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THE PRECAMBRIAN, EOCAMBRIAN AND EARLY PALAEOZOIC STRATIGRAPHY OF THE JØRGEN BRØNLUND FJORD AREA, PEARY LAND, NORTH GREENLAND

BY

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WITH 26 FIGURES AND 2 TABLES IN THE TEXT,
AND 3 PLATES

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Abstract

The sedimentary sequence in the platform area (approx. 2500 km^2) around Jørgen Brønlund Fjord, North Greenland, has been mapped, and sections through the Precambrian, Eocambrian and Lower Palaeozoic sequence are described.

After a summary of the previous geological field work carried out in the area, a lithological description of a composite section through the sequence below the Lower Cambrian Brønlund Fjord Dolomite (Troelsen, 1949) is given. This sequence, which is about 1000 m thick, is divided into four formations—in ascending order: Inuiteq Sø Formation (sandstone), Moræneso Formation (tillite and dolomite), Portfjeld Formation (dolomite) and Buen Formation (sandstone and shale). The first three named formations are separated by two unconformities both representing a long period of erosion. The strata are cut by two dolerite sequences, of which the older (the Midsommersø dolerites) is of Precambrian age and intrudes only the Inuiteq Sø Formation. Intrusions of the younger sequence penetrate all the strata in the Jørgen Brønlund Fjord area and are regarded as post-Palaeozoic.

In the last section the chronostratigraphy and the correlation with neighbouring areas are discussed. Special attention is given to the two newly discovered erosional unconformities, which together with the tillite occurrence and the radiometric K/Ar dated Midsommersø dolerites, throw new light on the stratigraphy of North Greenland.

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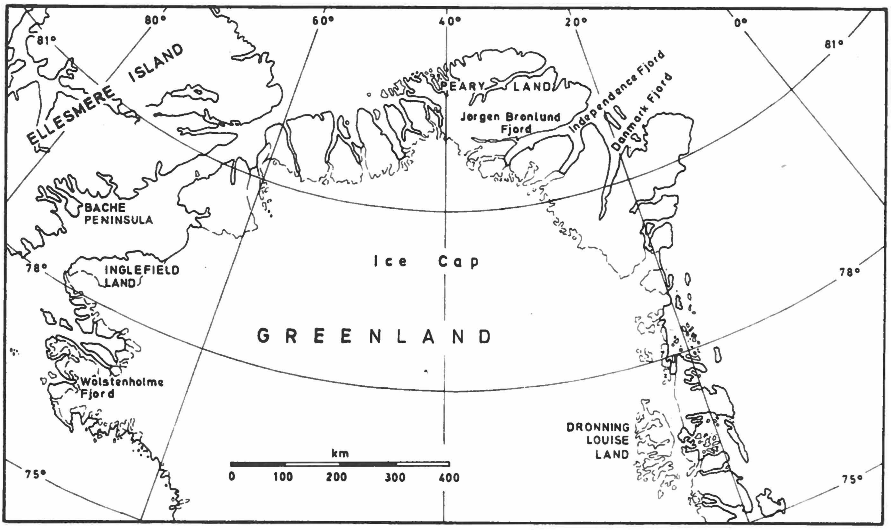

Fig. 1. Index map, North Greenland.

I. INTRODUCTION

As a member of the 4th and 5th Danish Peary Land Expeditions led by Count EIGIL KNUTH in 1966 and 1968, the present writer carried out geological field work in the southern part of Peary Land around Jørgen Brønlund Fjord, Midsommersøer, and Inuiteq Sø (for localities see fig. 1 and plate 1). The mapped area of approx. 2500 km² is bounded roughly by the following coordinates: 82°00′–82°20′ N and 29°30′–35°00′ W.

Tectonically, the area is part of the southern stable foreland region of the Innuitian Fold Belt, which occupies the northern part of Greenland and Ellesmere Island. The bedrock is composed of flat-lying Precambrian, Eocambrian and Lower Palaeozoic sedimentary strata. The sediments are cut by numerous basic intrusions, which can be divided into an older Precambrian sequence and a younger sequence, which is regarded as post-Palaeozoic. This paper mainly concerns the lithology and stratigraphy of the sediments—especially the lowermost mainly unfossiliferous strata. A paper describing the petrology of the intrusive rocks is in preparation.

2. PREVIOUS GEOLOGICAL FIELD WORK

The Jørgen Brønlund Fjord area was first visited in 1907 by 3 members of the disastrous Danmark Expedition. The only material existing from that visit is the map of HØEG HAGEN, on which Jørgen Brønlund Fjord is marked (see AMDRUP, 1913, pl. IV and V).

The next visit to Independence Fjord and Jørgen Brønlund Fjord was in 1912 during the 1st Thule Expedition led by KNUD RASMUSSEN. PETER FREUCHEN described sandstones from Kap Knud Rasmussen and from the coast west of that cape, where the sandstones are cut by intrusions (FREUCHEN, 1915, p. 360). Specimens of these rocks, which the expedition brought home, were examined by BØGGILD (1915) who classified them as red sandstones and diabases. BØGGILD tentatively proposed a Devonian or Cambrian age for the red sandstone sequence but remarked that the strata might well "belong to some other period".

The Danish Bicentenary Expedition under the leadership of LAUGE KOCH stayed in Jørgen Brønlund Fjord and Independence Fjord in 1921. In February and March 1923 KOCH published the geological results of the expedition (KOCH, 1923a & b). He established the following stratigraphy for the area around Independence Fjord and Jørgen Brønlund Fjord. The oldest sediments, which occupy the southern part of Heilprin Land, consist of a homogeneous, unfossiliferous, reddish and greenish sandstone sequence with ripple marks and cross-bedding (at least 900 m). The sandstone is intruded by numerous diabases and other more acid intrusions. A specimen brought home from the southern shore of Independence Fjord was described as "Quårzdiabas" by CALLISEN (1929, pp. 249–251). The sandstone is overlain by a limestone and dolomite sequence, which KOCH named Cryptozoon-Kalk because of the well-developed *Cryptozoon* structures (KOCH, 1923a, fig. 3 and 1923b, fig. 1). The Cryptozoon-Kalk is followed by a limestone sequence, which is at least 1000 m thick. In the upper part the limestone contains Ordovician fossils (*Maclurea*, *Halysites*, *Calapaecia*, *Receptaculites*). The whole sequence with a total thickness of about 2400 m has a slight dip towards the north-east. KOCH correlated the Cryptozoon-Kalk and the underlying sandstone with the Upper Cambrian or the Lower Ordovician. He saw that the basic intrusions are restricted to the lower sandstone sequence, but he did not succeed in detecting an erosional unconformity between that sequence and the overlying Cryptozoon-Kalk. However, he thought that the existence of such an unconformity was possible: "Det er ikke lykkedes mig at paavise nogen Dislokation mellem den røde Sandsten og Cryptozoon Kalken, men det er sandsynligt, at en saadan findes". ["I have not been able to find a discordance between the red sandstone and the Cryptozoon Kalk, but it does probably exist".] (Koch 1923a, p. 63).

In 1922 Koch (see Koch, 1924) visited Inglefield Land, where he found Cambrian fossils (*Olenellus*) in pebbles from a conglomerate resting on an eroded, intrusion-filled sequence of sandstone and carbonate rocks (Rensselaer Bay sandstone, Cape Leiper dolomites and Cape Ingersoll dolomite (Troelsen, 1950a, pp. 35–37)). That discovery caused him to correlate the oldest strata with the upper part of the Precambrian ("Algonkian"), and since he also correlated the strata with the lower intrusion-filled sandstone sequence in the Jørgen Brønlund Fjord area 800 km north-east of Inglefield Land, that sandstone was likewise given an Upper Precambrian age. Consequently, he regarded the overlying Cryptozoon-Kalk as belonging to the Cambrian. From this time Koch (1924 and 1925) was entirely convinced of the existence of an erosional unconformity between the lower sandstone sequence and the Cryptozoon-Kalk. This opinion was stressed in later publications (see Koch, 1929, pp. 227–273 and 1935, p. 122), where it was even said that this unconformity had actually been seen:—"1921 bemerkte Koch im südlichen Teil von Peary Land am Brønlund Fjord, dass in einem bestimmten Niveau alle die Ergussteine, die die grünlandischen Schichten durchsetzten, wegerodiert worden sind und von Konglomeraten und Kalken . . . ., überlagert wurden . . ." (Koch, 1935, p. 122).

In 1929 Koch grouped the lower intrusion-filled sandstone and carbonate sequences in north-west and North Greenland under the name "Thule Formation" (Late Algonkian), the type area of which was around Wolstenholme Fjord (Koch, 1929, pp. 220–222), Later on he included all the supposed Late Precambrian sedimentary sequences in Greenland (Thule Formation, Eleonore Bay Formation, Petermann Series and Igaliko Sandstone) under the collective designation "Grönlandium" (Koch, 1930, p. 346). In 1938 Koch flew over Midsommersøer and Jørgen Brønlund Fjord, but this did not increase the geological knowledge of the area (Koch, 1940, pp. 324–326).

Troelsen has given a similar, but very critical discussion of Koch's views of the stratigraphy in the Jørgen Brønlund Fjord area during this period (1923–35) (Troelsen, 1949, pp. 6–9).

As a member of the Danish Peary Land Expedition 1947–1950, Troelsen carried out geological field work in the Jørgen Brønlund

Fjord area in 1947 (TROELSEN, 1949) and 1948–49 (TROELSEN, 1950b and 1956a & b). After the first year he established a stratigraphy for the area around Jørgen Brønlund Fjord. The oldest beds TROELSEN described as reddish, feldspathic sandstones, in which one basic intrusion was observed (described as quartz dolerite by A. NOE-NYGAARD (see ELLITSGAARD-RASMUSSEN, 1950, p. 594)). The sandstone is followed by a dolomite sequence (at least 140 m) with *Cryptozoon* and *Collenia* structures. This sequence is followed by an interval of unknown magnitude above which is a 263 m thick, partly-covered sequence, which begins with sandstone and ends with interlayered shale and sandstone. He gave all these strata an Eocambrian age and included them in the Thule Group (TROELSEN, 1949, pp. 9–13); apparently he did not attach much importance to the stratigraphic status of the Thule Group, which for him was synonymous with Thule Formation (TROELSEN, 1956b, pp. 84–85). He knew this unit from Inglefield Land and the Bache Peninsula (TROELSEN, 1950a). TROELSEN was not able to find an erosional unconformity between the lower reddish sandstone and the overlying dolomite (of which the lower part is identical with KOCH's Cryptozoon-Kalk), but he did not exclude its possible existence. The Thule Group is overlain abruptly by a *c.* 100 m thick dolomite, which he correlated with the Cambrian and named the Brønlund Fjord Dolomite (TROELSEN, 1949, p. 13). TROELSEN (1956b, p. 87) found Lower Cambrian fossils in the basal parts of the dolomite (olenellidae, *Salterella*). The Brønlund Fjord Dolomite is overlain by a *c.* 360 m thick fossiliferous dark limestone (ostracods, cystoids, pelecypods, gastropods (incl. *Ceratopaea* sp.), cephalopods), which he named the Wandel Valley Limestone (TROELSEN, 1949, p. 15). The presence of *Ceratopaea* indicates a Lower Ordovician age. The Wandel Valley Limestone is overlain by a black fossiliferous limestone (*Maclurites*, bryozoans, cephalopods), which he named Børglum River Limestone (TROELSEN, 1949, p. 18). This limestone is at least 35 m thick. *Maclurites* indicates an Ordovician age, and the presence of bryozoans suggests that the formation is younger than Lower Ordovician.

