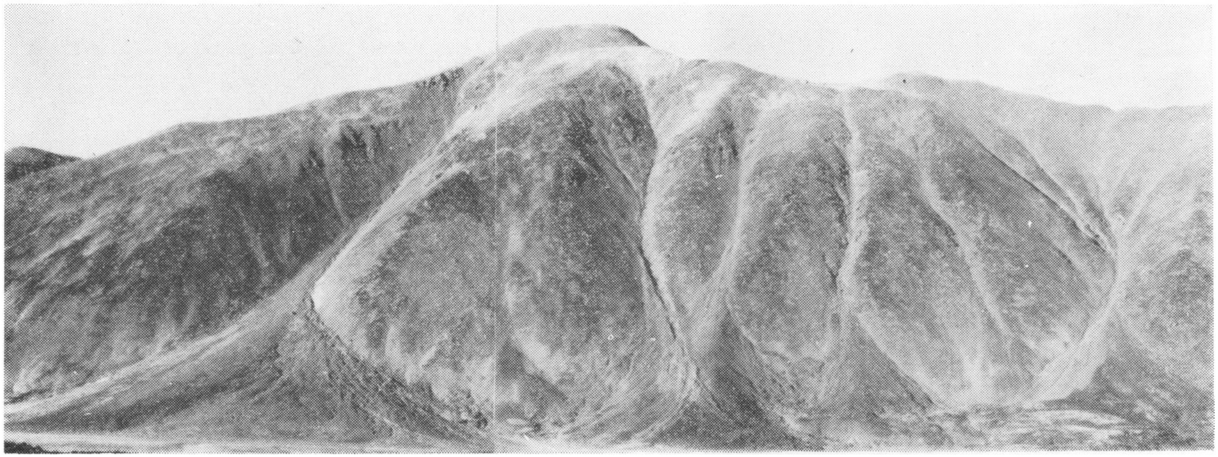

Fig. 5. South-western slope of Skoddefjellet with just formed heaped and alluvial fans, connected locally with one another at the foot into a subslope ridge

(Photo L. Marks)

Fig. 6. Upper part of Revdalen with a braided pattern of upper Revelva and Revvatnet with patches of winter ice

(Photo L. Marks)

Fig. 7. Revelva gorge in marine terraces to the south of Revvatnet: to the left — — a younger outwash level, to the right — a marine terrace 22-25 m asl

(Photo L. Marks)

Fig. 8. Lower part of Revelva cutting the marine terraces: 4.5—6 m asl. (to the left) and 8—12 m asl (to the right and in the hinterland) as well as a storm ridge at the border of these terraces

(Photo L. Marks)

Fig. 9. The Revelva outflow from Revvatnet: at the foreground — a younger outwash level used nowadays by Revelva, farther — an erosive outlier of a marine terrace 22—25 m asl, cut off by an older outwash from a compact area of this terrace

(Photo L. Marks)

Fig. 10. A view from a marine terrace 40—46 m asl., localized at the foot of Rotjesfjellet, at the mouth of Revelva to the Hornsund. At the foreground — the abrasive rocks of a marine terrace 8 — 12 asl, cut by an older outwash (Photo L. Marks)