In 1948–49 TROELSEN discovered a tillite horizon in the lower reddish sandstone (TROELSEN, 1950b, pp. 6–8), and in 1956 it was described (TROELSEN, 1956b, pp. 85–86). Its thickness varies between 1 and 100 m. The tillite is reddish-brown and unsorted and is composed mainly of rounded quartz grains. It contains a lot of pebbles and boulders with diameters up to 3 m, which consist mainly of quartzite with some volcanic fragments and very rarely coarse-grained rocks. The tillite rests concordantly on the underlying sandstone, and no glacial striae were observed on the upper surface of the sandstone. TROELSEN thought that the tillite was possibly deposited in shallow water, but nevertheless, he was convinced that it should be regarded as a true tillite:—"Since the sediments appear to be flat-lying for at least a hundred kilometres in all directions from the outcrops of the tillite and since the erratics in the tillite are scratched and 'flat-iron shaped' it is contended that the deposit must be interpreted as a true tillite rather than as, for instance, a mud flow coming from a mountain range" (TROELSEN, 1956b, p. 85). No basic rocks from the intrusions in the underlying sandstone were found among the blocks in the tillite, and TROELSEN observed one intrusion (?dyke) which cut through the post-tillitic sediments (TROELSEN, 1956b, p. 84). He correlated the deposition of the tillite with the Varanger Glaciation in Scandinavia, and since the Eocambrian was defined as the time interval between that glaciation and the oldest Cambrian beds (TROELSEN, 1956b, pp. 71–72), he gave the pre-tillitic sandstone a Precambrian age. Since he regarded the Thule Group as belonging to the Eocambrian, that group came to contain only those sediments between the lower boundary of the tillite and the lower boundary of the Lower Cambrian Brønlund Fjord Dolomite. On the basis of this he described a new (composite) section through the sediments below the Brønlund Fjord Dolomite (TROELSEN, 1956b, p. 86). The oldest strata are the intrusion-filled, yellowish sandstone (Late Precambrian) with ripple marks and cross-bedding, which is of unknown thickness. The overlying Thule Group, which possibly rests disconformably on the Precambrian beds, starts with the tillite and a reddish sandstone (*c.* 67 m). The tillite is overlain by a 250 m thick dolomite sequence, and the Eocambrian ends with a 435 m thick sequence, which consists of quartzite, quartz sandstone, a 150 m thick covered interval, and shale. Cross-bedding indicates a transport of material in a northerly direction during this last period of deposition. The overlying Brønlund Fjord Dolomite rests disconformably on the Thule Group.

Recently HALLER (1970, p. 48) has used the term Thule Group for sediments of the pre-Carolinidian cycle, without mention of TROELSEN's earlier use of this term. Since the age of the Thule Group in the type area in north-west Greenland is still not known, the value of this definition is open to discussion.

During the stay of the Danish Peary Land expedition in the Jørgen Brønlund Fjord area ELLITSGAARD-RASMUSSEN carried out geological field work in the area during 1949–50, and a part of this work was concentrated on a petrological examination of the intrusions in the lower sandstone sequence (Midsommersøer, Independence Fjord) (ELLITSGAARD-RASMUSSEN, 1950). Petrographically the intrusive rocks show great variation, but they were described under the collective designation "dolerite". The intrusions occur in great numbers as both dykes and sills. "Apparently the intrusions are sills grading into dikes, but it is

Table 1. *The stratigraphy known from the Jørgen Brønlund Fjord area before the area was visited by the 4th and 5th Danish Peary Land Expeditions in 1966 and 1968. The whole sequence has a slight dip (2–3°) towards the north-east. Compiled from* KOCH *(1923a & b)*, TROELSEN *(1949, 1956b) and* ELLITSGAARD-RASMUSSEN *(1950).*

LOWER–?MIDDLE ORDOVICIAN	Børglum River Limestone. At least	35 m
	erosional unconformity ?	
	Wandel Valley Limestone	350 m
	erosional unconformity ?	
LOWER CAMBRIAN	Brønlund Fjord Dolomite	100 m
	erosional unconformity	
EOCAMBRIAN (Thule Group)	Sandstone (cross-bedded) interlayered with shale	245 m
	Covered interval	150 m
	Sandstone, in the upper part interlayered with shale	40 m
	Dolomite (cherty in the lower part) with *Cryptozoon* and *Collenia* structures	250 m
	Tillite and reddish sandstone	c. 67 m
	erosional unconformity ?	
LATE PRECAMBRIAN	Yellowish sandstone with cross-bedding and ripple marks. The sandstone is cut by numerous intrusions (mainly dolerites). One intrusion (?dyke) which penetrates the overlying Eocambrian strata has been observed. At least	900 m

commonly difficult to distinguish between the two types as the same intrusive body may show all degrees of conformity or nonconformity with the pre-Cambrian sandstones that constitute the wall rock" (ELLITSGAARD-RASMUSSEN, 1950, p. 592). Sills with thicknesses up to about 200 m and with a horizontal extent of 20–30 km were seen in several localities in Independence Fjord. ELLITSGAARD-RASMUSSEN succeeded in distinguishing between seven "sequences of intrusives", and the relative ages of some of them were established by the aid of intersections. The stratigraphical position of the intrusions was not proved with certainty, but they were only observed in the Precambrian sandstones.

The next geological field work to be carried out on the bedrock of the Jørgen Brønlund Fjord area, was during the 4th and 5th Danish Peary Land expeditions in 1966 and 1968 (JEPSEN, 1966 and 1969). The geological knowledge from the area before those two expeditions is summarised in table 1.

Fig. 2. U-shaped valley surrounded by plateau mountains. In the foreground, Nedre Midsommersø and in the background, Øvre Midsommersø—both ice-covered. (Photo and copyright Geodetic Institute, Copenhagen, 548 G–V, 10210, July 15th, 1950).

3. TOPOGRAPHY AND EXPOSURES

The geographical localities are shown on the geological map (plate 1). The cartographic base has been drawn from aerial photographs (slotted template method). The main features of the topography were formed during the last glaciation (Wisconsin), and the area is dominated by two converging U-shaped valleys: Midsommersøer-Midsommerelv-Jørgen Brønlund Fjord (Wandel Dal) and Inuiteq Sø-Ítukussuk Dal-Jørgen Brønlund Fjord. These two valleys are connected in the western part of the area by a third U-shaped valley: Viddal. Remnants of the ice are found in the Storm Iskappe and Chr. Erichsens Iskappe, from the latter of which two piedmont glaciers pass down into the Ítukussuk Dal, Skjoldet and Elefantfoden. Moreover, the topography is controlled by the structure of the bedrocks, which are flat-lying sediments with a slight north-northeasterly dip. The mountains are plateau-mountains with plane surfaces, having corresponding north-northeasterly dips of the same order as the underlying sedimentary strata (e.g. Refsnæs and Rundfjeld). Fig. 2 shows a typical example of the topography in the area. Midsommersøer lie about 80 m above sea level, Inuiteq Sø is 200 m above sea level, the mountain north-west of Inuiteq Sø is 1000 m above sea level, Refsnæs and Rundfjeld are 900–1000 m (the southern parts) and 7–800 m above sea level (the northern parts), the mountains north of Midsommersøer are 7–800 m above sea level, the southern parts of Frysefjeld and Buen are 7–800 m above sea level, Catalinafjeld is 7–800 m above sea level (KNUTH, the altitude of Midsommersøer, personal communication; HØY, 1970; U.S. Army Map Service, C501, NU 25–35, Jørgen Brønlund Fjord, 1957).

The bottoms of all the larger valleys have very few bedrock exposures, but the mountain sides are very well exposed, which makes the measuring and correlation of stratigraphical sections very easy.

4. STRATIGRAPHY

During the two field seasons the sedimentary sequence under the Brønlund Fjord Dolomite has been mapped, and sections have been measured by the aid of an aeroid altimeter. On plate 2 six sections have been compiled:

Section 1: North-west of Inuiteq Sø 82°01′ N, 34°36′ W.
Section 2: Store Sandelv, upper course, 82°12′ N, 34°14′ W.
Section 3: The north-east side of Rundfjeld, 82°13′ N, 33°18′ W.
Section 4: Portfjeld, 82°13′ N, 32°29′ W.
Section 5: Moræneso, 82°09′ N, 32°16′ W.
Section 6: Buen, 82°11′ N, 30°33′ W.

Only four of these sections (1 and 4–6) are necessary for describing the whole sequence and, hence, they are selected as type sections. To facilitate a survey the lithological units have been numbered. Units 1–3 are described from section 1, units 4–8 from section 5, units 9–19(20) from section 4, and units (20)21–33 from section 6. Since the lower boundary of unit 11(10) is a completely plain surface, that boundary has been used as a reference plane (datum line) in plate 2. Representative rock specimens have been collected at an average interval of 15 m from the 978 m thick sequence with at least one specimen from every lithological unit. Thin sections of these specimens were used during the description of the sediments, but the rock names given in the following are provisional, because classification was carried out without the aid of modal analyses. The general sedimentological nomenclature used is in accordance with Pettijohn (1957) and Pettijohn & Potter (1964). Bedding classification is taken from Ingram (1954) and the scale of grain size from Wentworth (1922, p. 381).

4.1. Lithology

Brønlund Fjord Dolomite (Troelsen, 1949, pp. 13–15)

---- ---------- erosional unconformity ------------

33 Covered interval .... 5 m

32 Shale; black, laminated, black weathering. Upwards the shale is interlayered with an increasing amount of light grey beds

(5–50 cm) consisting of fine-grained, quartz-rich graywacke with cross-bedding on a small scale (5–10 cm, figs 3 and 4). The graywacke: angular grains, glauconitic, partly cemented (carbonate). Graded bedding can be observed in thin sections 120 m

31 Covered interval. Probably a downwards continuation of the black shale of unit 32 .... 45 m

30 Quartz-rich graywacke; brown to violet, fine-grained, medium- to thick-bedded, grey weathering.
Subangular grains, glauconitic and haematitic, partly cemented (carbonate)...................................... 5 m

29 Quartz-rich graywacke; light grey, fine-grained, thin- to medium-bedded, rust-coloured weathering.
Angular grains, glauconitic, partly cemented (carbonate) ... 35 m

28 Orthoquartzite; white, medium-grained, medium- to thick-bedded, cross-bedding on a small scale (5–10 cm).
Rounded grains, glauconitic, quartz-cemented .... 10 m

27 Orthoquartzite; light grey, medium-grained, thin- to medium-bedded, rusty weathering, a few conglomeratic horizons. The bedding is very irregular, because the orthoquartzite has a broken structure (fig. 5). In the conglomeratic horizons cross-bedding on a small scale is developed.
Subrounded to rounded grains, clastic glauconite grains, haematitic, quartz-cemented .... 60 m

26 Feldspathic sandstone; light grey, medium-grained, conglomeratic.
Subrounded grains, glauconitic, partly cemented (carbonate impregnated with iron-oxides) .... 10 m

25 Feldspathic graywacke; light grey, fine-grained, medium- to thick-bedded.
Angular grains, glauconitic, partly cemented (carbonate impregnated with iron-oxides) .... 15 m

24 Interlayered sequence consisting of:
1) Shale; dark grey, laminated, glauconitic.
2) Quartz-rich graywacke; grey, fine-grained, thin-bedded. Angular grains, glauconitic, partly cemented (carbonate). Load casts are developed along the upper boundary of the unit (fig. 6) .... 55 m

23 Covered interval .... 25 m

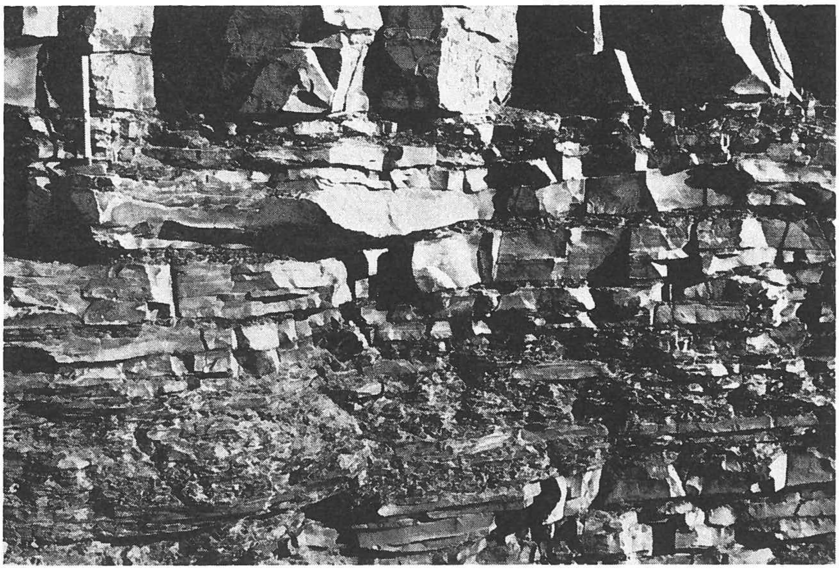

Fig. 3. Interlayered shale and quartz-rich graywacke. Unit 32, Buen Formation. Length of hammer 45 cm. Buen.

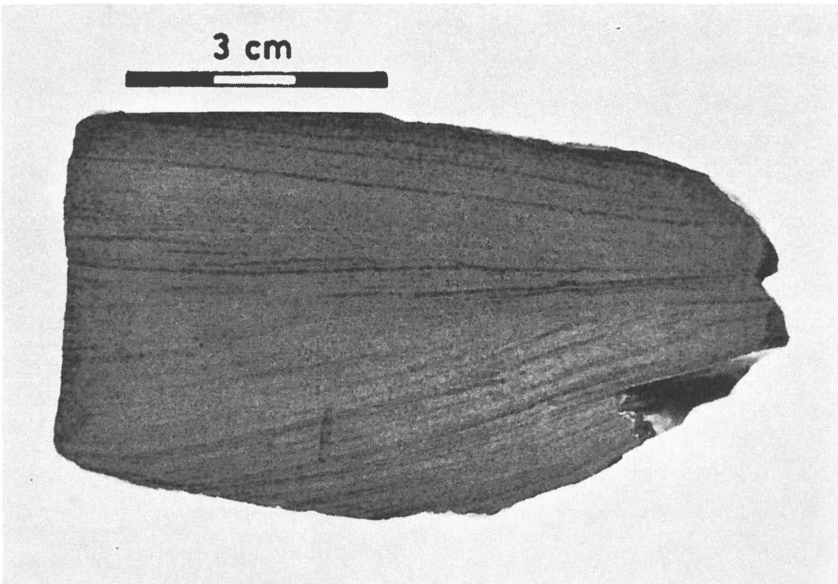

Fig. 4. Small-scale cross-bedding in a sample from one of the graywacke beds of fig. 3. Graded bedding can be observed in thin sections. Unit 32, Buen Formation. Buen.

22 Orthoquartzite; white, medium- to coarse-grained, thin-bedded, yellow rust-coloured weathering, conglomeratic.
Rounded grains, quartz-cemented .... 15 m

21 Orthoquartzite; white, fine- to coarse-grained, medium-bedded, yellow rust-coloured weathering, conglomeratic.
Rounded grains, quartz-cemented .... 10 m

20 Covered interval .... 35 m

19 Dolomite; grey, fine-grained, medium-bedded, dark grey weathering, oolitic. The dolomite contains a few scattered angular quartz-grains.
Recrystallised .... 30 m

18 Orthoquartzite; white, medium- to coarse-grained, thick-bedded, yellow rusty weathering.
Rounded grains, completely quartz-cemented .... 5 m

17 Dolomitic conglomerate; angular blocks (dolomite) with diameters up to 15 cm and subangular to subrounded quartzitic pebbles (fig. 7). The conglomerate is white, thick-bedded, and has a rusty weathering colour.
The dolomitic matrix is recrystallised .... 5 m

16 Dolomite; dark grey, fine-grained, medium-bedded, grey weathering. The bedding is irregular.
Recrystallised .... 10 m

15 Dolomite; white, fine-grained, thin-bedded, grey to yellow weathering. The bedding is very well-developed.
Recrystallised .... 15 m

14 Dolomite; interlayered light grey, red and light green beds, fine-grained, thin-bedded, a few scattered quartz-grains, slump structures and intraformational conglomerates (figs 8 and 9).
Recrystallised .... 15 m

13 Dolomite; white, fine-grained, very thick-bedded, yellow weathering. The dolomite contains a lot of centimetre-scale irregular cavities cut up by thin lamina. The cavities are often filled up by calcite and pyrite crystals.
Recrystallised .... 8 m

12 Quartz-rich dolomite; dark grey, fine-grained, laminated. The dolomite contains black, millimetre-thin, shaly flakes....... 1 m

11 Dolomite; dark grey, fine-grained, medium-bedded, light grey weathering. In the lower 5–10 m intraformational conglomeratic horizons are developed (fig. 10). In the upper 60 m the

Fig. 5. Orthoquartzite with a characteristic broken structure, which results in an irregular bedding. Unit 27, Buen Formation. Length of hammer 45 cm. Buen.

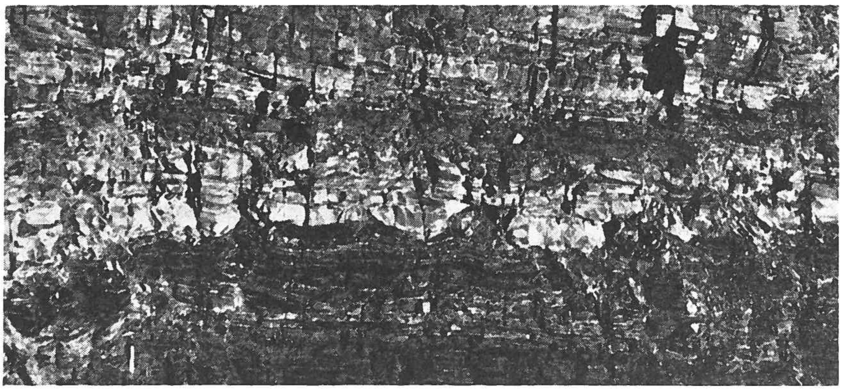

Fig. 6. Load casts developed at the boundary between unit 24 (dark grey shale) and unit 25 (light grey, feldspathic graywacke), Buen Formation. Field of view 20×10 m. Buen.

dolomite contains decimetre-large, black cherty layers and lenses (fig. 11). In addition, since the upper part of the dolomite is very dark grey that part stands out as a characteristic dark horizon (fig. 12). Several horizons of the dolomite and the chert are oolitic.

The dolomite is completely recrystallised .... 90 m

10 Covered interval .... 7 m

------------- erosional unconformity -------------

Fig. 7. Dolomitic conglomerate with angular dolomite blocks and subangular to subrounded quartzite pebbles. The latter cannot be seen on the photograph. Unit 17, Portfjeld Formation. Length of hammer 45 cm. Portfjeld.

9 Protoquartzite and orthoquartzite; white, medium- to coarse-grained, conglomeratic, rusty weathering. The pebbles which are well-rounded have diameters up to 5 cm and consist of white and grey protoquartzite. Rounded grains. In the lower part the quartzite is quartz-cemented and in the upper part it contains 1–2 cm thick dolomite lenses and is completely carbonate-cemented.
The carbonate-cemented part of the unit is stylolitic .... 4 m

8 Dolomite; white to reddish brown, very fine-grained. A few scattered angular quartz-grains. As described by TROELSEN (1949, pp. 11–12) the dolomite is built up of stromatolites of the *Cryptozoon* type (fig. 13). In the dolomite stylolitic seams are developed.
Completely recrystallised .... 25 m

7 Tillite; dark red-brown, thick-bedded to very thick-bedded. The matrix is a dark reddish-brown, fine- to medium-grained feldspathic graywacke of which the clay or silt content makes up more than 30 %. The matrix has angular grains and is unsorted. Partly cemented (carbonate and haematite).

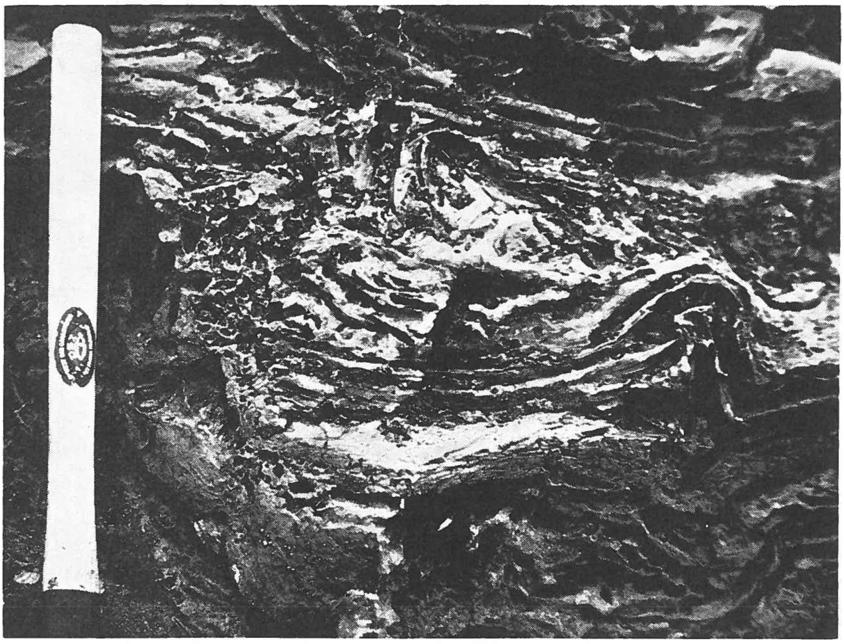

Fig. 8. Thin-bedded dolomite with slump structures. Unit 14, Portfjeld Formation. Length of hammer 45 cm. Portfjeld.