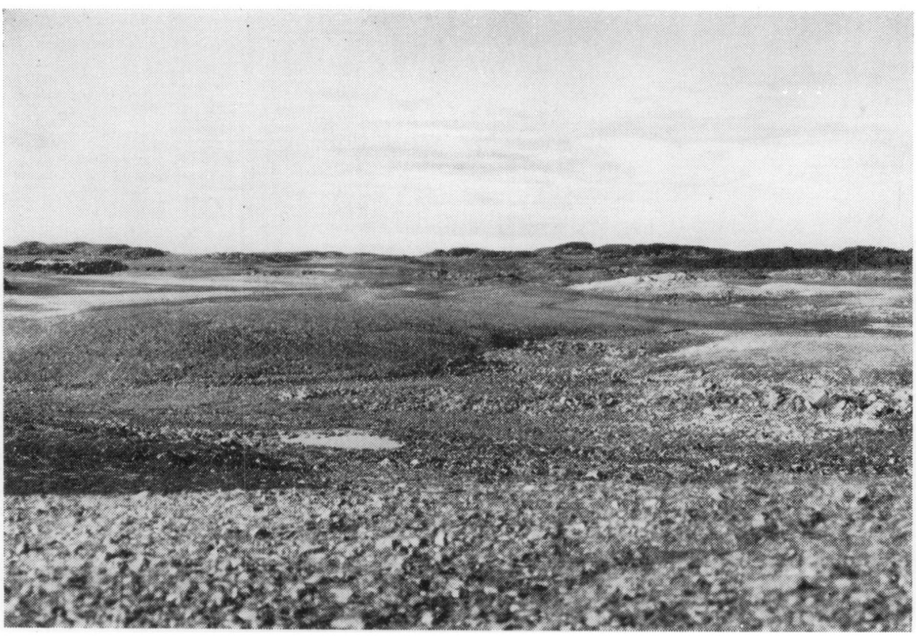

Fig. 11. Worcesterpynten area with older outwash routes at the marine terrace 8 — 12m asl. At the foreground — a storm ridge damming in the south a basin of a small lake

(Photo L. Marks)

3. Outwash routes in Revdalen

Middle and upper parts of the Rev valley possess a decidedly fresh morphology: the bottom is covered with rock pieces and vegetation is almost absent. A bottom of Skålfjelldalen, localized at 220—350 m a.s.l. looks very similar. Along the eastern shore of the Rev valley, from Eimfjellet to Skoddefjellet, there is an area occuppied by a ground moraine, with only two deeply incised streams rising in Skålfjelldalen (Fig. 1). Southwards there are marine terraces whereas the bottom of the upper, terminal part of the valley is dissected and completely transformed by numerous outwash streams starting at the glaciers of Eimfjellet and Gangpasset (Szczepankiewicz 1961). The debris transported by these streams, gradually fills up the upper part of the valley and of the Rev Lake (Fig. 6). The outwash track initiated in the terminal part of the Rev valley, can be also noted along the lake and then, it continues along Revelva towards the sea; it is usually up to 300—400 m wide (Fig. 1). In the lower part of the valley there are two narrowings of this outwash level: one occurs just to the south of the lake — at a rocky threshold whereas the other is localized several hundred metres farther (Fig. 7). This outwash level of Revelva is also connected with an outwash fan formed at the outlet of Ariedalen by meltwaters of the Arie Glacier; the fan is composed of several superimposed series (Szczepankiewicz 1961). Close to the mouth of Revelva it forms still two other gorges: across a storm ridge at a border of the marine terraces at 4.5—6 m and 8—12 m a.s.l. (Fig. 8) and across the recent storm ridge.

A detailed geomorphologic analysis of the surface of marine terraces to the south of Revvatnet enabled to find that there is also another, older outwash track in the valley (Fig. 1). It starts about 0.5 km to the south of the lake where it was undercut by the waters creating the younger outwash level (Fig. 9). The older outwash level occurs within the marine terrace 22—25 m a.s.l. (Fig. 2) but particularly, within the terrace 8—12 m asl where it formed a braided system of erosive cuts of meltwater origin (Fig. 10). These cuts keep gradually narrowing and deepening towards the sea but they are usually dammed by storm ridges occurring at a border of the marine terraces 4.5—6 m and 8—12 m a.s.l. (Fig. 11). For that reason, many small lakes are formed there; in summer they are usually filled with water (Fig. 11). The storm ridges are locally cut by gorges that enable to connect the mentioned outwash tracks with a surface of the marine terrace 4.5—6 m a.s.l. (Fig. 12). At the same time, the older outwash level does not occur at this marine terrace so, one can suppose its formation before an emergence of this terrace but when the marine terrace 8—12 m asl was not occuppied by the sea any longer.

4. Problem of older glacier advance

Therefore, a conclusion is to be drawn that there has been a glacier advance in Revdalen quite a short time ago. It is proved by an extent of the older outwash, a destruction of marine terraces in upper and partly, in middle parts of Revdalen but an occurrence of a ground moraine there and fresh features of the valley bottom as well as a moutonnée area to the south of the lake within the limits of the marine terraces 40—46 m and 22—25 m a.s.l. The age of this advance can be roughly estimated in relation to a more recent marine terrace 4.5—6 m a.s.l. Unfortunately, no remains of marine fauna within most sediments of marine terraces in Hornsund makes their direct dating impossible whereas the confrontation with other parts of the Svalbard Archipelago is difficult due to differentiated isostatic uplift of the land during Holocene (Jahn 1959 a, b; Birkenmajer 1959, 1960; Szupryczyński 1968, Boulton 1979). The Soviet dating of the terrace 5.5 m a.s.l. at the Barents Island defined its age for 2 400 ± 120 years B. P. (after Szupryczyński 1968). Then, in the Hornsund region, between the Hans Glacier and Rotjesfjellet, the marine terrace 8.0 m a.s.l. was formed (after Birkenmajer 1960) in the first half of the XVIIth century whereas the terrace 4.0—4.5 m a.s.l. — in the XVIIIth century. But the latter data were based on accepted, much too great, isostatic uplifting rate of Spitsbergen and so, they are to "young" (Birkenmajer and Olsson 1970). In the latter paper the age of the terrace 8 m a.s.l. was defined by a radiocarbon method for about 9 000 years B. P. (Boreal Period) and of the terrace 5.5 m a.s.l. — for about 1.000 years B. P.

Therefore, it seems more probable to connect the glacier advance in Revdalen with a period just preceding 2 400 years B. P. There are also some data suggesting that the advance occurred not only at the Svalbard Archipelago but also in other parts of the Arctic region as well as in Scandinavia and in the Alps (after Szupryczyński 1968, 1978). Baranowski (1977) found in the Hornsund region the evidence for a glacier advance in a period 3 500—2 000 years B. P. and similar conclusions have been drawn in Oscar II Land by Niewiarowski (in press).

A significant time interval between a formation of the marine terrace 5.5 m a.s.l. and 7.5—8.0 m a.s.l. in Hornsund area (about 8 000 years) may suggest, according to Birkenmajer and Olsson (1970), a submergence of southern Spitsbergen about 3 000 years ago (it is also supported by geologic evidence from other parts of the Svalbard Archipelago). When continuing this argumentation we came to a conclusion that the land submergence of that time resulted from its increased loading due to growing and advance of the Spitsbergen glaciers.

So, a glacier advance in Revdalen can also correspond in age with the Magdalenefjorden Stage (i.e. about 2 400 years B. P.), distinguished by Szupryczyński (1968) in the northern part of Spitsbergen.

The Revdalen glacier occuppied an area of the present Rev Lake but it also slightly passed across its southern limit, reaching the marine terraces 40—46 m and 22—25 m a.s.l. at the foot of Rotjesfjellet (Fig. 13); there, a small insolation (nowadays as well) favours a long conservation of snow patches in summer. The glacier did not fill the whole valley what is proved by an occurrence of non-destructed marine terraces at the foot of Skoddefjellet (comp. Fig. 1).

Probably at the same time the Hans Glacier occuppied a larger area

Fig. 12. A gorge in a storm ridge at a border of marine terraces 4.5 — 6 m and 8—12 m asl, lacalized to the east of Worcesterpynten, formed by a seasonal outflow along the ancient outwash routes

(Photo L. Marks)

Fig. 14. Southern slope of Ariekammen and neighbouring tundra of Fuglebergsletta with longitudinal rocky hummocks of a primary abrasive level of marine terraces 8 — 12 m and 22 — 25 m asl, formed due to cutting by pronival streams

(Photo L. Marks)

too (Fig. 13); it can be approximately fixed by numerous roche moutonnée in the forefield of the western ice-morainic ridge, found as far as the root of Wilczekodden (comp. Fig. 1).

Some attention should be also given to a problem of the alimentary area of the Revdalen glacier. According to Jahn (1959 b), a morphologic individual character of Revdalen and its separation from the inner part of the island by mountain ranges caused that the valley could be glaciated in the only case if the firn line got down to about 250 m a.s.l. i.e. to the bottom of large cirques entering the valley (now the firn line occurs in this area at about 400 m a.s.l.).