Fig. 9. Intraformational conglomerate in thin-bedded dolomite. Unit 14, Portfjeld Formation. Field of view 10 × 9 cm. South of Brønlundhus.

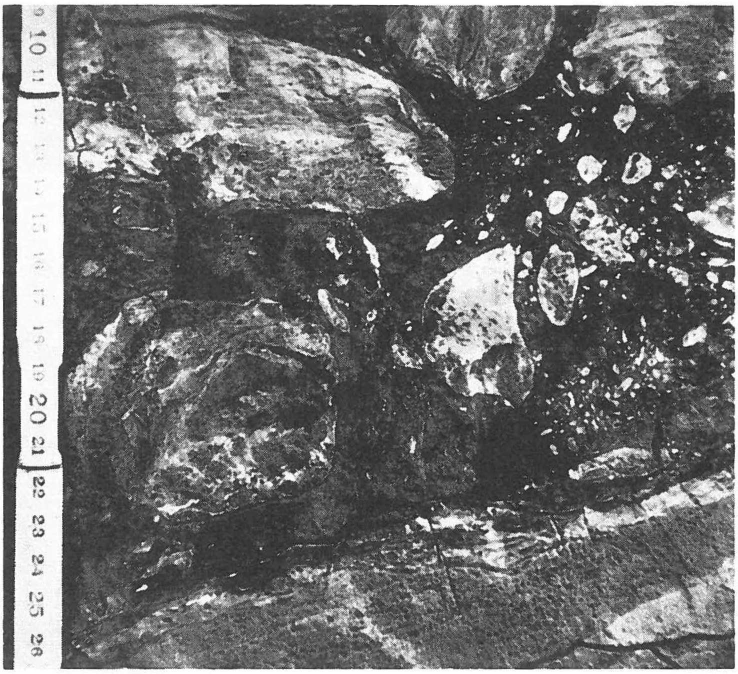

Fig. 10. Intraformational conglomerate in dolomite. Lower part of unit 11, Portfjeld Formation. Field of view 20 × 18 cm. Portfjeld.

The erratics make up a variable amount of the tillite, but the normal content is between 10 and 20 % (fig. 14). The blocks which have diameters up to 100 cm are angular or flat-iron shaped, and several of them have glacial striae (fig. 15). In some horizons where the tillite is stratified the blocks are well-rounded. The tillite blocks consist mainly of sandstone and quartz dolerite (from the Precambrian Midsommersø dolerites), but a few blocks of other rock types are found—granitic gneiss and folded quartzite with a large content of magnetite..... 45 m

6 Protoquartzite; white, fine- to medium-grained, thick-bedded, yellow weathering.
Subrounded to rounded grains, quartz-cemented .... 5 m

5 Sandstone-breccia; reddish-brown. The 1–10 cm large, angular fragments consist of fine-grained feldspathic sandstone, shale and strongly weathered dolerite. The matrix is a fine-grained, feldspathic graywacke with a large clay content.
Subangular to subrounded grains .... 3 m

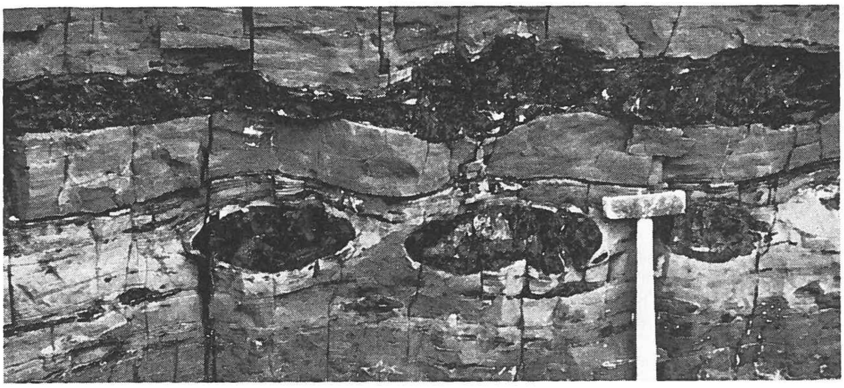

Fig. 11. Black, cherty layers and lenses in dolomite. Upper part of unit 11, Portfjeld Formation. Width of hammer 13 cm. Portfjeld.

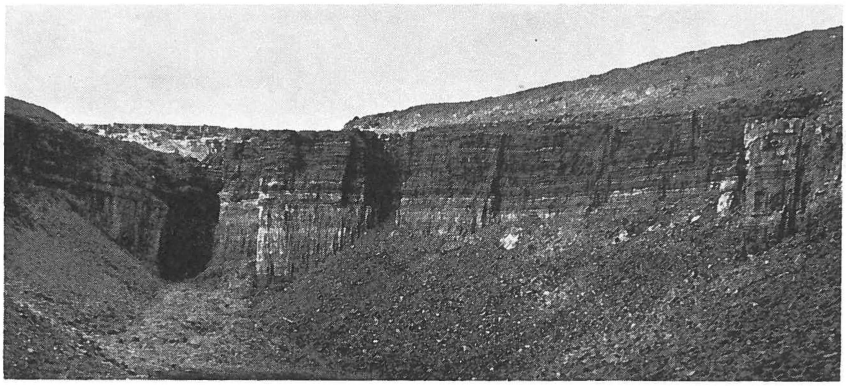

Fig. 12. The characteristic dark cherty dolomite horizon in the upper part of unit 11, Portfjeld Formation. Height of cliff 90 m. Portfjeld.

Fig. 13. Dolomite with *Cryptozoon* structures. Unit 8, Moræneso Formation. Moræneso.

Fig. 14. Tillite with boulders of sandstone and quartz dolerite (form the Precambrian Midsommersø dolerites). Unit 7, Moræneso Formation. Length of hammer 45 cm. Morænesø.

4 Protoquartzite; brownish-orange, medium- to coarse-grained, very thick-bedded. It contains scattered clusters of angular quartzite blocks (5–10 cm, fig. 16).
Subrounded to rounded grains, partly cemented (quartz), haematitic .... 35 m

-------------- erosional unconformity --------------

3 Feldspathic sandstone; light brown, fine- to medium-grained, medium-bedded, ripple marks (fig. 17). In the upper part, the sandstones are darker (haematitic) and thin-bedded.
Subangular to subrounded grains, quartz- and carbonate-cemented .... 40 m

2 Sandstone; interlayered sequence consisting of:

1) Feldspathic sandstone and graywacke; dark chocolate brown, fine- to medium-grained, very thin-bedded, conglomeratic. It weathers to a friable substance. Angular grains.

2) Feldspathic sandstone; white, medium- to coarse-grained,

Fig. 15. Sandstone boulder from the tillite of unit 7, Moræneso Formation. Notice the two parallel glacial striae, which were discovered on the hidden side of the boulder, when it was loosened from the lithified tillite matrix. Length of folded metre stick 12 cm. Moræneso.

medium-bedded, conglomeratic, cross-bedded. Carbonate-cemented.

In the sequence was found a 2 m thick dolomite-horizon. It is white and fine-grained and contains scattered angular quartz grains. The dolomite is completely recrystallised .... 25 m

1 c Feldspathic sandstone; white, coarse-grained, thin- to medium-bedded, cross-bedded and ripple marks. The upper 15 m the sandstone is light brown, fine- to medium-grained and has a light brown weathering colour.
Subrounded to rounded grains, partly cemented (carbonate) 35 m

(Dolerite sill .... 15 m)

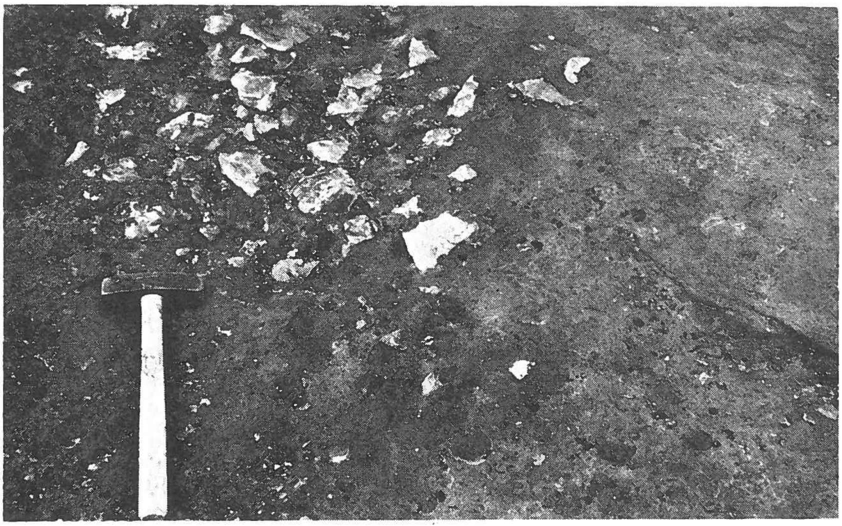

Fig. 16. Protoquartzite with scattered clusters of angular quartzite blocks. The blocks are possibly ice-dropped. Unit 4, Moræneso Formation. Length of hammer 45 cm. Moræneso.

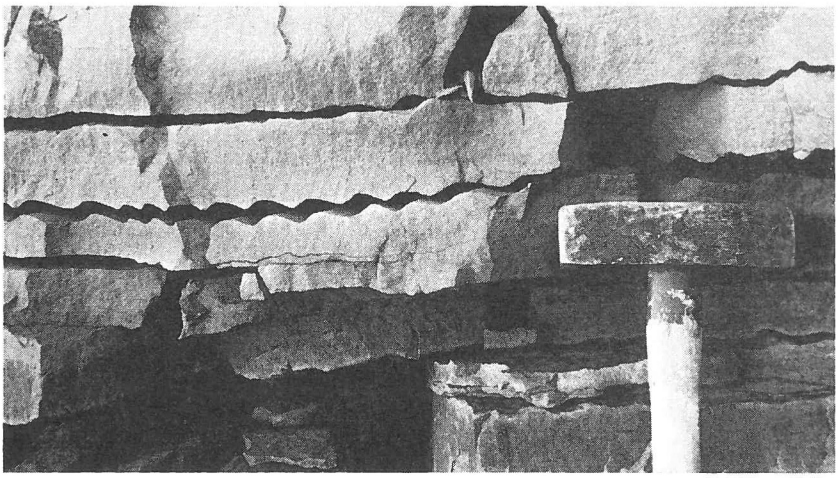

Fig. 17. Feldspathic sandstone with ripple marks. Unit 3, Inuiteq Sø Formation. Width of hammer head 13 cm. Inuiteq Sø.

1b Feldspathic sandstone; white, coarse-grained, thin- to medium-bedded, light yellow weathering, cross-bedding and ripple marks .... 20 m

(Dolerite sill .... 15 m)

Fig. 18. Feldspathic sandstone with cross-bedding. Unit 1 a, Inuiteq Sø Formation. Inuiteq Sø.

1 a Feldspathic sandstone; white, coarse-grained, thin- to medium-bedded, interlayered centimetre-thin shale lamina, cross-bedding (fig. 18) and ripple marks, mud cracks in connection with the shale lamina (fig. 19). In the lower 20 m the feldspathic sandstone is medium- to thick-bedded and conglomeratic with scattered white quartzite pebbles (1–3 cm).
Subrounded to rounded grains, partly cemented (quartz) ... 110 m

(Intrusive breccia intruded in an irregular sheet .... 120 m)

Without the intrusions the total thickness of the sequence below the Brønlund Fjord Dolomite is 978 m.

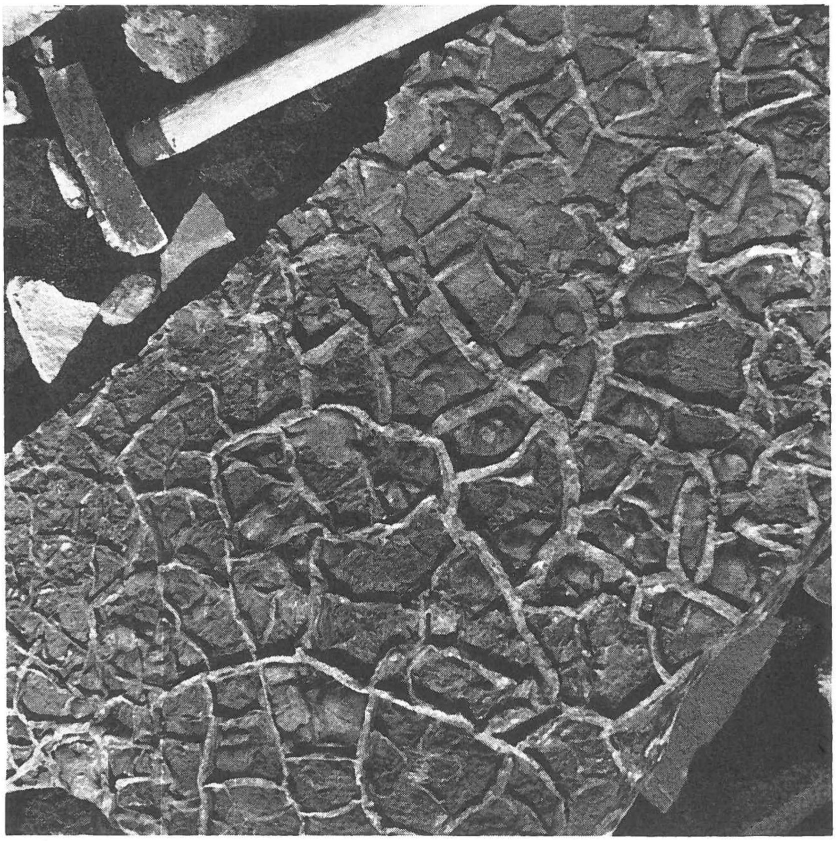

Fig. 19. Mud cracks in connection with interlayered shale laminae in feldspathic sandstone. Unit 1 a, Inuiteq Sø Formation. Width of hammer head 13 cm. Inuiteq Sø.

4.2. Formational division of the sequence

On the basis of lithological criteria the sedimentary sequence below the Brønlund Fjord Dolomite has been divided into four formations as shown in table 2. The distribution of these formations can be seen on the geological map (plate 1). The drawing of the formational boundaries is based partly on field observations and partly on photogeological interpretation of vertical aerial photographs taken by the Geodetic Institute, Copenhagen (from Himmerlanddal and Paralleldal, however, no field observations exist).

4.2.1. Inuiteq Sø Formation

This formation is mainly a clastic sequence consisting of sandstone (units 1–3). It has its widest distribution in the western part of the area, where it builds up the bedrock in the bottom of all the larger valleys.

Table 2. *Formational division of the sedimentary sequence below the Brønlund Fjord Dolomite. The thicknesses have been measured at the type locality. The ages of the formations are discussed in section 6.*

LOWER CAMBRIAN	Brønlund Fjord Dolomite...... 100 m	Dolomite
	------erosional unconformity------	--------------
	Buen Formation. Type locality: section 6, units (20)21–33 .... 425 m	Clastic sequence
-----------	--- covered interval (unit 20, 35 m) ---	--------------
CAMBRIAN or EOCAMBRIAN	Portfjeld Formation. Type locality: section 4, units 10–19(20) .... 206 m	Mainly dolomite
-----------	------erosional unconformity------	--------------
EOCAMBRIAN	Moræensø Formation. Type localities: sections 4 and 5, units 4–9 .... 117 m	Conglomeratic sandstone. Dolomite with *Cryptozoon* structures. Tillite
-----------	------erosional unconformity------	--------------
PRECAMBRIAN	Inuiteq Sø Formation. Type locality: section 1, units 1–3 .... 230 m	Clastic sequence

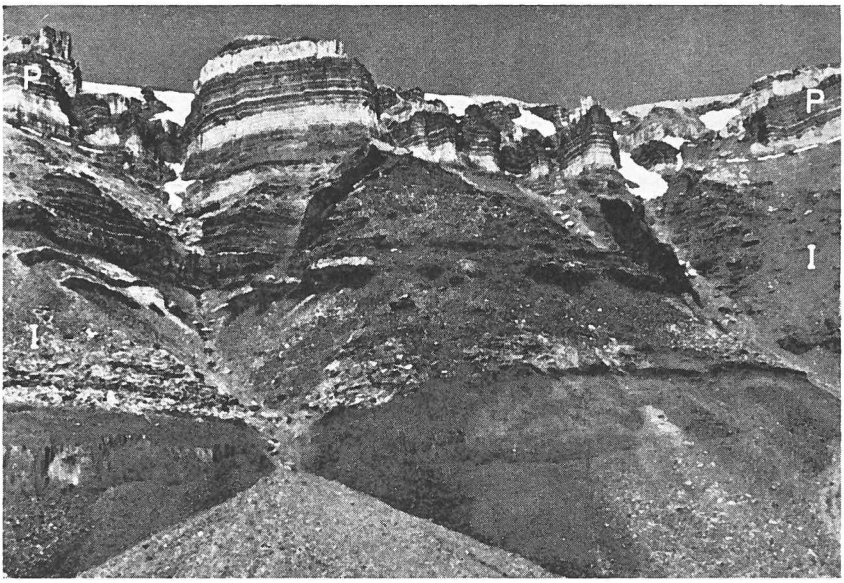

Fig. 20. The type locality of the Inuiteq Sø Formation (section 1) at Inuiteq Sø. At this locality the Moræensø Formation is only 10 m thick and cannot be seen on the photograph. Notice that the dark Midsommersø dolerites are cut off at the upper boundary of the Inuiteq Sø Formation. I = Inuiteq Sø Formation. P = Portfjeld Formation. Height of mountain side about 800 m. Inuiteq Sø.

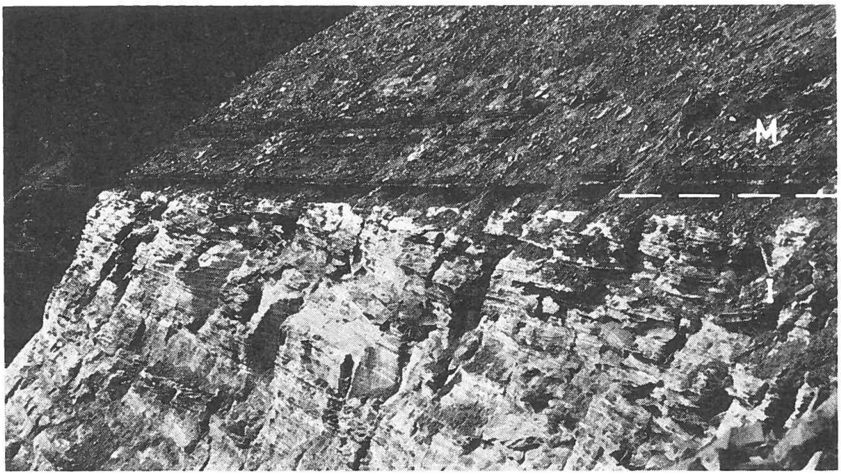

Fig. 21. Angular unconformity at the boundary between Inuiteq Sø Formation (I) and Moræneso Formation (M). The tilting of the beds in the Inuiteq Sø Formation is a local phenomenon at this locality and is interpreted as a result of intrusion of large dolerite bodies (Midsommersø dolerites) in the underlying parts of the formation. The photograph covers an interval of altitude of about 15 m. Inuiteq Sø.

This distribution results in the very bad exposure of the formation, and in many areas it is only the erosional resistant intrusions (Midsommersø dolerites) which project through the Quaternary deposits as glacial striated roches moutonnées. The type locality of the formation at Inuiteq Sø is shown in figure 20. The lower boundary is not exposed, but KOCH observed that the formation continues to the border of the Greenland Ice Cap in the south (20–60 km south and south-east of Inuiteq Sø), and he estimated the thickness to be over 900 m (KOCH, 1923a, p. 63). The intrusion of the Midsommersø dolerites has caused disruption of the strata, which are displaced along steep faults and are locally tilted, so that originally horizontal strata have now dips up to 20° (fig. 21).

4.2.2. Morænesø Formation

At the type localities this formation consists of three divisions. The lower division is the clastic tillite sequence (units 4–7), which in the lower part is stratified and not a true tillite. The tillite is overlain by dolomite with *Cryptozoon* structures (unit 8), and the formation ends with a sandstone conglomerate (unit 9). The boundary to the underlying Inuiteq Sø Formation is an irregular erosional surface probably excavated by the ice which deposited the overlying tillite. However, no glacial striae have been observed on the upper surface of the Inuiteq Sø Formation,

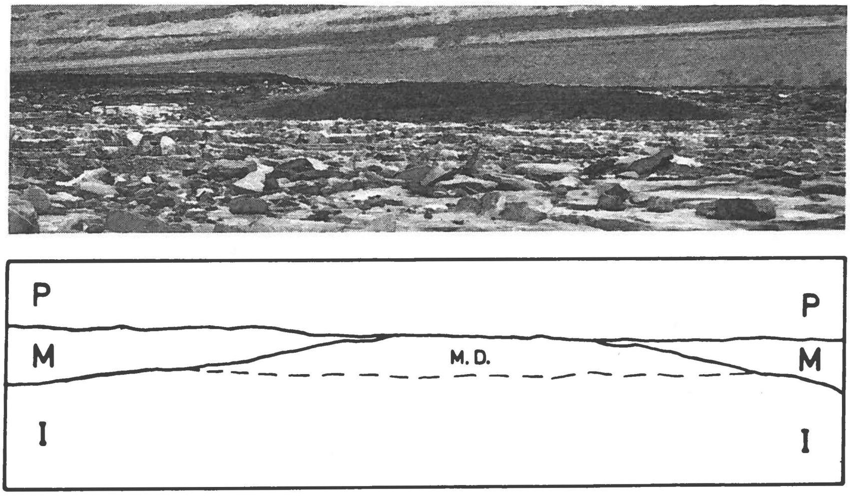

Fig. 22. Fossil roche moutonnée on the upper surface of the Inuiteq Sø Formation (I) probably excavated by the ice which deposited the tillite. The tillite can be seen as the dark layer in the upper part of the Moræneso Formation (M). During this Eocambrian glaciation the hill was protected by a resistant dolerite sill (M. D., Midsommersø dolerites)—a phenomenon which often is seen in the modern glacial eroded landscape. The sill is about 30 m thick. In the background Portfjeld Formation (P). 1 km south-west of Morænesø.

but the topography of that surface resembles very much the topography of the modern glacially eroded landscape—thus fossil roches moutonnées and canyons are developed on top of the Inuiteq Sø Formation (fig. 22). The upper boundary of the formation is a very plain erosional surface which is used as a reference plane in plate 2 as mentioned above. In places where the Inuiteq Sø Formation lies high in the stratigraphical succession, the erosion which preceded the deposition of the Portfjeld Formation has removed the interjacent Morænesø Formation (e.g. at sections 2 and 3, plate 2).