We hope that for a growing of ice mass in Revdalen (in Holocene as well as in Pleistocene) a principal role was played by a side valley — Skålfjelldalen where vast moutonnée areas are noted, especially in its northern part and the ice transfluence from a firn field of the Werenskiold Glacier is still observed nowadays (comp. Figs 1 and 13). This was probably the main source of ice masses that filled the Rev Valley; it is also proved by a characteristic curve of the south-western slope of the Rev valley (at the other side of the lake — opposite to Skålfjelldalen), caused probably

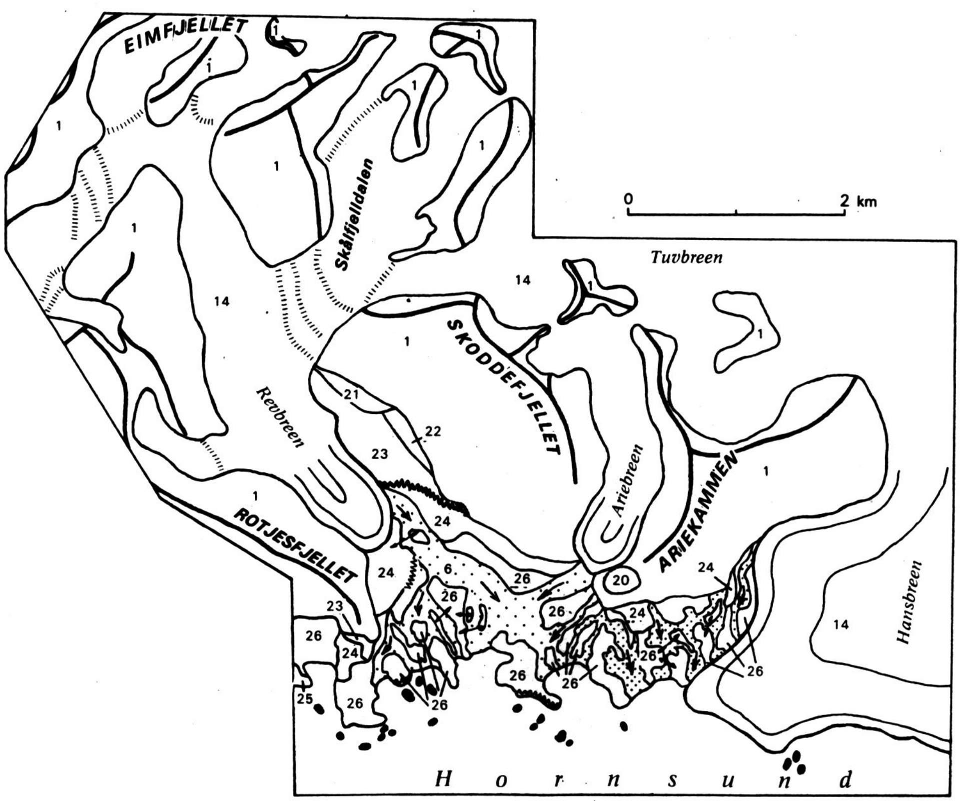

Fig. 13. A paleogeomorphologic sketch of Revdalen and Fuglebergsletta, Hornsund, during a glacier advance about 2 400 years B. P.
Explanations as at Fig. 1.

by a glacial erosion, and there is too a distinct overdeepening and widening of the basin of Revvatnet in the place where the ice from Skålfjelldalen reached the bottom of the main valley (comp. Fig. 1). The Skålfjell Valley of about 1.5 km^2 area seems to comply the requirements of the main source of ice masses for the glacier in Revdalen if taking into account a possibility of feeding of the Skålfjelldalen by the ice from the inner part of the island, with a participation of all the other small side glaciers in Revdalen and especially, from the Eimfjellet massif (where there could also occur a transfluence from the firn field of the Werenskiold Glacier). This predominating role of Skålfjelldalen, also during the older periods of glacier advances, is as well proved by a distinct and quite rapid widening of middle and lower Revdalen, starting from the Skålfjelldalen mouth (comp. Fig. 1). A small thickness of the glacier in Revdalen (suggested by non-destructed marine terraces at the eastern side of the valley) explains also a possibility of the so extensive advance of the glaciers supplied with relatively small firn fields.