The lithology of the formation changes from place to place. As shown in plate 2 the dolomite with *Cryptozoon* structures (unit 8) thins out towards the west, and the conglomeratic sandstone below the tillite (units 4–6) or the tillite itself are missing in several localities. Apart from the dolomite with *Cryptozoon* structures the sedimentary rocks of the formation are very susceptible to weathering, hence the formation does not stand out as a distinctive unit which can be recognised on aerial photographs. On the geological map, therefore, the lower boundary of the formation has only been drawn in full lines where it has been directly observed in the field.

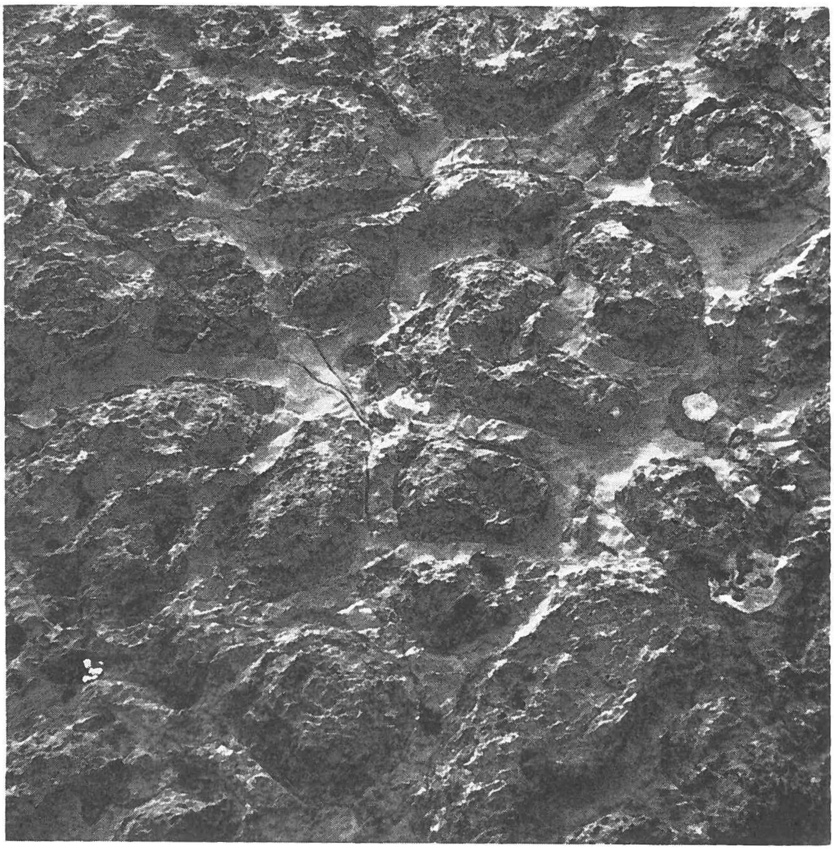

Fig. 23. *Collenia* structures developed in a dolomite layer which is correlated with units 17–18, Portfjeld Formation. Field of view 25×25 cm. Buen.

4.2.3. Portfjeld Formation

This formation consists mainly of dolomite except for a single 10 m thick clastic layer (units 17–18). The lower boundary is not exposed at the type locality, but at section 3 the formation begins with a dolomite conglomerate, which contains well-rounded pebbles consisting of sandstone and intrusive rocks. The boundary to the overlying formation is covered by 35 m of moraine and scree (unit 20), of which 20 m have been included in the Portfjeld Formation, a practise which is justified by the topography in the interval of unit 20.

As mentioned before, the cherty dolomite in the lower part of the formation (unit 11) stands out as a very characteristic layer which can easily be recognised on aerial photographs, and since the unit is distributed over the whole area it has been of great value during the drawing of the geological map. The 8 m thick massive dolomite layer of unit 13

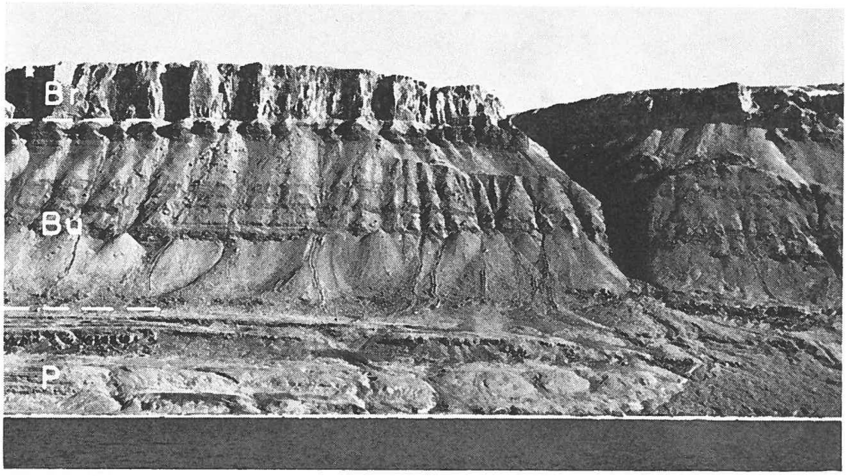

Fig. 24. The type locality of Buen Formation at Buen, northern shore of Jørgen Brønlund Fjord. The mountain side is about 700 m. P = upper part of Portfjeld Formation, Bu = Buen Formation, Br = Brønlund Fjord Dolomite.

is very distinctive and has been used in correlation between sections 4 and 6.

The clastic units 17–18 are replaced at section 6 by a dolomite which contains clastic quartz grains and which has developed stromatolite structures of the *Collenia* type (description by TROELSEN, 1949, p. 23). Fig. 23 shows the *Collenia* structures. Specimens from the black chert of unit 11 have been examined by RAUNSGAARD PEDERSEN (1970), who discovered algae(?) threads with lengths up to about 0.4 mm. The threads are segmented and probably bifurcated, and they can be divided into at least two groups.

4.2.4. Buen Formation

This formation is built up of two sedimentary cycles (units (20)21–24 and units 25–33), each of which begins with quartzitic sandstone and ends with shale interbedded with graywacke. Fig. 24 shows the formation at the type locality in Jørgen Brønlund Fjord. The lower beds are not exposed in a 15 m wide interval. Also the upper boundary is not exposed, but at another locality (towards ?the west) TROELSEN (1956, p. 87) observed that the boundary is a "simple erosional disconformity". The overlying Brønlund Fjord Dolomite stands out as a very distinctive steep bluff recognisable on aerial photographs, and this facilitated the drawing of the upper boundary of the Buen Formation on the geological map.

In a specimen of shale brought home by the author trilobite fragments were identified by V. POULSEN (1970, personal communication).

Fig. 25. The Precambrian Midsommersø dolerites penetrate the Inuiteq Sø Formation as sills, sheets and more irregular bodies. At this locality the Moræneso Formation is only 10 m thick and cannot be seen on the photograph. Notice that the dolerites are cut off at the upper boundary of the Inuiteq Sø Formation. The mountain side is about 700 m. I = Inuiteq Sø Formation, P = Portfjeld Formation. Inuiteq Sø.

The specimen was taken 100 m below the upper boundary of the formation (from unit 32). A generic classification of the fragments could not be accomplished because of their very broken nature, but in the summer of 1969 geologists of Ponderay Polar A/S collected well-preserved olenclid trilobites from fissile shales below the Brønlund Fjord Dolomite (J. C. SPROULE and Associates, personal communication to GGU).

North of section 3 on the north side of Nedre Midsommersø the total thickness of the Portfjeld and the Buen Formations was measured to be 575 m, which indicates that the two formations thin out towards the west as shown in plate 2.

Sections through the strata along the northern shore of Independence Fjord were measured in 1970 and revealed that all the post-Precambrian formations wedge out towards the south (JEPSEN, 1971).

4.3. Intrusions

The strata are cut by two sequences of dolerites: a pre-tillitic sequence the intrusions of which in the present paper are called Midsommersø dolerites, and a younger sequence of doleritic dykes which traverse all the formations of the Jørgen Brønlund Fjord area.

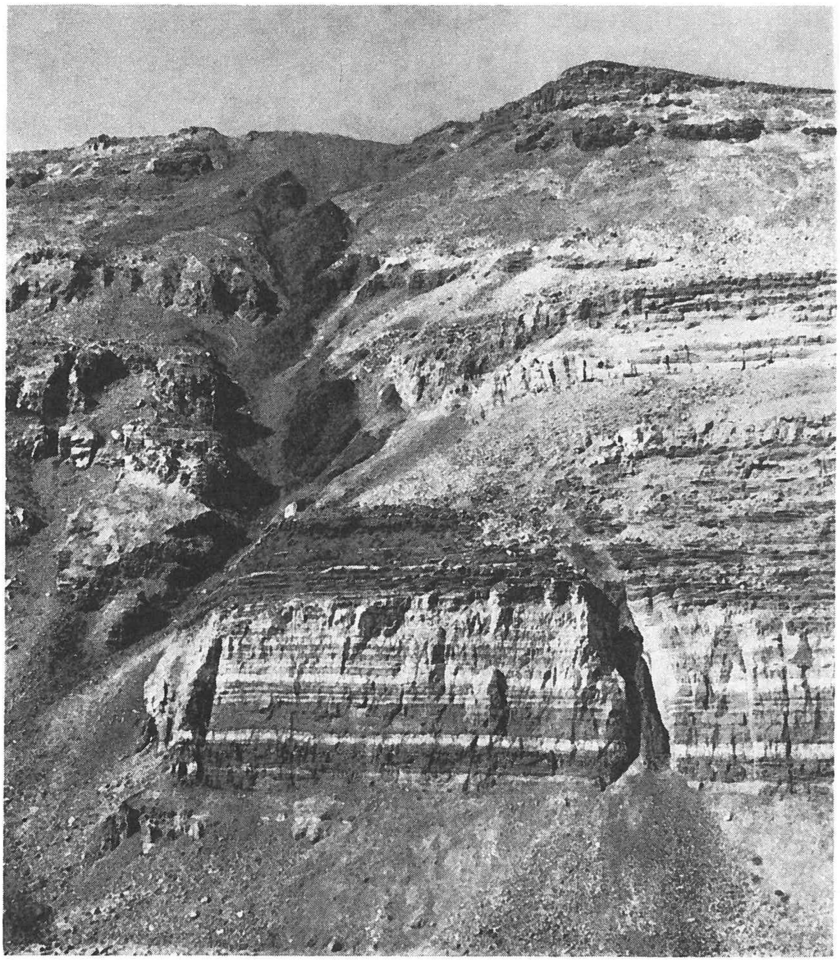

Fig. 26. A vertical dyke (considered here as post-Palaeozoic) cuts through the Portfjeld Formation. Northern shore of Øvre Midsommersø.