Some attention should be also given to the outwash system at the foot of Ariekammen, within the limits of the marine terraces 8—12 m a.s.l. and

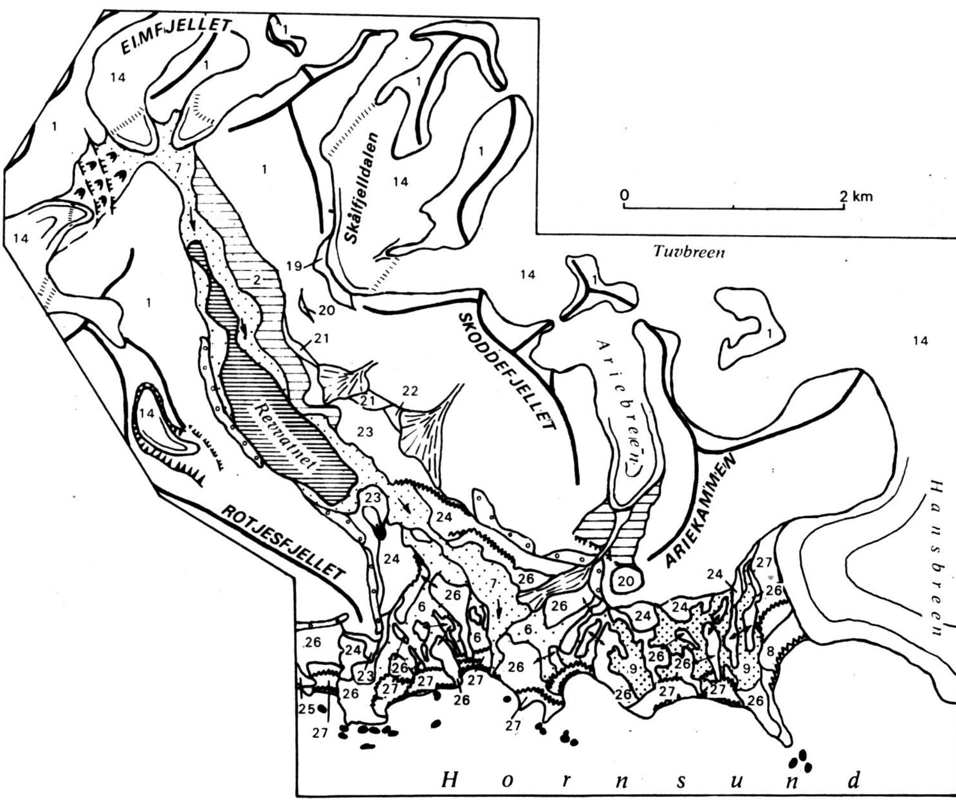

Fig. 15. A paleogeomorphologic sketch of Revdalen and Fuglebergsletta, Hornsund, during the last glacier advance in the XIXth century
Explanations as at Fig. 1.

22—25 m a.s.l. (Fig. 14). This system looks the same as the previously described outwash system to the south of Revvatnet (see Fig. 1). Undoubtedly, this system is not of a fluvioglacial origin as at the southern slope of Ariekammen no favourable conditions existed for a glacier development, the meltwaters of which could dissect such a large area. Instead, an increased air humidity (Baranowski 1977) that caused a glacier advance in Revdalen, could also result in a more intensive accumulation of snow at the Ariekammen slope. A quick melting of the snow (favoured by a southern exposition of the slope) caused a development of short-lasting but rapidly rising pronival streams.

5. Some remarks on the last glacier advance

The last glacier advance in Revdalen occurred probably, after all as in the whole Spitsbergen, during the Little Ice Age i.e. with maximum in the XVIIth century (Jahn 1959 b), in the XVIIIth century (Jahn 1959 a) or in the XIXth century (Baranowski 1977). A confrontation of the Norwegian topographic map (1953), showing the extents of the glaciers in 1936, with our observations proved that the greatest glacier advance of that time in Revdalen occurred in the Skålfjell Valley (Fig. 15). Probably, it was caused by a clearly intensified supply with ice from the firn field of the Werenskiold Glacier. The glacier filled probably at that time almost the whole Skålfjelldalen and its snout was localized at the valley mouth. An approximate glacier extent during a retreat is marked nowadays by a large ice-cored moraine, dissected by outwash routes of that time — now hanging at the proximal side. The extents of the other glaciers in Revdalen are probably defined by still existing outer ridges of ice-cored moraines. Locally, where the ridges have been already completely degraded, they can be most likely reconstructed with a use of the mentioned Norwegian topographic map (1953).