The Midsommersø dolerites intrude only the Inuiteq Sø Formation and are cut off by the erosion which preceded the deposition of the Moræneso Formation. The dolerites occur partly as concordant sills and partly as discordant dykes, sheets and more irregular bodies such as chonoliths, plugs and stocks (fig. 25). Normally it is difficult to classify the individual intrusions, especially as the above-mentioned forms are found within a single intrusive body grading into each other. The thicknesses of the intrusions vary, the smallest sills can be measured in decimetres, and the largest sills and sheets are up to 100 m thick. The lateral extent of the sills and sheets is difficult to measure because the exposures are limited. The Mågeklippe is built up of a 65 m thick sill with an exposed horizontal extent of 2.5 km, and in other localities intrusions of the same scale have been observed. Petrographically the Midsommersø dolerites are quartz dolerites with the following main constituents: plagioclase, orthopyroxene, augite, pigeonite and a quartzo-feldspathic mesostasis. In connection with the Midsommersø dolerites a quartz-rich intrusive breccia occurs (described as "flow breccia" by ELLITSGAARD-RASMUSSEN, 1950, p. 594). Probably the breccia was generated during the intrusion of the Midsommersø dolerites by mobilisation of the sandstone or the hidden basement rocks. Two rock specimens of the Precambrian Midsommersø dolerites have been dated by radiometric K/Ar determinations and gave 799 ± 68 m.y. and 982 ± 19 m.y. (HENRIKSEN & JEPSEN, 1970). These must be regarded as minimum ages.

The younger dolerite sequence forms 5–50 m wide dykes which are vertical and strike north-west–south-east (fig. 26). The dykes are olivine dolerites with the following main constituents: plagioclase, olivine and augite. Since the dykes strike roughly parallel to each other and since they are very alike petrographically the present writer considers them as belonging to the same magmatic epoch. A K/Ar determination on a rock specimen from one of these dykes gave 72 ± 9.0 m.y. (HENRIKSEN & JEPSEN, 1970), and all the north-west–south-east striking dykes in the mapped area are here regarded as post-Palaeozoic. TROELSEN (1950b) discovered "Basic sills of post-Ordovician but pre-Pennsylvanian (Triticites) age" in eastern Peary Land. It is possible that igneous rocks of this age may occur in southern Peary Land.

4.4. Structure

The average dip of the strata is 1.5° towards the north-north-east so that the boundary between the Moræneso and the Inuiteq Sø Formations (the datum line on plate 2) is 700 m above sea level at Inuiteq Sø and at Jørgen Brønlund Fjord it is at sea level. Because of this structure the oldest beds of the sequence are found in the southwestern part of the area. From the head of Independence Fjord, HALLER (1961, pp. 156–158) has described very open folds with wave lengths up to 25 km. The folds were said to affect only the strata of the Inuiteq Sø Formation (HALLER's "Older Strata"), and he correlated them with the Carolinidian orogeny. The present writer was not able to demonstrate these structures in the mapped area.

The aerial photographs show that the area is cut by numerous vertical faults, which strike north-east–south-west. All the pre-Quaternary strata are affected by the faults, and therefore they have a post-

Lower Ordovician age (see table 1). Normally it is difficult to measure the displacement along the faults, but at Midsommerelv between Portfjeld and Nedre Midsommersø a vertical displacement of 60 m was measured. The area bounded by Glaciologelv and Botanikerelv south of Jørgen Brønlund Fjord is down-faulted, and the total displacement, which has occurred along several parallel faults, is about 225 m. Only faults which appreciably have influenced the course of the formational boundaries have been marked on the geological map.

5. STRATIGRAPHICAL CORRELATION

Apart from algae structures and fucoidal markings, the Precambrian and Eocambrian beds are unfossiliferous and thus the chronostratigraphical correlation with neighbouring areas cannot be carried out with certainty because, instead of faunal evidence, one has to make use of other more problematic aids to correlation such as lithology, unconformities and radiometric age determinations.

The Inuiteq Sø Formation can be placed in the upper part of the Precambrian because of the radiometric K/Ar ages of the pre-tillitic Midsommersø dolerites which have penetrated the whole formation (section 4.3).

Kulling (1942, pp. 312–314) and Katz (1952, pp. 27–28; 1953, pp. 96–101; 1954, pp. 47–52; 1961, pp. 325–327) correlated the tillite above the Precambrian Eleonore Bay Group in central East Greenland with the deposits from the Varanger Glaciation in Scandinavia (Kulling, 1942, p. 315). Kulling (1951, pp. 39–41), Fränkl (1954, pp. 56–59), Troelsen (1956b, pp. 85 and 89) and Berthelsen (Berthelsen & Noe-Nygaard, 1965, p. 232) have suggested that the same correlation should be adopted for the tillite in the Jørgen Brønlund Fjord area, and this correlation is followed by the present writer. In accordance with Poulsen (1956, pp. 59–60) and Troelsen (1956b, pp. 71–72) the term Eocambrian is used for "the time which is represented by the sequence of sediments which starts with the tillites and ends with the disconformity which precedes the first appearance of Olenellidae" (Troelsen, 1956b, pp. 71–72). Whether the Eocambrian should be grouped with the upper part of the Precambrian or with the lower part of the Lower Cambrian has been discussed (Rosendahl, 1945, p. 339; Poulsen, 1956, p. 60; Neuman & Palmer, 1956; Cowie, 1961, pp. 18–19), but this problem is not important here because it does not affect the above-mentioned definitions.

The upper part of the Buen Formation contains the oldest beds in which olenellid trilobites have been observed in the Jørgen Brønlund Fjord area, and since the formation is built up of two identical sedimentary cycles the whole formation is considered to be Lower Cambrian. Consequently the Eocambrian comprises the Moræneso and the Portfjeld Formations; however, as the boundary between the Buen and Portfjeld Formations has not yet been observed the latter formation can only tentatively be included in the Eocambrian. The lower part of the Brønlund Fjord Dolomite has been placed in the Lower Cambrian because of the presence of olenellid trilobites (TROELSEN, 1956b, p. 87). The Wandel Valley Limestone is placed in the Lower Ordovician (*Ceratopaea* sp.) and the Børglum River Limestone is placed in the Middle or Lower Ordovician (*Maclurites* and bryozoans) (TROELSEN, 1949, pp. 18–19).

Four other platform areas with flat-lying Precambrian and early Palaeozoic strata are known from North Greenland and Ellesmere Island (plate 3): Bache Peninsula (TROELSEN, 1950a; CHRISTIE, 1967), Inglefield Land (KOCH, 1933; TROELSEN, 1950a; COWIE, 1961), Danmark Fjord (ADAMS & COWIE, 1953; FRÄNKL, 1955) and Dronning Louise Land (PEACOCK, 1956). In all these areas the older beds consist of a reddish or yellow, feldspathic sandstone sequence intruded by dolerites, which is followed by a carbonate or sandstone sequence without intrusions. In none of the areas has it been possible to ascertain with certainty whether there is a post-intrusive unconformity between the two sequences, but many attempts have been made to solve the problem with the aid of theoretical considerations (KOCH, 1933, p. 23; TROELSEN, 1950a, p. 19; ADAMS & COWIE, 1953, p. 16; FRÄNKL, 1955, pp. 14–16; PEACOCK, 1956, p. 36, 1958, pp. 123–124; TROELSEN, 1956b, p. 77; COWIE, 1961, p. 21; HALLER, 1961, p. 156; HALLER & KULP, 1962, p. 26; BERTHELSEN & NOE-NYGAARD, 1965, pp. 216–217; CHRISTIE, 1967, p. 55; KERR, 1967a, p. 30). However, the lack of sufficiently detailed field observations has made it impossible to solve the problem definitely. When the beds on both sides of an unconformity are concordant, it can be very difficult to detect the unconformity, even if it represents a prolonged period of erosion. In the Jørgen Brønlund Fjord area it was only during the fifth field season that the existence of the two post-intrusive unconformities above the lower sandstone sequence (Inuiteq Sø Formation) was definitely demonstrated (JEPSEN, 1969, p. 13).

In the Jørgen Brønlund Fjord area the discovery of these erosional unconformities, one of which is pre-tillitic and the other post-tillitic, has thrown light on the Precambrian and the Eocambrian stratigraphy in North Greenland. Plate 3 shows how the writer supposes that the correlation between the Jørgen Brønlund Fjord area and the Danmark Fjord area should be carried out. The Portfjeld Formation and the Fyn Sø Dolomite are lithologically very alike, and since there is apparently no unconformity between the Campanuladal Sandstones and Limestones and the Fyn Sø Dolomite (ADAMS & COWIE, 1953, p. 10), both formations are here correlated with the Eocambrian or Lower Cambrian Portfjeld Formation. The period of erosion which in the Jørgen Brønlund Fjord area has preceded the deposition of the Portfjeld Formation could have eroded away the glacial deposits, if any, above the Norsemandal Sandstone in the Danmark Fjord area. This theory is supported by the situation in the Jørgen Brønlund Fjord area, where the tillite is missing in two of the measured sections (plate 2, sections 2 and 3).

The correlation with the foreland area in Dronning Louise Land is rather hypothetical, but PEACOCK (1956, p. 36; 1958, pp. 122–123) and others have correlated the Trekant Serie with the Norsemandal Sandstone and the rocks now referred to the Inuiteq Sø Formation, and this correlation is provisionally followed by the present writer.