6. Significance of the Rev Lake in Late Holocene.

A part played by the Rev Lake nowadays as well as in the past, is worth mentioning. During the glacier advance about 2 400 years B. P. the area occuppied by the present lake was entirely covered by ice masses. Due to that, the outwash waters flew directly into the sea, creating a vast outwash plain and numerous melwâter routes. Instead, later on i.e. already during an existence of the Rev Lake, the latter acted as a buffer that stopped the sediment transported from the glaciers by meltwaters and considerably levelled the seasonal amounts of water in Revelva. Such a role of Revvatnet is also proved by hydrologic investigations of Kuziemski (1959, 1968), dealing with changes of water level in the present lake. On the other hand, the bottom of the present Revelva seems to be a survived feature, not subjected to more serious modifications and it was formed mainly during a more intensive meltwater outflow just after the maximum extent of the glaciers during the Little Ice Age. Probably at that time the Rev Lake occuppied a smaller area (due to smaller supply with water) and did not refreeze completely in summer as even at the end of August 1979 quite big pieces of winter ice could be noted in the northern part of the lake — (see Figs. 4 and 6). The outwash could occur then also at the ice and at the lake edge what is suggested by an outwash level at the eastern side of the lake as well as by its present submarine terrace. Therefore, an origin of the terrace seems to be rather connected with an outwash outflow during a lower water level in the lake; the solifluction processes played in such a case a secondary part in its formation (Kuziemski 1959).

7. Conclusions

An analysis of the geomorphologic map of Revdalen enabled to draw the following conclusions:

— at the bottom of the Rev Valley there are the features of a glacier advance at about 2 400 years B. P. The advance corresponds in age only with the previously distinguished (by other authors) period of glacier growing at Spitsbergen as it was found on the basis of quite different evidence;

— an occurrence of two outwash levels of a varying age was found in Revdalen; they allowed to draw a conclusion about the older glacier advance;

— the glacier in Revdalen could be fed sufficiently from the Werenskiold Glacier firn field and from the Skålfjelldalen although there are only small firn fields in the valley and it is almost completely isolated nowadays;

— a probable glacier extent in Revdalen can be presented, during the glacier advance about 2 400 years B. P. as well as during the Little Ice Age.

8. Summary

A geomorphologic map of Revdalen and Fuglebergsletta was prepared in the scale of 1: 10 000; it covered an area of about 38 km^2 (Fig. 1). In the lower part of Revdalen and along the eastern side of the Rev Lake, at the mouth of side hanging valleys of Arie and Skålfjell as well as in a seashore tundra of Fuglebergsletta, an occurrence of marine terraces was noted at the altitudes: 180—190 m, 100—115 m, 70—75 m, 60—65 m, 45—46 m, 40—46 m, 22—25 m, 16—18 m, 8—12 m, 4.5—6 m a.s.l. (Fig. 1). The terraces were covered with slope sediments (Figs. 4 and 5).

A bottom of the upper part of Revdalen is almost entirely applied by outwash of the glaciers from Gangpasset, Eimfjellet and Skålfjelldalen (Figs. 1 and 3). Along the north-eastern side of the valley there is an area occuppied by a ground moraine only. The outwash waters in that part of the valley carry much deposit which gradually fills the upper part of the lake (Fig. 6).

An analysis of the outwash (Figs. 2 and 7—12), destruction od marine terraces in upper and partly, in middle Revdalen but an occurrence of a ground moraine there and fresh features of the valley bottom, also a large roche moutonnée to the south of the lake, suggest a glacier advance in Revdalen after a formation of the marine terrace 8—12 m a.s.l.

and before, or during a development of the marine terrace 4.5—6 m a.s.l. In connection with the observations from the other parts of the Svalbard Archipelago the advance can be accepted to have occurred before 2 400 years B. P. The glacier in Revdalen occuppied an area of the present Rev Lake but also, it surpassed its southern bank, although it did not fill completely the Rev Valley (Fig. 13). At the foot of Ariekammen a system of pronival outflow routes was formed at that time (Fig. 14). Probably, a considerable part of the ice mass in Revdalen have originated in Skålfjelldalen in that period. In the latter valley there are today large moutonnée zones and still an ice connection with the Werenskiold Glacier exists. The very beginning of this glacier advance was much similar to the one of the glacier advance at Spitsbergen with a maximum in the XIXth century (Fig. 15).

9. Резюме

Составлено геоморфологическую карту Ревдален и Буглебергслетта в масштабе 1:10000, охватывающую территорию поверхностью ок. 38 км² (рис. 1). В нижнем участке Ревдален и вдоль восточного берега озера Рев при устье боковых, завешенных долинок Аре и Скальфель, а также в поясе приморской тундры Буглебергслетта констатировано выступление системы морских террас, расположенных на высоте: 180—190 м, 100—115 м, 70—75 м, 60—65 м, 45—46 м, 40—46 м, 22—25 м, 16—18 м, 8—12 м, 4,5—6 м выше уровня моря (рис. 1), надстроенных склоновыми осадками (рис. 4 и 5).