In agreement with TROELSEN (1950a, pp. 35–45) and CHRISTIE (1967, pp. 28–29) the correlation between Inglefield Land and Bache Peninsula has been carried out as shown in plate 3. TROELSEN (1950a, pp. 35–37) thought that the Rensselaer Bay sandstone, the Cape Leiper dolomite, and the Cape Ingersoll dolomite should be correlated with the Eocambrian, as the Cape Ingersoll dolomite is unconformably overlain by the Wulff River Formation, which contains the lowest known olenellid trilobites in Inglefield Land (KOCH, 1933, pp. 23–26). CHRISTIE (1967, p. 28) and KERR (1967a, pp. 29–31) consider that the Rensselaer Bay sandstone or at least the upper parts of it, the Cape Leiper dolomite and the Cape Ingersoll dolomite should be regarded as Lower Cambrian, as they have correlated these formations with lithological similar beds in Ellesmere Island north of Bache Peninsula, which contain Lower Cambrian trilobites. Since the total thickness of the lower unfossiliferous bed in Bache Peninsula and Inglefield Land is relatively small, one must except lacunes in the sedimentary sequence which do not exist in the neighbouring areas, and this possibility makes correlations on the basis of lithology problematic because, as mentioned above, the existence of unconformities in a sequence of concordant beds is very difficult to detect. Intrusive activity is independent of deposition or non-deposition of sediments, and therefore, as a third possibility, the present writer tentatively proposes to correlate the intrusion-veined part of the Rensselaer Bay sandstone with the intrusion-filled, Precambrian Inuiteq Sø Formation in the Jørgen Brønlund Fjord area about 800 km north-east of Inglefield Land (plate 3). A confirmation or an invalidation of this theory could possibly be obtained by radiometric dating of the intrusions.

As mentioned in chapter 2, parts of the lower unfossiliferous beds in Ellesmere Island, Inglefield Land and North and North-East Greenland have earlier been grouped with the Thule Group, which has its type area around Wolstenholme Fjord about 200 km south of Inglefield Land (KOCH, 1929, pp. 220–222; MUNCK, 1941; KURTZ & WALES, 1950; DAVIES, KRINSLEY & NICOL, 1963). CHRISTIE (1967, pp. 26–28) and

Kerr (1967a, p. 8 and 1967b, pp. 487–489), however, do not recommend the usage of the term Thule Group for any strata in areas north of the type area. They follow Koch (1929, p. 271) and consider that the Wolstenholme Fjord area lies in a distinct sedimentary basin structurally separated from the northern areas. Kerr (1967b, fig. 2) postulates an east–west trending barrier—the Bache Peninsula arch. Kerr and Christie also consider that the strata in the Wolstenholme Fjord area may be of an age different from that of the succession overlying the basement in Inglefield Land. Therefore, to prevent confusion while awaiting further field work in the area between Wolstenholme Fjord and Inglefield Land, the term Thule Group has not been used in the present paper.

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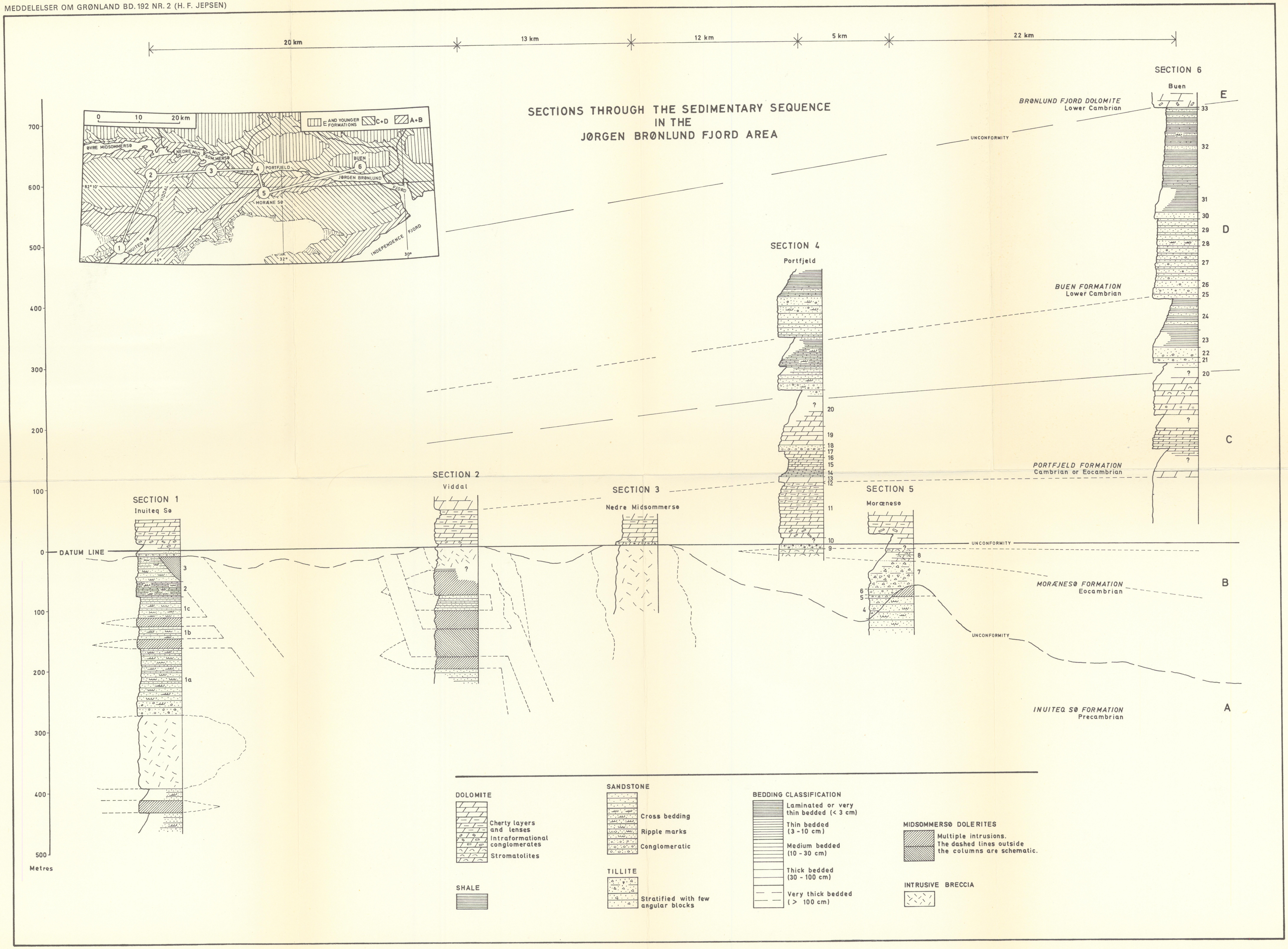
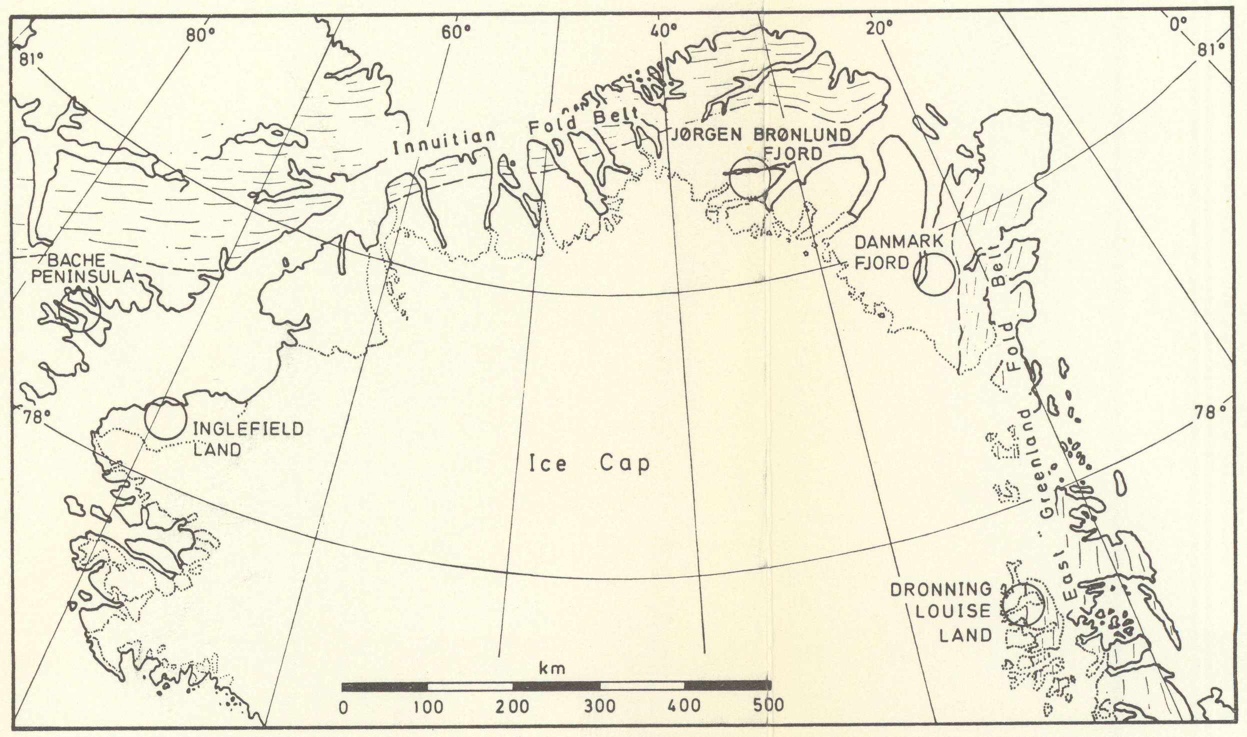
GRØNLANDS GEOLOGISKE UNDERSØGELSE
THE GEOLOGICAL SURVEY OF GREENLAND


SECTIONS THROUGH THE SEDIMENTARY SEQUENCE
IN THE
JØRGEN BRØNLUND FJORD AREA
20 km
13 km
12 km
5 km
22 km
0
10
20 km
E AND YOUNGER FORMATIONS
C+D
A+B
ØVRE MIDSOMMERSØ
NEDRE MIDSOMMERSØ
PORTFJELD
BUEN
JØRGEN BRØNLUND
FJORD
VIDDAL
MORÆNE SØ
INUITEQ SØ
INDEPENDENCE FJORD
82°10'
34°
32°
30°
SECTION 1
Inuiteq Sø
SECTION 2
Viddal
SECTION 3
Nedre Midsommersø
SECTION 4
Portfjeld
SECTION 5
Morænesø
SECTION 6
Buen
DATUM LINE
UNCONFORMITY
UNCONFORMITY
UNCONFORMITY
BRØNLUND FJORD DOLOMITE
Lower Cambrian
BUEN FORMATION
Lower Cambrian
PORTFJELD FORMATION
Cambrian or Eocambrian
MORÆNESØ FORMATION
Eocambrian
INUITEQ SØ FORMATION
Precambrian
E
D
C
B
A
700
600
500
400
300
200
100
0
100
200
300
400
500
Metres
DOLOMITE
Cherty layers and lenses
Intraformational conglomerates
Stromatolites
SHALE
SANDSTONE
Cross bedding
Ripple marks
Conglomeratic
TILLITE
Stratified with few angular blocks
BEDDING CLASSIFICATION
Laminated or very thin bedded (< 3 cm)
Thin bedded (3 - 10 cm)
Medium bedded (10 - 30 cm)
Thick bedded (30 - 100 cm)
Very thick bedded (> 100 cm)
MIDSOMMERSØ DOLERITES
Multiple intrusions.
The dashed lines outside the columns are schematic.
INTRUSIVE BRECCIA



Tentative correlation of pre-Ordovician formations in foreland areas of northern Greenland and Ellesmere Island