Дно верхней части долины Рев находится под влиянием зандровых стоков ледников из Гангпассет, Эймфеллет, Скальфельдален (рис. 1 и 3). Только вдоль северо-восточного берега выступает выше положенная область донной морены. Зандровые притоки в этой части Ревдален несут много материала, постепенно засыпывая верхнюю часть озера (рис. 6).

Анализ сети зандрового притока (рис. 2 и 7—12), уничтожение морских террас в верхней и частично серединной партии долины, выступление там долинной морены и свежесть резьбы дна долины, а также большой мутон южнее озера свидетельствуют о трансгресси ледников в Ревдален в период после образования морской террасы 8—12 м выше уровня моря, а перед и во время возникновения морской террасы 4,5—6 м выше уровня моря. На фоне наблюдений с других частей архипелага Свальбард можно принять, что эта трансгрессия выступила 2400 лет тому назад. Ледник в Ревдален занимал пространство сегодняшнего озера Рев, а также выходил за его южний берег, но не заполнил всей ширины долины (рис. 13). У подножья Арекаммен возникла тогда сеть пронивального стока (рис. 14). Вероятно значительная часть ледовой массы в Ревдален в этот период происходила из Скальфельдален, где находятся великие мутонизированные поверхности, а также существует до сих пор ледяное соединение с ледником Веренскиольда. Начало этой трансгресси было похоже на ход последней трансгресси ледников на Шпицбергене с максимумом в XIX веке (рис. 15).

10. Streszczenie

Wykonano mapę geomorfologiczną Revdalen i Fuglebergsletta w skali 1: 10 000, obejmującą obszar o powierzchni około 38 km². W dolnym odcinku Revdalen i wzdłuż wschodniego brzegu jeziora Rev, u ujścia bocznych zawieszonych dolinek Arie i Skallfjell, a także w pasie nadmorskiej tundry Fuuglebergsletta stwierdzono występowanie systemu tarasów morskich leżących na wysokościach: 180—190 m, 100—115 m, 70—75 m, 60—65 m, 45—46 m, 40—46 m, 22—25 m, 16—18 m, 8—12 m, 4,5—6 m npm (rys. 1), nadbudowanych przez osady zboczowe (por. rys. 4 i 5).

Dno górnej części doliny Rev jest zdominowane przez odpływy sandrowe lodowców z Gangpasset, Eimfjellet i Skalfjelldalen (rys. 1 i 3). Jedynie wzdłuż północno-wschodniego brzegu doliny występuje wyżej położony obszar moreny dennej. Dopływy sandrowe w tej części Revdalen niosą dużo materiału stopniowo zasypując górną część jeziora (rys. 6).

Analiza sieci odpływu sandrowego (rys. 2 i 7—12), zniszczenie tarasów morskich w górnej i częściowo w środkowej partii doliny a występowanie tam moreny dennej i świeżość rzeźby dna doliny, a także duży muton na południe od jeziora świadczą o transgresji lodowców w Revdalen w okresie po utworzeniu tarasu morskiego 8—12 m npm, a przed lub w czasie powstawania tarasu morskiego 4,5—6 m npm. W nawiązaniu do obserwacji z innych części archipelagu Svalbard można przyjąć, że transgresja ta wystąpiła przed 2 400 laty. Lodowiec w Revdalen zajmował obszar obecnego jeziora Rev, a także wykraczał poza jego południowy brzeg, ale nie wypełniał całej szerokości doliny (rys. 13). U podnóża Ariekammen powstała wówczas sieć odpływu proniwalnego (rys. 14). Prawdopodobnie znaczna część masy lodowej w Revdalen w tym okresie czasu pochodziła ze Skalfjelldalen, gdzie są bardzo duże zmutonizowane powierzchnie oraz istnieje do dziś połączenie z lodowcem Werenskiolda. Początek tej transgresji lodowcowej był podobny do przebiegu ostatniej transgresji lodowców na Spitsbergenie z maksimum w XIX wieku (rys. 15).

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